Dec. 14, 1965 R. L. KOBLE. JR 3,222,848

ELECTROSTATIC AIR CLEANER

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Fig. 1.

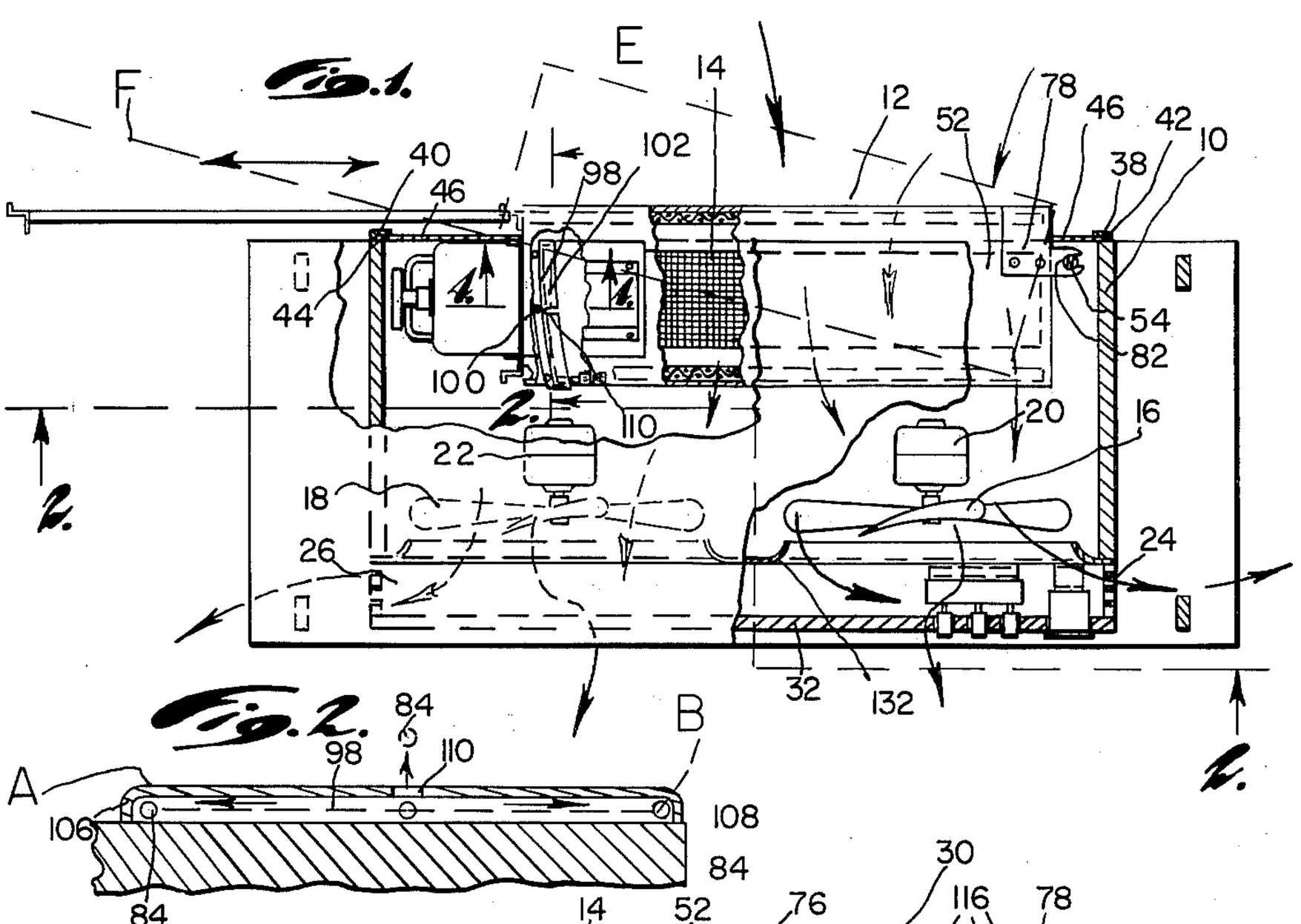
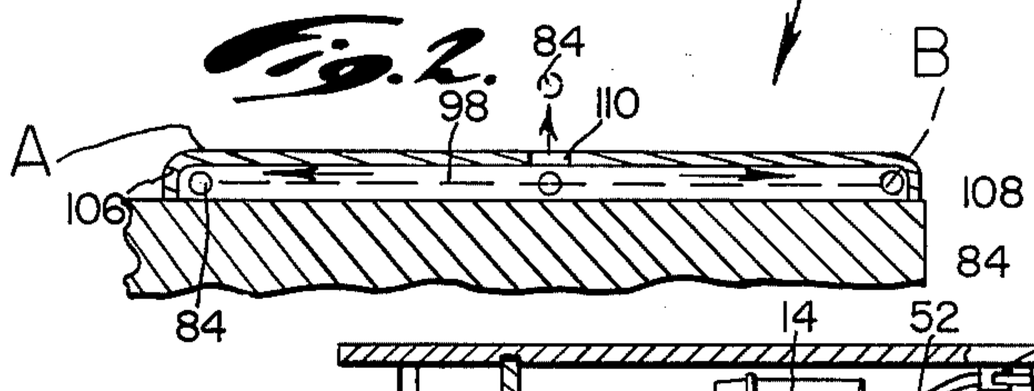


Fig. 2.



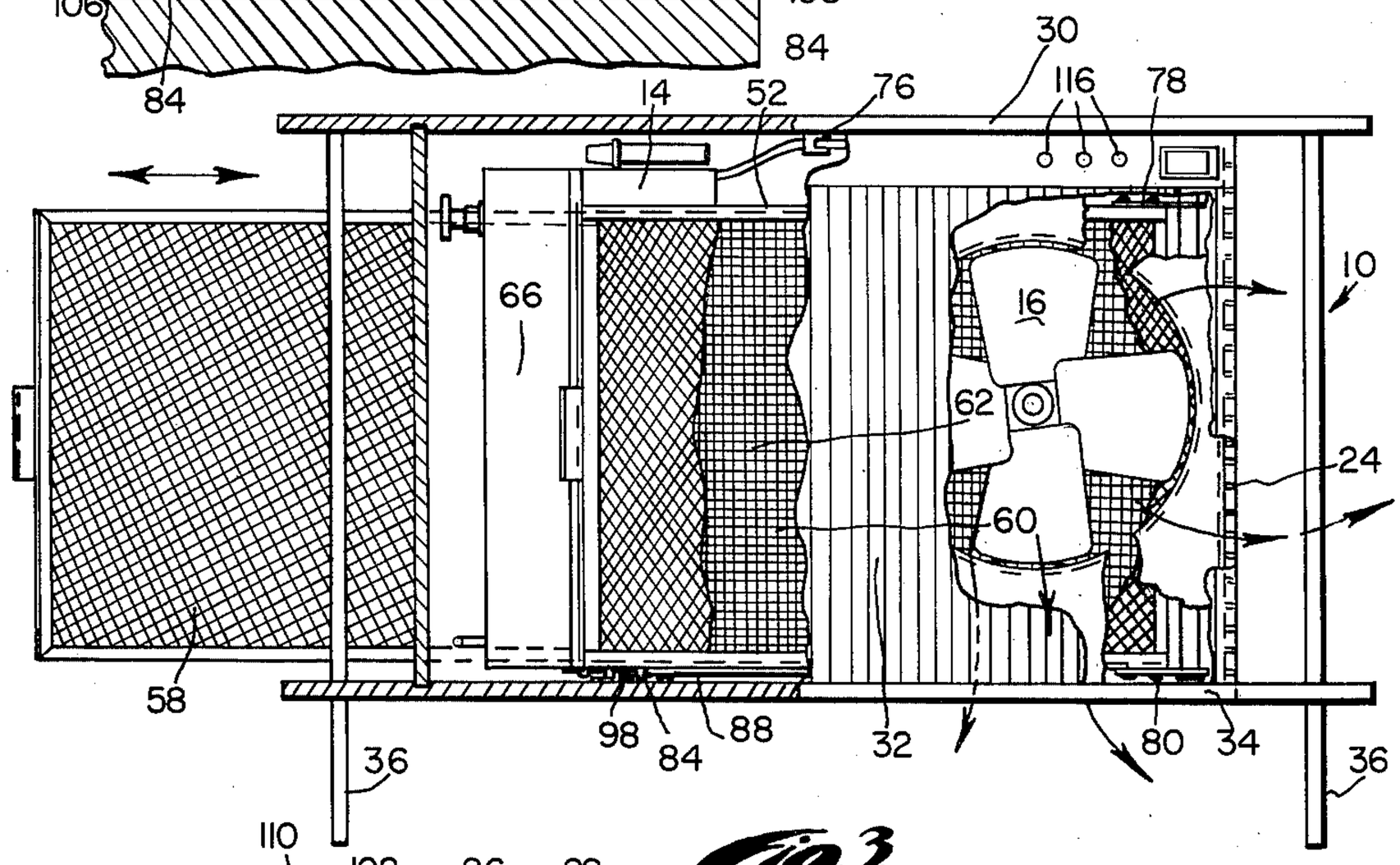


Fig. 3.

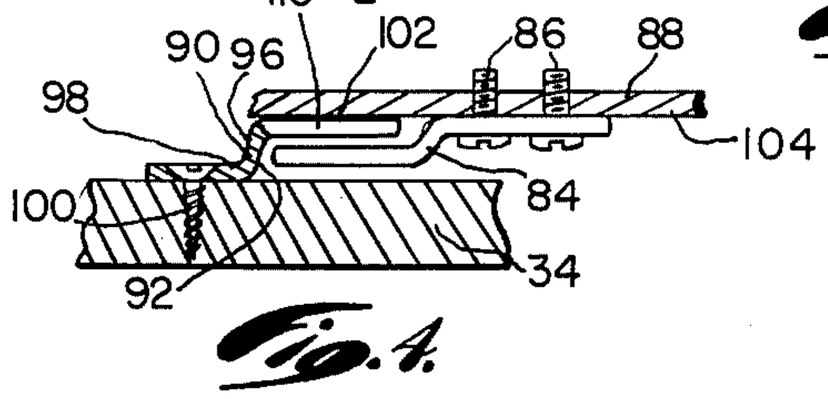


Fig. 4.

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ELECTROSTATIC AIR CLEANER

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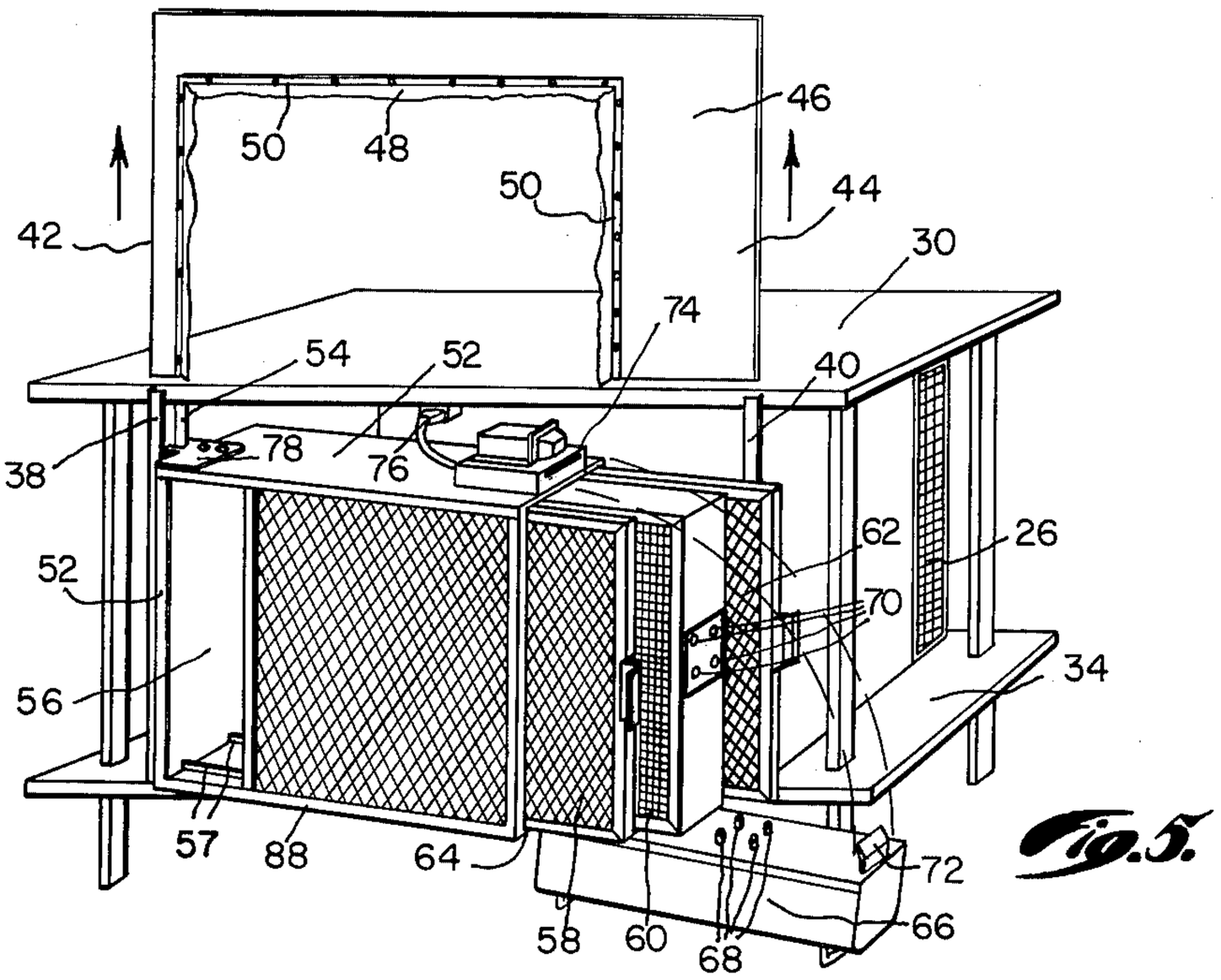

Fig. 5.

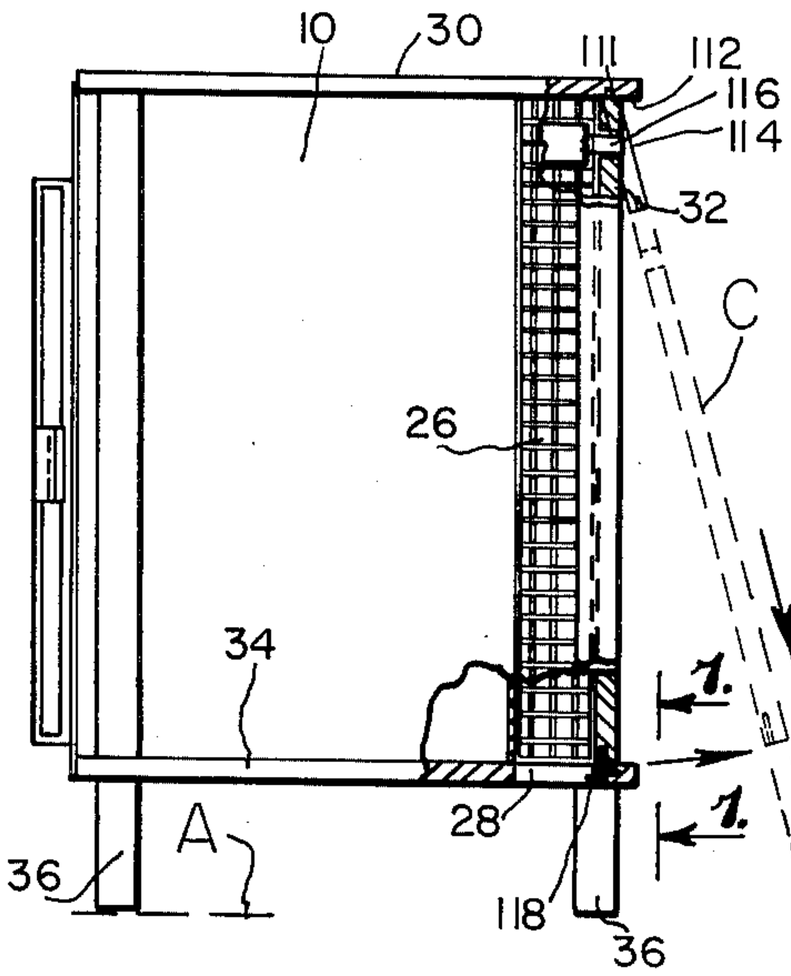

Fig. 6.

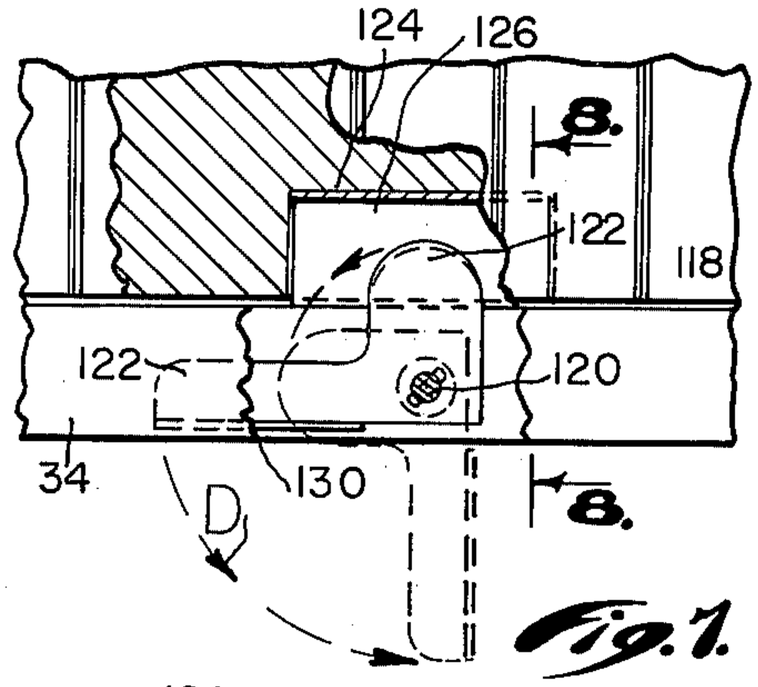

Fig. 7.

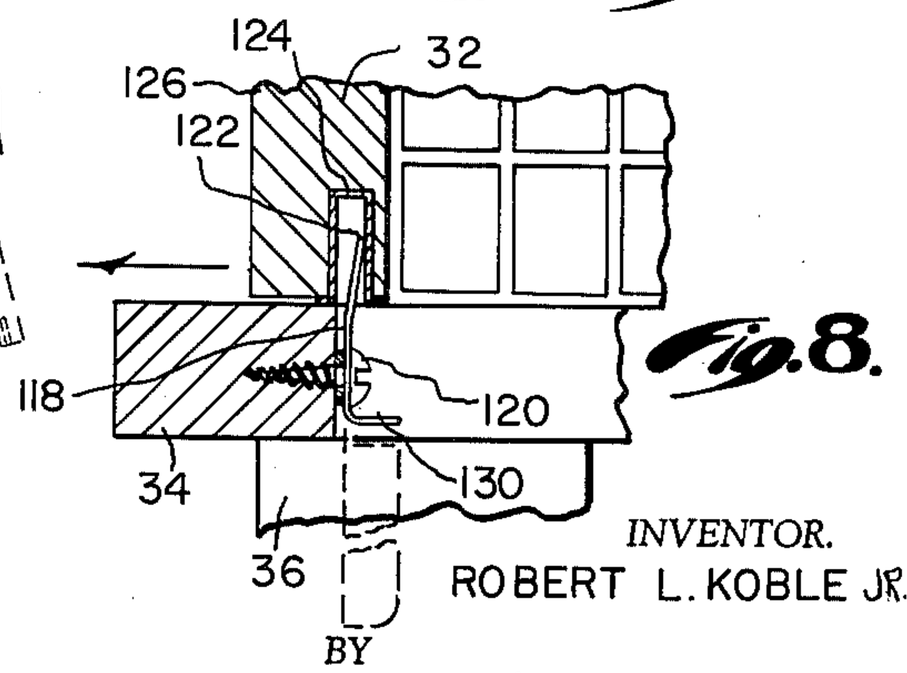

Fig. 8.

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ELECTROSTATIC AIR CLEANER

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4 Claims. (Cl. 55—131)

This invention relates to an electrostatic air cleaner and more particularly for an electrostatic air cleaner designed for domestic use and wherein means is provided for conveniently servicing an electrostatic air cleaning unit embodied in a cabinet which may have the character of a fine piece of furniture.

Electrostatic air cleaners have heretofore been installed in various locations and in some instances, have been inconvenient to service particularly with respect to the removal of the various units of the cleaner for disposing of dust, lint and other foreign matter collected therein.

It is recognized that electrostatic air cleaners for domestic use must be retained in a cabinet wherein blowers or fans are utilized to force air through the electrostatic air cleaner and it has been further appreciated that such units for domestic use must have configurations and external features which are appealing to the aesthetic senses. Accordingly, it is an object of the present invention to provide an electrostatic air cleaner having a cabinet wherein an electrostatic air cleaning unit is readily, removably mounted and also swingable outwardly of one side thereof to provide convenience in removing and cleaning elements of the cleaner without removing the entire air cleaner assembly from the cabinet.

Another object of the invention is to provide an electrostatic air cleaner having a cabinet which is provided with a partially open side in which an electrostatic air cleaning unit is pivotally mounted about a substantially vertical axis whereby one end of the air cleaning unit may pivot outwardly beyond the open side of the cabinet so that line screens and air diffuser screens, as well as the main electrostatic grid of the cleaner may be removed from a grid frame thereof so that material collected on the screen, the diffuser screen and the grid may be removed from time to time without completely removing the electrostatic cleaner structure from the cabinet.

Another object of the invention is to provide a very novel means of mounting an electrostatic air cleaning unit in a cabinet.

Another object of the invention is to provide a novel means for mounting an electrostatic air cleaning unit in a furniture-like cabinet for domestic use in order to provide the optimum in convenience for servicing the electrostatic air cleaning unit in such a cabinet.

Another object of the invention is to provide an electrostatic air cleaner having a novel arrangement of an electrostatic air cleaning unit, means for moving air therethrough and air outlets in the cabinet, all of which are particularly adapted for a domestic installation, such as found in an ornamental or aesthetic article of furniture.

Another object of the invention is to provide an electrostatic air cleaner having a cabinet wherein an electrostatic air cleaning unit is readily, removably mounted and wherein the air cleaning unit is retained to pivot outwardly of the cabinet at one end thereof for removing and servicing elements of the air cleaner and whereby the entire electrostatic air cleaning unit may readily be removed from the cabinet without the use of any tools.

Further objects and advantages of the invention may be apparent from the following specification, appended claims, and accompanying drawings, in which:

FIG. 1 is a top or plan view of an electrostatic air cleaner, in accordance with the invention, showing portions thereof broken away and in section to amplify the illustration and illustrating by arrows, the flow of air through the cleaner;

FIG. 2 is an enlarged fragmentary sectional view taken from the line 2—2 of FIG. 1;

FIG. 3 is a front view of an electrostatic air cleaner, in accordance with the invention, showing portions thereof broken away and in section to amplify the illustration and further showing a position of one of the elements of the electrostatic air cleaner while being removed from the cabinet for servicing of the electrostatic air cleaner unit;

FIG. 4 is an enlarged fragmentary sectional view taken from the line 4—4 of FIG 1;

FIG. 5 is a perspective view of the rear side of an electrostatic air cleaner, in accordance with the present invention, showing a panel of the rear of the cabinet moved upwardly to permit the electrostatic air cleaning unit to be swung outwardly about a substantially vertical axis so that the lint screen, the electrostatic grid and the defuser elements may readily be removed from the grid frame in order to service these units;

FIG. 6 is an end view of an electrostatic air cleaner of the invention showing portions thereof broken away and in section to amplify the illustration and showing, by broken lines, the pivotal removal of the front enclosure panel of the cabinet of the invention;

FIG. 7 is an enlarged fragmentary view taken from the line 7—7 of FIG. 6 showing portions broken away and in section to amplify the illustration and showing, by broken lines, the varying position of the latch structure for the front panel of the cabinet; and

FIG. 8 is a fragmentary sectional view taken from the line 8—8 of FIG. 7.

The electrostatic air cleaner of the invention comprises a cabinet 10 which is preferably designed for domestic use, as for example, this cabinet may be made to simulate an aesthetic piece of furniture and may be used in the home or office buildings or other areas in which it is desired to provide electrostatic cleaning of air.

The cabinet 10 is provided with a partially open side 12 through which air passes into an electrostatic air cleaning unit indicated generally at 14. The air is driven through this unit 14 by means of fans 16 and 18 powered by motors 20 and 22, respectively. These fans deliver air outwardly through grill structures 24 and 26 in the sides of the cabinet 10 and the air also passes outwardly through a bottom opening 28, as shown in FIG. 6 of the drawings.

The cabinet 10 is provided with a closed top 30 and a closed front panel 32 which may have ornamental or aesthetic features. The cabinet is also provided with a solid bottom plate 34 supported above a floor area A by means of legs 36.

The partially open side 12 of the cabinet 10 is normally at the rear thereof and the closed panel 32 is normally at the front of the cabinet presenting an aesthetic effect.

At the rear and partially enclosed side 12 of the cabinet 10 are substantially vertical panel retaining clips 38 and 40 disposed to retain and hold edges 42 and 44, respectively, of an enclosure panel 46. This panel 46 is provided with a three-sided opening 48 having soft flexible seal strips 50 projecting inwardly thereof and disposed to provide an air seal around edges of a grid frame 52, which is removably mounted in the cabinet, as will be hereinafter described.

Supported by and extending between the upper and lower plates 30 and 34 of the cabinet is a bar 54 having a substantially vertical axis and forming a mount and pivotal bearing structure for the grid frame 52. This grid frame 52 is a substantially box-shaped structure having one closed side 56 adjacent to the bar 54 and this grid

frame is provided with track structures **57** disposed to provide slideways for a lint screen **58**, an electrostatic grid **60**, and a defuser screen **62**, all as shown best in FIG. 5 of the drawings.

Pivotally mounted at a lower corner **64** of the grid frame **52**, is a conventional electrostatic power supply unit **66** having electrical prongs **68** adapted electrically to fit into sockets **70** of the electrostatic grid **60** when the unit **66** is pivoted upwardly into the position, as shown in FIGS. 1 and 3 of the drawings. In this position, the lint screen **58**, electrostatic grid **60** and the defuser **62** are all retracted into the frame **52** and a prong **72** of the power supply **66** is coupled to a complemental plug **74** which connects with a conventional 110 volt power supply plug **76**.

It will be understood that the grid frame **52**, lint screen **58**, electrostatic grid **60**, power supply **66**, and plug structure **74** are all a conventional electrostatic air cleaner structure.

In accordance with the invention, bearing clips **78** and **80** are secured to upper and lower portions of the grid frame **52** at one end thereof and these clips **78** and **80** are provided with arcuate bearing portions **82** open at one side thereof in order to permit lateral engagement and removal thereof relative to bar **54** with which they are pivotally engaged.

Secured to the bottom of the grid frame **52** at the opposite end thereof is a prong member **84**. This prong member **84** is fixed by screws **86** to the bottom **88** of the grid frame.

The prong **84** is provided with an end **90** which bears against an arcuate ledge **92** of an offset portion **96** of a bearing plate **98**. This bearing plate **98** is fixed to the lower plate **34** of the cabinet by means of screws **100**.

The plate **98** is provided with an upper surface **102** which forms a slide bearing for the lower surface **104** of the bottom **88** of the grid frame **52**.

The plate **98** is substantially arcuate, as shown in FIG. 1 of the drawings, and the arcuate structure is preferably mounted in a substantially concentric relationship with the axis of the bar **54** which, as hereinbefore described, is disposed on a substantially vertical axis.

The plate **98** is provided, at its opposite ends, with downwardly directed flange portions **106** and **108** forming stops for the prong **84** when said prong moves to broken line positions A and B, as will be hereinafter described.

Substantially at the middle portion of the bearing portion **102** of the plate **98**, the bearing portion **102** is provided with a slot **110** through which the prong **84** may be vertically removed, as shown in FIG. 2 of the drawings, in order to relieve the end portion **90** of the prong **84** from the arcuate ledge **96** and thereby permit separation of the bearings **82** from the bar **54** so that the entire grid frame **52** and its content may be removed from the cabinet **10**.

As shown in FIGS. 6, 7 and 8 of the drawings, the front panel **32** is provided with a projection **111** which fits in a complemental recess on the underside of the top **30** at its forward overhanging portion **112**.

Openings **114** in the front panel **32** receive control knobs **116** which may readily be cleared by outward pivotal movement of the panel **32**, as indicated by broken lines C, said outward pivotal movement being permitted by release of a latch member **118**, shown best in FIGS. 7 and 8 of the drawings. This latch member **118** is pivoted on a screw **120**, shown best in FIGS. 7 and 8 of the drawings. A projecting portion **122** of the member **118** projects upwardly into a slotted portion **124** in the lower edge of the front panel **32**. This slotted portion is lined by a sheet metal liner **126** which prevents the locking tab portion **122** from wearing the structure of the panel **32** internally of the slotted portion **124**.

The latch **118** is provided with a handle portion **130** which permits manual pivotal movement of the locking

tab **122** into a broken line position, as shown in FIG. 7 of the drawings. This is accomplished by moving the handle in the direction of the arrow D, thus permitting release of the lower edge of the panel **32** so that it may be pivoted outwardly to the broken line position C and removed from the front of the cabinet so that the fans and motors may be serviced.

Between the fans and the panel **32** is a fan shroud plate **132** having individual openings therein adjacent the fans **16** and **18**. This fan shroud **132** is spaced from the panel **32** to provide a passage for air which travels from the fan and outwardly through the outlet grills **24** and **26** and the bottom opening **28**, hereinbefore described.

Operation of the electrostatic air cleaner of the present invention is substantially as follows:

The electrostatic air cleaner carried by the grid frame **52** is a substantially concentric unit and operates electrically in a conventional manner.

According to the invention, the grid frame **52** and the entire electrostatic air cleaning unit is mounted, by means of the vertical axis bar **54**, the bearing plates **78** and **80**, and the plate **98** and prong **84**.

When it is desired to insert the electrostatic air cleaner grid frame **52** into the cabinet, the panel **46** is removed from the holders **38** and **40** and the bearing portions **82** of the bearing plates **78** and **80** are laterally engaged with the bar **54** at a position so that the prong **84** is above the plate **98**. Then the prong is slidably moved along the upper surface **102** of the plate **98** until the prong reaches the slot **110** whereupon the prong then passes through this slot **110** and downwardly into a position below the offset portion of the plate which forms the bearing **102**. The grid frame **52** may then be pivoted about the axis of the bar **54** with the lower surface **104** of the grid frame bearing on the upper surface **102** of the plate **98**. This offset plate **98** thereby serves as a vertical support and slide bearing for the grid frame **52** and the end **90** of the prong **84** contacting or tending to bear against the offset portion **96** of the plate **98** prevents the grid frame **52** from moving in a direction to substantially separate the bearing portions **82** of the bearing plate **78** and **80** from the bar **54**. Thus, the entire grid frame **52** may readily be pivoted about the axis of the bar **54** to an outward position E, as shown in FIG. 1 of the drawings, whereupon an end of the grid frame **52**, opposite the bearing plate **78**, may be swung outwardly to clear the normally rear open side portion of the cabinet **10**. In this position, the prong **84** may be against the stop **108** of the plate **98** thus limiting outward pivotal movement of the grid frame **52**. In this outer position, the innermost side of the grid frame may be aligned with a broken line F, shown in FIG. 1 of the drawings so that the defuser **62**, electrostatic grid **60** and the lint screen **58** may all be removed from the frame **52** while it is still supported by the bearing plates **78** and **80** in engagement with the bar **54** and the bottom **104** of the grid frame **52** is supported on the bearing surface **102** of the plate **98**. Thus, the power supply **66** may be pivoted downwardly into the position as shown in FIG. 5 and all of the elements of the electrostatic cleaner which require servicing may be readily removed, cleaned and replaced in a very convenient manner. When such maintenance work is accomplished, these elements are then slid backwardly into the grid frame **52** and the power supply **66** is pivoted upwardly into the position as shown in FIG. 3 of the drawings, wherein it is again ready for operation.

It will be understood that the conventional alternating current power supply plug **76** may be disconnected when it is desired to remove the entire structure or to replace it. Accordingly, the 110 volt power supply is carried by the cabinet **10** and is removably connected by means of the plug **76** to the power supply **66** and the connector **74**.

When the grid frame **52** is pivoted into a flush position

with the rear open portion **12** of the cabinet **10**, as shown in FIG. 1 of the drawings, the sealing structure **50** carried by the plate **46** engage the surfaces of the grid frame **52**, thereby forming an air seal around the grid frame causing all of air moved by the fans **16** and **18** to pass through the lint screen **58**, electrostatic grid **60** and outwardly through the defuser **62** so that the clean air ultimately passes outwardly through the grills **24** and **26** and the opening **28**.

Constant operation of the unit thus causes recirculation of the air in a room through the electrostatic air cleaner which removes minor particles of dust, as well as larger airborne matter.

When it is desired to remove the entire grid frame **52**, together with the lint screen **58**, electrostatic grid **60**, and the defuser **62**, the plate **46** is moved upwardly out of the slide holders **38** and **40** and the grid frame **52** is then pivoted outwardly about the axis of the bar **54** until the prong **84** reaches the slot **110**, at which time the bearings **82** of the plates **78** and **80** are slidably moved upwardly on the bar **54** while the prong **84** is moved upwardly through the slot **110**. The prong **84** is thus relieved from the offset portion of the plate **98** and the prong may then be moved backwardly while the bearings **82** of the plates **78** and **80** may be removed laterally from the vertical bar **54** whereupon the entire grid frame and assembly may be removed from the cabinet **10**.

It will be obvious to those skilled in the art that various modifications of the present invention may be resorted to in a manner limited only by a just interpretation of the following claims.

I claim:

1. In an electrostatic air cleaner the combination of: a cabinet having an open side portion forming a fluid inlet for said cabinet; a grid frame mounted in said open side portion; an electrostatic grid having an outlet side and an opposite inlet side, said inlet side disposed toward said fluid inlet, said grid removably mounted in said frame and normally extending over a substantial area of said open side portion of said cabinet; first means in said cabinet for forcing air through said grid; and second means pivotally mounting one end of said grid frame on said cabinet and on a substantially vertical axis whereby the opposite end of said grid frame may be swung clear of said open side portion of said cabinet; and third means permitting removal of said grid from said opposite end of said grid frame when said grid frame at said opposite end is swung clear of said open side portion of said cabinet; a lint screen removably mounted in said grid frame at the inlet side of said grid and removable from said grid frame at said opposite end thereof when it is swung clear of the open side portion of said cabinet; a fluid outlet for said cabinet situated so that said grid is between the inlet and the outlet; a bottom structure of said cabinet below said grid frame; fourth means slidably supporting said grid frame thereabove near said opposite end to permit pivotal movement of said opposite end relative thereto about said substantially vertical axis; stop means connected to said grid frame to limit outward pivotal movement of said opposite end of said grid frame relative to said cabinet; said second means comprising bearings separable laterally of said substantially vertical axis to permit removal of said grid frame from said cabinet; and seventh means connected to said grid frame and movable in an arcuate path relative to said cabinet and disposed to oppose separation of said bearings; portions of said separable bearings being connected to said cabinet and to said grid frame.

2. In an electrostatic air cleaner the combination of: a cabinet having an open side portion forming a fluid inlet for said cabinet; a grid frame mounted in said open side portion; an electrostatic grid having an outlet side and an opposite inlet side, said inlet side disposed toward said fluid inlet, said grid removably mounted in said frame and normally extending over a substantial area of said open side portion of said cabinet; first means in said cabinet for forcing air through said grid; and second means pivotally mounting one end of said grid frame on said cabinet and on a substantially vertical axis whereby the opposite end of said grid frame may be swung clear of said open side portion of said cabinet, and third means permitting removal of said grid from said opposite end of said grid frame when said grid frame at said opposite end is swung clear of said open side portion of said cabinet; a fluid outlet for said cabinet situated so that said grid is between the inlet and outlet; a bottom structure of said cabinet below said grid frame; fourth means slidably supporting said grid frame thereabove near said opposite end to permit pivotal movement of said opposite end relative thereto about said substantially vertical axis; stop means connected to said grid frame to limit outward pivotal movement of said opposite end of said grid frame relative to said cabinet; said second means comprising bearings separable laterally of said substantially vertical axis to permit removal of said grid frame from said cabinet; and seventh means connected to said grid frame and movable in an arcuate path relative to said cabinet and disposed to oppose separation of said bearings; portions of said separable bearings being connected to said cabinet and to said grid frame; and eighth means removably retaining said seventh means and permitting said seventh means to be relieved therefrom for separating said bearings and removing said grid from said cabinet.

3. In an electrostatic air cleaner the combination of: a cabinet having an open side portion forming a fluid inlet for said cabinet; a grid frame mounted in said open side portion; an electrostatic grid having an outlet side and an opposite inlet side, said inlet side disposed toward said fluid inlet, said grid removably mounted in said frame and normally extending over a substantial area of said open side portion of said cabinet; first means in said cabinet for forcing air through said grid; and second means comprising separable bearings; pivotally mounting one end of said grid frame on said cabinet and on a substantially vertical axis whereby the opposite end of said grid frame may be swung clear of said open side portion of said cabinet; a fluid outlet for said cabinet situated so that said grid is between the inlet and outlet; a bottom structure of said cabinet below said grid frame; a plate structure secured thereon and having a vertically offset portion slidably supporting the bottom surface of said grid frame and disposed in spaced relation to said bottom structure; a prong member on a lower portion of said grid frame and disposed below said offset portion, said offset portion having a stop portion disposed to limit outward pivotal movement of said frame at its opposite end relative to said cabinet; an end of said prong movable along said offset portion in opposed relationship to the separation of said bearings to prevent said bearings from being separated; and a slotted portion of said offset portion through which said prong may be moved vertically to relieve it from said offset portion and to permit separation of said bearings and thereby permit removal of said grid frame from said cabinet.

4. In an electrostatic air cleaner the combination of: a cabinet having an open side portion forming a fluid inlet for said cabinet; a grid frame mounted in said open side portion; an electrostatic grid removably mounted in said frame and normally extending over a substantial area of said open side portion of said cabinet; first means in said cabinet for forcing air through said grid; second means pivotally mounting one end of said grid frame on said cabinet and on a substantially vertical axis, whereby the opposite end of said grid frame may be swung outwardly beyond said open side portion of said cabinet; and third means permitting slidable removal of said grid from said opposite end of said grid frame when said grid frame at said opposite end is swung outwardly beyond said open side portion of said cabinet; a fluid outlet for said cabinet situated so that said grid is between the inlet and

outlet; said third means including a means pivotally mounting said opposite end of said grid frame on a horizontal axis and on said grid frame at a lower portion thereof and at said opposite end thereby permitting said opposite end to be pivoted downwardly about said horizontal axis and out of the way for removal of said grid from said grid frame.

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