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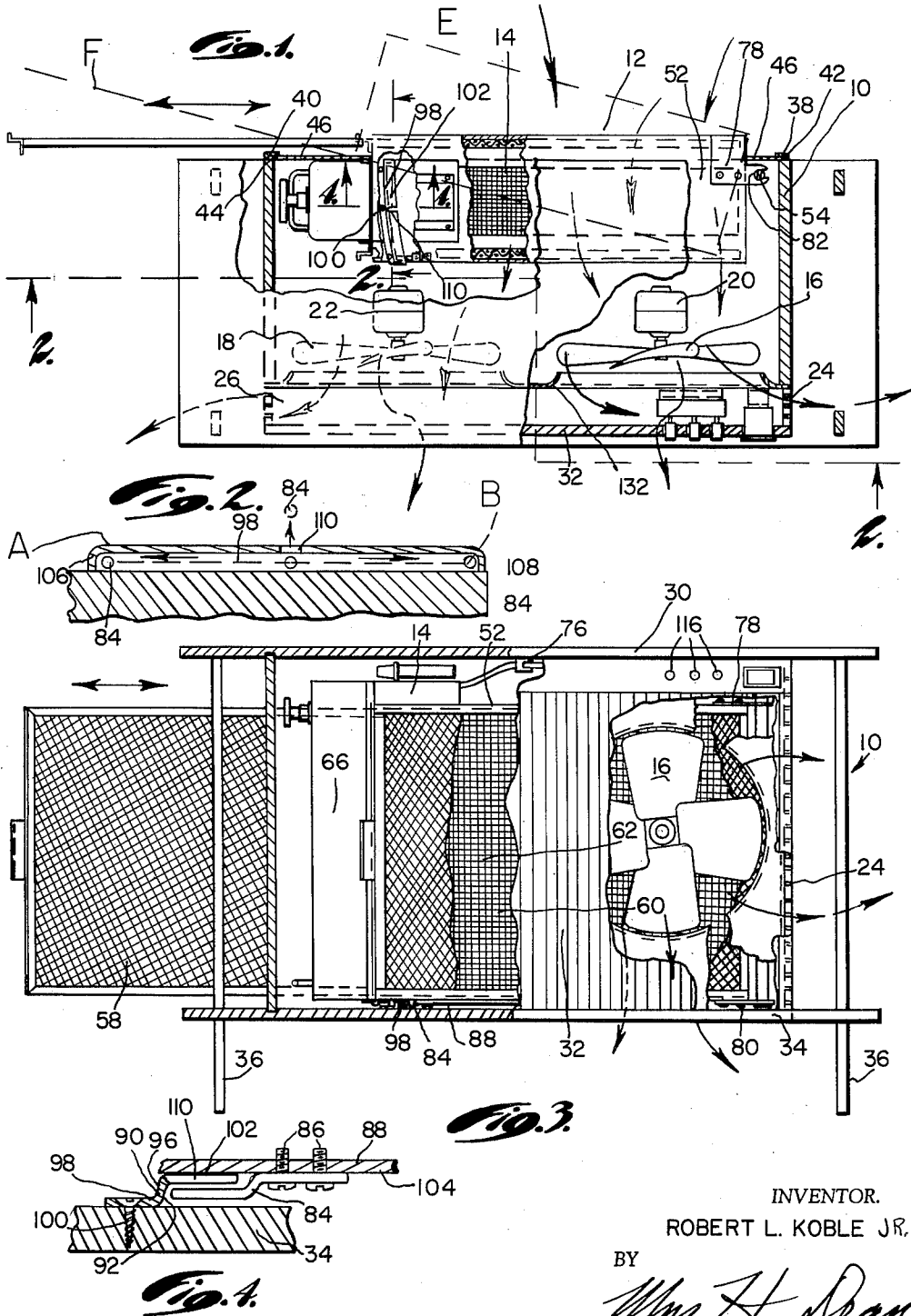
R. L. KOBLE, JR

3,222,848

ELECTROSTATIC AIR CLEANER

Filed April 16, 1962

2 Sheets-Sheet 1



INVENTOR.

ROBERT L. KOBLE JR.

BY

Wm. H. Dean

Dec. 14, 1965

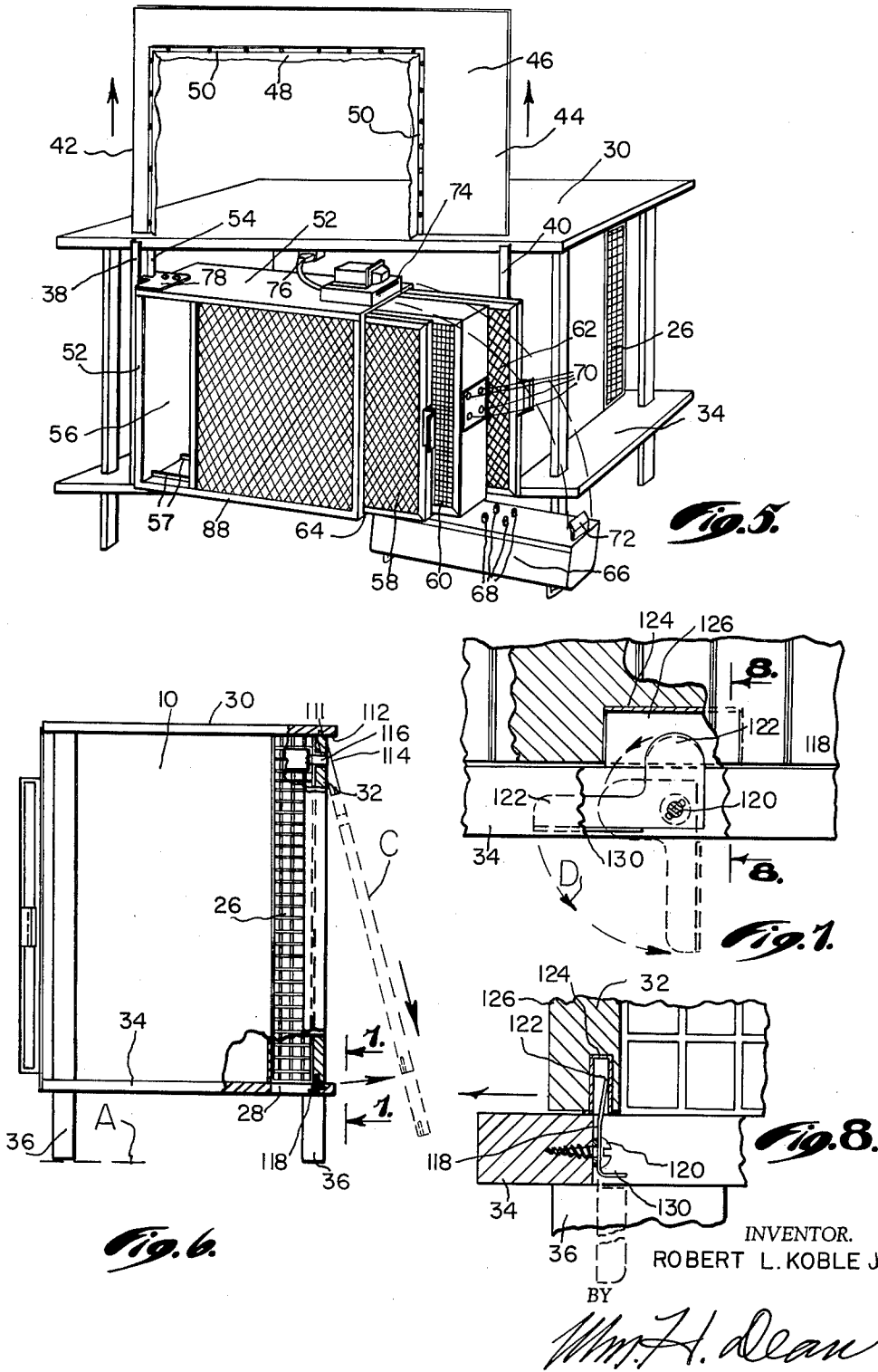
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ELECTROSTATIC AIR CLEANER

Robert L. Koble, Jr., Phoenix, Ariz., assignor to McGraw-Edison Company, Milwaukee, Wis., a corporation of Delaware

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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 there-through 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 por-

tions 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.

Pivotaly 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 complementary 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 complementary 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

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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

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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.

References Cited by the Examiner

UNITED STATES PATENTS

669,736	2/1901	Smith	312—308	XR
977,335	11/1910	Shaffner	55—279	XR
1,214,154	1/1917	Gustavson	55—279	XR
1,739,239	12/1929	Keffer	312—308	XR
1,887,737	11/1932	Shurtleff	55—493	XR
1,889,171	2/1933	Warren	312—300	XR
2,135,750	11/1938	Harding	55—495	XR
2,233,639	3/1941	Pegg	55—139	XR
2,346,430	4/1944	Hauser	312—308	XR

2,486,520	11/1949	Dahlman	55—126
2,486,521	11/1949	Dahlman	55—139 XR
2,575,499	11/1951	Manow	55—422
2,594,688	4/1952	Shapiro	55—233 XR
2,606,804	8/1952	Lambert et al.	312—308 XR
2,628,083	2/1953	Rense	55—279 XR
2,639,781	5/1953	Savitz	55—141 XR
2,640,751	6/1953	Robbins	312—308 XR
2,712,858	4/1955	Wintermute	55—126 XR
3,016,980	1/1962	Gonzalez	55—143 XR
3,041,807	7/1962	Getzin et al.	55—143
3,137,550	6/1964	Fruth	55—131

FOREIGN PATENTS

631,740	11/1961	Canada.
789,360	1/1958	Great Britain.

HARRY B. THORNTON, *Primary Examiner*.

20 RONALD F. BURNETT, *Examiner*.