VALUE ANALYSIS

WEATHERTRON TASK FORCE REPORT

by

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Submitted to:

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Bloomfield, New Jersey

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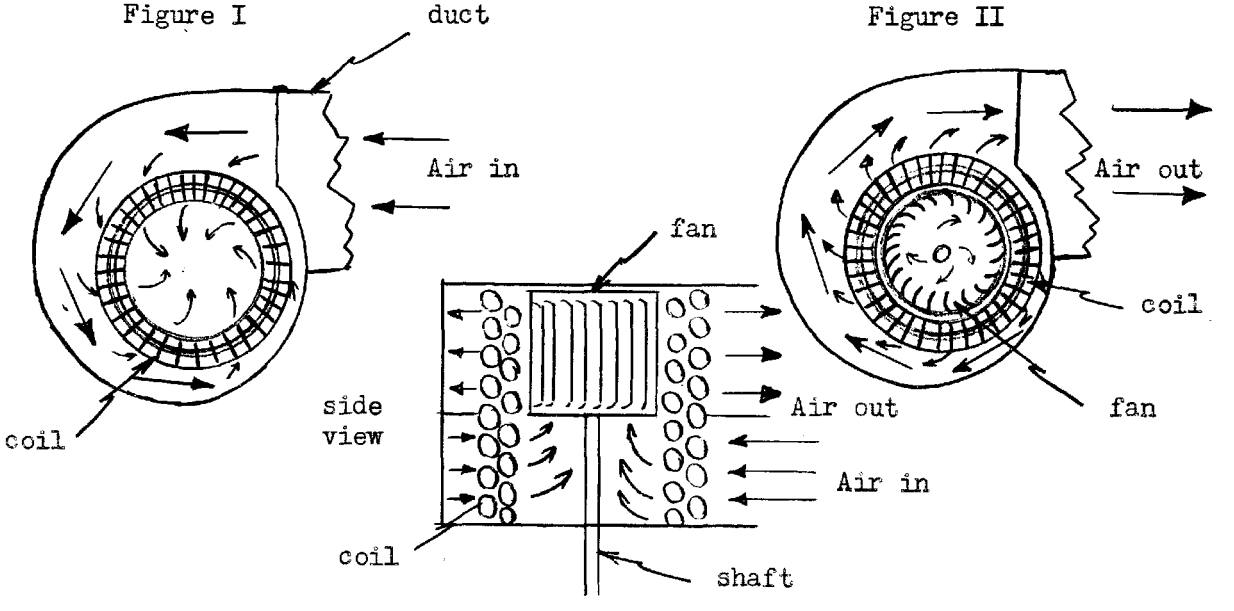
PROPOSED WEATHERTRON DESIGN

The following proposed Weathertron Design is a result of ideas discussed at Weathertron Task Force Meetings.

It has been found that the pressure drop in the air ducts and the unit itself will require fans with high static pressure characteristics such as the centrifugal type fan. Keeping in mind the physical shape of the centrifugal type fan with its scrawl and cylindrical rotor, it seems quite obvious that the Weathertron should be designed to fit this basic device. The entire Weathertron Housing will have the shape of a long upright scrawl as shown in the following paragrpahs. It should be noted that this housing is self-supporting without additional structural members and is altogether different than any heat pump on the market.

Instead of the present flat heat transfer surfaces which could hardly be adapted in this design, a circular helical single flow heat transfer surface has been developed by the Task Force Engineers and has been tested and found to operate successfully. The centrifugal fan rotor may be placed inside or outside the coil as shown and there is not a serious roadblock concerning the satisfactory operation of this. In itself, this type of airhandling in unique. It offers good air distribution over the entire heat transfer surface and certain desirable air turbulance can be incorporated, particularly where the fan rotor is placed inside the coil. Regarding the outdoor fan circuit which is located on the top part of the unit, the outdoor air enters the lower half of the coil as shown in Figure #1 circulates up through the center of the coil and out through the upper half where the fan throws the air out as shown in Figure II.



It seems reasonable to assume that the velocity vector of the incoming air will remain approximately constant in the scrawl as indicated by the arrows, however, the amount of air will of course diminish as the air passes through the coil at the various points.

The air handling for the indoor coil (the middle part of the unit) is in principle the same as that of the outdoor circuit. However, the indoor air circuit includes additional equipment such as auxiliary heaters and air filters. The air filters indicated on the drawings are shown somewhat small but Figure I shows how the filter should be placed in the unit in order to obtain correct filter size. The auxiliary heaters indicated are of the "W" shaped finned calrod type (see auxiliary heater report in back of report).

The lower part of the unit contains the control panel, compressor and fan motors. The internal fan unit is shown using only one fan motor for both outdoor and indoor fan while the external fan unit is shown with two fan motors and the indoor fan driven through a coaxial shaft. The latter system adds features such as independent fan modulation, however, it is felt that the single motor fan system which is less costly may be used in standard models considering that both fans run or stop during defrost conditions.

HEAT TRANSFER SURFACES

The suggested heat transfer surfaces are single flow, double layer, cylindrical coils made of finned tubing. The Wolverine integral finned tubing of anodized aluminum has a good heat transfer characteristic and good corrosion resistance.

Cost Comparision:	YR 30 outdoor coil
Present:	$126.00
Proposed:	45.00 (Wolverine)
Cost reduction:	64%

FANS

It may be necessary to use a backward pitched centrifugal single entry fan rotor in the design showing the fan rotor inside the coil, however, the best fan performance should be developed experimentally.

Probably the best solution to the air handling scheme is to use the outside fan. This type of fan has a relatively large diameter for the amount of air it handles. however, the relative dimensions of the rotor blades are the same as that of a standard forward pitched wheel designed to handle the same amount of air. In other words, the tip speed of the blower wheels should be approximately the same.

The cost reduction involved in regard to the fans should be quite substantial as the standard blower housing - mounting brackets are eliminated, including some labor savings.

Present blower cost YR 30-

Indoor & Outdoor - $36.70

Estimated proposed cost including shafts and bearings-

Blowerwheels	- $5.00 - $7.00, manufacturers estimate.
Shafts	- $1.50, approximately - quote from Revere Copper and Brass.
Bearings	- $2.74 (2 nylon and 2 ball bearing) - estimated
Total	- $16.24 (Labor cost not included in above)

COMPRESSOR AND CONTROLS

Value Analysis has not attempted to propose any re-design of the present hermetic type compressor or control circuit. In order to eliminate the switch-over valve, a reversible compressor should be designed and we also feel that a rotary type reversible compressor can be developed resulting in substantial reduction in cost over the present system. There are a number of rotary refrigeration compressor manufacturers who would be interested in working with us in order to develop this type of compressor to suit the capacity of the Weathertron.

Rotory Compressor Manufacturers:

Lammert & Mann Company	Fuller Company
Chicago	Catasavgva
Illinois	Pennsylvania

Control equipment in general including valves is covered under the proper heading in this report.

HOUSING & STRUCTURE

It should be noted from the drawings that the proposed housing is essentially self-supporting and without structural members, except for supporting items such as the control panel fan motors and other non self-supporting equipment.

The entire Weathertron housing is shaped like and acts as a fan scrawl, consequently serving three function such as:

1) Fan scrawl
2) Appearance housing
3) Structure and support for operating members

The YR 30 housing is designed so that it can enter through any door 27" wide without being disassembled. It will however, be necessary to disassemble the YR 50 housing in order to enter the unit through a 27" door. This can be done by considering the unit as three separate units; the outdoor coil circuit, the indoor coil circuit and the compressor-control unit, each of which can be entered through a 27" door. Considering that the units will be separated only a few times, during its entire life, low cost, hermetic shut-off valves can be used in the refrigerant circuit. The Mueller Brass Company has expressed interest in developing such valves. Another solution may be to change the unit in the field either by factory drying the component sections or by drying the units in the field, which of course, will require special equipment.

In most cases one may assume that a good percentage of the YR 50 is initially installed in new homes and that several units are installed in other places than cellars, such as special porches or outside the house, and also one may consider that a good many cellar doors are over 27" wide. In other words, should all the YR 50 units be made to enter a 27" cellar door, or should just a few be made so that they can be disassembled? Value Analysis is in no position to answer the above questions, however, it seems reasonable to assume that to make a few units to be disassembled should result in lower cost of the standard units even on a production basis.

Housing & Structure

Present Cost	- $137.84
Proposed Cost - estimated	- 49.85

The proposed cost is estimated by the Manufacturing Services Department in Schenectady, and is an approximation since detailed drawings were not submitted. However, the cost analysis sheets which follow on the next pages indicates that many details were included.

Cost reduction proposals of other Weathertron equipment are covered in the following pages of this report.

DIRECT LABOR ESTIMATE
(Housing and Structure Only)
OF PROPOSED ROUND SHELL DESIGN
"WEATHERTRON" YR-30.

Part No.	Part Name	Operations	No. of Operators	Est. Prod. per Hour Including Su. Allowance	Hrs./100 Units	Est. D.L. And Cost/100units @ 2.00/hr.
1	Shell Top	10-Blank	1	100	1.00	$ 2.00
		20-Form	1	60	1.7	3.40
		30-Trim & pierce center hole	1	85	1.2	2.40
		40-Pierce Flange Mounting Holes	1	75	1.3	2.60
		50-Sand & Fender work		20	5.0	10.00
		60-Bonderizing and Paint		50	2.0	4.00
						$ 24.40
2	Pan (Upper)	10-Blank & Pierce	1	110	.9	1.80
		20-Form	1	75	1.3	2.60
		30-Pierce Flange Mounting Holes	1	75	1.3	2.60
		40-Bonderizing and Paint		50	2.0	4.00
						$ 11.00
3	Pan (Lower)	10-Blank	1	100	1.0	2.00
		20-Form	1	60	1.7	3.40
		30-Pierce Center Hole	1	85	1.2	2.40
		40-Pierce Flange Mounting Holes	1	75	1.3	2.60
		50-Extrude Flange Mtg. Holes	1	75	1.3	2.60
		60-Tap Flange Holes	1	35	2.9	5.80
		70-Bonderizing and Paint		50	2.0	4.00
						$ 22.80
4	Base	10-Blank	1	90	1.1	2.20
		20-Form Flange	1	55	1.8	3.60
		30-Pierce and Trim	1	75	1.3	2.60
		40-Pierce Flange Mounting Holes	1	75	1.3	2.60
		50-Sand and Fender work		25	4.0	8.00
						$ 19.00
5	Insulation Shield	10-Pierce Mounting Holes	2	85	2.4	4.80
		20-Bend Lower Flange	2	75	2.7	5.40
		30-Bend Ends (2 Strokes)	2	40	5.0	10.00
		40-Slip Roll	2	20	10.0	20.00
		50-Slip Roll	2	20	10.0	20.00
		60-Bonderizing and Paint		40	5.0	10.00
						$ 70.20

Part No.	Part Name	Operations	No. of Operators	Est. Prod. per Hour Including Su. Allowance	Hrs./100 Units	Est. D.L. and Cost/100 Units @ 2.00/hr.
7	Baffles (2 Reg.)	10-Blank	1	110	1.8	$ 3.60
		20-Form Outer Flange	1	75	2.7	5.40
						$ 9.00
8	Motor Mount Assem.(4 Reg.)	10-Pierce and Cut to Length	1	250	1.6	3.20
		20-Form Hat Section	1	150	2.7	5.40
		30-Proj. Weld Mounting Bolts	1	75	5.4	10.80
						$ 19.40
9	Shell	10-Blank and Pierce	2	60	3.3	6.60
		20-Form Upper & Lower Offsets and Center Bead (3 Strokes)	2	20	10.0	20.00
		30-Bend Vertical Flange	2	60	3.3	6.60
		40-Slip Roll	2	15	13.4	26.80
		50-Slip Roll	2	15	13.4	26.80
		60-Spot Weld Vertical Seam	2	25	8.0	16.00
						$ 102.80
10	Shell Assembly	10-Spot Weld Upper & Lower Baffles	2	15	13.4	26.80
		20-Spot Weld Motor Mount Channels	2	30	6.6	13.20
		30-Sand and Fender work		10	10.00	20.00
		40-Bonderizing and Paint		10	10.00	20.00
						$ 80.00
11	Cover Assembly Unit Service	10-Blank and Form	1	175	.6	1.20
		20-Spot Weld Closing Clip	1	150	.7	1.40
		30-Sand and Fender work		100	1.0	2.00
		40-Bonderizing and Paint		150	.7	1.40
						$ 6.00
12	Cover Assembly Motor Chamber	10-Blank and Form	1	175	.6	1.20
		20-Spot Weld Closing Clip	1	150	.7	1.40
		30-Sand and Fender work		100	1.0	2.00
		40-Bonderizing and Paint		150	.7	1.40
						$ 6.00

ESTIMATED MATERIAL COST
(Housing and Structure Only)
Of Proposed Round Shell Design
"WEATHERTRON" YR-30

June 7, 1954

Part No.	Part Name	Material	Approx. Weight per Unit	Estimated Mat. Cost/100 Units
1	Shell Top	.075 x 29" x 36" C.R.D.Q. Steel	22.2 lbs.	$ 144.00
2	Pan - Upper	.035 x 29" x 36" H.R.C.Q. Steel	10.6 lbs.	58.00
3	Pan - Lower	.075 x 29" x 36" H.R.D.Q. Steel	22.2 lbs.	133.00
4	Base	.090 x 29" x 36" H.R.C.Q. Steel	27.2 lbs.	150.00
5	Insulation Shield	.020 x 13" x 86" H.R.C.Q. Steel	6.4 lbs.	35.00
6	Insulation	1/2# Density Fiber Glass		1 000.00
7	Baffle (2 Req.)	.035 x 28" x 35" H.R.C.Q. Steel	19.4 lbs.	106.00
8	Motor Mount Channels (4 Required)	.090 x 3" x 18" H.R.C.Q. Steel	5.3 lbs.	29.00
9	Shell	.050 x 71" x 90" C.R.C.Q. Steel	91.0 lbs.	546.00
11	Cover Assem. - Unit Service	.035 x 14" x 14" C.R.C.Q. Steel	2.0 lbs.	12.00
12	Cover - Motor Chamber	.035 x 8" x 27" C.R.C.Q. Steel	2.2 lbs.	13.00
13	Filter			75.00
14	Drain Tube	1" Aluminum Tubing	1.4 lbs.	57.00
15	Control Panel	.062 x 6" x 12" H.R.C.Q. Steel	1.3 lbs.	7.00
16	Cover Assem.- Control Panel	.035 x 7" x 14" C.R.C.Q. Steel	1.0 lbs.	6.00

Estimated Material Cost -

Part No.	Part Name	Material	Approx. Weight per Unit	Estimated Mat. Cost/100 Units
17	Bearing Cover (2 required)	.062 x 4" x 4" C.R.C.Q. Steel	.6	$ 4.00
	Finishing Materials			90.00
	Misc. Hardware			700.00
			TOTAL	$ 3165.00

Part No.	Part Name	Operations	No. of Operators	Est. Prod. per Hour Including Su. Allowance	Hrs./100 Units	Est. D.L. and Cost/100 Units @ 2.00/hr.
14	Drain Tube	10-Flange & Cut to Length	1	50	2.0	$ 4.00
		20-Cross Drill Drain Holes	1	75	1.3	2.60
						$ 6.60
15	Control Panel	10-Blank and Pierce	1	175	.6	1.20
		20-Bend Lower Mtg. Flange	1	125	.8	1.60
		30-Bonderizing and paint		150	.7	1.40
						$ 4.20
16	Cover Assembly Control Panel	10-Blank and Form	1	175	.6	1.20
		20-Spot Weld Closing Clip	1	150	.7	1.40
		30-Sand and Fender Work		100	1.0	2.00
		40-Bonderizing and Paint		150	.7	1.40
						$ 6.00
17	Bearing Covers (2 Reg.)	10-Blank and Pierce	1	225	.9	1.80
		20-Form	1	175	1.2	2.40
		30-Bonderizing and Paint		300	.7	1.40
						$ 5.60

6/7/54

SUMMARY OF ESTIMATED SHOP COST
(Housing and Structure Only)
OF PROPOSED ROUND SHELL DESIGN
"WEATHERTRON" YR-30

Material	Direct Labor	IME @ 362%	Shop Cost
31.65	3.93	14.27	49.85

Labor based on approximate production at 10,000/yr. with 4 set-ups per year.

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ESTIMATED SHOP COST
(Housing and Structure Only)
OF PROPOSED ROUND SHELL DESIGN
"WEATHERTRON" YR-30

Part No.	Part Description	Material	Direct Labor @ 2.00/hr.	IME @ 362%	Shop Cost
1	Shell Top	$ 1.44	.24	.87	2.55
2	Pan (Upper)	.58	.11	.40	1.09
3	Pan (Lower)	1.33	.23	.84	2.40
4	Base	1.50	.19	.69	2.38
5	Insulation Shield (Upper Exhaust)	.35	.70	2.53	3.58
6	Insulation	10.00			10.00
7	Baffles	1.06	.09	.33	1.48
8	Motor Mount Channels	.29	.19	.69	1.17
9	Shell	5.46	1.03	3.75	10.24
10	Shell Assembly		.80	2.90	3.70
11	Cover Assembly Unit Serv.	.12	.06	.22	.40
12	Cover - Motor Chamber	.13	.06	.22	.41
13	Filter Indoor Exhaust	.75			.75
14	Drain Tube	.57	.07	.25	.89
15	Control Panel	.07	.04	.14	.25
16	Cover (Control Panel)	.06	.06	.22	.34
17	Bearing Covers	.04	.06	.22	.32
	Finishing Materials	.90			.90
	Misc. Hdwe Buckets, etc.	7.00			7.00
	Totals	31.65	3.93	14.27	49.85

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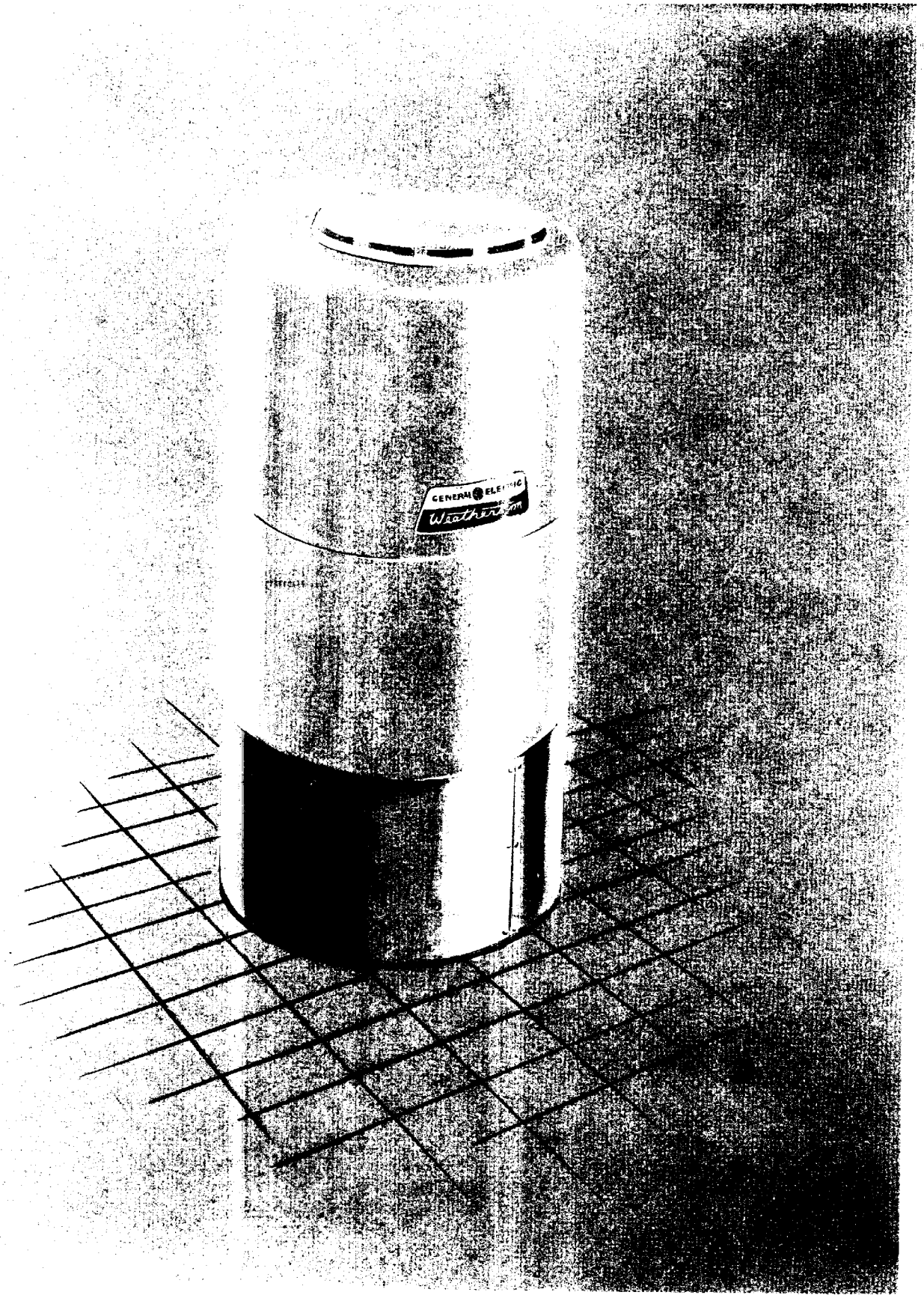
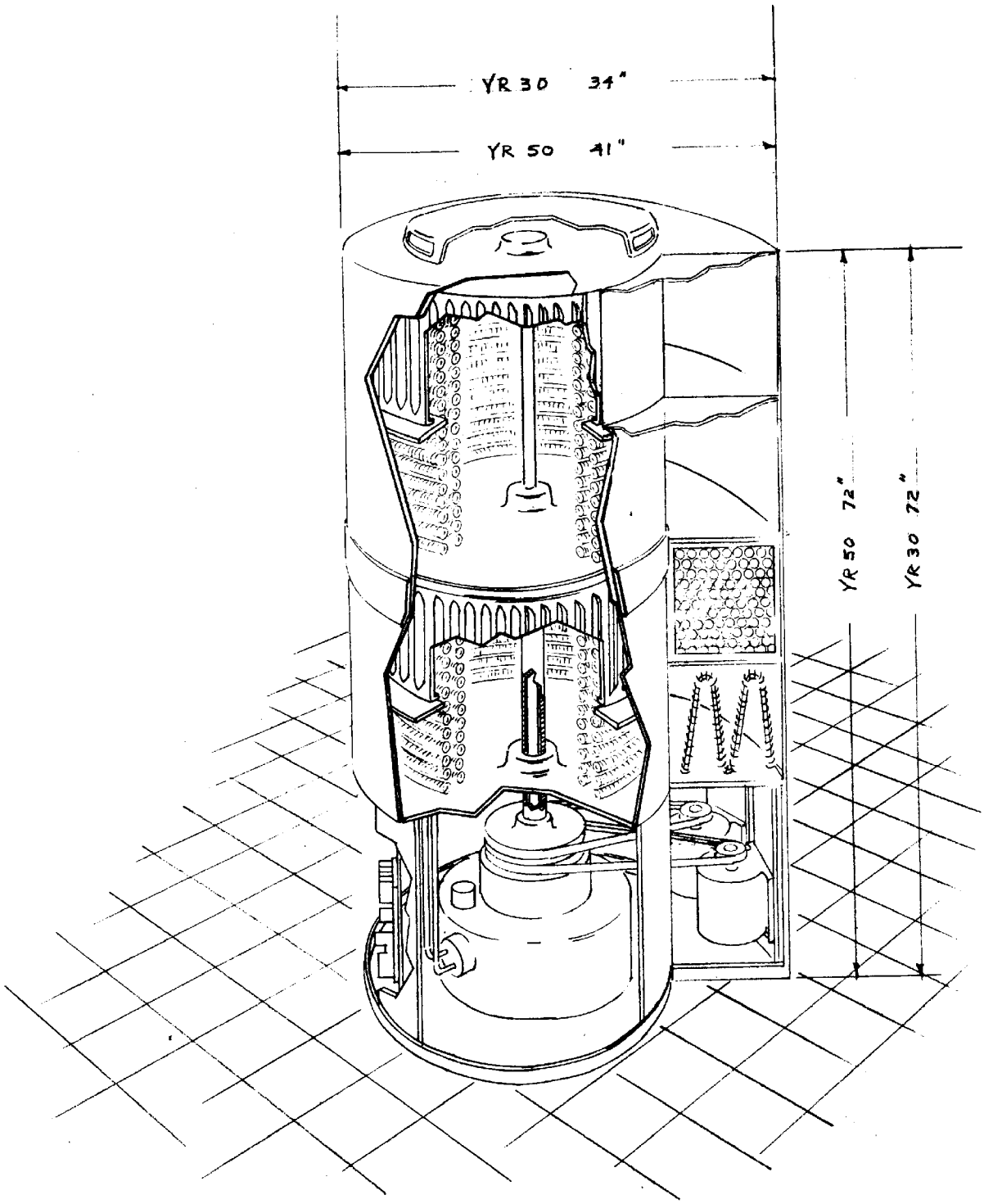
JUST

WONDERFUL


GENERAL ELECTRIC
Weathertron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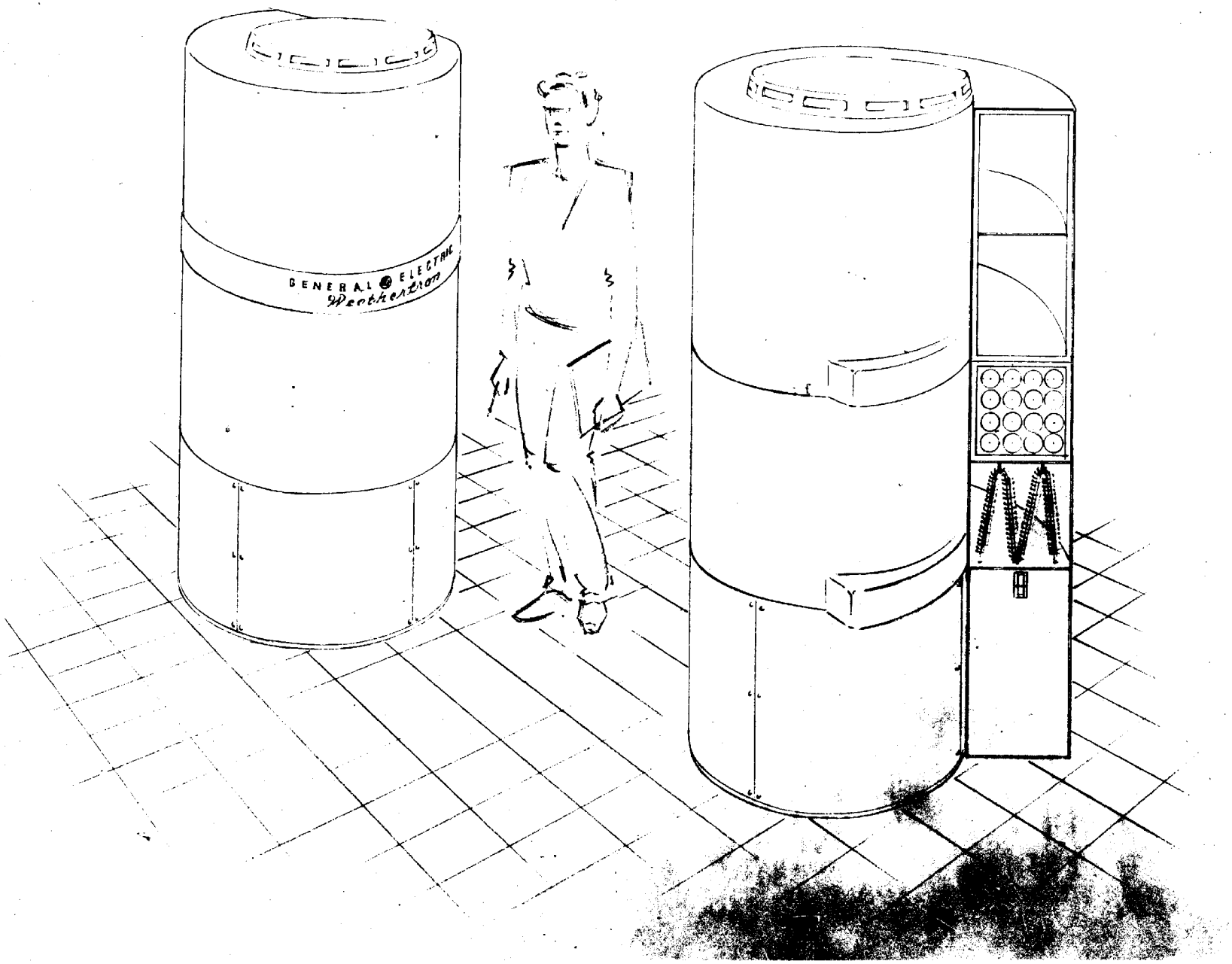
YR 50 41"
YR 50 72"
YR 30 72"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