

Bolt Beranek and Newman Inc.



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Interim Report**

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**Identification and Classification of
Noise-Producing Household Consumer Products**

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Prepared for:
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Interim Report

IDENTIFICATION AND CLASSIFICATION OF
NOISE-PRODUCING HOUSEHOLD CONSUMER PRODUCTS

March 1978

Submitted to:

Environmental Protection Agency
Crystal Mall Building, No. 2
1921 Jefferson Davis Highway
Arlington, VA 20460

Attention: Mr. Ted Ricci

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1. INTRODUCTION AND BACKGROUND

Of the thousands of products that are used in and about the home, many generate noise which affects people to varying degrees. Some, like power saws, food waste disposers, and lawn mowers, generate noise levels that are obviously of concern to a large number of users and bystanders. The noise of others, such as refrigerators or clothes dryers, is marginally significant, while many more either are silent or create so little noise as to be of no apparent concern.

The Environmental Protection Agency (EPA), recognizing the potential for annoyance and harmful effects of noise from household appliances, has contracted with Bolt Beranek and Newman Inc. (BBN) to conduct a broad study of household product noise. BBN is conducting this study in three major parts:

- *Noise Technology* - To determine noise levels, appropriate measurement methodologies, and potential noise control technologies of significant noise sources;
- *Health and Welfare* - To determine the impact of household product noise on the public's physiological and psychological well-being;
- *Industry Overview* - To determine the structure and economic situation of the household products industry.

Because of the broad and ill-defined range of household products that could fall within the scope of this study, it is necessary to identify and classify the specific products that will be studied. This identification and classification is the subject of this report. We start by considering a comprehensive set of products; we then discuss the most significant among these.

1.1 Range of Products

Potentially noisy products used in and about the home have been divided into eight product categories:

- Household Appliances
- Power Shop Tools
- Outdoor Power Equipment
- Appliances Designed to Emit Sound
- Toys and Sporting Goods
- Heating, Ventilating, and Air Conditioning Equipment
- Plumbing Fixtures
- Electronic Entertainment Equipment.

We define them below.

Household Appliances are those electrically powered products used for a variety of functions performed within the home. Among these functions are food preparation, storage, and disposal; personal hygiene and grooming; certain aspects of environmental control; cleaning; certain crafts and hobbies; and laundry. From this category, we exclude power shop tools, which are of sufficient diversity to justify a separate category. We also exclude appliances designed to emit sound, because of the very different regulatory treatment that they would probably receive.

Household appliances are the most ubiquitous of all the product categories. They generate a wide range of noise levels. Refrigerators, for example, which are present in nearly 100% of all households, expose people to levels of only about 35 to 52 dBA. Vacuum cleaners, found in most homes, are significantly noisier at 62 to 85 dBA - levels that can interfere with sleep

and speech, and can even contribute to hearing loss under circumstances of sustained exposure or in combination with personal exposure to other noisy sources.

Power Shop Tools are those portable and fixed electrically powered tools used in a home workshop and elsewhere for cutting and processing wood, metal, and other such materials. This category includes various types of saws, drills, sanders, grinders, lathes, planers, and similar devices.

While less pervasive than household appliances, shop tools are generally noisier and can contribute more readily to hearing damage among frequent users. Noise levels of a variety of saws can generate over 100 dBA at the operator's ear, while other tools, such as sanders, routers, and grinders, generate approximately 90 dBA. Use of such tools typically precludes speech communication by the operator and bystanders and may interrupt the sleep of people in nearby rooms.

Outdoor Power Equipment is a category that encompasses motor- and engine-powered devices used for maintenance of lawns, gardens, and other outdoor areas around homes. Included are lawnmowers and trimmers, chain saws, garden tractors, leaf blowers and shredders, snow-throwers, and similar devices.

Like power shop tools, outdoor power equipment can expose operators to levels that can contribute to hearing damage. Gasoline-powered chain saws are among the noisiest, with levels at around 110 dBA. Other equipment, such as lawn mowers and shredders, often exposes users to approximately 90 dBA. Outdoor equipment also has an impact on nonusers, typically neighbors and families of equipment operators. Of particular concern in the discussion of this category is sleep interruption.

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Appliances Designed to Emit Sound generate sounds that are meant to alert or warn people in the vicinity of the device or to mask other noises. These include burglar and fire alarms, smoke detectors, alarm clocks, marine horns, and white noise emitters.

Since the purpose of warning devices is to attract the attention of people nearby, it is not surprising that they often interfere with sleep or speech. Accordingly, they require a type of evaluation different from that of products which generate sound as an unwanted by-product.

Toys and Sporting Goods comprise a broad range of devices used for entertainment and improvement of physical fitness by children and adults. Within this broad category, there are a few items which can produce significant noise levels. Children's popguns and adults' small-bore firearms are among those devices most frequently mentioned in the literature because of their hearing-damage potential. Tricycle-like vehicles with plastic wheels, small engine-powered vehicles (i.e., go-carts), and engine-powered model airplanes, boats, and cars are other examples of sources deserving attention.

Heating, Ventilating, and Air Conditioning Equipment comprises built-in units for home climate control. This category includes central heating and unitary air conditioning equipment, as well as hot water heaters. There is a fine distinction between this type of equipment and room air conditioners, portable electric heaters, and portable fans, which are normally regarded as household appliances. While HVAC equipment is not likely to cause hearing damage, there is a potential for sleep and possibly speech interference.

Plumbing Fixtures include pipes, faucets, toilets, and other devices for the distribution and metering of water within a

dwelling. Some faucets and toilets generate noise levels of approximately 60 to 65 dBA - not enough to contribute to hearing damage, but enough to disturb the sleep of people in adjacent rooms.

Electronic Entertainment Equipment comprises radio, television, high-fidelity, stereophonic, and similar equipment used for sound reproduction. Of particular concern in this category is the playing of music either through room loudspeakers or headsets at levels that are high enough to damage the listeners' hearing. In addition, transmission of such sound to neighboring rooms or to apartments in multifamily dwellings can cause sleep disturbance.

1.2 Scope of Study

While each of the above-mentioned categories deserves attention, the present study is limited to the first three: household appliances, power shop tools, and outdoor power equipment. All three of these categories have been identified by EPA as candidates for classification as major noise sources* [1]; the others have not been similarly identified.

1.3 Method of Approach

Within the three categories identified for this study, there are hundreds of products which may produce noise. To narrow this range to a manageable number of significant products, we have

*EPA actually identified two categories: "lawn care" and "household appliances." The lawn care category comprises a number of products including snow and leaf blowers, and corresponds to our category "outdoor power equipment." The EPA household appliances category includes home shop tools, which we have separated out as "power shop tools."

devised a two-stage classification process, illustrated in Fig. 1. The first stage involves identifying, classifying, and screening all possible products on the basis of somewhat subjective criteria and in the absence of concrete noise and usage data. The second stage relies on more rigorous criteria and experimental data to perform a final classification.

Products are identified through a review of the retail and industry literature, as well as through interviews with industry associations. From these sources, we prepare a comprehensive list of products which are then screened on the basis of:

- Primary use -- by private consumers or by industrial or commercial operators;
- Determination of whether noise is of any apparent concern;
- Other special aspects of product design, usage, or installation.

Products that emerge as candidates for further investigation are (1) defined and described in detail and (2) classified further on the basis of noise and usage data and more precise and stringent criteria than used for the preliminary screening.

1.4 Organization of Report

The remainder of this report is arranged in three major sections and an appendix. Section 2 deals with the preliminary product identification, classification, and screening. In Sec. 3, we provide a one-page definition and description of each product. Section 4 discusses and demonstrates the final classification of products into groups. Noise data on approximately 50 products, which had to be acquired to conduct the final classification, are given in Appendix A.

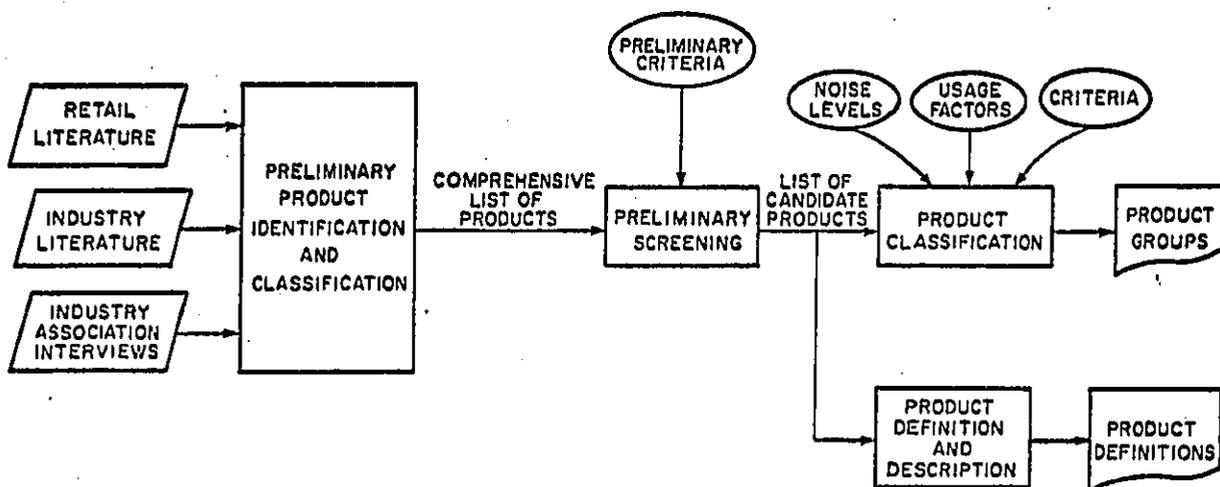


FIG. 1. CLASSIFICATION PROCESS.

2. PRELIMINARY IDENTIFICATION AND CLASSIFICATION

The first step in the preliminary identification and classification is to obtain and review sources of information in the literature and among experts in the field. Accordingly, we reviewed the following sources of retail, industry, and other literature:

- Sears Roebuck and Company, *Merchandise Catalog, Fall-Winter 1977*
- *Appliance Manufacturer, 1977-1978*, Annual Directory of the Appliance Industry (June 1977)
- *Hardware Age*, Buyer's Guide Issue (Dec. 1976)
- Simone L. Yaniv *et al.*, "Procedure for Assessing Impact on Public Health and Welfare Due to Noise Emitted by Household and Consumer Products," National Bureau of Standards Report (Sept. 1977) (unpublished).

In addition, we interviewed representatives of three industry associations:

- Association of Home Appliance Manufacturers (AHAM)
- Power Tool Institute (PTI)
- Outdoor Power Equipment Institute (OPEI)

Once the household product field was determined, those items which were obviously not noise sources (e.g., clothing, linens, bedding products, etc.) were eliminated from further consideration. This task was carried out by a BBN team, and whenever ambiguity arose regarding the noise characteristics of given items (e.g., electric blankets), those items were included for further analysis.

Criteria for Preliminary Product Screening

Products first selected as possible noise sources were next screened to determine candidates for more detailed analysis. Three criteria were established for excluding items from further study:

1. *Products are primarily purchased for, and used in, commerce and industry.* This criterion was established because the study focuses on *consumer* products.
2. *Noise levels are of no apparent concern.* This criterion allowed products to be excluded on the basis of qualitative guidelines, thereby eliminating the need for expensive testing of products which are unlikely to be of concern. Here, again, a team of BBN personnel made decisions regarding product exclusion.
3. *Other.* This was a general category of exclusion, which included products with noise characteristics that are overwhelmingly user-dependent and products which emit structureborne, rather than airborne, sound.

Tables 1 through 3 list 175 products that fall within the scope of the study. Of these, 3 have been merged into a single product type, and 82 have been excluded on the basis of the criteria discussed above, leaving 91 products for further evaluation.

TABLE 1. HOUSEHOLD APPLIANCES.

Item	Include In Study	Reasons for Exclusions		
		Primarily Industrial or Commercial	Noise of No Apparent Concern	Other
Air Deodorizer/Ionizer			x	
Air Heater	x			
Aquarium Air Compressor	x			
Blanket, elec			x	
Blender, elec	x			
Calculator Printer			x	
Camera, Movie			x	
Camera, Still			x	
Can Opener, elec	x			
Carpet & Rug Steam Cleaner		x		
Clothes Dryer	x			
Clothes Washer	x			
Clock	x			
Coffee Grinder/Mill	x			
Coffee Maker, elec			x	
Coffee Urn/Percolator, elec			x	
Corn Popper			x	
Deep Fryer			x	
Dehumidifier	x			
Dental Irrigator	x			
Dishwasher	x			
Electronic Air Cleaner			x	
Facial Brush, elec	x			
Facial Sauna			x	
Fan	x			
Fired Fireplace log, gas			x	
Floor Polisher/Waxer	x			
Floor Sander		x		
Food Chopper	x			
Food Grinder	x			

TABLE 1 (Cont'd.).

Item	Include In Study	Reasons for Exclusions		
		Primarily Industrial or Commercial	Noise of No Apparent Concern	Other
Food Mixer	x			
Food Processor	x			
Food Slicer	x			
Food Warmer			x	
Food Waste Disposer	x			
Freezer	x			
Fry Pan, elec			x	
Grille, gas			x	
Hair Clippers, elec	x			
Hair Dryer	x			
Hair Setter			x	
Hair Styler			x	
Hamburger Maker, elec			x	
Hand Kitchen Utensils				x*
Heating Pad			x	
Hot Dog Maker, elec			x	
Hot Lather Dispenser	x			
Humidifier	x			
Ice Cream Maker	x			
Ice Crusher, elec	x			
Juicer, elec	x			
Incinerator			x	
Knife, elec	x			
Knife Sharpener	x			
Manicure Set	x			
Massager	x			
Movie Projector	x			
Microwave Oven			x	
Oven Broiler			x	
Pastry Gun, elec			x	

*Hand kitchen utensils are not considered because noise levels are not generally high, are significantly dependent on users, and cannot readily be measured under controlled conditions.

TABLE 1 (Cont'd.).

Item	Include In Study	Reasons for Exclusions		
		Primarily Industrial or Commercial	Noise of No Apparent Concern	Other
Pencil Sharpener, elec	x			
Pet Clipper, elec	x			
Plastic Film Sealer			x	
Range, elec			x	
Range, gas			x	
Range Hood	x			
Refrigerator	x			
Roaster Oven			x	
Room Air Conditioner	x			
Rotisserie			x	
Rug Shampooer	x			
Scissors, elec	x			
Sewing Machine	x			
Shaver, elec	x			
Shoe Polisher, elec	x			
Slide Projector	x			
Slow Cooker, elec			x	
Steam Bath, portable			x	
Steam/Spray Iron			x	
Telephone Answering System			x	
Toaster			x	
Toaster Oven			x	
Tooth Brush, elec	x			
Trash Compactor	x			
Typewriter, elec.	x			
Vacuum Cleaner	x			
Vaporizer	x			
Waffle Grill			x	
Whirlpool Bath			x	

TABLE 2. HOME SHOP TOOLS.

Item	Include In Study	Reasons for Exclusion		
		Primarily Industrial or Commercial	Noise of No Apparent Concern	Other
Air Drive Chipping Hammer		x		
Air Drive Drill		x		
Air Drive Impact Hammer		x		
Air Drive Impact Wrench		x		
Air Drive Orbital Sander		x		
Air Drive Power Chisel		x		
Air Drive Ratchet & Wrench Kit		x		
Airless Paint Sprayer		x		
Arc Welder		x		
Band Saw	x			
Belt Sander	x			
Bench Grinder	x			
Chipper Cleaner		x		
Circular Saw	x			
Disc Sander	x			
Drill Bit Sharpener	x			
Drill, elec	x			
Drill, multipurpose	x			
Drill Press	x			
Engraving Pen, elec	x			
Flameless Heat Gun		x		
Hand Tools - All				x*
Impact Tools, elec	x			
Jointer/Planer	x			
Lathe	x			
Miter Box, power	x			
Motors, elec			x	
Nail Gun, power		x		
Orbital Sander	x			

*Hand tools are not considered because noise levels are not generally high, are significantly dependent on users, and cannot readily be measured under controlled conditions.

TABLE 2 (Cont'd.).

Item	Include In Study	Reasons for Exclusion		
		Primarily Industrial or Commercial	Noise of No Apparent Concern	Other
Paint Sprayer, elec			x	
Polisher	x			
Power Shears		x		
Radial Arm Saw	x			
Reciprocating Saw	x			
Rotary Grinder	x			
Router	x			
Saber Saw	x*			
Sand Blaster		x		
Saw Sharpeners		x		
Scroller	x*			
Shaper		x		
Spray Gun			x	
Stapler, elec	x			
Table Saw	x			
Vibration Sander	x			
Welder		x		
Winch, power		x		

*Classified as reciprocating saw.

TABLE 3. OUTDOOR, LAWN, AND GARDEN EQUIPMENT.

Item	Include In Study	Reasons for Exclusion		
		Primarily Industrial or Commercial	Noise of No Apparent Concern	Other
Air Compressor, gas		x		
Air Cooled Replacement Engines	x			
Antenna Rotor			x	
Bug Killer, elec				x*
Brush Cutter, power	x			
Cement Mixer		x		
Chain Saw	x			
Edger Trimmer	x			
Engine Generator		x		
Fence-Hole Digger, gas		x		
Fiberglass Waterfall/ Fountain			x	
Garage Door & Opener				x†
Garden Tractor	x			
Hand Tools, Lawn & Garden				x**
Hedge Trimmer, elec	x			
Insect Fogger			x	
Lawn Mower, riding	x			
Lawn Mower, walk behind	x			
Lawn Thatcher	x			
Log Splitter, gas		x		
Metal & Mineral Detector			x	
Outdoor Barbeque			x	
Planter/Fertilizer (acc. to tractor)			x	
Leaf Blower	x			
Portable Outdoor Heater	x			
Power Lawn Sweeper	x			
Power Shears	x			
Power Sprayer			x	

TABLE 3 (Cont'd.).

Item	Include In Study	Reasons for Exclusion		
		Primarily Industrial or Commercial	Noise of No Apparent Concern	Other
Pump Sprayer			x	
Rotary Tiller	x			
Shredder	x			
Snow Thrower	x			
Swimming Pool Aerator			x	
Swimming Pool Pump			x	
Swimming Pool Vacuum Cleaner			x	
Vacuum Collector, lawn	x			
Weed Cutter, elec	x			

*Primary noise source often involves insect electrocution which cannot readily be measured in a controlled manner.

† Structureborne sound probably dominates transmission to adjacent living space. Thus an acoustical measurement of the mechanism would not be meaningful.

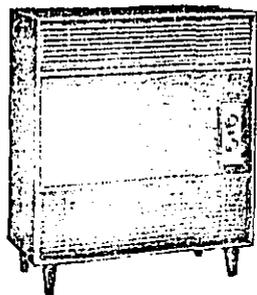
**Hand tools are not considered because noise levels are not generally high and are significantly dependent upon users and cannot readily be measured under controlled conditions.

3. PRODUCT DESCRIPTION

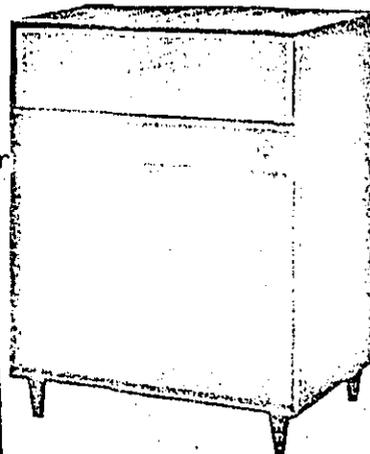
Because almost every product identified in Tables 1 through 3 will be the subject of further study and of possible regulation, each must be described as completely and unambiguously as possible. In this section, a one-page pictorial and written description is given of the products identified for further study. The description encompasses a definition, a discussion of sizes and types, and an identification of typical usage.

Products are organized in alphabetical order within each of the major categories.

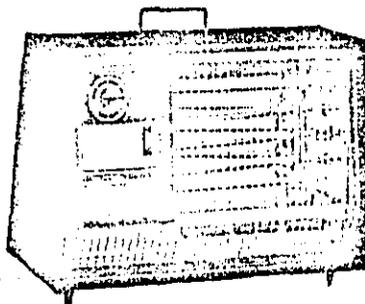
AIR HEATERS



Gas Heater



Oil
Heater



Electric Heater

Definition:

An air heater is a device which produces and distributes heat in a room, using electrical resistance, natural gas, or fuel oil. Fins may be used to add heat dissipating area. Heaters may also include an electric blower or fan to circulate the heat.

Types, Sizes, and Power:

Electrical heaters may have exposed resistor coils mounted on insulators, metallic resistors embedded within refractory insulation encased in a protective metal sheath, or a printed circuit encased in glass sheets. Gas and oil heaters have valves to control the fuel input, and automatic safety features. Sizes range from 18 x 5 x 12 inches high to 40 x 32 x 20 inches high.

Electric heaters are usually smaller, gas heaters mid-size, and oil heaters larger. Typical power range is 1320 to 1500 watts.

Usage:

Air heaters warm cold rooms and areas where extra heat is desired.

AQUARIUM AIR COMPRESSOR

Definition:

An aquarium air compressor is a pump which forces air in fine bubbles through the water of an aquarium.

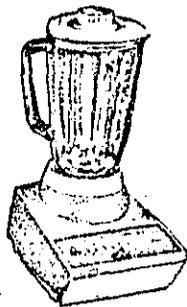
Types, Sizes, and Power:

Aquarium pumps are differentiated by the motor size, which is directly related to the pumping capacity. Typical motor sizes range from 3 to 8 watts.

Usage:

Aquarium air compressors add dissolved oxygen for the fish and induce a slow circulation of the tank water to prevent stagnation.

BLENDER, ELECTRIC



Definition:

A blender is a motor-driven electrical appliance which reduces solid food to smaller particles, and blends liquids and mixtures by the slicing and mixing action of rotating blades within a container designed for the self-feeding of the ingredients into the blades.*

Types, Sizes, and Power:

There are four types of blenders:

1. Single-speed Blender - designed to perform all blending operations at one speed.
2. Multiple-speed Blender - designed with several speeds or with a variable speed control to perform a variety of blending jobs.

3. Blenders with Timers - provided with a built-in timing device for controlling the time sequence of the blender.

4. Solid State Blender - uses solid state circuitry to produce speed and/or time functions.*

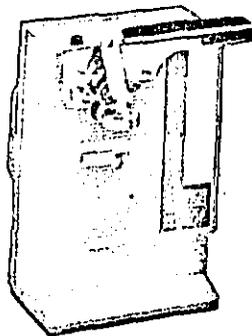
Container capacity is usually 40 to 44 ounces. Typical size is around 9 x 6-1/2 x 14 inches high. Typical power range is 350 to 720 watts.

Usage:

A blender chops, grinds, shreds, grates, purees, liquifies, blends, and aerates liquids and mixtures.

*"AHAM Standard Method for Measuring Performance of Household Electric Food Blenders FB-1," AHAM, November 29, 1977, p. 1

CAN OPENER, ELECTRIC AND CAN OPENER KNIFE-SHARPENER



Definition:

A can opener is a motorized appliance which is intended to rapidly open several cans in succession, but is not intended for continuous operation.* It typically contains a slicing wheel to pierce and slice open the metal, a motor-driven toothed wheel to rotate the can and brace the can edge as it is cut, a magnet to hold the top of the can, and a lever to fasten the can in position and activate the motor. This category includes can opener/knife sharpener.

Types, Sizes, and Power:

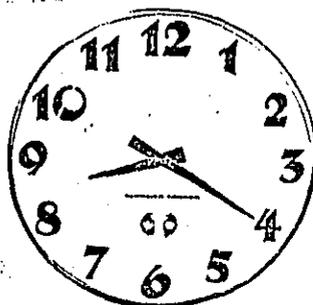
Can openers are differentiated by features such as a knife-sharpener (usually installed in the back) and automatic shut-off. Can openers range from 3-1/2 x 4 x 7-3/8 inches high to 5-1/2 x 4 x 7-3/8 inches high. A home electric can opener should be able to open cans from 2-1/8 inches (53.8 mm) in diameter to 5-1/8 inches (130.2 mm) in diameter. Typical wattage is 100.

Usage:

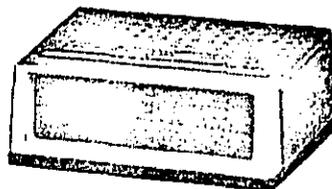
Can openers are used in the kitchen to open cans containing food.

*"AHAM Standard Method for Measuring Performance of Household Electric Can Openers", AHAM, November 28, 1977, p.1.

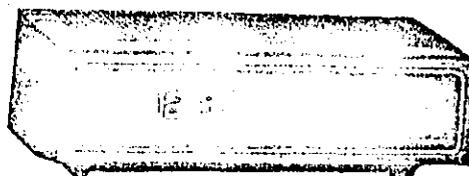
CLOCK, ELECTRIC



Moving-Hands



Electronic Digital



Electric Digital

Definition:

A clock is a time indicating device operated from either electric household current, batteries, or mechanical spring winding. Alarm clocks feature a device capable of issuing an audible and/or visible signal at a pre-set time.*

Sizes and Types:

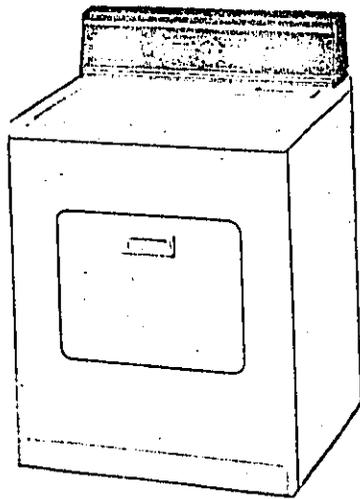
Three general types of clocks are traditional moving-hands clocks, electric digital clocks that mechanically change the indicated numbers, and electronic clocks which reveal the time by a liquid crystal or light-emitting diode display.

Usage:

Clocks indicate the time of day, measure time intervals, and (with alarm clocks) give a signal at a pre-set time.

*"AHAM Standard Method for Measuring Performance of Household Electric and Battery Operated Clocks C-1," Confidential Draft, AHAM, September 23, 1977, p. 2.

CLOTHES DRYER



Definition:

A clothes dryer is a power-driven machine for drying fabrics by evaporation through the use of various combinations of heat, air flow and tumbling.*

Types, Sizes, and Power:

Two types of energy sources for dryers are electricity and natural gas. Dryers are also differentiated by whether they shut off after a certain time interval or after the attainment of a certain temperature. Capacity is usually 8 to 9 lbs dry weight

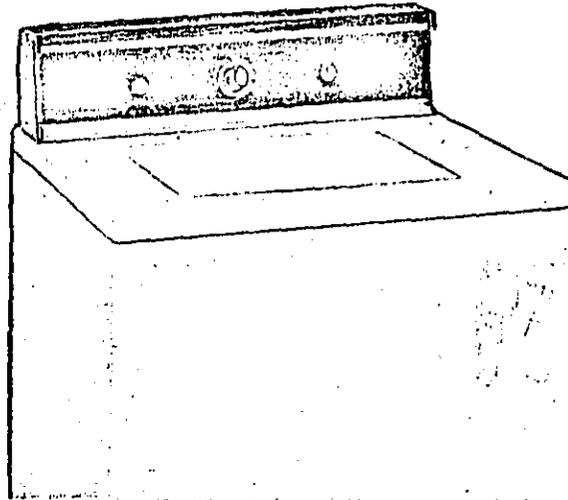
*Encyclopedia Britannica, "Home Equipment".

of clothes, and the dryer can remove 8 to 12 lbs of water per hour. Typical size is 29 x 27-1/2 x 43 inches high. Typical power range is 5200 to 5600 watts for electric dryers, 400 watts for the electric starter on natural gas dryers.

Usage:

Drying clothes.

CLOTHES WASHER



Definition:

A clothes washer is a power-driven machine for washing fabrics in water.*

Types, Size, and Power:

Clothes washers are differentiated by many features including cubic-foot capacity, number of speeds and temperature settings, number and type of cycles, and type of agitator. Almost all clothes washers have automatic cycles, including

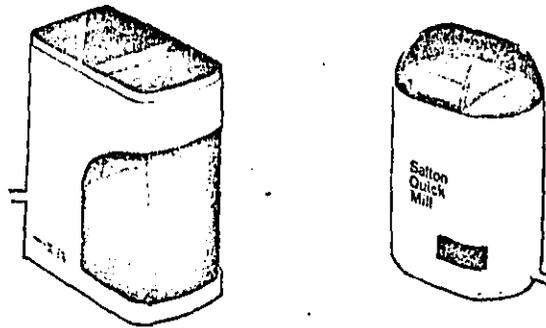
*"American National Standard A197.2, Plumbing Requirements for Home Laundry Equipment," American Society of Sanitary Engineers and AHAM, March, 1970, p. 3.

spin and rinse cycles. Typical size ranges from 24 x 20 x 32 in. high to 29 x 26 x 43 in. high. Typical power ranges from 600 watts to 840 watts.

Usage:

Clothes washers wash, rinse, and spin clothes and other cloth goods.

COFFEE GRINDER



Definition:

A coffee grinder is a motor-driven appliance which reduces roasted coffee beans to smaller particles, by the slicing action of rotating blades designed for the self-feeding of the coffee beans into the grinding area. Small powered food mills are included in this definition.

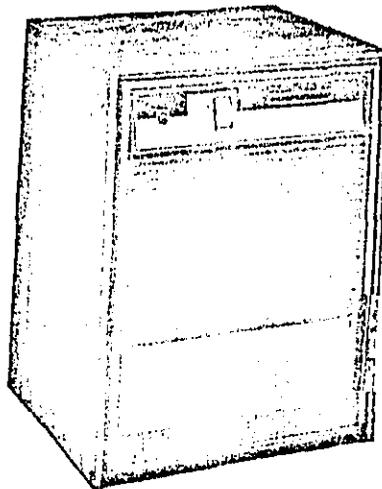
Types, Sizes, and Power:

Coffee grinders are differentiated by the number of settings (up to seven, typically), and by the capacity of food they can grind (up to twelve cups). Typical Size is 3 x 4 x 6 ins. high, and typical power is 100 watts.

Usage:

Coffee mills grind coffee and other foods. Because they are smaller and easier to clean than food grinders or food processors, they are suitable for fast grinding of small quantities of coffee or food.

DEHUMIDIFIER



Definition:

A dehumidifier is a self-contained, electrically operated, mechanically-refrigerated appliance consisting of:

1. A refrigerated surface (evaporator) on which moisture from the atmosphere condenses.
2. A refrigerating system, including an electric motor.
3. An air circulating fan.
4. A drain arrangement for collecting and/or disposing of the condensate.*

*"American National Standard, Dehumidifiers, B149.1-1972," American Association of Home Appliance Manufacturers (AHAM), July 11, 1972, p. 6.

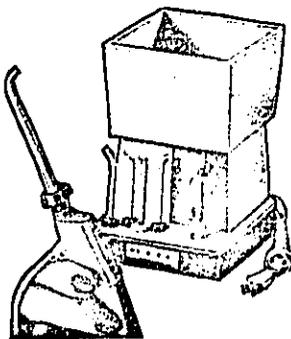
Types, Sizes, and Power:

Dehumidifiers are differentiated mainly by capacity for removing moisture from the air. 14, 20, 30 and 35 pint-per-hour capacity is most often found. Sizes range from Typical power range is from 240 watts to 560 watts.

Usage:

Dehumidifiers remove moisture from household air.

DENTAL IRRIGATOR



Definition:

A dental irrigator is an electrically-powered device which pumps a pulsating jet of water through a removeable jet tip onto the teeth and gums.

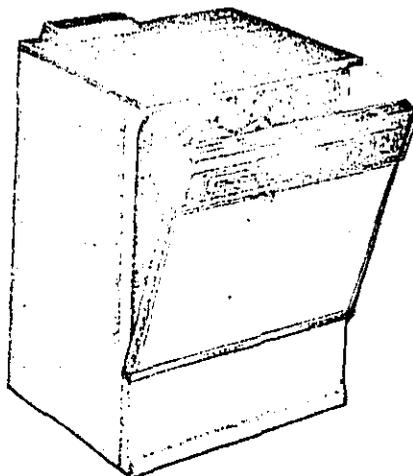
Types, Sizes, and Power:

Dental irrigators are differentiated by the number of water pressure settings (up to five settings are common). Typical power range is from 35 to 95 watts.

Usage:

Dental irrigators remove food particles from between teeth and massage the gums.

DISHWASHER, HOUSEHOLD



Definition:

A household dishwasher is a device which, with the aid of water, washes, rinses and dries (where drying process is included) dishware, glassware and cutlery, and most cooking utensils by chemical, mechanical, and/or electrical means and discharges to the plumbing drainage system. A blower dries the dishes with cool room air, or with air heated by a heating element.*

Types, Sizes, and Power

Dishwashers are differentiated by number of washing periods (one, two or three wash periods), and by the presence of pots

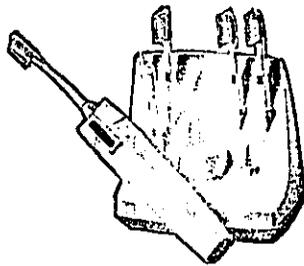
*"American National Standard, Plumbing Requirements for Household Dishwashers A1971-1973," American Soc. of Sanitary Engineers/AHAM, March, 1971, p. 3.

and pans wash cycle. Typical sizes range from 24 x 24 x 34 inches high, to 24 x 26 x 38. Typical power range for heating element is 750 watts.

Usage:

Dishwashers wash, rinse and dry most kitchen and dining utensils.

ELECTRIC TOOTHBRUSH



Definition:

An electric toothbrush is a motor driven hand-held electric grooming aid which brushes the teeth by a rapid back and forth movement in a detachable toothbrush.

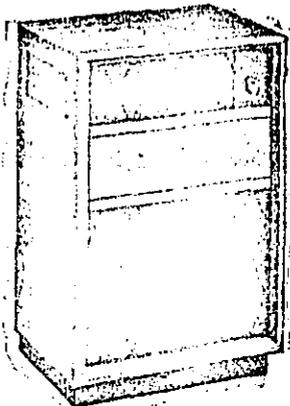
Types, Sizes, and Power:

Toothbrushes either have a permanent cord attached to the toothbrush handle or have a battery in the handle which is recharged in the electrically-powered base. Some have both up-down and side-to-side action, while others only have one type of action. Power ranges around two to 5 watts, typically.

Usage:

Electric toothbrushes clean and polish teeth and massage gums.

ELECTRONIC AIR CLEANER



Console Air Cleaner

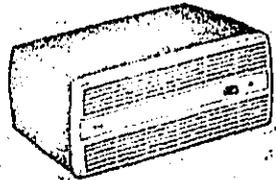


Table-Top Air Cleaner

Definition:

An electronic air cleaner is an electrical device which removes dust and smoke from the air by giving the particles an electric charge in passing through an ionizing zone, then collecting them when they pass between oppositely charged plates.*

Types, Sizes, and Power:

Electronic air cleaners are differentiated according to their capacity for cleaning square feet of room air (8 ft ceiling typically assumed). Small table-top air cleaners clean up to around 275 square feet; larger console air cleaners clean up to

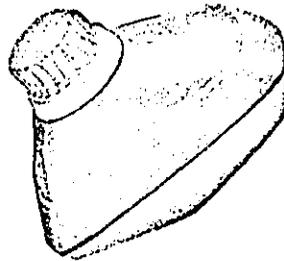
*Encyclopedia Britannica, "Home Equipment".

around 725 square feet. Sizes range from around 16-3/4 x 10-7/8 x 7-15/16 inches high, to around 17 x 14 x 26 inches high. Typical power range is from 85 watts to 175 watts.

Usage:

Electronic air cleaners remove dust, pollen, smoke and extremely fine particles from household air.

FACIAL BRUSH, ELECTRIC



Definition:

A facial brush is a hand-held electric grooming device which uses soft rotating brush(es) or other surface to clean and stimulate facial skin.

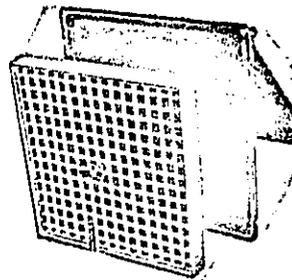
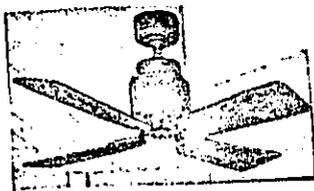
Types, Sizes, and Power:

Most facial brushes use a rotating brush, but a rotating disc containing soft rubbery "finger tips" is featured on some models. Facial brushes are either powered by house current, rechargeable batteries or standard batteries. Typical power range is around 2 watts.

Usage:

Facial brushes, when used with cleansers and water, clean make-up and dirt from skin, and stimulate skin circulation.

FAN



Definition:

A fan is a motor-driven electrical appliance which uses rotating blades to circulate air.

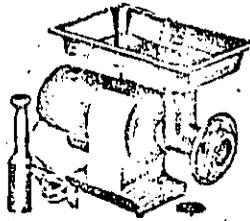
Types, Sizes, and Power:

Fans can be categorized as either free-standing, through-wall type, or duct-connected (usually installed in ceiling) type.

Usage:

Fans are used to circulate air to keep temperatures consistent, to provide a sensation of coolness to those nearby, and to ventilate cooking and other odors to the outside.

FOOD CHOPPER.



Definition:

A food chopper is a motor-driven electrical appliance which reduces food to smaller particles, by the slicing action of rotating blades within a container designed for self-feeding of the ingredients into the chopping area.

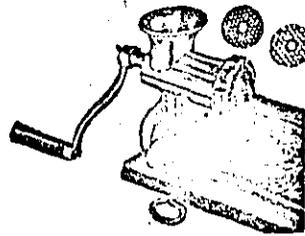
Types, Sizes, and Power:

Choppers are differentiated by number and types of attachments, and by capacity of food per minute. For example, some choppers can handle 5 lbs of food per minute, others can handle up to 8 lbs of food per minute. Typical size is 18-1/2 x 10-1/2 x 15-1/4 inches high. Typical power range is 480 to 675 watts.

Usage:

Food choppers chop, shred, grate and mince food.

FOOD GRINDER



Definition:

A food grinder is a motor-driven electrical appliance which, by a rotating screw presses food against a flat plate with many holes. Typically, a cutter blade behind the plate chops the food.

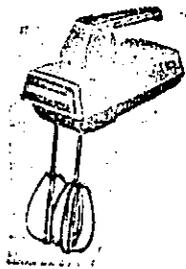
Types, Sizes, and Power:

Grinders differ by number of blades and number and type of attachments. Typical size varies from 6 x 4-1/2 x 9 inches high to 7-3/4 x 4-1/2 x 11-1/2 inches high. Typical power range is around 370 watts.

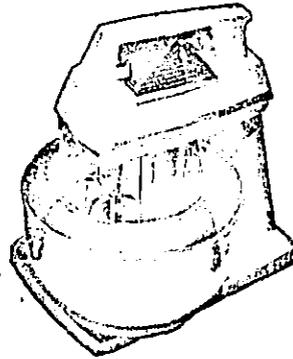
Usage:

With fine plates a food grinder can produce ground raw meat. Coarser plates process cooked meat, nuts, dried fruits and vegetables.

FOOD MIXER



Hand Mixer



Stand Mixer

Definition:

A motor-driven electrical device incorporating one or more power-driven beaters which may be detachable.*

Types, Sizes, and Power:

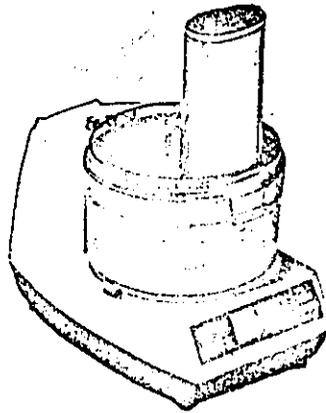
Hand-held mixers feature three to five mixing speeds, and a convenient hand-grip. Stand mixers feature a stand which positions the beater inside a suitable bowl during the food-mixing function. Stand-hand mixers can convert to hand-held or stand use. Stand mixers often feature dough hook attachments, up to ten speeds, and more power. Stand-hand mixers adapt to either stand or hand use. Typical power range is 125-150 watts.

Usage:

Food mixers blend liquids and whip cream, egg whites, or other liquids to a fluffy, aerated state.

*"AHAM Standard Method for Measuring Performance of Household Electric Food Mixers FM-1" Confidential Draft, AHAM, September 28, 1972, p. 2

FOOD PROCESSOR



Definition:

A motor-driven electrical appliance which uses different attachments, speeds, and timing to slice, chop, shred, grate, grind, puree, liquify, blend and whip ingredients.

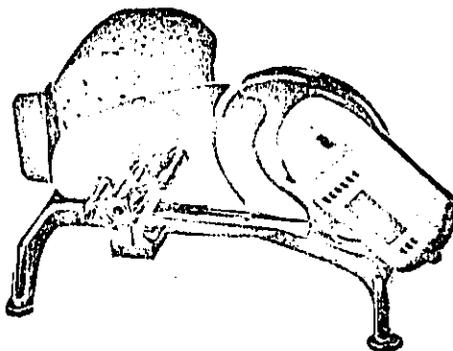
Types, Sizes, and Power:

Food processors are differentiated chiefly by number of speeds, available processing capabilities, and capacity. Not only are food processors generally larger than food mixers and blenders, they are often more powerful, with a typical power range of 200-700 watts.

Usage:

Food processors slice, chop, shred, grate, grind, puree, liquify, blend and whip ingredients.

FOOD SLICER



Definition:

A motor-driven electrical appliance which slices food by a rotating steel disc-shaped blade. The food is fed into the blade by gravity, by hand pushing (using a protective shield), or by a food clamp.

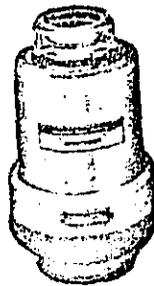
Types, Sizes, and Power:

Slicers are usually differentiated by diameter of the steel slicing wheel, and by whether the body of the unit is plastic or steel. Typical sizes range from 9-1/2 x 7-1/2 x 15-1/2 inches high to 19-1/2 x 12-1/2 x 9-3/4 inches high. Usual diameter of slicing wheel is around 7-1/4 to 7-1/2 inches. Typical power range is from 100 to 120 watts.

Usage:

Electric slicers slice meat, cheese and other foods in slices of variable thickness.

FOOD WASTE DISPOSER



Definition:

A device that reduces food waste to particle sizes which, with the aid of water, are discharged into the plumbing drainage system.*

Types, Sizes, and Power:

Food disposers come in two types:

1. Batch feed type: a disposer which is first loaded with food waste and requires the locating of a device, (usually used also as a sink stopper) in the feed opening of the disposer in such a position that the disposer is energized.*
2. Continuous feed type: a disposer type which may be loaded with food waste continuously.*

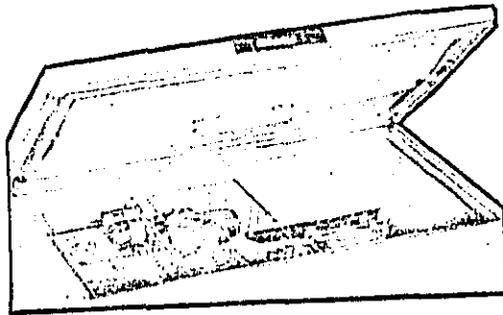
*American National Standard A1973-1973, "Plumbing Requirements for Household Food Waste Disposer Units," American Soc. of Sanitary Engineers/Association of Home Appliance Manufacturers, Issued March, 1970, p. 5.

Typical sizes range from 6 5/8 inches in diameter, 13 5/16 inches high, to 9 1/2 inches in diameter, 16 1/2 inches high. A typical water load uses around 400 watts.

Usage:

Food waste disposers shred and discharge food waste.

FREEZER, HOUSEHOLD



Definition:

A household freezer is a refrigerated cabinet which is intended for household use and is designed for the extended storage of frozen food at a recommended temperature of 0°F (-17.8°C) and with inherent capability for freezing of food.* This category does not include refrigerator-freezers.

Types, Sizes, and Power:

Freezers come in upright and chest-type models, and are differentiated by amount of interior space and into frostless and conventional defrost types. Upright and chest-type models both typically range from 6 cubic feet to over 30 cubic feet.

Usage:

Household freezers freeze food and ice and store the frozen food and ice at temperatures generally around 0°F.

*Adapted from "Refrigerator-Freezer Standard and Recommended Levels of Performance HRF-1," Confidential Draft, AHAM, June 13, 1977, p. 6.

HAIR CLIPPERS



Definition:

A hair clipper is a hand-held electric grooming device which cuts human hair using rapid back-and-forth movement of a blade. Comb-like cutting guides permit consistent trimming at various hair lengths.

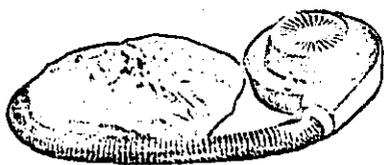
Types, Sizes, and Power:

Hair clippers are categorized by power capacity, by the type of attachments available, and by the type of motor (pivot or magnetic). Typical power is around 12 watts.

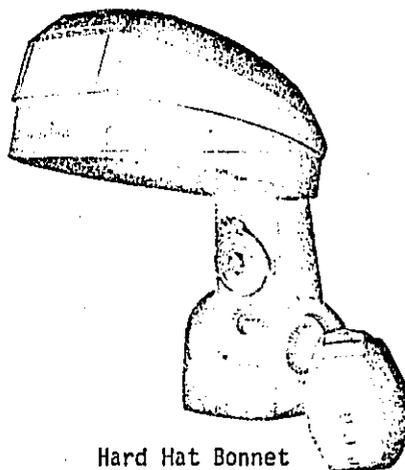
Usage:

With proper attachments, hair clippers shape, trim, cut, and style hair.

HAIR DRYER, BONNET



Flexible Hose Bonnet
Hair Dryer



Hard Hat Bonnet
Hair Dryer

Definition:

Three types of bonnet hair dryers are defined as follows by the AHAM:

1. Soft bonnet hairdryer with flexible hose. A hairdryer consisting of a flexible bonnet which is supported by the head and is connected by a flexible hose to a heater and blower assembly which is supported by external means.
2. Soft bonnet hairdryer with motor, fan, and heater as an integral part of the bonnet: A hairdryer consisting of a flexible bonnet which is supported by the head with motor, fan, and heater as an integral part of the bonnet.

3. Hard hat bonnet hairdryer: A hairdryer containing a rigid drying hood which is supported by external means.*

Types, Sizes, and Power:

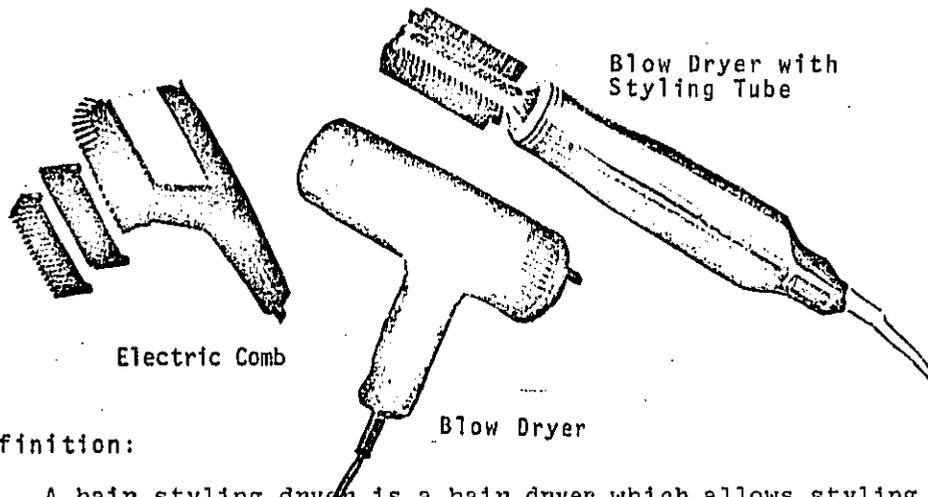
Within each of the above categories, the hairdryers are differentiated by wattage and by number of speed and heat settings. Typical power for the soft bonnet with flexible hose is 400 watts, while the hard-hat bonnet hairdryer ranges around 1400 watts.

Usage:

Bonnet dryers quickly and uniformly dry hair or wigs, and are especially useful for drying hair or wigs in curlers. The bonnet leaves the hands and attention free for other tasks.

*"AHAM Standard Method for Measuring Performance of Household Electric Hairdryers," Confidential Draft, AHAM, November 16, 1977, p. 2.

HAIR STYLING DRYER, ELECTRIC



Definition:

A hair styling dryer is a hair dryer which allows styling while drying hair by the application of heated, blown air.

Types, Sizes, and Power:

Hair Styling Dryers come in three main types: electric combs, blow dryers, and styling wands.

According to the AHAM, an electric comb is: A hairdryer designed to be supported in whole or in part by the hand while drying hair. It contains grooming and/or styling attachments designed to be in contact with the hair. Units blow hot air directly from the power unit through the comb or brush attachment.*

Blow dryers, on the other hand, dry hair by a directed stream of forced, heated air. Standard blow dryers do not contain grooming or styling attachments. The addition of an air

funnel and a styling tube attachment (with comb or brush), however, has been used by some manufacturers to give the user both blow dryer and electric comb use. Both the standard blow dryer and the styling blow dryer with tube are used so that the power unit is further from the ear than the electric comb. Styling blow dryers should, for noise purposes, be classified with the blow dryer.

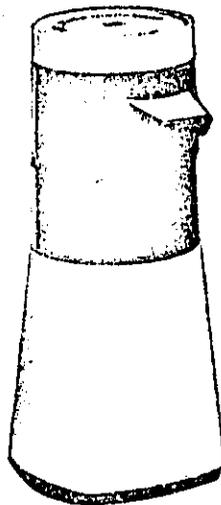
Styling wands are slimmer, and lower in power than electric combs or blow dryers. They may apply direct or blown heat and, sometimes, a water mist to the hair.

Electric combs, blow dryers, and styling wands are categorized by power level and the variety of heat and speed settings available. Styling wands are also differentiated by whether or not they feature mist. Electric comb power usually ranges from 700 to 1000 watts. Blow dryers equipped with styling tubes range around 1000 watts. Standard blow dryers have a typical power range of 1100 to 1500 watts. Styling wands usually range from 90 to 300 watts.

Usage:

Electric combs quickly dry and style hair, using a number of attachments (comb, brush, etc.). Blow dryers with styling wands have similar usage. Standard blow dryers are used with a separate nonpowered brush to dry and style hair. A blow dryer's concentrated air stream makes spot drying easy. The gentle heat (and mist production, in some models) of styling wands make them most appropriate for quick restyling and shaping of dry hair.

HOT LATHER DISPENSER



Definition:

A hot lather dispenser is an electrically powered grooming device which uses electrical resistance to heat shaving lather.

Types, Sizes, and Power:

Hot lather dispensers are differentiated by size, wattage, and physical method of heating the lather. While some are merely a cap which heats lather emerging from a separately purchased lather can, others are large enough to heat a shaving can within the device. Power for the simplest types averages around 50 watts; larger types, measuring around 4 x 3-1/2 x 8-1/2 ins. high have typical power of around 140 watts

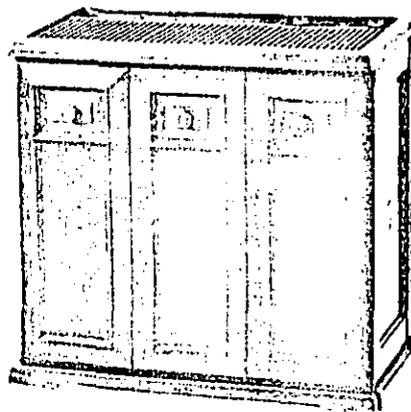
Usage:

Hot lather dispensers heat lather for better hair or beard-softening properties before shaving.

HUMIDIFIER



TABLE-TOP HUMIDIFIER



CONSOLE HUMIDIFIER

Definition:

A humidifier is an encased assembly which can be used to add moisture directly to the air within a building enclosure without requiring connection to a separate system for heating, cooling, distribution or otherwise heating circulated air within the building enclosure.*

Types, Sizes, and Power:

Humidifiers are differentiated by gallons of water output per day and by the number of fan speeds available (one, two or three). Gallon output range is from under three gallons to over

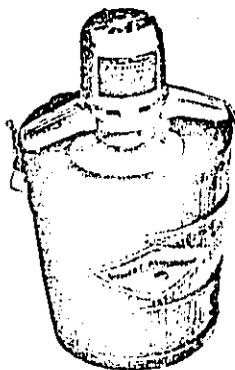
*"American National Standard, Humidifiers, Z235.1-1972," AHAM, November 22, 1972, p. 5.

seventeen gallons per day. Typical size range is from 14 x 10 x 18 inches high to 30 x 19 x 29 inches high. Typical power range is from 47 watts to 200 watts.

Types, Sizes, and Power:

A humidifier adds moisture to the air to prevent the drying of nasal passages, reduce static electricity, and keep furniture and plants from drying out.

ICE CREAM MAKER, ELECTRIC



Definition:

An electric ice cream maker is a cylindrical container which chills and whips a sweetened creamy mixture. An outer ring of ice and salt is normally used for cooling, and rotating blades provide the whipping action.

Types, Sizes, and Power:

Ice cream makers are categorized by ice cream making capacity. Most freezers have 4-quart or 6-quart capacity. Typical power range is 80-160 watts.

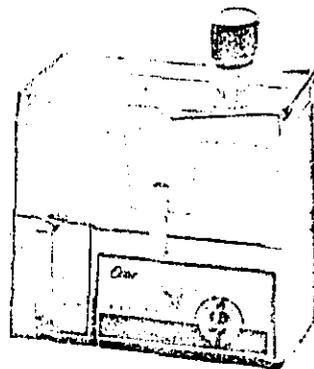
Usage:

Ice cream makers produce ice cream, ice milk, and similar foods from a sweetened creamy mixture.

JUICER



Fruit Juicer



Juice Extractor

Definition:

A juicer is a motor-driven electrical appliance which extracts juice from fruits and vegetables.

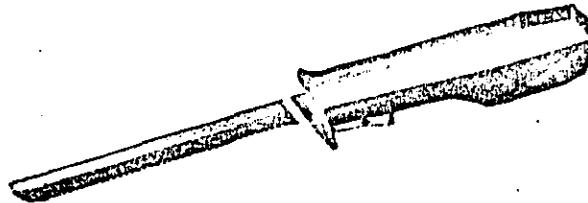
Types, Sizes, and Power:

There are two main types of juicers. The juice extractor liquifies the fruit or vegetable with cutting blades and then filters out the juice. The fruit juicer rotates a reamer (a fluted, pointed dome) which extracts juice from a sliced-open fruit pressed upon it. The juice extractor typically measures 8-1/2 x 11-3/4 x 12-1/2 in. high, while generally the fruit juicer is about as high but less wide and broad. While the juice extractor frequently has more than one speed and a powerful (around 400 watt) motor, the fruit juicer is more likely to have only one speed and a smaller (around 60 watt) motor.

Usage:

Juicers extract juice from fruits and vegetables. The juice extractor is best for vegetables and firm fruits, and juice extractors with pulp ejectors are best for non-stop juicing of a large amount of fruit. Simple fruit juicers, on the other hand, work best with citrus fruit.

KNIFE, ELECTRIC



Definition:

An electric slicing knife is a hand-held device, incorporating an electric motor to power the reciprocating motion of the cutting blade(s), which may be detached from the power head for cleaning.*

Types, Sizes, and Power:

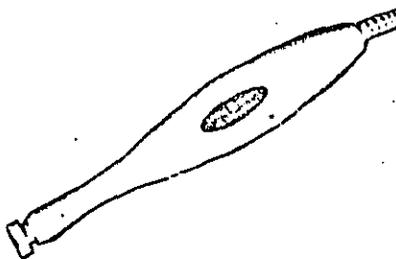
Electric knives are differentiated by length of knife blades and by motor power. Typical blade length is 6 to 9 inches, and typical power range is 100 to 160 watts.

Usage:

Electric knives quickly, easily, and precisely cut slices and pieces of meat and other food. They are most often used for cutting roasted meat and fowl.

*Adapted from AHAM "Standard Method for Measuring Performance of Household Electric Slicing Knives SK-1," Confidential Draft, AHAM, September 29, 1977, p. 2.

MANICURE SET, ELECTRIC



Definition:

An electric manicure set is a motor-driven appliance which uses a small rotating shaft and attachments to groom nails, hands, and feet.

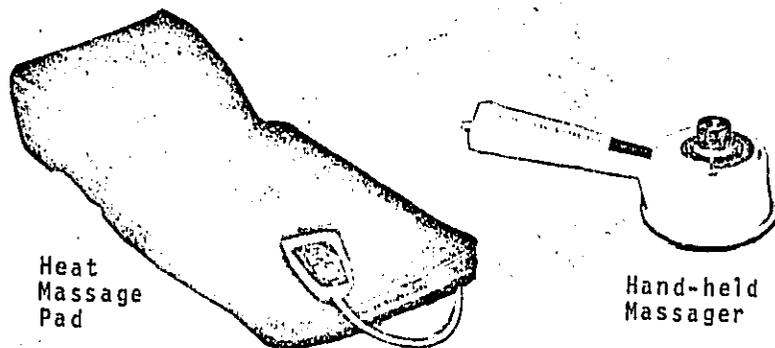
Types, Sizes, and Power:

Manicure sets are differentiated according to power source (electrical, rechargeable battery or regular battery). Power is under ten watts.

Usage:

With appropriate attachments, manicure sets can groom nails, lift and help remove cuticles, buff nails, and smooth callouses.

MASSAGER



Definition:

A massager is a device which uses vibration and sometimes heat to massage and relax the body.

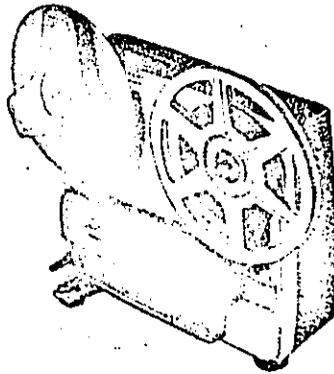
Types, Sizes, and Power:

The three general types of massagers are hand-held, hand-supported (Swedish Style) and heating-massage pads. Hand-held massagers apply vibrations and/or heat directly to the skin. Hand-supported massagers are strapped to the back of the hand and transmit vibrations (but not heat) through the fingers and palm. Heating massage pads are designed to rest either on or under a part of the body. They include back massagers which can be used sitting or lying down. Within these three categories massagers are further differentiated by number of speed and heat settings and by power of motor. Typical power range is around 8 watts for hand-held, 16-30 watts for hand-supported, and 60-90 watts for heating-massage pads.

Usage:

Massagers relax muscles and stimulate skin (and scalp) circulation.

MOVIE PROJECTOR



Definition:

A movie projector is a self-supported electric device which uses a motor-driven reel to show movies. As each frame passes, a light projects its image on a separate screen, and (for sound projectors) a photoelectric cell picks up the sound for an amplifier and speaker(s) to broadcast.

Types, Sizes, and Power:

The major division among movie projectors is between sound and nonsound projectors. Other features which differentiate movie projectors are size (8 mm is typical for home projectors), forward and reverse showing, number of speeds, and forced-air cooling, and recording capability. Typical power range is around 230 watts.

Usage:

Movie projectors show silent or sound movies. Certain models can record sound while movie is showing.

PENCIL SHARPENER (ELECTRIC)

Definition:

A motor-driven electric appliance which sharpens pencils by the rotation of blades. It is activated by the insertion of a pencil.

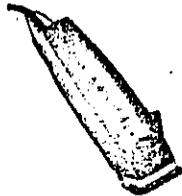
Types, Sizes, and Power:

Some pencil sharpeners feature automatic shut-off to prevent excess sharpening; others do not. Otherwise, pencil sharpeners vary only slightly in design and motor. Typical size is 8 x 3-1/2 x 4 inches high. Typical power is around 100 watts.

Usage:

Electric pencil sharpeners rapidly and evenly sharpen pencils.

PET CLIPPERS



Definition:

A pet clipper is a hand-held electric device which cuts animal hair using rapid back-and-forth movement of a blade with comb teeth.

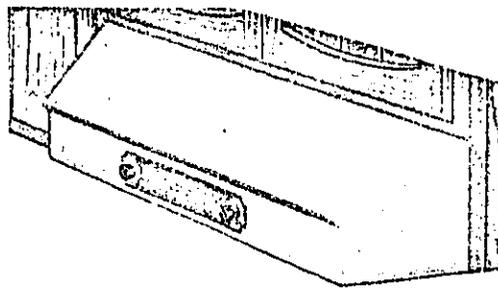
Types, Sizes, and Power:

Pet clippers are categorized by power capacity, by the number and type of attachments available, and by the type of motor. Typical power range is 10-35 watts.

Usage:

Pet clippers trim animal hair for purposes of health, comfort, and appearance.

RANGE HOOD



Definition:

A range hood is a hood designed to pull cooking-polluted air from the stove area, using one or more blowers.

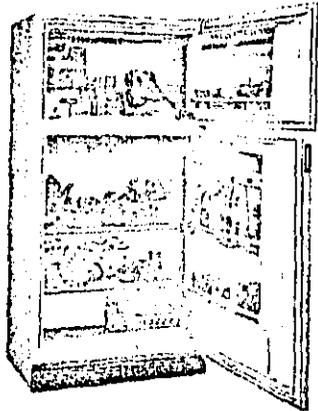
Types, Sizes, and Power:

Range hoods are differentiated by the number of cubic feet per minute (CFM) they can pull out of the kitchen, and by the desired destination of the air: outdoors (vented) or back into the house (ventless). Ventless models are equipped with a filter, while vented models may or may not have this feature. Some range hoods have more than one blower speed and some hoods feature lighting. Range hoods are generally 5 to 6-1/2 in. high, around 17-20 in. deep and around 30 in. wide. Power range is 25-180 watts.

Usage:

Range hoods filter and/or remove grease, odors, smoke, heat, and humidity from the kitchen area. They are generally used during and after cooking. Range hoods also can help prevent stove-top fires from igniting above-stove cabinets.

REFRIGERATOR, HOUSEHOLD



Definition:

A household refrigerator is a cabinet or any part of a cabinet which is designed for the refrigerated storage of food at temperatures above 32°F (0°C), which has a source of refrigeration and which is intended for household use. It may include a compartment for the freezing and storage of ice and/or for storage of food at temperatures below 32°F (0°C).*

Types, Sizes, and Power:

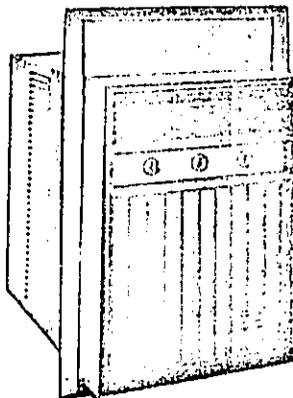
Refrigerators are differentiated into frostless and conventional defrost types, and by the amount of interior space available. Combined freezer and refrigerator sizes range from around 5 cu ft to over 24 cu ft.

Usage:

Refrigerators cool and store food at above-freezing temperatures, and, in the freezer section, freeze and store food and ice at below-freezing temperatures.

*"Refrigerator-Freezer Standard and Recommended Levels of Performance HRF-1," Confidential Draft, AHAM, June 13, 1977, p. 6.

ROOM AIR CONDITIONER



Definition:

A room air conditioner is an encased assembly designed as a unit primarily for mounting in a window or through a wall, or as a console. It is designed primarily to provide free delivery of conditioned air to an enclosed space, room, or zone. It includes a prime source of refrigeration for cooling and dehumidification and means for circulating and cleaning air, and may also include means for ventilating and heating.*

Types, Sizes, and Power:

Room air conditioners are differentiated by the number of btu's per hour they can deliver. The usual range is from 4500 btu's (using around 830 watts) to 10,000 btu's (using around 1340 watts).

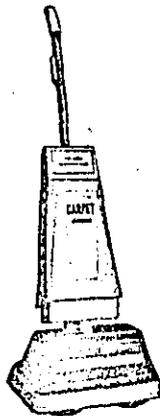
Usage:

Room air conditioners can cool, heat, dehumidify, clean, and circulate room air.

*"American National Standard, Room Air Conditioners Z234.1-1972," AHAM, December 21, 1972, p. 6.

RUG SHAMPOOER AND SHAMPOOER-POLISHER

Rug Shampooer



Shampooer-Polisher



Definition:

A rug shampooer is a walk-behind appliance which cleans rugs and carpets using motor-driven rotating brushes and detergent liquid. Shampooer-polishers use attachments to convert from shampoo use to floor polishing use. Polishers are included in the shampooer-polisher category.

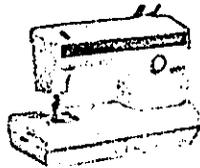
Types, Sizes, and Power:

Both shampooers and shampooer-polishers are differentiated by number of speeds, width of cleaning path (12 or 14 inch widths are typical), and capacity of detergent-liquid dispenser (90-144 ounces are the typical capacity). Typical power range is 300-450 watts.

Usage:

Rug shampooers soap and scrub rugs and carpets. Shampooer-polishers use accessory brushes and pads to shampoo, polish, and buff.

SEWING MACHINE, ELECTRIC



Definition:

An electric sewing machine is a machine powered by an electric motor which sews cloth by means of a threaded needle and bobbin moving together and apart so as to form interlocking stitches, with adjustable tension, stitch length, and speed.

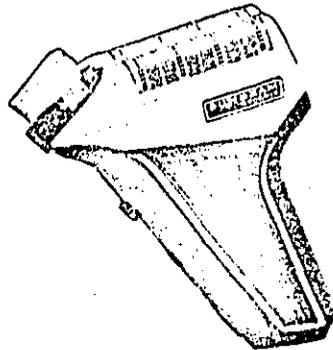
Types, Sizes, and Power:

Sewing machines are basically categorized by the types of stitching available. Most new sewing machines feature zig-zag and buttonhole stitching. Some machines have built-in buttonhole and/or special stitch capability; others use cams and snap-in attachments. Sewing machines can feature from one to over thirty stitches. Typical power range is 120-150 watts.

Usage:

Sewing machines sew fabric to make and mend clothes and other goods. The basic machine sews straight and, frequently, simple zig-zag. More sophisticated machines can include straight, zig-zag, blind hem, mending, box, shell, straight stretch, rick-rack, overcast and elastic stitches.

SHAVER (Electric)



Definition:

A shaver is a hand-held electric grooming aid which catches facial or body hair and clips it at the skin line by means of blades that rotate or move back and forth.

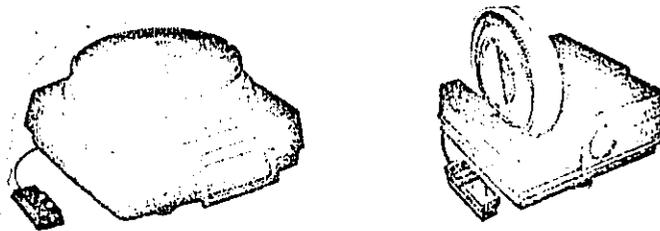
Types, Sizes, and Power:

Shavers are categorized according to cutting surface type, motor type, and power source (electrical, rechargeable battery, or regular battery). Power is under ten watts.

Usage:

Shavers for men are used daily (more or less depending on thickness and darkness of beard) to shave part or all of the beard, upper lip, and neck hair. Shavers for women are used on the legs and underarm around three times a week (more or less depending on darkness of hair and need for neat appearance).

SLIDE PROJECTOR



Definition:

A slide projector is a self-supported electric device which uses light to project an image of a slide onto a separate screen.

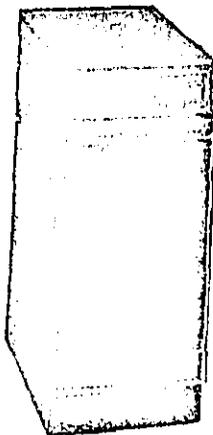
Types, Sizes, and Power

Slide projectors are generally differentiated by the type of slide tray and by features such as automatic timing and remote control slide changing. Typical sizes range from 11-1/2 x 11 x 6 in. high to 14-1/2 x 13 x 8-3/4 in. high. Typical lamp wattage is 300-400 watts.

Usage:

Slide projectors are used indoors for large screen viewing of small slides. Because of the set-up time involved, slide projectors are used infrequently but generally show many slides once set up.

TRASH COMPACTOR



Definition:

A trash compactor is a device designed to reduce the volume of trash generated in a single family household using the principle of compaction.* It compresses a load of wet and dry, food and nonfood waste to around one-fourth of its original volume. The compactor is designed to fit waste into a disposable compactor bag which can be lifted out and disposed of.

Types, Sizes, and Power:

Compactors are differentiated by features such as removable ram and wall wiper (for easy cleaning), automatic deodorizing,

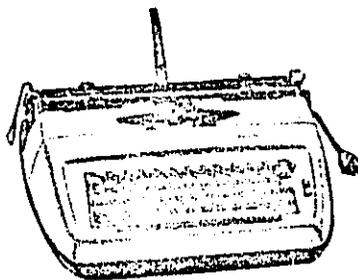
*"American National Standard A1977-1976. Performance Eval. Procedure for Household Trash Compactors," AHSM, June 1976, p. 4

and sound insulation. Most use a 1/3 hp motor to develop around 2300 pounds of pressure. Typical size is 15 x 24 x 34 in.

Usage:

Trash compactors reduce the volume of trash to reduce the number of garbage disposal trips.

TYPEWRITER, ELECTRIC



Definition:

An electric typewriter uses a motor-driven belt to add power to the fingers' strokes on a keyboard, so as to quickly produce dark, even characters. Some electric typewriters feature push-button functions such as carriage return and multiple dashes, periods, or x's.

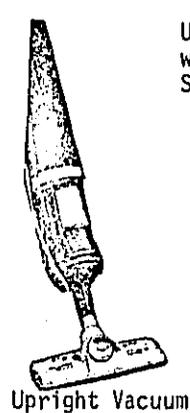
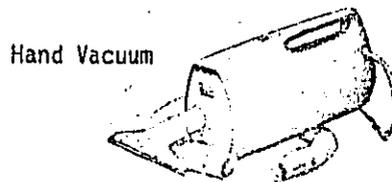
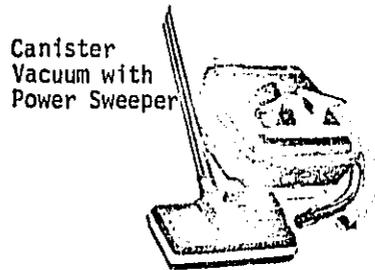
Types, Sizes, and Power:

Electric typewriters are differentiated by type faces (pica, elite, etc.), by the functions featured, and by carriage size (10 inch or 12 inch). Typical power range is around 70 watts.

Usage:

Typewriters convert finger strokes on around 88 alphabetical, numerical, punctuation, and symbolic characters into even, printed text.

VACUUM CLEANER



Definition:

A vacuum cleaner is a powered machine that removes dirt and other debris from surfaces through a suction (and sometimes brushing) action.

Types, Sizes, and Power:

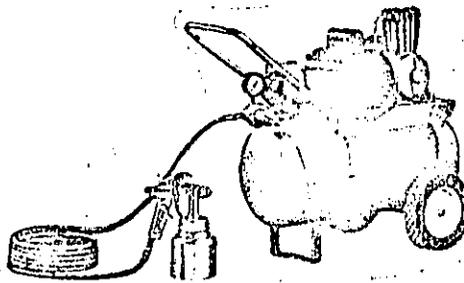
Vacuum cleaners come in five basic types:

- Upright vacuum (typical power 300-350 watts)
- Upright vacuum with powered beater brush (typical power 460-725 watts)
- Canister vacuum (typical power 600-800 watts)
- Canister vacuum with upright powered beater brush unit (typical power around 720 watts)
- Hand held vacuum cleaners (typical power around 250 watts).

Usage:

Vacuum cleaners are used in the house, shop, garage, and patio to remove debris from hard surfaces and to loosen and remove dirt from rugs.

AIR COMPRESSOR, ELECTRIC



Definition:

An electric air compressor is a device that uses electric power to operate a reciprocating compressor which provides high pressure air. This compressed air is normally used to operate air tools, paint sprayers, and to perform other functions.

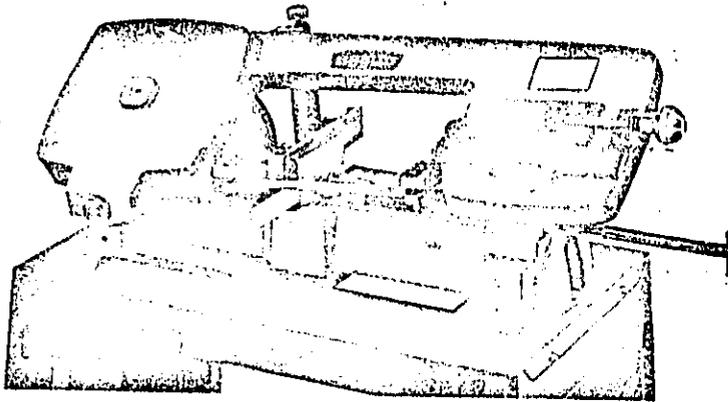
Types, Sizes and Power:

Air compressors are differentiated by the amount of horsepower available (1/2 to 3 hp, usually), which is in turn related to the compressor's SCFM (Standard Cubic Feet per Minute), and PSI (Pounds per Square Inch) delivered. Typical sizes range from 13-1/2 x 11 x 9 in. high to 50 x 24 x 33 in. high. Units typically draw from 130 to 2800 watts.

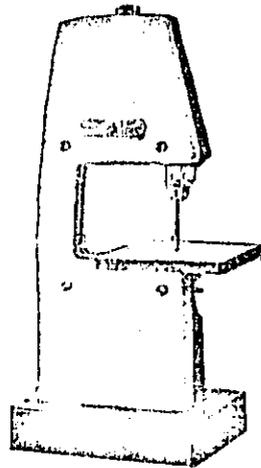
Usage:

Air compressors provide air to operate air tools, inflate tires, air-clean machinery, and spray paints, insecticides, and herbicides.

BAND SAW



Horizontal Band Saw



Vertical
Band Saw

Definition:

A band saw is an electrically powered tool which incorporates a saw blade in the form of a continuous loop or band.

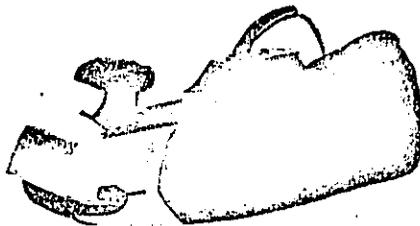
Types, Sizes and Power:

Although most band saws are self-supported, there is a type which is hand-held. Self-supported band saws either feature a vertical or a horizontal (these are sometimes tiltable) cutting blade. Band saws are also differentiated by height of cutting area, usually 10 in. to 14 in. Typical sizes range from 18 x 11 x 33 in. high to 25 x 18 x 65 1/2 in. high. The range of electric motor power is 1/3 to 1/2 HP, producing around 1725 revolutions per minute.

Usage:

Band saws cut (and sand, with attachment) straight lines, curves, and other patterns into wood, metal, or other stock.

BELT SANDER



Definition:

A belt sander is a fixed or hand-guided electrically powered tool which sands wood or other stock surfaces using a gear-driven replaceable sanding belt. Belt-disc sanders (belt sanders with sanding disc attached) are included in this definition.

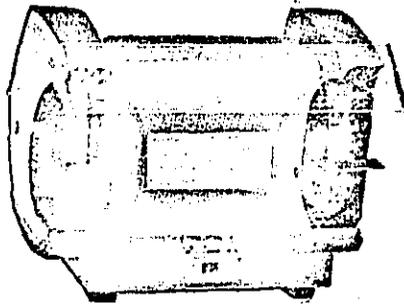
Types, Sizes and Power:

Belt sanders are differentiated by number of speeds available (usually one or two) and by size of sanding belt (3 in. x 18 in., 3 in. x 21 in., 3 in. x 24 in. and 4 in. x 21 3/4 in. are typical belt sizes). Power typically ranges around 3/4 to 7/8 hp.

Usage:

Sanders are used when high speed is desired to remove paint and coatings from surfaces, "plane down" stock, smooth plaster, remove rust and give wood a fine finish. Progressively finer grit belts can be used.

BENCH GRINDER



Definition:

A bench grinder is a self-supported electrically powered tool which rapidly rotates a grinding wheel and/or wire wheel brush for the purposes of grinding, sharpening, and polishing.

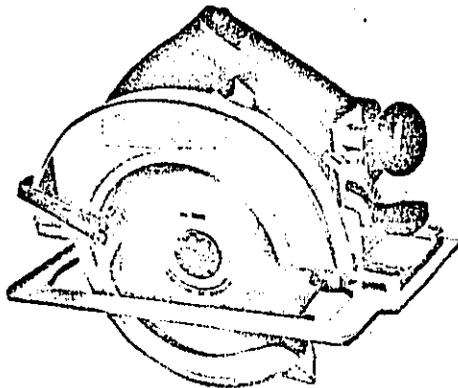
Types, Sizes, and Power:

Bench grinders are differentiated chiefly by the diameter of their grinding wheels, which are usually 5 to 6 in. in diameter. Motor output is usually 1/4 HP or below.

Usage:

Bench grinders grind, polish, clean, and sharpen. They are most often used to sharpen knives, lawn mower blades, chisels, and hatchets.

CIRCULAR SAW



Definition:

A circular saw is a hand-held, electrically powered tool designed to cut wood or other stock in a straight line, using a rapidly rotating disc blade.

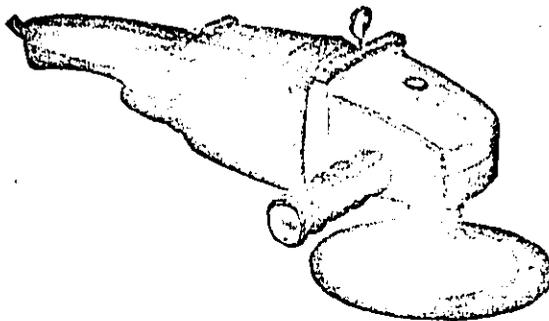
Types, Sizes, and Power:

Circular saws are mainly differentiated by amount of horsepower (home-use range is generally from 1 to 1 1/2 HP). Speed of rotation is around 5300 to 5800 RPM.

Usage:

Circular saws, because they combine high power and blade speed, can handle demanding cutting jobs, and are useful, indoors and outdoors, for standard house construction.

DISC SANDER



Definition:

A disc sander is a hand held electrically powered tool which uses a rapidly rotating disc to sand surfaces. Disc sander-polishers are included in this definition, but belt-disc sanders are not.

Types, Sizes, and Power:

The usual home-use disc sander uses a 7-in. diameter sanding disc, which rotates at around 2400 rpm. Typical maximum motor output is 1 1/4 HP.

Usage:

Disc sanders with sanding attachment are used on non-grained stock, to remove paint and coatings from surfaces, to "plane down" stock, and to smooth plaster. Their high speeds make them suited for big jobs such as removing paint or rust from a car. With a polishing attachment, the tool can polish a variety of surfaces.

DRILL BIT SHARPENER



Definition:

A drill bit sharpener is a self-supported portable tool which uses a rapidly rotating grinding wheel to sharpen dull or broken twist bits.

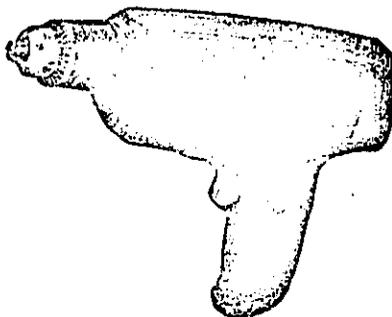
Types, Sizes, and Power:

The home-use sharpener typically accepts and sharpens the full range of smaller size bits (smaller than 1/2 in. drills). Chief differences are in motor size. Typical horsepower is 0.2 HP.

Usage:

Drill bit sharpeners resharpen dull or broken carbon and high speed steel twist bits, but do not usually resharpen carbide-tipped drill bits.

DRILL, ELECTRIC



Definition:

An electric drill is a portable, hand held tool which uses an electric motor to drive a rotating adjustable chuck that normally holds a drill bit or other device. A set of gears is normally incorporated between the motor and chuck to obtain lower speed, higher torque drill bit rotation.

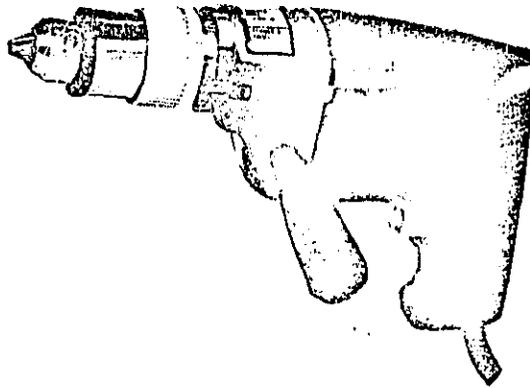
Sizes, Types, and Power:

Drills are normally classified by the maximum diameter drill bit that will fit in the chuck and are usually found in 1/4-in., 3/8-in., and 1/2-in. sizes for home use. Handles may be of the pistol grip type as illustrated above or may have end handles and/or auxiliary side handles. Drilling is usually in line with the major axis of the drill but may be at right angles for special purposes. Typical power range is from 1/6 to 7/8 HP.

Usage:

Electric drills are used throughout the home and out of doors. While their main purpose is for drilling holes, there are a wide variety of attachments such as disk sanders and polishers, wire brushes, and grinding wheels that may be attached.

DRILL, MULTI-PURPOSE



Definition:

A multi-purpose drill is a hand-held tool that uses an electric motor to produce rotational power for attachments such as a drill bit, screwdriver, disc sander, grinding wheel, wire brush, and polishing bonnet, and to produce a rapid reciprocating action for hammer-drilling or hammer-chiseling.

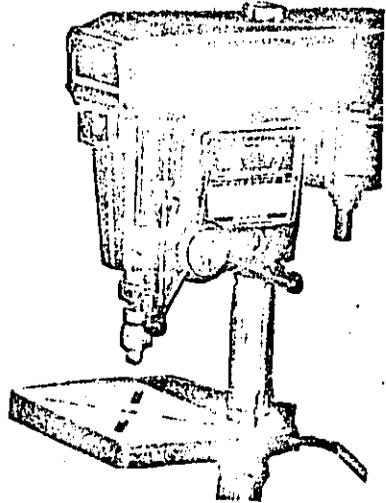
Sizes, Types and Power:

Multi-purpose drills, like regular electric drills, are classified by the maximum diameter drill bit that will fit in the chuck and are usually found in 3/8-in. and 1/2-in. sizes for home use. Multi-purpose drills generally have auxiliary side handles for greater control. Speed is around 0-800 RPM, and 36,000 blows per minute. Typical power range is from 1/3 to 7/8 HP.

Usage:

The multi-purpose drill can drill, drive screws, sand, grind, clean and polish, using just the rotational motion. Combining rotational and hammering motion and using special drill bits makes it a hammer-drill for masonry, stone, and brick. The hammering motion alone, using a chisel or scraper accessory, makes it a tool to mortise, chisel, gouge, and scrape paint, wallpaper, and tile.

DRILL PRESS



Definition:

A drill press is a self-supporting electrically powered tool which drills, using variable speeds and drill bit sizes, into stock clamped onto a work table.

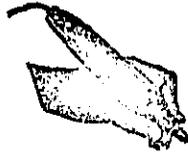
Types, Sizes, and Power:

Drill presses are differentiated by attachments, features, and horsepower available. Typical size ranges from 15 x 27 x 72 in. to 17 x 29 x 64 in. Typical power range is 1/2 to 3/4 HP.

Usage:

Drill presses are useful for precision hole drilling. With a tilting work table, drilling can be done at 45° angles or on the narrow edge of a sheet of stock. Positive stops allow fast repetitive drilling. With attachments, the press can do routing, planing, mortising, and other finishing work.

ENGRAVING PEN, ELECTRIC



Definition:

An electric engraving pen is a hand-held tool which delivers around 7200 strokes per minute to a small tip, to make permanent, etched marks on metal and other materials. Stroke adjustments vary for fine or wide lines.

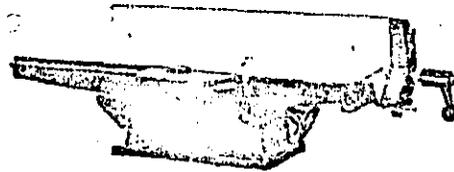
Types, Sizes, and Power:

There are no major differences among engraving pens, which weigh around one pound each. Typical power is around 12 watts.

Usage:

An engraving pen makes permanent, etched marks on keys, cameras, tools, camping gear, jewelry, appliances, and other valuables.

JOINTER



Definition:

A jointer is a self-supported electrically powered tool which planes wood to allow pieces to fit precisely when jointed together. Jointer-planers are included in this definition.

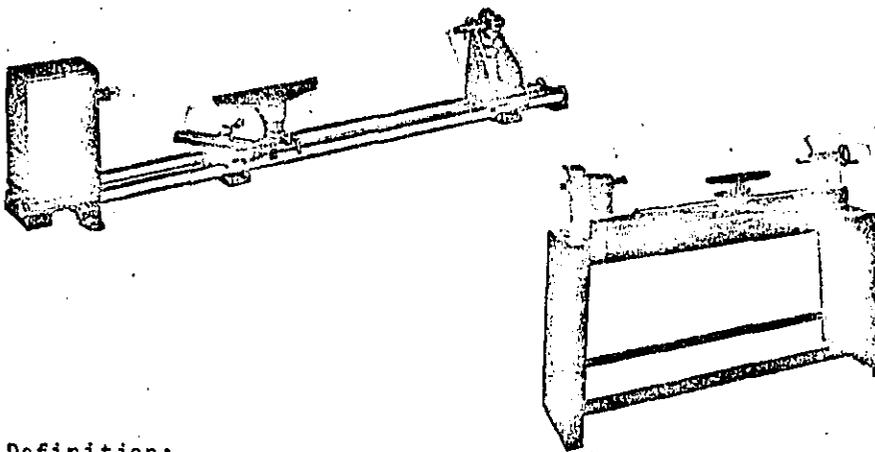
Types, Sizes, and Power:

Jointers are differentiated by the width of wood they are capable of planing (usually 4 in. to 6 in.) and by the type of optional motor (standard or heavy-duty). Typical size range is from 12 x 32 x 9 1/2 in. high to 22 x 39 x 9 1/4 in. high. Some come with stands. The jointer knives usually rotate at around 3450 to 4200 RPM, and use a 1/2 to 3/4 HP motor.

Usage:

Jointers plane wood to make precisely fitting glue or other joints.

LATHE



Definition:

A lathe is a self-supported electrical machine in which stock is rotated about a horizontal axis and shaped by a tool that is usually hand held for wood working and positioned by screw feeds for metal working.

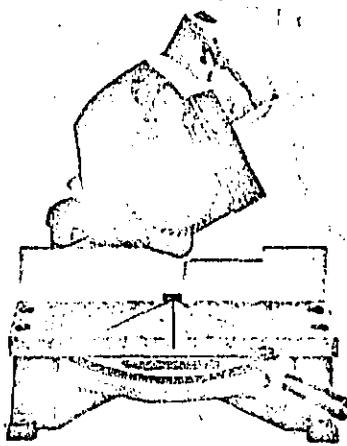
Types, Sizes, and Power:

Lathes are generally classified by their application to wood or metal turning, by number of speeds available, and by the maximum diameter of stock that can be shaped (1 1/2 in. to 10 in. is the usual range). Home use lathes are almost always wood lathes, with one to four speeds. Dimensions range from around 12 x 6 x 4 1/2 in. high to around 18 x 42 x 53 in. high. Speeds range from 800 to 3700 RPM, and power ranges from around 1/3 to 1/2 horsepower.

Usage:

Home-use lathes can turn pieces of wood and other stock to produce such shapes as chair legs, bannister supports, candlesticks, and chess pieces.

MITER BOX, POWER



Definition:

A power miter box is a self-supporting, electrically powered tool which makes fast, accurate square cuts and angle cuts (miters) using a pivoting circular saw installed into a table designed for aligning stock and guiding the cut.

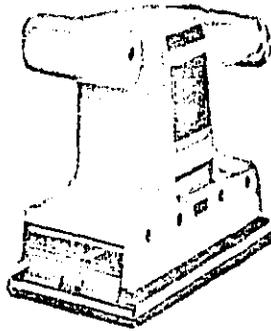
Types, Sizes, and Power:

Miter boxes generally feature a 9-inch diameter saw blade and a 1.5 horsepower motor.

Usage:

Power miter boxes can make straight and angle cuts in wood, plastics, and light metals. They are best for trim work.

ORBITAL SANDER.



Definition:

An orbital sander is a hand-held electrically powered tool which drives, in an orbital motion, a rectangular platen that holds the abrasive sheet. This category includes dual action orbital/straight-line sanders.

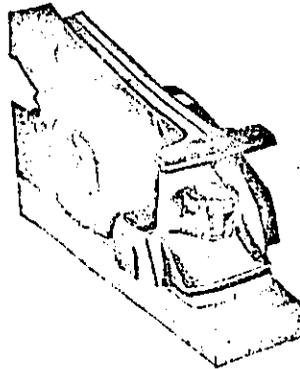
Types, Sizes, and Power:

Orbital sanders are differentiated into single action sanders, which have only the orbital motion, and dual action sanders which have a lever to switch from orbital action to straight-line action. Orbital sanders are also differentiated by number of orbits per minute (8,400 to 12,000 usually), and by the size of the rectangular platen (3 5/8 in. x 9 in. and 4 1/2 in x 5 in. are typical sizes). Power ranges around 1/8 HP.

Usage:

Orbital sanders are typically used to obtain an even removal of material from extended surfaces, especially where sanding lines are undesirable.

PLANER, ELECTRIC



Definition:

An electric planer is a hand held tool which uses rapidly rotating steel blades to plane down stock.

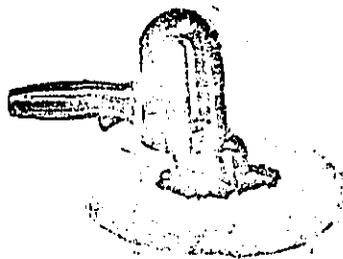
Types, Sizes and Power:

Planers are differentiated by speed (typically 14,500 - 15,000 RPM) and power (typically 3/8 to 1/2 HP).

Usage:

Power planes plane stock extremely fast, and are suitable for large-scale planing and removal of stock.

POLISHER



Definition:

A polisher is a hand-held tool which uses an electrical motor to rotate rapidly a disc containing a polishing pad. Sander-polishers are not included in this definition.

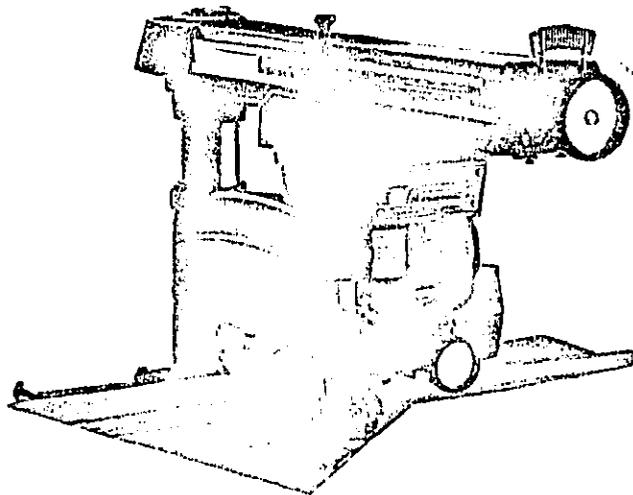
Types, Sizes, and Power:

Polishers can be differentiated by the maximum speed capability, which is usually in the range of 2000-2500 RPM. A 7-inch polishing disc is usually used.

Usage:

Polishers are most useful for quickly creating a high gloss, especially when a large amount of polishing is required.

RADIAL ARM SAW



Definition:

A radial arm saw is a self-supporting electrically powered tool which combines a pivotable circular saw cutting action with movement of the saw along a straight groove on a rotatable "turret arm." With attachments, the saw can be adapted to wood shaping and finishing work.

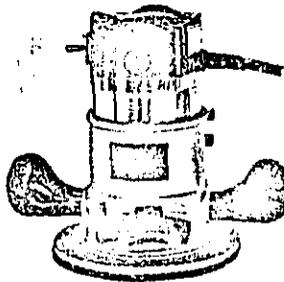
Types, Sizes, and Power:

Radial saws are differentiated by the number of features and attachments available. Typically, dimensions are 33 1/2 x 32 x 27 inches high, and motors develop 3450 RPM. Power is around 1 1/2 to 2 HP.

Usage:

Radial saws crosscut, rip, miter, level, and cut compound angles. With proper attachments, the saw can be adapted to shaping, molding, dadoing, sanding, routing, boring, and drilling.

ROUTER



Definition:

A router is a hand-guided, high speed shaping tool that uses different bits and accessories to shape wood precisely.

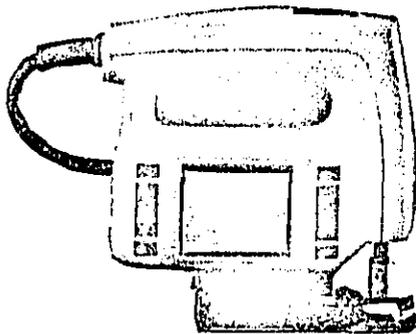
Types, Sizes, and Power:

Routers are differentiated mainly by horsepower and bearing construction. Power in home-use routers usually ranges from 1/2 to 1 HP. Bit rotation speed ranges from around 22,000 RPM to around 28,000 RPM.

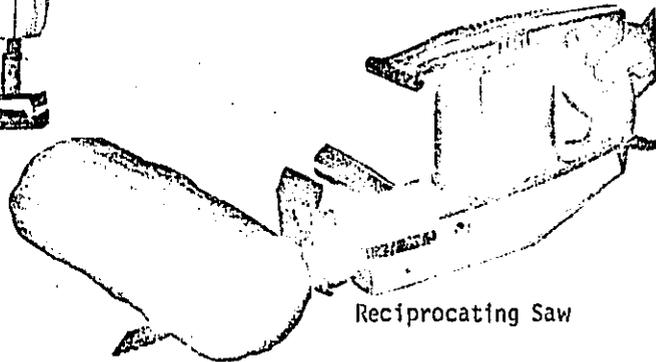
Usage:

Routers can be used in the workshop for planing, shaping, cutting multi-curve moldings, decorating edging, free-hand mortising, rabbeting, dadoing, dovetailing, laminate trimming, door handing, lock mortising, making signs, and cutting precise grooves for professional inlay work.

RECIPROCATING SAW



Jig Saw



Reciprocating Saw

Definition:

A reciprocating saw is a hand-held or hand-guided tool using electric power to rapidly move a saw blade back and forth against the stock to permit precise, flexible sawing. The saw blade holder accepts various types of saw blades. Sabre saws, jig saws, and scroll saws are included in this category.

Types, Sizes, and Power:

The standard reciprocating saw is hand-held and uses a bare horizontal saw blade. One, two, and variable speeds are available. This type generally uses $3/8$ to $1/2$ horsepower to achieve no-load speeds of 2000 to 2400 strokes per minute (SPM). Variable speed reciprocating saws achieve zero to 2400 SPM.

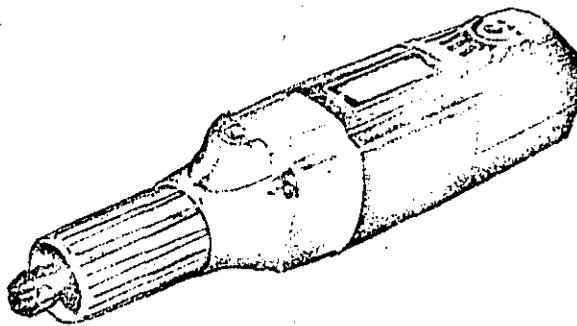
The jig saw is designed to make precise straight or curved cuts in stock sheets. It is hand-guided, but self-supported on a flat base that glides over the wood as the cut is made. One, two, and variable-speed jig saws are available. The motor

generally draws 2.5 to 2.8 amps. One-speed jig saws usually achieve 3200 to 3300 SPM. Two-speed saws operate around 2400 to 2500 low speed and around 3200 to 3300 SPM. at high speed. Variable speeds can operate from zero to around 2900 to 3300 SPM. Jig saws and sabre saws are generally synonymous. The scroll saw, or scroller, resembles the jig saw except that the blade swivels for intricate cutting. It typically uses a 3/8 to 1/2 HP motor.

Usage:

Various reciprocating saw blades permit cutting of wood, metal, composition board, plaster, and leather. Standard reciprocating saws are useful for pruning trees, and cutting metal pipe, tubing, trim, and sheets. Jig saws can cross cut, miter and level cut, rip plywood paneling, and cut curves in a variety of stock. Scroll saws can act as jig saws and can also cut intricate curves.

ROTARY GRINDER



Definition:

A rotary grinder is a hand-held tool that uses a motor-driven rapidly rotating shaft and attachments to grind and shape stock.

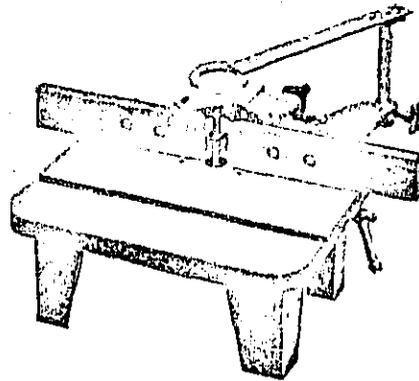
Types, Sizes, and Power:

The major differences among rotary grinders are the type of motor (permanent magnet or electromagnetic) and the cutter and point attachments available. The rotary grinder is lighter and more compact than the hand motors that can drill, grind, sand, and polish. It is designed to be held like a very large pencil. A typical motor develops 1/4 hp maximum for a 25,000 rpm no-load speed.

Usage:

The rotary grinder and its small attachments (diameter is frequently .25 in. or less) are designed for precise work. With proper attachments, the grinder can rough, finish, rout, bevel or mill in wood, fiber, plastic, or metal.

SHAPER



Definition:

A wood shaper is a self-supported tool which uses an electric motor to rotate a shaft to which any of a number of wood shaping accessories are fitted. The shaft is attached to a table designed for aligning and guiding stock as it is shaped.

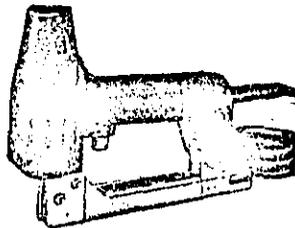
Types, Sizes, and Power:

Wood shapers are generally differentiated by the available accessories and attachments. Typical size is around 25 x 25 x 10 in. high, and a typical motor uses 1/2 horsepower to make the shaft rotate at 9000 RPM.

Usage:

Wood shapers, with appropriate attachments, perform functions such as routing, making turnings and dowels, corner rounding, jointing, sanding, and other ornamental work.

STAPLER, ELECTRIC



Definition:

An electric stapler is a hand-held tool that uses an electromagnetic power unit to drive staples flush to surface.

Types, Sizes, and Power:

Home use electric staple guns do not vary significantly in design or size. The stapler typically weighs under two pounds.

Usage:

Electric staplers quickly drive strong staples into stock, and are used in place of small nails or other fasteners.

STRAIGHT-LINE SANDER

Definition:

A straight-line sander is a hand-held tool which uses an electric motor to rapidly drive a rectangular sandpaper-bearing platen in a back-and-forth motion. Straight-line sanders are also called vibration sanders.

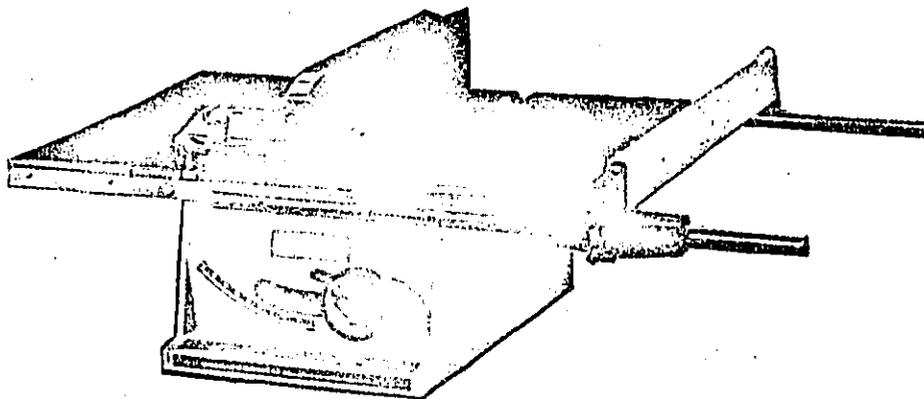
Types, Sizes, and Power:

There are only minor differences among this type of sander. Most straight-line sanders are smaller than orbital or dual-action sanders. Typical pad area is 3 x 5-7/8 in., and typical performance is 14,400 strokes per minute.

Usage:

The straight-line sander, because it can follow the grain of the wood, is useful for a fine, swirl-free finish. The tool can also polish when equipped with polishing pads.

TABLE SAW



Defintion:

A table saw is a self-supporting electrically powered tool which features a rotating circular saw installed into a table designed for aligning and guiding stock.

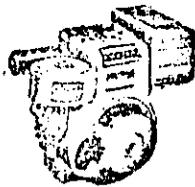
Types, Sizes, and Power:

Table saws are generally differentiated by the diameter of the saw blade, usually 9 or 10 in., and by attachment availability. Typical dimensions range from 20 x 30 in. to 22 x 32 in. for the table, and 10 x 22 in. for the rip fence extension. Typical speed and power ranges from 3450 to 5400 RPM and 1 1/2 to 2 1/2 HP.

Usage:

The table saw quickly and accurately cuts sheets of stock. An arbor can allow tilting for level and miter cutting. Attachments can be used on the table saw for moulding, dadoing, and other professional cuts.

AIR-COOLED REPLACEMENT ENGINE



Definition:

An air-cooled replacement engine is an engine designed to replace a worn-out or damaged engine in an otherwise operable machine.

Types, Sizes, and Power:

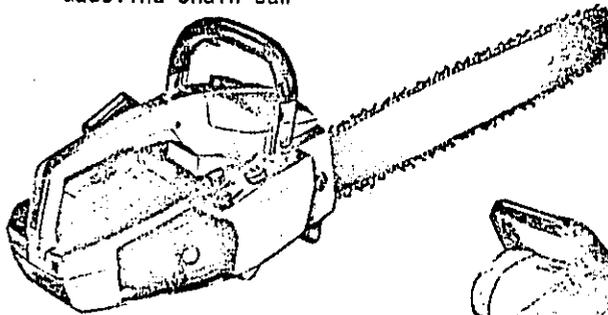
Replacement engines are differentiated by amount of available power, which usually ranges from 2 to 16 hp, and by engine design features such as bearing configuration.

Usage:

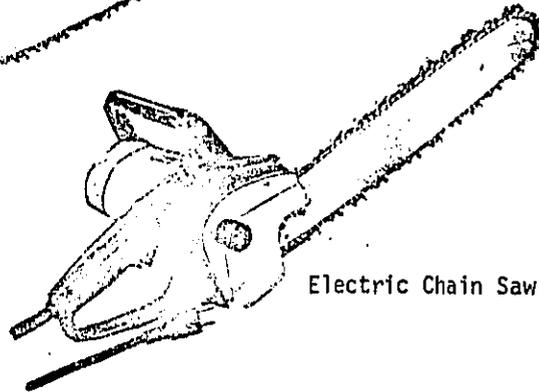
Replacement engines, since they come in many sizes, power levels, and types, can replace many types of engines used for lawn and garden use. Typical replacement needs are for pumps, compressors, and tractors.

CHAIN SAW

Gasoline Chain Saw



Electric Chain Saw



Definition:

A chain saw is a hand-held tool that uses a gasoline or electric-powered motor to rapidly rotate a sharp-toothed chain around an oblong guide bar, for the purposes of sawing wood.

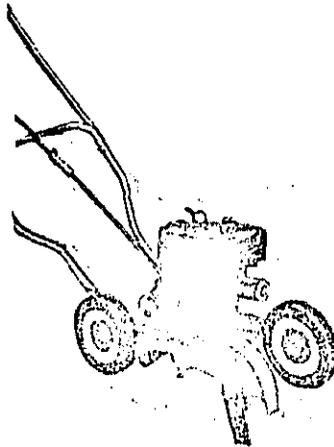
Types, Sizes, and Power:

Chain saws are either electric or gas-powered, and are differentiated chiefly by engine size (for gas saws, size ranges from 2.3 to 3.7 cu. in.) and by length of guidebar, usually 12 to 17 inches long for consumer use.

Usage:

Chain saws are used outdoors for rapid sawing when accuracy and a smooth cut are not necessary.

EDGER TRIMMER



Definition:

An edger trimmer is a walk-behind powered lawn and garden tool which uses a rapidly rotating disc blade to trim shrubbery and, with an adjustment, to edge the borders of walks and other man-made surfaces. Edgers are included in this category.

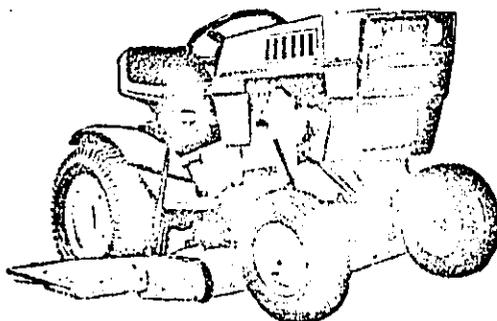
Types, Sizes, and Power

Edger trimmers are differentiated by source of power (gasoline or electric) and by the diameter of the cutting blade. Blades are usually 6 to 9 inches in diameter, and rotation speeds range from around 5,000 rpm to over 13,000 rpm. Electric edger trimmers use approximately 500 watts, while gasoline-powered trimmers feature an engine size of around 120 cc.

Usage:

Edger trimmers are used outdoors to trim areas that are difficult to mow, such as around fences, trees, shrubs, and flower beds. Converted to an edger, it will neatly clear a narrow path along the edge of a sidewalk or other paved surface.

GARDEN TRACTOR



Definition:

A riding garden tractor is a self-propelled riding vehicle designed for general purpose lawn and garden work which:

1. Must have all attachments removable from the tractor
2. Must have provisions for a capability of handling ground engaging attachments, such as either a moldboard plow tiller, disc, or cultivator, and a device to lift such attachments.*

Types, Sizes, and Power:

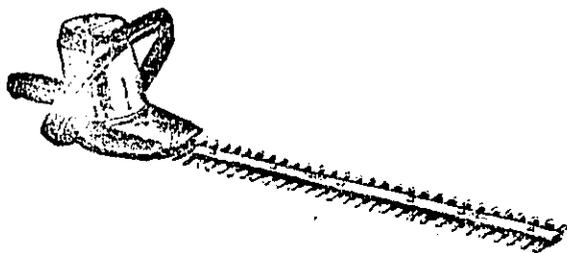
Garden tractors are categorized by amount of horsepower and type of special features available. Typical available power is 10-16 hp.

Usage:

Accessories allow a wide range of uses including snowplowing, snow throwing, plowing, mowing, tilling, preparing seed beds, cultivating, hauling, and lawn sweeping.

*"Marketing Manual," Outdoor Power Equipment (OPEI), Washington, D.C., page 11.

HEDGE TRIMMER



Definition:

A hedge trimmer is a hand-held lawn and garden tool which uses a motor to power rapid back and forth strokes of a long, toothed blade.

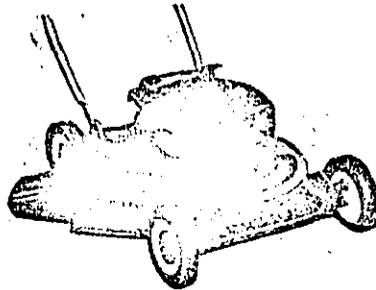
Types, Sizes, and Power:

Hedge trimmers are categorized by blade length, which usually range from 16 in. to 22 in. Maximum power is usually under 1/3 hp.

Usage:

Hedge trimmers are used to trim hedges, bushes, and thin tree branches.

LAWN MOWER, Walk-Behind



Definition:

Walk-behind lawn mowers are divided into four types by the Outdoor Power Equipment Institute:

A Powered Reel Mower is a grass-cutting machine which utilizes a power source to rotate several helically formed blades about a horizontal axis to provide a shearing action with a stationary cutter bar or bed knife.

A Powered Rotary Mower is a push or self-propelled grass-cutting machine which utilizes a power source to rotate one or more cutting blades about a vertical axis (axes).

A High Wheel Walking Power Mower is a rotary mower with rear wheels (usually 12 in. to 14 in. diameter) significantly larger than the front wheels designed to be used on extremely soft turf or other applications where the large rear wheels facilitate ease of motion.

A Mulching Mower is a powered rotary mower whose deck has no discharge opening and whose design prohibits field modifications to add a catcher or discharge opening.*

Types, Sizes, and Power:

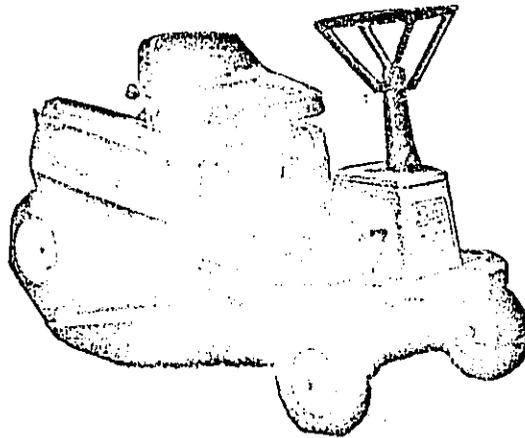
In each of the four types defined above, mowers can be differentiated into push-type and self-propelled, and into gasoline or electric types. Within each of these categories motors are differentiated by the engine power and the cutting swath width. Engine power is frequently described as reserve power. Walk-behind mowers typically have engines in the range from 3.5 to 4.0 hp, and cut swaths around 20-22 in. wide. Some mowers come equipped with grass catchers to catch the clippings as they are mowed.

Usage:

Walk-behind mowers are used in lawns and gardens to clip grass, weeds and other plants to a uniform adjustable height of from 1-1/8 to 3-3/4 in. High wheel walking power mowers can move on soft turf. Mulching mowers reduce the clippings into finer pieces to produce mulch. All walk-behind mowers are suitable for small or medium-size lawns.

*"Marketing Manual," OPEI, Washington, D.C., page 11.

LAWN TRACTOR AND RIDING MOWER



Definition:

Lawn tractor and riding mowers are self-propelled riding vehicles designed for general purpose lawn work which:

1. Are generally designed for cutting grass
2. Do not have provisions for or capability of handling a ground-engaging attachment, such as either a moldboard plow, tiller disc, or cultivator, nor a device to lift such attachments.*

Types, Sizes, and Power:

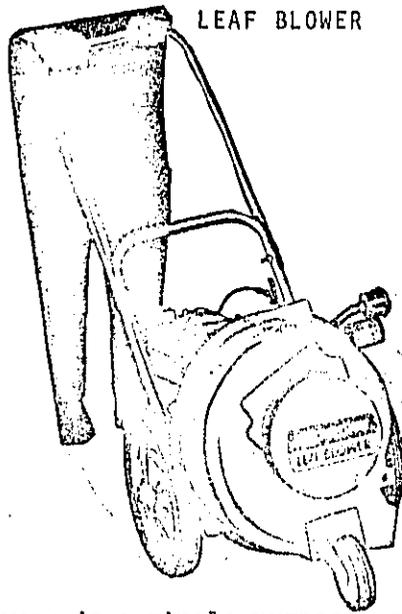
Lawn tractors/rider mowers are differentiated by amount of horsepower available. Seven to ten horsepower is the most common range.

*"Marketing Manual," OPEI, Washington, D.C., page 11.

Usage:

Lawn tractor/riding mowers are chiefly used for mowing large lawns. Trail-behind accessories such as a dump cart, spiker-aerator, drop spreader, broadcast spreader, and lawn roller allow a variety of lawn care activities.

LEAF BLOWER



Definition:

A leaf blower is a single purpose, engine-powered machine, designed to blow debris from one area to another. Combination yard vacuum-blowers are excluded from this category. *

Types, Sizes, and Power:

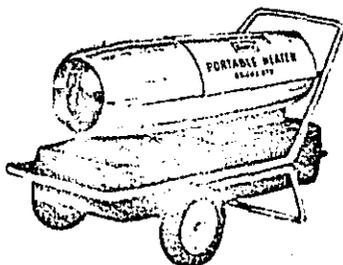
Leaf blowers are differentiated chiefly by engine size. Typical power range is around 3-1/2 horsepower.

Usage:

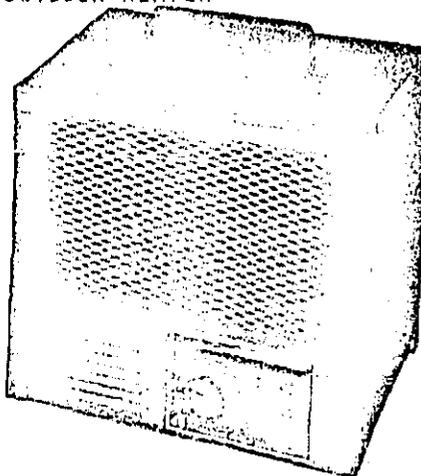
The leaf blower blows leaves into rows or piles for simplified mulching or bagging, and scatters leaves from beneath shrubbery or porches for easier pickup.

*"Marketing Manual," OPEI, Washington, D.C., page 12.

PORTABLE OUTDOOR HEATER



Electric Fuel-Fired Heater



Electric Resistance Heater

Definition:

A portable outdoor heater is a portable device that uses electricity, liquid fuel, or both to produce heat.

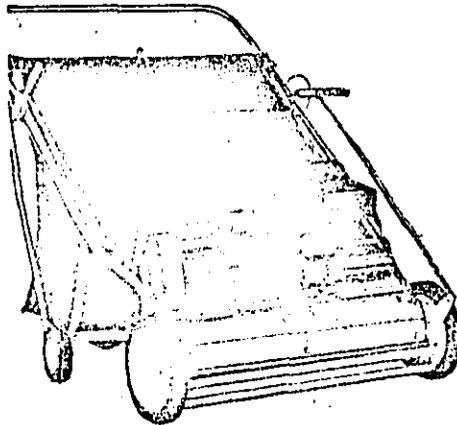
Types, Sizes, and Power:

Heaters are categorized by the Btu's/hour they can deliver, and by the type of heat source. Electric resistance heaters typically provide 4500 to 5600 Btu's, using 1320 to 1650 watts. Combination electric - fuel-fired units deliver much more heat, in the range of 50,000 to 80,000 Btu's.

Usage:

A portable outdoor heater is used in outdoor or well-ventilated areas, such as construction sites, garages, barns, or workshops, to warm a cold room or add extra heat for special purposes (drying paint or warming a newborn calf, for example).

POWER LAWN SWEEPER



Definition:

A power lawn sweeper is a walk-behind engine-powered lawn and garden tool which uses rows of brushes on a rotating axle to sweep lawn debris into a large basket.

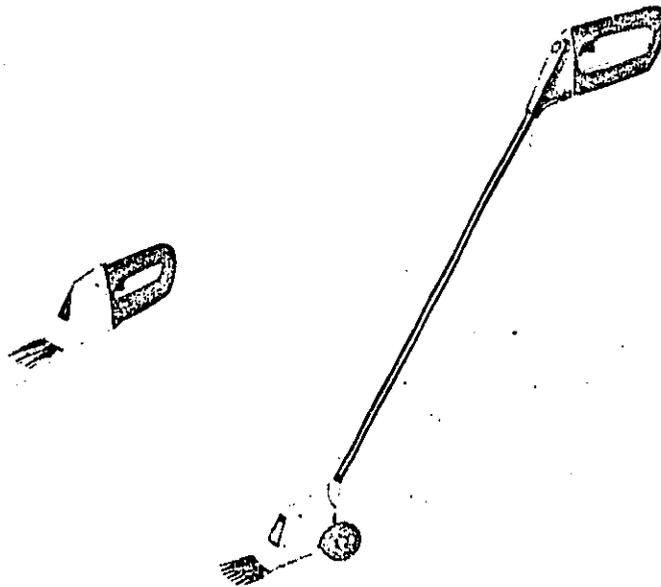
Types, Sizes, and Power:

Power lawn sweepers can be self-propelled or push type, and have varying engine sizes (usual size is around 3-1/2 hp). Some sweepers have attachments available that permit dethatching as well as sweeping.

Usage:

Power lawn sweepers pick up grass clippings, leaves, and other lawn debris. With dethatching attachment, the sweeper can remove thatch to aid lawn growth.

POWER SHEAR



Definition:

A power shear is a hand-held lawn and garden tool which uses electric or battery power to give a set of blades a rapid scissors-like slicing motion.

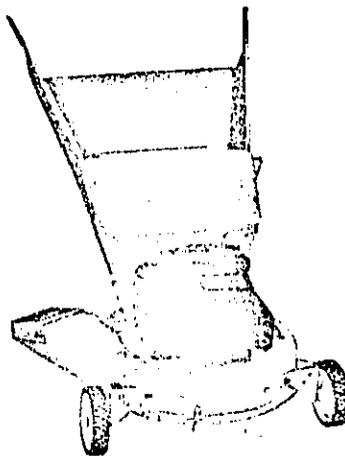
Types, Sizes, and Power:

Power shears can be held directly by the hand or can be designed with a rod to extend reach and do ground work more easily. Power range is around 1/5 hp or less.

Usage:

Power shears are used in the yard or garden to prune, trim hedges, clip weeds or grass, and do other minor cutting jobs.

ROTARY SHREDDER



Definition:

A rotary shredder is a self-powered machine for processing vegetation debris and trimmings, having a rotating shredding mechanism, gravity or force fed receiving intake, and which accomplishes processing without the use of a grinding screen or grid.*

Types, Sizes, and Power:

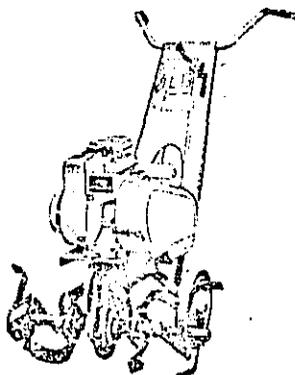
Shredders, which can be either electric or gasoline-powered, and are differentiated by engine size. Typical power range is from 1-1/2 to 6 hp. Units with larger engines are able to shred larger branches, and can shred finer and faster, than those equipped with smaller engines.

Usage:

Rotary shredders reduce various kinds of lawn and garden debris for disposal or recycling as mulch or compost.

*"Marketing Manual," OPEI, Washington, D.C., p. 12.

ROTARY TILLER



Definition:

A rotary tiller is a walk-behind lawn and garden tool which uses an engine to spin a horizontal shaft carrying a number of curved blades, for the purpose of conditioning soil.

Types, Sizes, and Power:

Rotary tillers are differentiated by amount of horsepower available. The typical range is from 2 to 8 hp. The width and width adjustability of the cutting path also varies, as does the type of drive (gear or chain).

Usage:

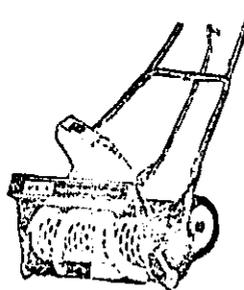
Rotary tillers are most often used for breaking up and turning garden soil. They can also be used for weeding, cultivating, and mixing mulch into the soil.

*"Marketing Manual," OPEI, Washington, D.C., p. 12.

SNOW THROWER, WALK BEHIND



Gasoline Powered
Snow Thrower



Electrical Powered
Snow Thrower

Definition:

A walk-behind rotary snow thrower is a snow-throwing machine, either push or self-propelled, designed to remove snow from any given area. It excludes rotary snow throwers designed for attachments to riding equipment, but includes those designed for use with multipurpose garden tools.*

Types, Sizes, and Power:

Snow throwers are generally categorized by engine power, width of path each can clear, and by whether the thrower is power-propelled or push-type. Two to five horsepower units generally can clear a 20-in. path, while a more powerful 8-hp, 3-stage unit can clear a path 26 in. wide. Most snow throwers features auger blades to break up and feed snow into a discharge chute. This can be done using one, two, or three

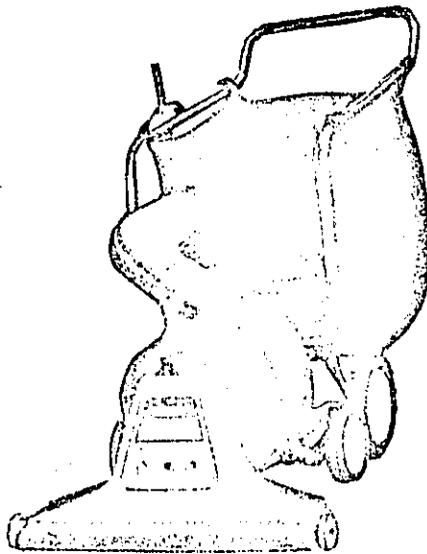
auger stages. Another type of snow thrower uses a rotating drum with 2 paddles and directional fins to scoop in snow, and throw it up and out. Smaller electrical snow throwers are yet another type.

Usage:

Snow throwers are used outdoors for removing snow from sidewalks and driveways.

*"Marketing Manual," OPEI, Washington, D.C., page 11.

VACUUM COLLECTOR



Definition:

A vacuum collector (or yard vacuum) is an engine-powered machine for vacuuming surfaces for the removal of vegetation debris and trimmings. Combination yard vacuum/blowers are included in this category.*

Types, Sizes, and Power:

Outdoor vacuums are differentiated by capacity for holding refuse, by the amount of horsepower and airpower available, and by the number of features available (wet or dry pick-up, blower conversion, etc.). Single-use vacuums develop around one to

*"Marketing Manual," OPEI, Washington, D.C., page 12.

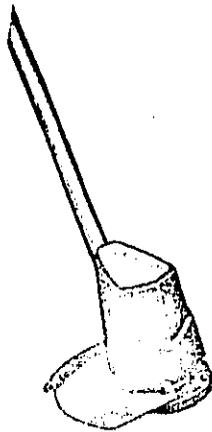
VACUUM COLLECTOR - Page 2

two horsepower and can only vacuum. Yard vacuum/blower units have more power (3-1/2 hp) and can blow leaves as well as vacuum, compact and bag leaves.

Usage:

Yard vacuums clear yard of debris, clear soil and leaves from paved surfaces, and pick up water.

WEED CUTTER, ELECTRIC



Definition:

An electric weed cutter is a walk-behind machine that uses a rapidly rotating nylon whip, powered by an electric motor, to trim grass and light weeds.

Types, Sizes, and Power:

There are only minor differences in types and sizes. Typical power use is 100 watts.

Usage:

Weed cutters trim grass and light weeds in areas unsuited for regular mowing, such as along chain-link fences and sidewalks or against buildings.

4. CLASSIFICATION

In this section we develop criteria for classification, then apply these criteria to each of the major three product classes. The output will be a recommended classification of the products identified in Sec. 2 and described in Sec. 3.

4.1 Criteria

The purpose of classification is to allow products to be treated in groups, rather than individually. Classification can be based on:

- Measurement procedures;
- Dividing products of potentially significant noise impact from those likely to be of little concern in terms of health and welfare;
- Methods already established by industry and government.

Below we discuss all three methods of classification.

Measurement Factors

Of the many factors that measurement criteria must satisfy, relevance is of primary concern for developing a classification strategy. The basic problem is that products used at different distances from users or bystanders and under different circumstances must be measured by procedures that account for such usage. For example, hair dryers are always used close to the operators' ears, whereas dishwashers operate through automatic cycles at greater distances. One would not expect the same measurement procedure (e.g., reverberant room) to apply equally well to both devices. Moreover, the levels measured by such a common procedure would not indicate the exposure actually

experienced by the user. Thus, for purposes of classification, we have established the following distance parameters, depending on the noise source location:

Head: The noise source is located in, or in conjunction with a device used around the operator's head.

Arm's Length: The noise source is located in a device used at arm's length.

6-8 Ft: The noise source is located at the end of a handle or hose and, typically, on the floor or ground

Far: The product does not require an operator and is usually stationary, with users or bystanders located somewhere in the far field.

Product installation is another factor that bears on the relevance of measurements. The sound radiated into rooms will be affected by walls in which fans and air conditioners are mounted, whereas cabinets will reduce sound radiated by dishwashers. In other situations, the installation can amplify radiated sound, as with food waste disposers mounted in steel sinks. For many portable devices, there is no installation to speak of, and the surrounding structures do not have a large influence on radiated sound levels. For our purposes, we will distinguish products according to whether they are *fixed* or *portable*.

Health and Welfare

Health and welfare factors comprise three major elements:

- Location

- Noise level
- Impact.

The *location* in which a source is used is clearly important because of the acoustic properties and the human activities associated with each space. Noise sources in a remote basement workshop, a bedroom, or out-of-doors will all result in different levels of exposure and different types of disturbances (speech, sleep, etc.). We have identified the following major locations for consideration:

- Kitchen
- Living/dining
- Work/utility
- Bedroom/bathroom
- Out-of-doors.

The noise *level* will be important for subsequent comparison with health and welfare criteria. We will accordingly provide data on the mean as well as range of levels.

Of the various ways in which noise affects people, we have selected three for purposes of this study:

- Hearing loss
- Speech interference
- Sleep interruption.

It is necessary to establish criteria levels which, if exceeded, establish that a product *may* contribute to one or more of these types of impacts. We emphasize the term "may" because we are seeking a minimum threshold which justifies further evaluation in a detailed health and welfare analysis.

The EPA has established a 24-hour energy equivalent exposure level, $L_{eq}(24)$ of less than 70 dB as requisite to protect the public health and welfare [2]. Accordingly, exposure to a constant level of 70 dBA for 24 hours is regarded as barely unacceptable. $L_{eq}(24)$ is calculated from

$$L_{eq}(24) = 10 \log \left[\frac{1}{24} \int_0^{24} 10^{L_A(t)/10} dt \right], \quad (1)$$

where $L_A(t)$ is the time-varying A-weighted level to which a person is exposed. Because of the structure of Eq. 1, values of $L_A(t)$ in excess of 70 dBA contribute significantly to $L_{eq}(24)$, whereas values below 70 dBA contribute only weakly. Therefore, we have selected 70 dBA as the threshold above which a source may contribute to hearing loss.

Intelligibility of speech communication depends on background noise, the distance between the speaker and listener, and whether the speaker is willing to raise his voice to overcome the background noise. These relationships have been summarized by Miller [3], as illustrated in Fig. 2. For communication in the presence of household products, one would expect a speaker/listener distance of less than about 15 to 20 ft. Therefore, we have selected 50 dBA as a criterion. Again, this level does not preclude speech communication but indicates a *potential* problem.

Miller [3] has also summarized the effects of noise on sleep disturbances (see Fig. 3). As with other psychoacoustic effects, there is a broad range of responses. However, in the vicinity of 30 to 40 dBA, there is an abrupt rise in percentage of people awakened generally, or awakened from Stage II (light) sleep. Accordingly, we select 35 dBA as a threshold above which further evaluation is warranted.

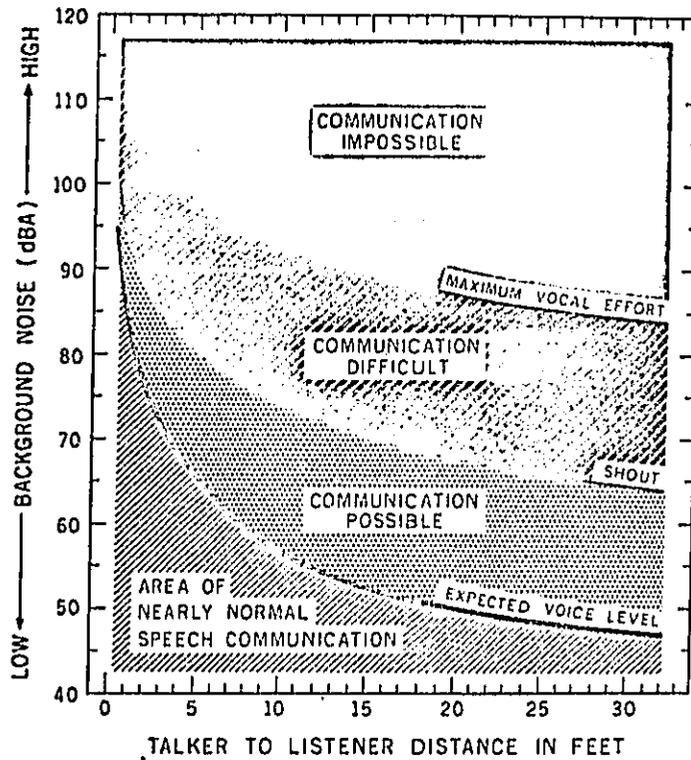


FIG. 2. SIMPLIFIED CHART THAT SHOWS THE QUALITY OF SPEECH COMMUNICATION IN RELATION TO THE A-WEIGHTED SOUND LEVEL OF NOISE (dB(A)) AND THE DISTANCE BETWEEN THE TALKER AND THE LISTENER [s].

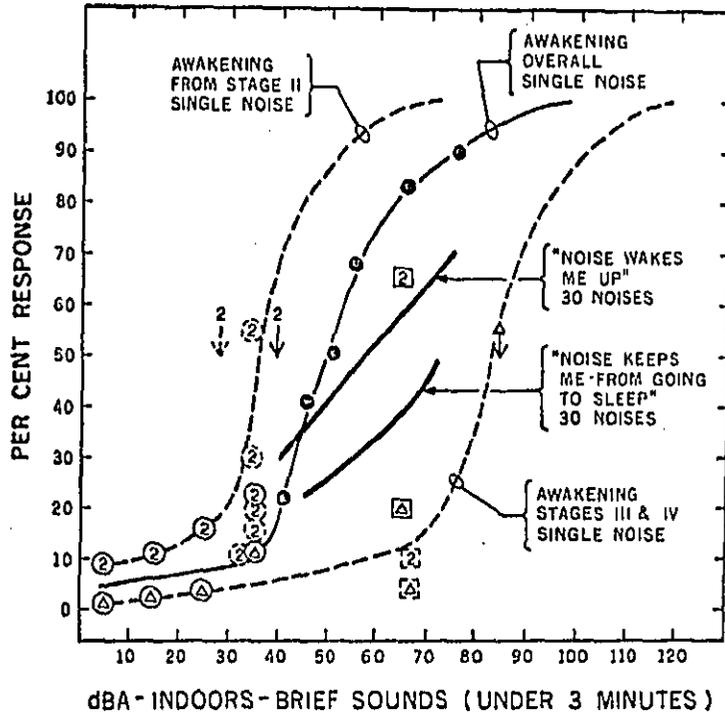


FIG. 3. AWAKENINGS TO VARIOUS SOUND LEVELS [3].

One of the problems that we will face is deciding whether products used exclusively in certain spaces can affect people in other spaces. Of specific concern is whether outdoor power equipment, shop tools, or appliances used in kitchens, living, or work areas can awaken people sleeping in their bedrooms. There is a wide range of scenarios for this problem and an equally wide range of approaches for solving it. For a comprehensive health and welfare evaluation, one would use a number of scenarios and a reasonably sophisticated level of analysis. However, for purposes of classification, a few simple formulas are needed.

The one that we shall use to estimate sleep disturbances from household appliances and power shop tools used in rooms other than the bedroom is:

$$L_b = L_s - 25, \quad (2)$$

where L_b is the estimated sound level in the bedroom and L_s is the product level measured at approximately 3 ft. The rationale for the 25-dBA adjustment in Eq. 2 is provided in Appendix B.

For outdoor power equipment we use

$$L_b = L(50) - C_1, \quad (3)$$

where $L(50)$ is the level which is measured at (or extrapolated to) 50 ft and

$$C_1 = 15 \text{ for window-open conditions [4]}$$

$$C_1 = 25 \text{ for window-closed conditions* [4].}$$

The 50 ft distance is selected as representative of the equipment-to-listener distance.

Industry and Government

The products that we are investigating have been dealt with by industry and government organizations for many years, and it is useful to consider the classification techniques that they have used. Accordingly, we will account for the way in which the three principal industry associations - AHAM, PTI, and OPEI - classify products. In addition, we will consider the way in which the U.S. Department of Commerce classifies products through its Standard Industrial Classification (SIC) Codes.

*Which we assume applies for leaf blowers, portable outdoor heaters, and snow throwers.

4.2 Household Appliances

Table 4 arrays household appliances against the measurement, health and welfare, and industry and government classification factors discussed above. The x's denoting that a condition applies were determined for distance, installation, and location factors by a three-person team. Noise levels were obtained by surveying published data and from measurements conducted on appliances for which no data were available. (These measurements are presented in Appendix A of this report.) The potential health and welfare impact was determined by comparing exposure levels (given in the table or estimated by means of Eqs. 2 and 3) with the indicated criteria levels. Industry association and DOC classifications were obtained from published literature.

Table 4 shows that certain products do not exceed the criteria for health and welfare impact. Therefore, we eliminate these from further study. The remainder then, have to be classified according to measurement, health and welfare, or industry/government criteria.

Classifying by health and welfare criteria would give the EPA a rationale for prioritizing products but would still leave problems with measurement methods. Such diverse products as blenders, dishwashers, and hair dryers would be classified together in the group with the highest impact, yet it is doubtful that a meaningful measurement method could be established for all three.

Similarly, industry/government criteria do not prove to be appropriate. The industry associations identified in Table 4 account for only 56% of the products in the table. The SIC codes cut across too large a range of products to be useful for our purposes. For example, SIC 36343 includes products as diverse as can openers, hair clippers, manicure sets, and vaporizers.

We conclude that classifying household appliances primarily on the basis of distance is the most appropriate for purposes of this study. Table 5 shows that this approach, taking other factors into account, leads to seven categories of products. All products used around the face and head form one homogeneous category. Not only are they all used at the same distance, but they are all portable and are used predominantly in the same location (bedroom/bathroom). All fall within the (rather broad) 4-digit SIC Code 3634, Electric Housewares and Fans.

Products used at arm's length are divided into three categories primarily because of the different spaces in which they are operated. The first of these categories forms a very homogeneous group of kitchen counter-top appliances. They are all portable, and 75% are identified by AHAM as portable appliances. All fall with SIC Code 3634. The four appliances in the next category of health and grooming aids are also portable, but tend to be used in bedrooms and bathrooms. Seventy-five percent of these are also identified by AHAM, and all are within SIC Code 3634. The category of other appliances used at arm's length is more diffuse: While they are all portable, 83% are used in multiple locations. None is identified by AHAM, and they span three different 4-digit SIC codes.

The fifth category in Table 5 comprises three appliances used at 6 to 8 ft. They form a fairly homogeneous group, of which all are portable, and all are used in multiple locations. None of these appliances is identified by AHAM; they are divided between two SIC codes.

We have divided products that do not require an operator into two groups: fixed and portable. Appliances within both groups are used in various locations. AHAM classifies all of

TABLE 5. RECOMMENDED CLASSIFICATION OF HOUSEHOLD APPLIANCES.

1. Products Used Around the Face or Head
 - Facial Brush
 - Hair Clipper
 - Hair Brush, comb
 - Hair Dryer
 - Shaver
 - Tooth Brush, elec.
2. Products Used at Arm's Length: Kitchen
 - Blender
 - Can Opener
 - Coffee Grinder
 - Food Chopper
 - Food
 - Food Mixer
 - Food Processor
 - Food Slicer
 - Ice Crusher
 - Juicer
 - Knife, elec.
 - Knife Sharpener
3. Products Used at Arm's Length: Health and Grooming Aids
 - Dental Irrigator
 - Hot Lather Dispenser
 - Manicure Set
 - Massager
4. Products Used at Arm's Length: Other
 - Pencil Sharpener
 - Pet Clipper
 - Scissors, elec.
 - Sewing Machine
 - Shoe Polisher
 - Typewriter
5. Products Used at 6-8 Ft.
 - Floor Polisher/Waxer
 - Rug Shampooer-Polisher
 - Vacuum Cleaner
6. Products That Do Not Require An Operator: Fixed Appliances
 - Clothes Dryer
 - Clothes Washer
 - Dehumidifier
 - Dishwasher
 - Food Waste Disposer
 - Range Hood
 - Refrigerator
 - Room Air Conditioner
 - Trash Compactor
7. Products That Do Not Require An Operator: Portable Appliances
 - Air Heater
 - Aquarium Air Compressor
 - Clock
 - Fan
 - Humidifier
 - Ice Cream Maker, elec.
 - Movie Projector
 - Slide Projector
 - Vaporizer

the fixed appliances, except for range hoods, as major and identifies slightly more than half of the portable appliances. These products span eight different SIC codes.

4.3 Power Shop Tools

A classification matrix for power shop tools is shown in Table 6. Unlike household appliances, not a single tool was found to be below the potential health and welfare impact levels. Therefore, none can be eliminated from further consideration at this point.

As with household appliances, there is little rationale for classifying power shop tools other than by distance. Since all tools for which data are available are capable of contributing to hearing loss, there is no good way to prioritize by type of health and welfare impact.*

In its published literature provided to BBN during an interview, the Power Tool Institute (PTI) identifies 68% of the tools in Table 6. However, in a draft ANSI Measurement Standard, prepared by the PTI, 88% of the tools were identified[†] [5]. PTI also identifies certain types of outdoor equipment as power tools. Therefore, classifying on the basis of industry perspective leaves some uncertainty as to which products to include.

While one could also classify the products in Table 6 on the basis of SIC code, it is not clear that this would be the most advantageous approach. All of the tools identified in Table 6

*One could, however, prioritize by degree of impact. For example, circular saws are noisier than drill presses and could be given a higher priority for regulatory action.

[†]PTI does not identify air compressors, drill bit sharpeners, or lathes in draft Standard S10.1.

TABLE 6. CLASSIFICATION MATRIX FOR POWER SHOP TOOLS.

	MEASUREMENT FACTORS				HEALTH AND WELFARE FACTORS								INDUSTRY ASSOCIATION & DOC CLASSIFICATION					
	Distance		Installation	Location	Noise Data		No. of Samples	Potential H&W Impact			AHAM	PTI	OPEI	Other	SIC			
	Oper Controlled	No Op			Mean	Range		Hearing >70 dBA	Speech >50 dBA	Sleep >35 dBA or >60 dBA	Major	Portable	Power Tool			Outdoor Power Equipment		
	Arm's Head	6-8 Length Ft	Far	Kitchen	Living/ Dining	Work/ Utility	Bdrm/ Bath	Out of Doors										
Air Compressor, elec	x		x						81		1	x	x	x				3546110
Band Saw	x		x						87.7	74.4 - 103	2	x	x	x				3553221
Beit Sander	x		x		x				93	86 - 99	4	x	x	x				3546133
Bench Grinder	x		x						89	89 - 97	4	x	x	x				3553298
Circular Saw	x		x						98.2	95 - 102	5	x	x	x				35461
Disc Sander	x			x					92	89 - 95	2	x	x	x				3546134
Drill Bit Sharpener	x			x					89		1	x	x	x				3553298
Drill, elec	x			x					88.5	72 - 89	11	x	x	x				35461
Drill, multi-purpose	x			x					90	88 - 92	1	x	x	x				35461
Drill Press	x			x					79.4	72 - 87	3	x	x	x				3553298
Engraving Pen, elec	x			x					90		1	x	x	x				3546135
Impact Tools, elec	x			x					0		0	x	x	x				3546123
Jointer/Planer	x			x					0		0	x	x	x				3553298
Lathe	x			x					74.3	74 - 80	3	x	x	x				35461
Mitre Box, power	x			x					0		0	x	x	x				3553298
Orbital Sander, elec (incl. comb.)	x			x					83.6	73 - 91	5	x	x	x				3546134
Planer	x			x					0		0	x	x	x				3546127
Polisher	x			x					0		0	x	x	x				3546131
Radial Arm Saw	x			x					90.7	83 - 102	3	x	x	x				3553221
Reciprocating Saw	x			x					84.8	71 - 110	5	x	x	x				35461
Rotary Grinder	x			x					90.4	87 - 96	2	x	x	x				35461
Router	x			x					93	81 - 104	3	x	x	x				3546127
Stapler, elec	x			x					0		0	x	x	x				3546135
Table Saw	x			x					86	77 - 95	2	x	x	x				3553221
Straight Line Sander	x			x					63		1		x	x				3546134

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fall into the following 5-digit SIC codes:

35461: Power-driven hand tools, electric.

35532: Woodworking machinery for home workshop (except power-driven hand tools), including parts and attachments.

35631: Air and gas compressors and vacuum pumps.

Since the first two groups are used at arm's length, we have combined them and formed the categories illustrated in Table 7. All of these tools would be used primarily in home work/utility areas, but some of the portable units (e.g., drills, circular saws) could also be used in numerous other locations.

TABLE 7. RECOMMENDED CLASSIFICATION OF POWER SHOP TOOLS.

1. Products Used At Arm's Length	
<ul style="list-style-type: none">• Band Saw• Belt Sander• Bench Grinder• Circular Saw• Disc Sander• Drill Bit Sharpener• Drill, elec.• Drill, multi-purpose• Drill Press• Engraving Pen, elec.• Impact Tools, elec.• Jointer/Planer	<ul style="list-style-type: none">• Lathe• Mitre Box, power• Orbital Sander, elec.• Polisher• Radial Arm Saw• Reciprocating Saw• Rotary Grinder• Router• Stapler, elec.• Table Saw• Vibration Sander
2. Products That Do Not Require An Operator	
<ul style="list-style-type: none">• Air Compressor	

4.4 Outdoor Power Equipment

Table 8 presents the classification matrix for outdoor power equipment. This table differs from the others in that it makes provision for noise data at far distances as well as near. This is necessary because of (1) the greater potential for outdoor power equipment to affect neighbors and (2) the greater difficulty in extrapolating nearfield data to larger distances.

As with power shop tools, all of the outdoor power equipment for which noise data are available are capable of contributing to hearing damage. Therefore, none can be eliminated from further study on the basis of health and welfare impact, nor is there a basis for classification by type of impact.

From the perspective of industry, the Outdoor Power Equipment Institute identifies about 67% of the appliances in Table 8 and the PTI about 17%. Some 22% are not identified by either association. Interestingly, both PTI and OPEI identify electric lawn mowers.

Table 9 provides three categories of outdoor power equipment, established on the basis of distance. The majority are used at 6 to 8 ft, five are used at arm's length, and only one is regularly used without an operator. We have divided air-cooled replacement engines into two categories: hand-held or ground-supported.

TABLE B. CLASSIFICATION MATRIX FOR OUTDOOR POWER EQUIPMENT.

	MEASUREMENT FACTORS					HEALTH AND WELFARE FACTORS										INDUSTRY ASSOCIATION AND DOC CLASSIFICATION									
	Distance			Installation	Location	Noise Data			Noise Data			Potential H/W Impact			AHAM	PTI	DPET	Other	SIC						
	Oper Controlled	No Op	Far			Level - dBA at Operator's Ear	Mean	Range	No. of Samples	Level - dBA at 50 Ft	Mean	Range	No. of Samples	Hearing >70 dBA						Speech >50 dBA	Sleep >50 dBA at 50 Ft				
	Head Length	Arm's Length	6-8 Ft	Fixed	Portable	Kitchen	Living/Dining	Work/Utility	Bdrm/Bath	Out of Doors	Mean	Range	No. of Samples	Mean	Range	No. of Samples	Hearing >70 dBA	Speech >50 dBA	Sleep >50 dBA at 50 Ft	Major	Portable	Power Tools	Outdoor Power Equipment		
Air Cooled Replacement Engine	x	x		x	x				x			0										x		3519100	
Brush Cutter	x	x			x				x			0										x		3524781	
Chain Saw	x	x			x				x	-105	90 - 120	-20					x	x	x			x		3533167	
Edger Trimmer	x	x			x				x	81		1					x	x	x			x		3524781	
Garden Tractor	x	x			x				x			0										x		3524200	
Hedge Trimmer	x	x			x				x	84		1					x	x	x			x		3534761	
Lawn Mower, riding	x	x			x				x	93	90 - 95	7					x	x	x			x		35247	
Lawn Mower, walk behind	x	x			x				x	90	81 - 98	26	-67	62 - 72	28		x	x	x			x		35247	
Lawn Thatcher	x	x			x				x			0	-74	63 - 81	9							x		3524200	
Leaf blower	x	x			x				x			0										x		35247	
Portable Outdoor Heater			x		x				x			0													
Power Lawn Sweeper					x				x			0													3524200
Power Shears	x	x			x				x			0													3524911
Rotary Tiller	x	x			x				x			0													3524200
Shredder	x	x			x				x	97	94 - 100	2					x	x	x			x		3524200	
Snow Thrower					x				x	84	84 - 93	0	74		1		x	x	x			x		3524761	
Vacuum Collector					x				x			0					y								3524200
Weed Cutter, elec					x				x			0													3546135

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TABLE 9. RECOMMENDED CLASSIFICATION OF OUTDOOR POWER EQUIPMENT.

1. Products Used At Arm's Length	
• Air Cooled Replacement Engines (for chain saws and brush cutters only)	
• Brush Cutter	
• Chain Saw	
• Hedge Trimmer	
• Power Shears (hand held)	
2. Products Used at 6-8 Ft	
• Air Cooled Replacement Engines (other than for chain saws)	• Leaf Blower
• Edge Trimmer	• Power Lawn Sweeper
• Garden Tractor	• Rotary Tiller
• Lawn Mower, riding	• Shredder
• Lawn Mower, walk behind	• Snow Thrower
• Lawn Thatcher	• Vacuum Collector, lawn
	• Weed Cutter, elec.
3. Products That Do Not Require An Operator	
• Portable Outdoor Heater	

Bolt Beranek and Newman Inc.

REFERENCES

1. 40 CFR 103, p. 23106-7, May 28, 1975.
2. "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare With an Adequate Margin of Safety." Environmental Protection Agency Report 550/9-74-004, March 1974.
3. J.D. Miller, "Effects of Noise on People." Environmental Protection Agency Report NTID 300.7, Dec. 1971.
4. "Background Document for Medium and Heavy Truck Noise Emission Regulations." Environmental Protection Agency Report EPA-550/9-76-008, March 1976.
5. E.C. Dudek *et al.*, "Power Tool Institute Standard for the Measurement of Sound Emitted by Portable, Stationary and Fixed Electric Tools." ANSI S101.1 (in draft), 23 Feb. 1978.

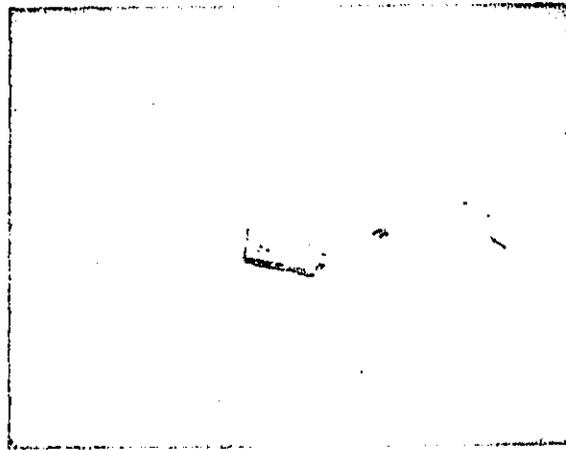
Bolt Beranek and Newman Inc.

APPENDIX A
NOISE DATA ON CONSUMER PRODUCTS

PRODUCT: Aquarium Air Compressor DATE TESTED March 11, 1978 BY KJF

Mfgr: Rena Model Name & Number: Rena R101

Size: 1/4 in dia. Output Tube



TEST CONDITIONS MEASUREMENT METHOD
Room Type: * Bedromm Microphone Distance 3 ft
Operator Present (X) ()
Yes No
Operating Parameters: † 120 volts 5 watts
Installation: ** On table connected to water bubbler
Processed Material: †† Air

DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Normal Operation	41	33	54	41	40	41	35	24	24	24
Ambient Noise	20	31	28	21	16	11	10			

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.
**On table, on floor, built-in etc. ††grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Aquarium Air Compressor DATE TESTED March 5, 1978 BY RDB

Mfgr: Second Nature

Model Name & Number: Whisper 400

Size:

TEST CONDITIONS

Room Type: * In Situ

MEASUREMENT METHOD

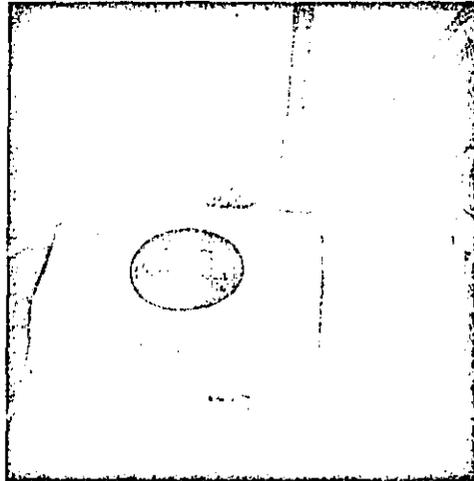
Microphone Distance: as noted

Operator Present: () (x)
Yes No

Operating Parameters: † 3 watts

Installation: ** On stand

Processed Material: †† Air



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
At 3 ft	40	57	54	49	43	38	33	26	23	18
At 1 ft	46	58	57	54	50	43	37	33	28	24
Ambient	36	57	53	46	41	33	27	17	12	13

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.

**On table, on floor, built-in etc. ††grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Aquarium Air Compressor DATE TESTED Mar 5, 1978 BY EKB

Mfgr: Metaframe

Model Name & Number: Hush I, Cat. #81

Size: _____

TEST CONDITIONS

Room Type: * Den

MEASUREMENT METHOD

Microphone Distance: 3 ft.

Operator Present: () (x)
Yes No

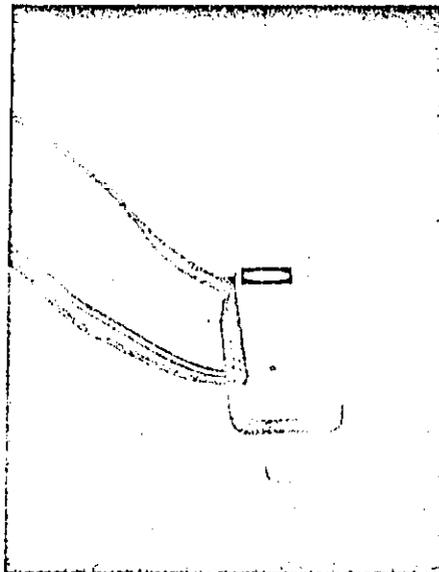
Operating Parameters: † 115 V., 60 Hz.

3 Watts. GR1982 Precision SLM 1/2 in. mic.

SLM on slow

Installation: ** Floor

Processed Material: †† Air



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Operating	34.9	31	39.5	42.3	38	31	28.6	22.8	20.7	21.5
Background	26.7	31.4	37	28	23	22.5	21.5	16.6	18.6	19.5

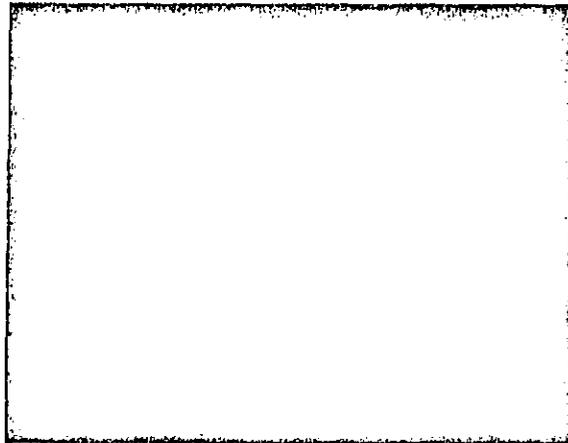
*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.

**On table, on floor, built-in etc. ††grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Aquarium Air Compressor DATE TESTED Mar 7, 1978 BY RLB

Mfgr: Meta Frame Model Name & Number: Hush I

Size: 2 psi 80 cu.in./min.



TEST CONDITIONS

MEASUREMENT METHOD

Room Type: * In situ Microphone Distance 2 ft.

Operator Present () (x)
Yes No

Operating Parameters: † Unloaded

Installation: ** On floor

Processed Material: †† Air

DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Unloaded	40.0	50.2	59.5	48.7	45.7	32.9	28.2			

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.
**On table, on floor, built-in etc. ††grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Blender DATE TESTED March 5, 1978 BY RDB

Mfgr: Waring

Model Name & Number: 1186

Size: ---

TEST CONDITIONS

Room Type: * Reverberant

MEASUREMENT METHOD

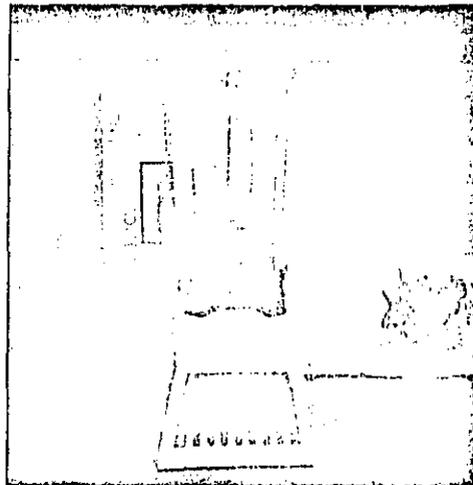
Microphone Distance: 1 ft

Operator Present: (X) ()
Yes No

Operating Parameters: † 5.9 amps, 720 wat

Installation: ** On counter

Processed Material: †† 2 cups water



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Whip	75	57	59	72	59	66	71	72	65	64
Grate	82	58	60	70	75	74	77	78	72	73
Liquefy	88	59	60	60	74	78	83	86	79	75

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.

**On table, on floor, built-in etc. ††grass, ½ in. plywood, bread dough etc.

PRODUCT: Can Opener DATE TESTED Mar 5, 1978 BY RLB

Mfgr: Waring

Model Name & Number: 410 T

Size: _____

TEST CONDITIONS

Room Type: * Kitchen

MEASUREMENT METHOD

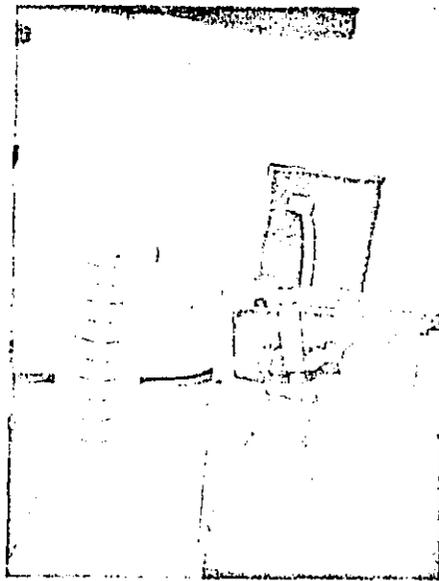
Microphone Distance: _____

Operator Present: () ()
Yes No

Operating Parameters: † Unloaded

Installation: ** Counter top

Processed Material: †† None



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Free running	61.3	47.2	60.1	57.6	54.6	60.0	54.2	52.5	50.0	42.4

*Kitchen, livingroom, bedroom etc.

†voltage, current, power, speed, etc.

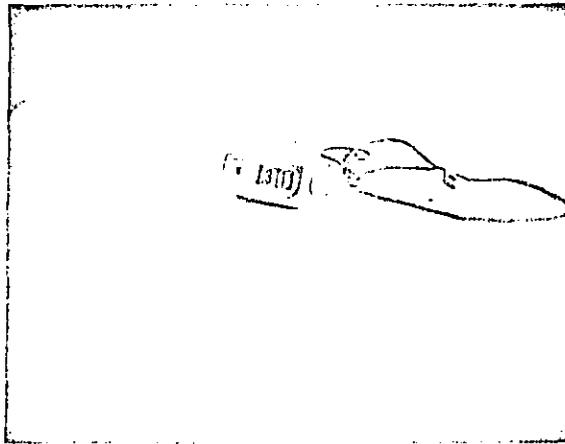
**On table, on floor, built-in etc.

††grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Digital Clock DATE TESTED March 12, 1978 BY KJF

Mfgr: Copal Model Name & Number: Model 226

Size: 2 in x 5 in Face Size



TEST CONDITIONS

MEASUREMENT METHOD

Room Type: * Bedroom

Microphone Distance 1 ft

Operator Present (X) ()
Yes No

Operating Parameters: † 120 volts 3 watts

Installation: ** On table

Processed Material: †† _____

DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Click ***					28	31	36	36	30	28
Ambient Noise	20	31	28	21	16	11	10			

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.

**On table, on floor, built-in etc. ††grass, ½ in. plywood, bread dough etc.

***Click of mechanism once every minute at change of number-peak measurement with "Fast" setting of SIM

PRODUCT: Clock DATE TESTED March 5, 1978 BY RDB

Mfgr: Westclox

Model Name & Number: NAP

Size: —

TEST CONDITIONS

Room Type: * Semi-Anechoic

MEASUREMENT METHOD

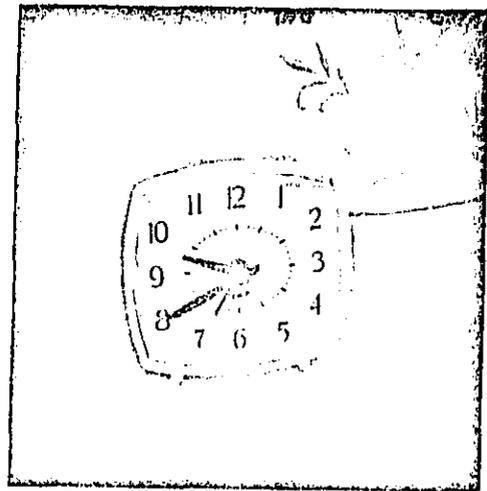
Microphone Distance: As noted

Operator Present: () (X)
Yes No

Operating Parameters:† —

Installation:** On night stand

Processed Material:†† —



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
At 16 in.	32	44	38	31	23	24	14	21	25	21
Ambient	24	43	38	30	22	23	14	11	11	13

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.

**On table, on floor, built-in etc. ††grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Electric Clock DATE TESTED Mar 5, 1978 BY EKB

Mfgr: Seth Thomas

Model Name & Number: _____

Size: _____

TEST CONDITIONS

Room Type: * Bedroom

MEASUREMENT METHOD

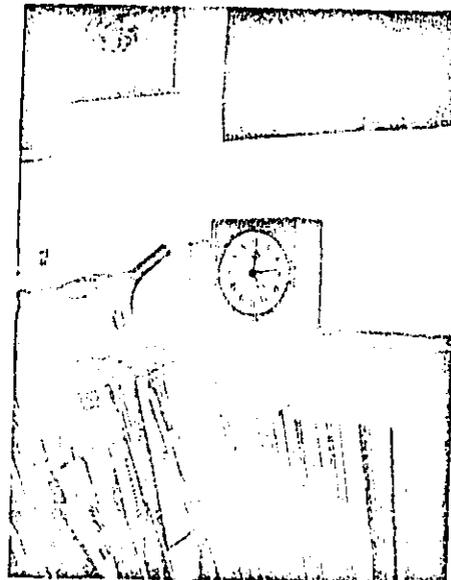
Microphone Distance: 6 ins. from face

Operator Present: () (x)
Yes No

Operating Parameters: † 110 V, A.C.
household outlet, gr 1982 Precision SLM
1/2 in. mic. SLM on slow

Installation: ** On bookcase

Processed Material: †† _____ None



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
6 ins. from face	29.2									
Background	26.3									

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.
**On table, on floor, built-in etc. ††grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Battery Clock DATE TESTED Mar 7, 1978 BY RLB

Mfgr: Welby

Model Name & Number: _____

Size: 21 ins. high

TEST CONDITIONS

Room Type: * In Situ

MEASUREMENT METHOD

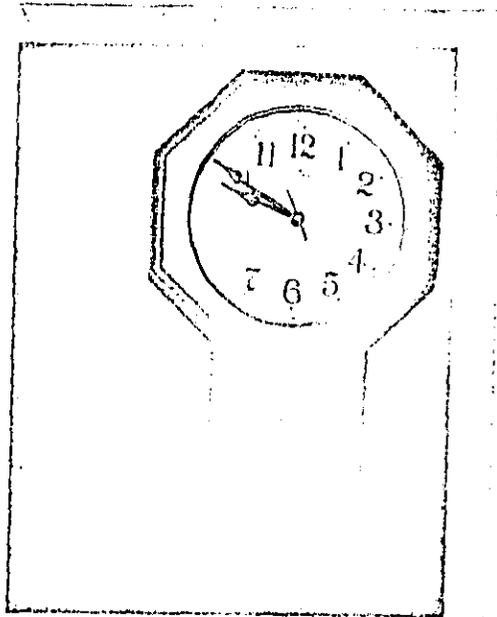
Microphone Distance: 6 ins.

Operator Present: () (X)
Yes No

Operating Parameters: † 1, 1.5 Volt
"C" Battery

Installation: ** On wall

Processed Material: †† Time



Ticking not above ambient on "slow"; on "fast", ticking gave 2 dB variation.

DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Normal Oper.	37.2									

*Kitchen, livingroom, bedroom etc.

†voltage, current, power, speed, etc.

**On table, on floor, built-in etc.

††grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Coffee Grinder DATE TESTED Mar 7, 1978 BY RLB

Mfgr: SEB (Melitta)

Model Name & Number: Type 136

Beanery

Size: _____

TEST CONDITIONS

Room Type: * Kitchen

MEASUREMENT METHOD

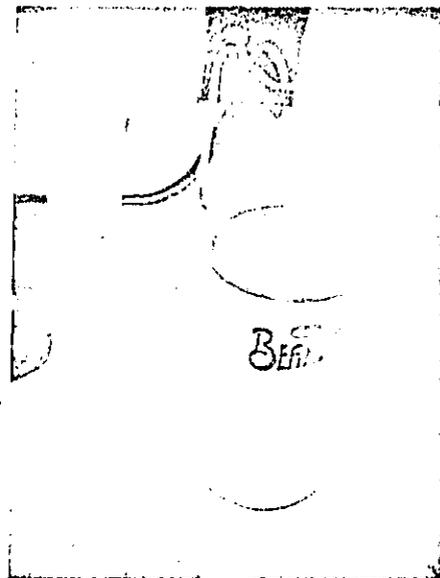
Microphone Distance: 32 ins.

Operator Present: (x) ()
Yes No

Operating Parameters: † House current

Installation: ** counter top

Processed Material: †† unloaded



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Free running	82.1	42.0	45.0	59.5	57.1	80.2	70.7	66.5	unit	got hot

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.
**On table, on floor, built-in etc. ††grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Dental Irrigator DATE TESTED Mar 7, 1978 BY RLB

Mfgr: Aqua Tech

Model Name & Number: Model 37

Size: _____

TEST CONDITIONS

Room Type: ^{*} Bathroom

MEASUREMENT METHOD

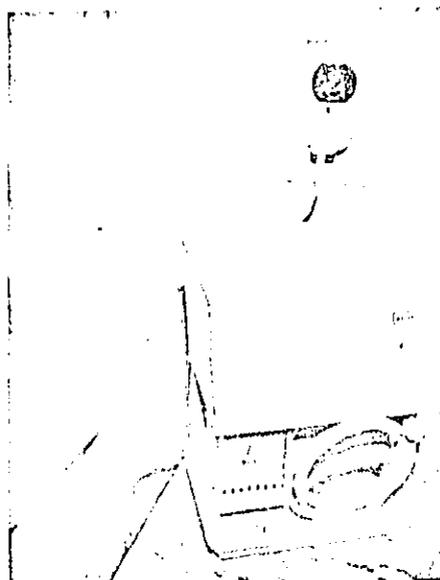
Microphone Distance: 24 ins.

Operator Present: (x) ()
Yes No

Operating Parameters: [†] House Current

Installation: ^{**} Bathroom counter

Processed Material: ^{††} Water



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Normal Operation	74.2	54.8	56.4	61.0	60.8	73.5	68.0	65.6	64.2	58

*Kitchen, livingroom, bedroom etc.

[†]voltage, current, power, speed, etc.

**On table, on floor, built-in etc.

^{††}grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Dental Irrigator DATE TESTED Jan 24, 1978 BY ILV

Mfgr: Teledyne Co.

Model Name & Number: Water Pik, Model 37

Size: _____

TEST CONDITIONS

Room Type: * Bathroom

MEASUREMENT METHOD

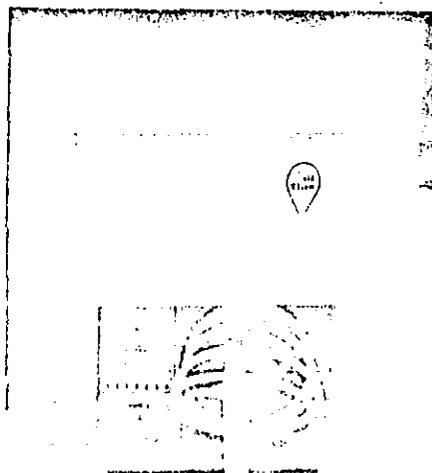
Microphone Distance: 2 ft.

Operator Present: () ()
Yes No

Operating Parameters: † 120 V, 8 A.

Installation: ** On shelf

Processed Material: †† Water



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Low	73	51	61	77	63	72	68	65	63	52
Medium	75	59	64	79	68	71	67	65	62	53
High	47	43	55	60	52	45	39	32	<25	<25

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.
**On table, on floor, built-in etc. ††grass, ½ in. plywood, bread dough etc.

PRODUCT: Floor Polisher DATE TESTED Mar 12 1978 BY KJF

Mfgr: Hoover

Model Name & Number: Shampoo-Polisher #5460

Size: 2 (5½ in. ea.) polishing pads

TEST CONDITIONS

Room Type: * bedroom

MEASUREMENT METHOD

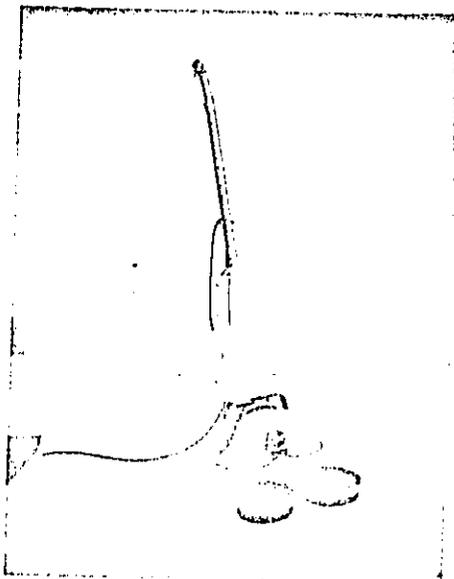
Microphone Distance: Operator's ear hgt-6 ft.

Operator Present: (x) ()
Yes No

Operating Parameters: † 120 volts
220 watts

Installation: ** On floor

Processed Material: †† oak parquet



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Normal Opera.	72	53	38	45	60	62	64	66	67	62
Ambient Noise	20	31	28	21	16	11	10	--	--	--

*Kitchen, livingroom, bedroom etc.

†voltage, current, power, speed, etc.

**On table, on floor, built-in etc.

††grass, ½ in. plywood, bread dough etc.

PRODUCT: Professional Hair Dryer DATE TESTED March 5, 1978 BY RDB

Mfgr: Electrical and Electronics Ltd.

Model Name & Number: PC6

Size: _____

TEST CONDITIONS

Room Type: * Reverberant

MEASUREMENT METHOD

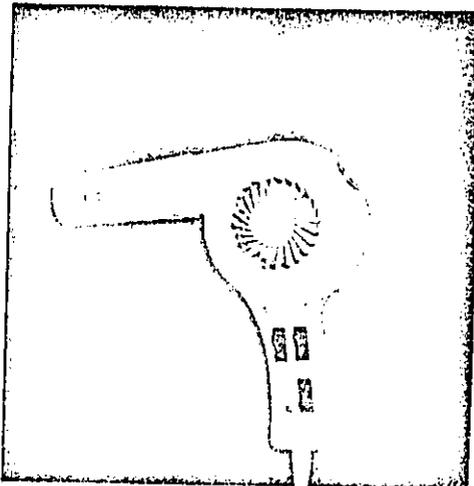
Microphone Distance: 12 in.

Operator Present: (X) ()
Yes No

Operating Parameters: † 1000 watts

Installation: ** Hand held

Processed Material: †† Air



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Position A	81	49	49	53	56	75	76	67	62	55
Position B	74	44	48	52	55	72	71	66	62	54

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.

**On table, on floor, built-in etc. ††grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Hair Dryer DATE TESTED Mar 4, 1978 BY EKB

Mfgr: Osterizer

Model Name & Number: Professional
Beauty Salon

Size: _____

TEST CONDITIONS

Room Type: * Livingroom

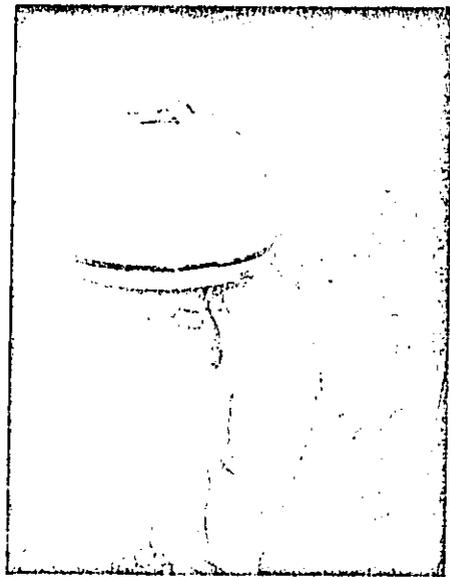
MEASUREMENT METHOD 2 ins. from ear
Microphone Distance: 3 ft. from

Operator Present: (x) ()
Yes No

Operating Parameters: † 110 V, house-
hold outlet

Installation: ** On chair (see photo)

Processed Material: †† Air



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
2 in from l. ear	75.5	61.5	66	70.5	76.5	69.5	71	68	57	48.2
Backgrd. 2" fr. ear	35.4	43.5	42	44.5	41	28	27	26	<26	<26
dryer † 3 ft. to left of	60.5	50	50.2							

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.

**On table, on floor, built-in etc. ††grass, ½ in. plywood, bread dough etc.

PRODUCT: Vaporizer-Humidifier DATE TESTED Jan 24, 1978 BY ILV

Mfgr: Sears Roebuck & Co.

Model Name & Number: 320-2221

Size: 1 1/2 gal., 16 in. dia.

TEST CONDITIONS

Room Type: * Livingroom

MEASUREMENT METHOD

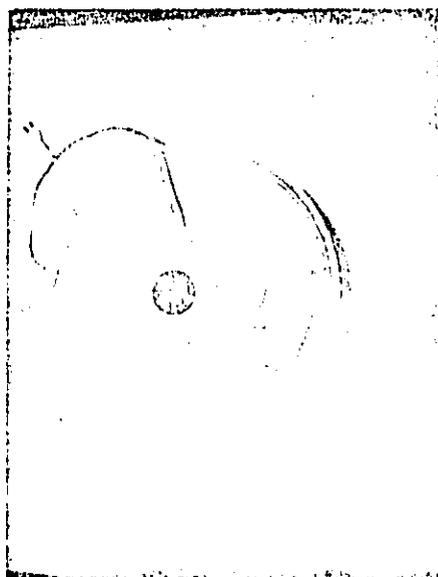
Microphone Distance: 3 ft

Operator Present: (x) ()
Yes No

Operating Parameters: †
110 V, 0.6 A.

Installation: ** On floor

Processed Material: †† Water



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Low	55	41	47	55	54	53	49	45	39	41
Medium	54	37	44	55	50	53	48	45	39	41
High	54	38	45	56	51	53	48	45	39	40

Ambient 26 36 29 29 <25 <25 <25 <25
*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.
**On table, on floor, built-in etc. ††grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Vaporizer DATE TESTED Mar 5, 1978 BY EKB

Mfgr: Hankscraft

Model Name & Number: Cool Vapor

Humidifier

Size: _____

TEST CONDITIONS

Room Type: * Bedroom

MEASUREMENT METHOD

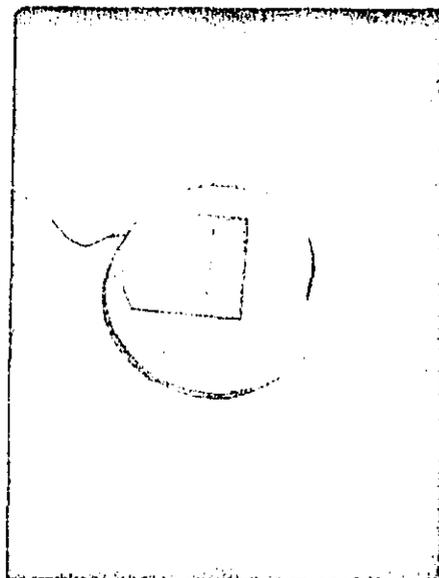
Microphone Distance: 3 ft.

Operator Present: () (x)
Yes No

Operating Parameters: † 110 V., A.C. House-
hold outlet; GR 1982 Precision SIM
½ in. mic. SIM on slow

Installation: ** On floor

Processed Material: †† Cold water



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
3 ft. from cent.	52.4	35	44.5	44	54	43.2	46	40.5	40.6	49.2
	47.2	45	49.6	41	52	36	38	35.5	36.3	43.8
	27	35	40	40	29	<26	<26	<26	<26	<26

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.

**On table, on floor, built-in etc. ††grass, ½ in. plywood, bread dough etc.

PRODUCT: Juicer DATE TESTED Mar 5, 1978 BY EKB

Mfgr: Proctor-Silex

Model Name & Number: Silex Juiclt
Oscillating Strainer

Size: _____

TEST CONDITIONS

Room Type: * Kitchen

MEASUREMENT METHOD

Microphone Distance: 18 ins.

Operator Present: () (x)
 Yes No

Operating Parameters: † 110 v. 60 Hz,
1.75 amps (rated)

GR 1982 Precision SLM $\frac{1}{2}$ in. mic. SLM on

Installation: ** _____ Slow

_____ Kitchen countertop

Processed Material: †† nothing



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Operating	75.8	51.8	60.1	56.7	62.5	66.8	70.4	73.1	67.6	60.8
Background	27.4	50.3	38.6	34.5	28.0	21.9	26	18	21	20

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.

**On table, on floor, built-in etc. ††grass, $\frac{1}{2}$ in. plywood, bread dough etc.

PRODUCT: Knife Sharpener DATE TESTED March 5, 1978 BY RDB

Mfgr: General Electric

Model Name & Number: Cat No. E3EC-25HR

Can Opener/Knife Sharpener

Size: _____

TEST CONDITIONS

Room Type: * In Situ

MEASUREMENT METHOD

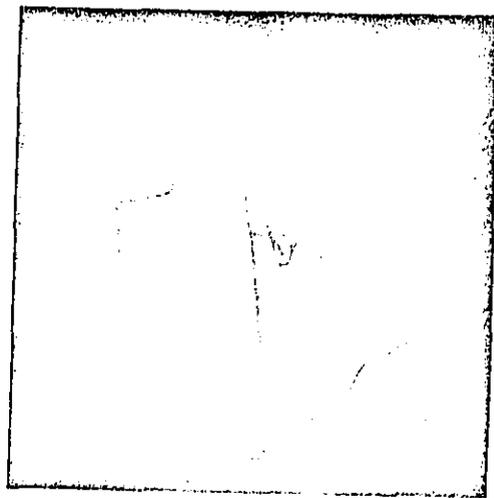
Microphone Distance: 12 in

Operator Present: (x) ()
Yes No

Operating Parameters: † 3.5 amps, 120 vo

Installation: ** On counter top

Processed Material: †† As noted



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Running without Knife	70	54	70	63	56	59	72	64	59	46
*** Running with Knife	78	55	70	65	57	69	70	75	70	70
Ambient	46	53	48	51	49	45	40	31	20	17

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.

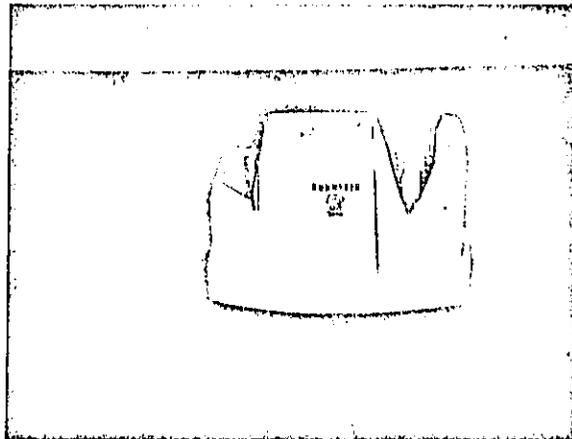
**On table, on floor, built-in etc. ††grass, ½ in. plywood, bread dough etc.

***Levels vary ± 5 dB depending on knife position, etc.

PRODUCT: Knife Sharpener DATE TESTED Mar 18, 1978 BY EMW

Mfgr: Dormeyer (Chicago) Model Name & Number: Model 14

Size: home kitchen



TEST CONDITIONS MEASUREMENT METHOD
Room Type: * In situ Microphone Distance 2 ft.***
Operator Present (x) ()
Yes No
Operating Parameters:† 110-120 v., 0.7 amps
Installation:** On counter
Processed Material:†† Carving knife

DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Amb.	42	51	53	52	40	40	37	30	14	10
On-not sharpen.	58	55	70	60	51	56	52	50	46	36
Sharpening	8 ₈₁	54 ₅₅	68 ₇₀	57 ₅₈	55 ₆₀	65 ₆₈	62 ₆₉	69 ₇₂	75 ₇₇	74 ₇₇

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.

**On table, on floor, built-in etc. ††grass, ½ in. plywood, bread dough etc.

PRODUCT: Movie Projector DATE TESTED March 5, 1978 BY RDB

Mfgr: Bell & Howell

Model Name & Number: Autoload Design
462A

Size: Super 8

TEST CONDITIONS

Room Type: * Semi-Anechoic

MEASUREMENT METHOD

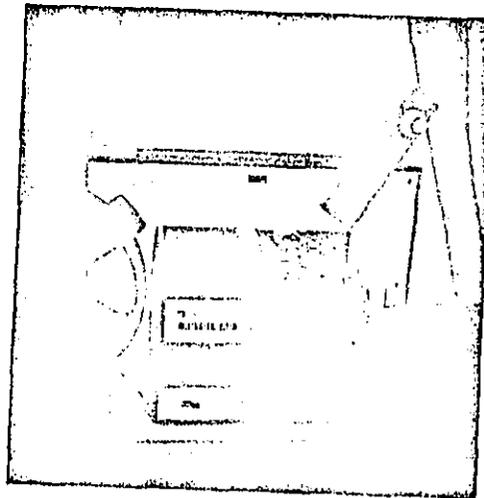
Microphone Distance: 12 in

Operator Present: () (X)
Yes No

Operating Parameters: † 5 amps

Installation: ** On table

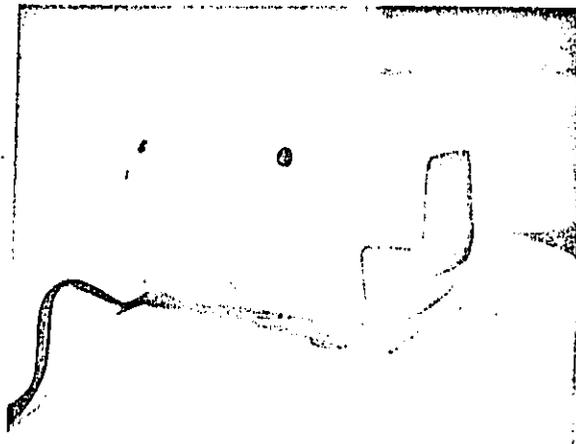
Processed Material: †† _____



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Motor Running	64	43	44	52	56	61	62	54	46	38
With film	65	44	45	55	55	62	62	60	50	47

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.
**On table, on floor, built-in etc. ††grass, 1/2 in. plywood, bread dough etc.

Panasonic Electric Pencil
 PRODUCT: Sharpener DATE TESTED Jan 24, 1978 BY ILV
 Mfr: Matsushita Elec. Ind. Model Name & Number: KP-88A
Co. Ltd.
 Size: 7 in.x4.5 in.x3in.



TEST CONDITIONS MEASUREMENT METHOD
 Room Type: * In situ Microphone Distance 2 ft
 Operator Present (x) ()
 Yes No
 Operating Parameters: † 120 V, 100 W.
 Installation: ** On table
 Processed Material: †† Faber Mongol 482F pencil

DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Pencil Sharpen.	72	54	58	66	56	62	67	67	60	54
Ambient	47	43	55	60	52	45	39	32	<25	<25

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.
 **On table, on floor, built-in etc. ††grass, ½ in. plywood, bread dough etc.

PRODUCT: Rug Shampooer DATE TESTED Mar 12, 1978 BY KJF

Mfgr: Hoover

Model Name & Number: Shampooer-Polisher No. 5460

Size: two 5 1/2 in. shampoo wheels

TEST CONDITIONS

Room Type: * bedroom

MEASUREMENT METHOD

Microphone Distance: Operators ear Hgt (6 ft)

Operator Present: (x) ()
Yes No

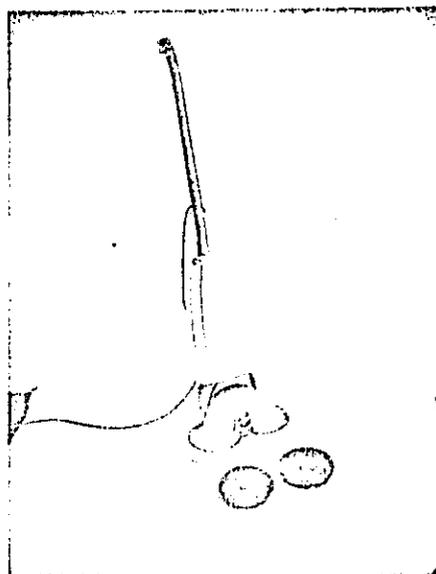
Operating Parameters: † 120 volts

220 watts

Installation: ** On floor

Processed Material: †† 1/4 in. wool

carpet w/o underpad



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Normal Opera.	70	29	34	45	55	65	63	55	66	59
Ambient Noise	20	31	28	21	16	11	10	--	--	--

*Kitchen, livingroom, bedroom etc.

†voltage, current, power, speed, etc.

**On table, on floor, built-in etc.

††grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Electric Scissors DATE TESTED March 5, 1978 BY RDB

Mfgr: Singer

Model Name & Number: Deluxe Electric
Scissors

Size: _____

TEST CONDITIONS

Room Type: * Semi-Anechoic

MEASUREMENT METHOD

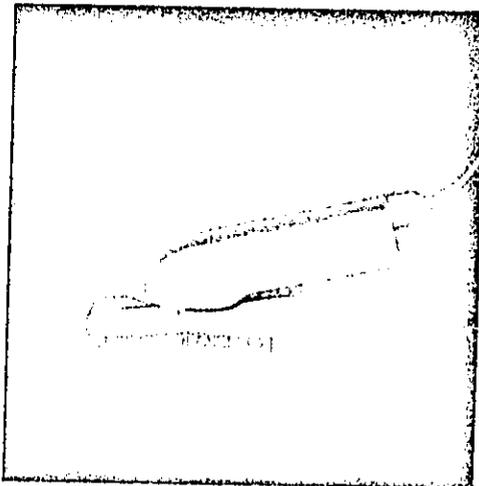
Microphone Distance: 12 in

Operator Present: (x) ()
Yes No

Operating Parameters: † _____

Installation: ** On carpeted floor

Processed Material: †† As noted



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
With cloth	70	43	39	39	53	59	62	62	56	55
Without cloth	71	42	40	46	50	61	65	67	54	55

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.
**On table, on floor, built-in etc. ††grass, ½ in. plywood, bread dough etc.

PRODUCT: Vaporizer (hot water) DATE TESTED Mar 5, 1978 BY EKB

Mfgr: DeVilbiss

Model Name & Number: 140

Size: _____

TEST CONDITIONS

Room Type: * Bedroom

MEASUREMENT METHOD

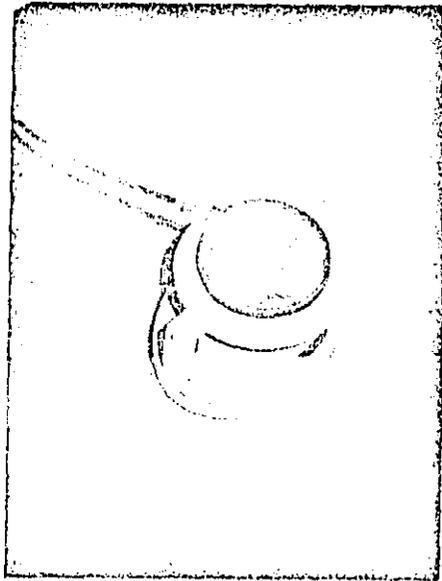
Microphone Distance: 3 ft.

Operator Present: () (x)
Yes No

Operating Parameters: † 120 V., 5 amps / (rated)
GR 1982 Precision SLM, 1/2 in mic. SLM
on slow

Installation: ** On floor

Processed Material: †† Hot water



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Operating	28.6									
Background	25.5									

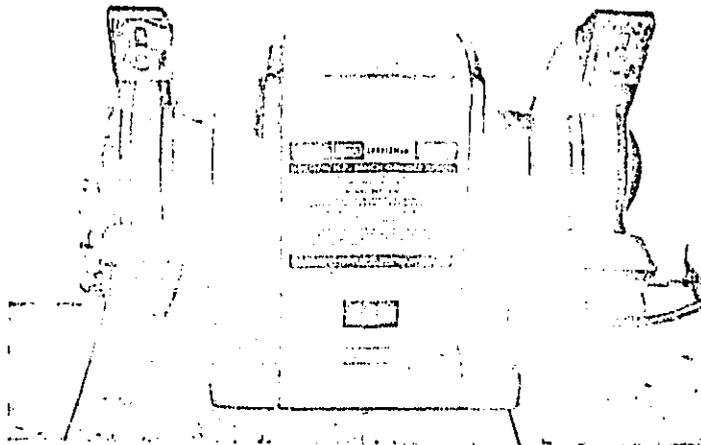
*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.

**On table, on floor, built-in etc. ††grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Bench Grinder DATE TESTED Mar 12, 1978 BY WEB

Mfgr: Sears Craftsman Model Name & Number: #397.19301

Size: 1/4 HP rated, 1/3 HP max



TEST CONDITIONS

MEASUREMENT METHOD

Room Type: * In Situ Microphone Distance 2 ft (Operator's ear)

Operator Present (x) ()
Yes No

Operating Parameters: † 115 V, 3580 rpm idle, 3.8 amps.

Installation: ** On workbench

Processed Material: †† Steel Chisel

DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Idling	69	57	75	57	61	62	66	62	57	52
Grind. (60 Grit)	80	56	74	60	62	64	68	73	76	76
Grind. (36 Grit)	88	57	74	58	65	72	74	79	82	82
Ambient	31	47	51	41	30	27	25	24	20	16

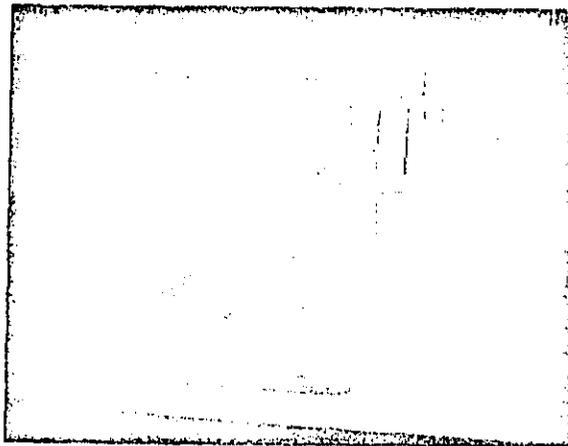
*Kitchen, livingroom, bedroom etc. † voltage, current, power, speed, etc.

**On table, on floor, built-in etc. †† grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Grinder DATE TESTED Mar 5, 1978 BY EKB

Mfgr: Brown-Brockmeyer Co. Model Name & Number: B-Line Ser. #2201 774

Size: 1/3 HP, 6 in. wheel



TEST CONDITIONS

MEASUREMENT METHOD

Room Type: * Basement

Microphone Distance 2 ft.

Operator Present (x) ()
Yes No

Operating Parameters: † 110 V, 3450 rpm (rated)***

Installation: ** on workbench

Processed Material: †† 1/4-in. steel screw

DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Op. left grinding ear not	75.8									
Op. " " grind steel	87.6	53.1	71.1	64.7	78.1	78.5	81.2	74.6	77.1	78.7
Background	34.7	39	43.3	38	34.1	24.5	24.8	28.7	29.8	24.3

*Kitchen, livingroom, bedroom etc.

†voltage, current, power, speed, etc.

**On table, on floor, built-in etc.

††grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Bit Sharpener DATE TESTED Mar 5, 1978 BY CKJ

Mfgr: Black & Decker

Model Name & Number: 7980/9080

Size: _____

TEST CONDITIONS

Room Type: * Workroom

MEASUREMENT METHOD

Microphone Distance: 20 ins.

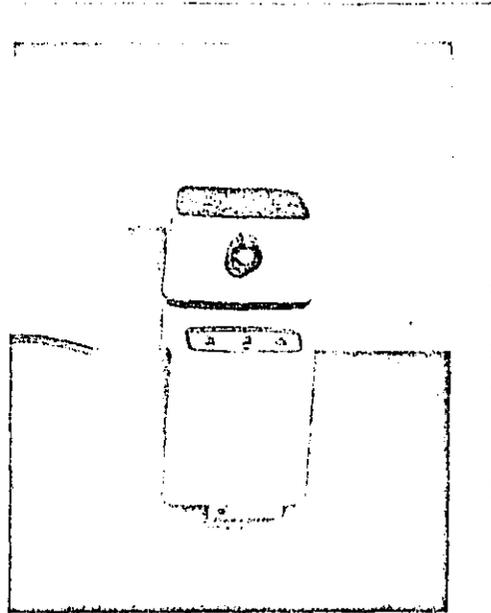
Operator Present: (X) ()
Yes No

Operating Parameters: † 1.9A., 120 v.

2250 RPM, 1/7 HP

Installation: ** On workbench

Processed Material: †† 5/32 ins. bit



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Sharpening bit	89	63	71	82	81	80	76	80	85	77
Running idle	86	64	65	65	76	76	75	76	81	75
Background	31									

*Kitchen, livingroom, bedroom etc.

†voltage, current, power, speed, etc.

**On table, on floor, built-in etc.

††grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Multi-purpose drill DATE TESTED Mar 12, 1978 BY WEB

Mfgr: Sears Craftsman Model Name & Number: 315.11420

Size: 1/5 HP Max, 3/8 in. dia.



TEST CONDITIONS

MEASUREMENT METHOD

Room Type: * In Situ Microphone Distance 2 ft. (Operator's ear)

Operator Present (X) ()
Yes No

Operating Parameters: † 1200 rpm Idle, 115 V, 264 watts

Installation: ** Drilling vertical on workbench

Processed Material: †† 5/8 in. particle board

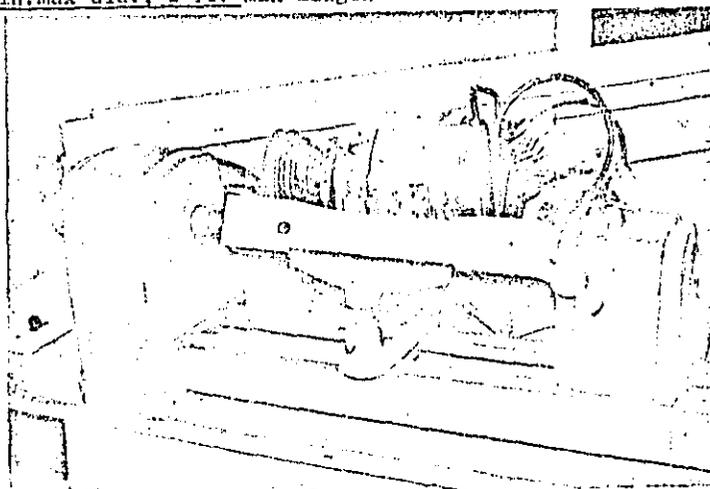
DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Idling	88	43 ¹	49 ¹	52 ¹	68	73	77	79	84	77
Drill. 3/8" ^{br. bit}	91	52 ¹	49 ¹	52 ¹	67	71	77	80	89	82
Drill. 1" ^{br. bit} wood	92	55	54 ¹	59 ¹	67	74	79	82	89	85
Ambient	37	43	50	50	42	30	25	18	15	15

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.

**On table, on floor, built-in etc. †† grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Wood Lathe DATE TESTED Mar 12, 1978 BY WEB
 Mfgr: Sears Model Name & Number: 103,21600

Size: 8 in. max dia., 2 ft. max length



TEST CONDITIONS

Room Type: * In Situ

MEASUREMENT METHOD

Microphone Distance 2 ft. (operator's ear)

Operator Present (x) ()

Yes No

Operating Parameters: † 1/4 HP, 115 V, 1.8 amps, 2250 rpm lathe, 1725 rpm/ motor

Installation: ** On workbench

Processed Material: †† 2 ft. pine

DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Idling	72	55	57	61	65	68	65	61	59	51
Turn. (sq. mater.)	81	59	60	62	69	73	71	69	75	73
Turn. (rnd. mater.)	79	59	63	60	68	73	70	72	75	74
Ambient	37	43	50	50	42	30	25	18	15	15

*Kitchen, livingroom, bedroom etc.

†voltage, current, power, speed, etc.

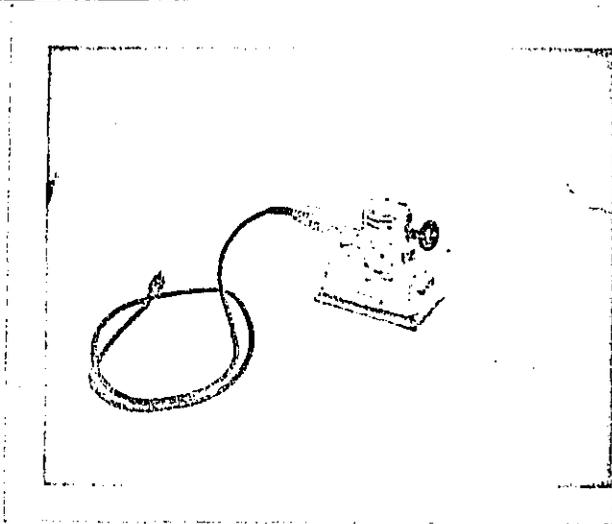
**On table, on floor, built-in etc.

††grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Orbital Sander DATE TESTED Mar 12, 1978 BY KJF

Mfgr: Black & Decker Model Name & Number: U-241

Size: Paper Size 3-5/8 in. x 9 in.



TEST CONDITIONS MEASUREMENT METHOD
Room Type: * Shop Microphone Distance 3 ft
Operator Present () ()
Yes No
Operating Parameters: † 120 volts, 2.2 amps, 4300 rpm 0.17 HP
Installation: ** Hand held on work piece
Processed Material: †† 3/4 in. thick maple work piece on floor/120 grit
carborund sandpaper

DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Normal Opera.	84	34	61	57	66	68	81	78	80	79
Ambient Noise	30	29	47	38	28	21	16	14	--	--

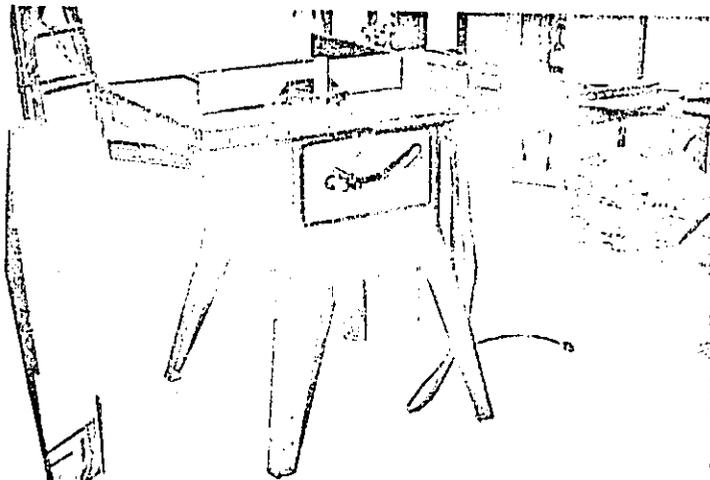
*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.

**On table, on floor, built-in etc. ††grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Table Saw DATE TESTED Mar 12, 1978 BY WEB

Mfgr: Sears Craftsman Model Name & Number: 113.299040

Size: 10 in. 2 HP max rated



TEST CONDITIONS

MEASUREMENT METHOD

Room Type: * In Situ Microphone Distance 3 ft. (operator's ear)

Operator Present (x) ()
Yes No

Operating Parameters: † 3450 rpm, 115 v., 1250 watts

Installation: ** On floor

Processed Material: †† 5/8 in. particle board

DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Ambient	37	43	50	50	42	30	25	18	15	15
Idling	77	62	63	67	73	69	65	73	72	58
Cutting	94	66	65	69	73	73	80	81	90	88

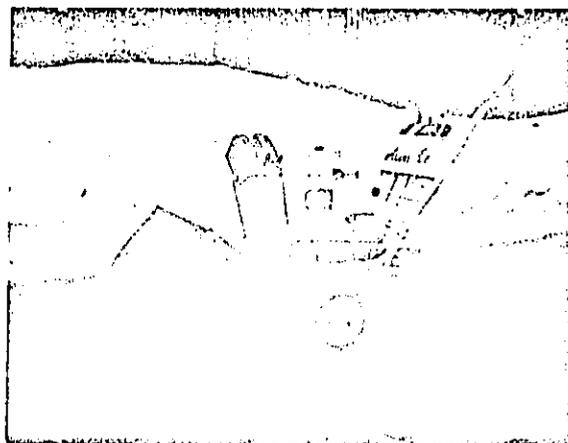
*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.

**On table, on floor, built-in etc. ††grass, 1/2 in. plywood, bread dough etc.

PRODUCT: Snow Thrower DATE TESTED Mar 11, 1978 BY KJF

Mfgr: Ariens Model Name & Number: Sno-Thro Model 924032

Size: 2 ft blade, 2 stage



TEST CONDITIONS MEASUREMENT METHOD
Room Type: * Driveway Microphone Distance 3 ft
Operator Present (X) ()
Yes No
Operating Parameters: † Gasoline engine, 7 HP
Installation: ** on ground
Processed Material: †† dry packed snow

DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
High	88	81	78	86	89	82	83	83	78	72
Low	86	74	77	84	85	81	82	81	77	72
Ambient Noise	32	45	52	55	40	35	30	22	15	15

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.

**On table, on floor, built-in etc. ††grass, ½ in. plywood, bread dough etc.

PRODUCT: Snow Thrower DATE TESTED March 4, 1978 BY RDB

Mfgr: Jacobson

Model Name & Number: Super Blitz

Imperial 20

Size: 5 HP

TEST CONDITIONS

Room Type: *

MEASUREMENT METHOD

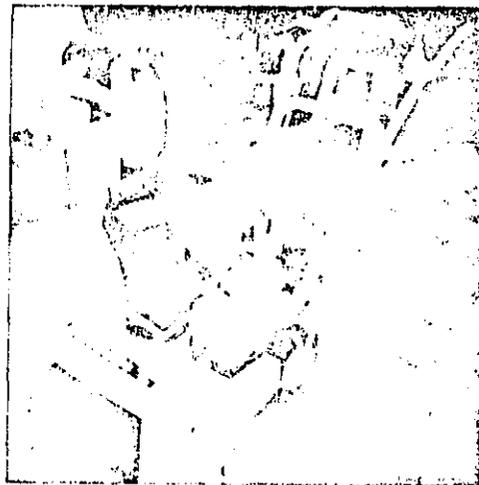
Microphone Distance: 3 ft, 8 in from / exhaust

Operator Present: (X) ()
Yes No

Operating Parameters: † 5 HP

Installation: ** On asphalt driveway

Processed Material: †† With or without
snow did not change readings



DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Idle	83	74	78	84	90	81	76	74	72	68
Full throttle without screw	93	87	85	91	95	88	86	83	81	82***
Full throttle with screw	92	87	85	92	93	88	86	84	81	77***

25 ft in front of machine

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.

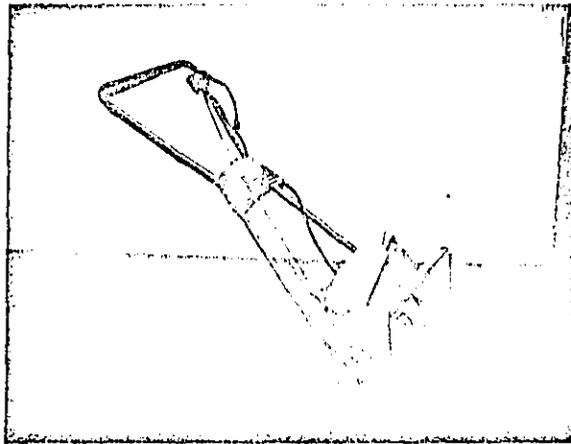
**On table, on floor, built-in etc. ††grass, 1/2 in. plywood, bread dough etc.

***This change is due to throttle linkages rattling.

PRODUCT: Snow Thrower DATE TESTED Mar 5, 1978 BY CKJ

Mfgr: Sunbeam Model Name & Number: DSA, electric

Size: _____



TEST CONDITIONS MEASUREMENT METHOD
Room Type: * Outdoors Microphone Distance 4 ft.
Operator Present (X) ()
Yes No

Operating Parameters: † 115 v. 10A.

Installation: ** On driveway, 20 ft. from house

Processed Material: †† light snow, 6 ins. deep

DESCRIPTION	OCTAVE BAND CENTER FREQUENCY IN CPS									
	A	31.5	63	125	250	500	1000	2000	4000	8000
Idling	93	53	59	59	77	87	86	86	87	84
Working	91	60	64	65	73	84	62	83	86	82

*Kitchen, livingroom, bedroom etc. †voltage, current, power, speed, etc.

**On table, on floor, built-in etc. ††grass, ½ in. plywood, bread dough etc.

APPENDIX B: ATTENUATION FROM ONE ROOM TO ANOTHER WITHIN A DWELLING

In evaluating the noise impact of consumer products, one must consider the impact on people in the same room where the device is being used as well as the impact on those in adjacent rooms. (Usually, there is no significant impact on people with a buffer room between them and the noise source, even with open doors.) Thus, it is necessary to determine an approximate "typical" value for sound attenuation from one room to another within dwellings. Since the noise impact is evaluated in terms of A-weighted sound levels, the attenuation must be stated in terms of sound level difference between rooms.

Sound level differences will depend on the spectrum shape for the noise in question; therefore, it is essential that the appropriate difference be determined for a spectrum shape typical of consumer products. Northwood, in developing the Sound Transmission Class (STC) that is the single-number rating for sound transmission loss between dwellings, defined a standard household noise spectrum. The shape of this spectrum was based on measured noise from room air-conditioners, vacuum cleaners, normal speech, and radios and television [B.1]. This standard spectrum (in octave bands) is as shown in Table B.1; the absolute level of the spectrum is arbitrarily chosen. The corresponding A-weighted sound level is 103.7 dB.

The second line in the table shows the noise reduction between adjacent rooms with an ordinary, typical household door in the common wall. The door is assumed to be closed,* but un-gasketed and undercut by about one-half inch [B.2]. Actually, a range of values for "typical" noise reduction between rooms would

*A closed door is assumed on the ground that, if there is any significant noise impact, someone would close the door.

TABLE B.1. STANDARD HOUSEHOLD NOISE SPECTRUM.

Frequency (Hz)	125	250	500	1000	2000	4000	L _A
Standard Household Spectrum (source room)	98	99	100	100	96	92	103.7 dB
Noise Reduction, Door Closed	15	18	23	25	26	26	-
Receiving Room Noise Levels	83	81	77	75	70	66	79.8 dB

be found in any extensive measurement survey of sound attenuation in dwellings. The values chosen above lie within the range of data scatter that would be found, but nearer the lower boundary of the range, so that the subsequent analysis would apply to conditions with somewhat less than average between-room sound attenuation.

The last line of the table shows the corresponding noise levels in the room adjoining the noise source (derived by subtracting the noise reduction values from the source noise spectrum levels, octave by octave). The corresponding A-weighted sound level is 79.8 dB. The difference in A-weighted sound levels in the source and receiving rooms, for this standard household spectrum shape, is 23.8 dB; it is a measure of the attenuation of A-weighted sound levels for devices whose noise spectrum resembles the standard spectrum of Table B.1, as the sound passes from room to room in a typical dwelling.

Since there will be variations in the spectra of consumer products from one to another, and also in the amount of attenuation at different frequencies between rooms in different

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dwellings, the value of 23.8 dB must be considered as "representative" or "typical." Variations of several decibels may be expected, both above and below this figure. For the sake of simplicity, this value can be round off to, say, 24 or 25 dB.

REFERENCES FOR APPENDIX B.

- B.1 T.D. Northwood, "Sound-Insulation Ratings and the New ASTM Sound Transmission Class," *J. Acoust. Soc. Am.*, 34, 493-501 (1962).
- B.2 Bolt Beranek and Newman Inc., Cambridge, MA.: Company files.

