May 21, 1957 R. EVANS 2,792,906

SUPPORT FOR AIR FILTER UNITS AND THE LIKE

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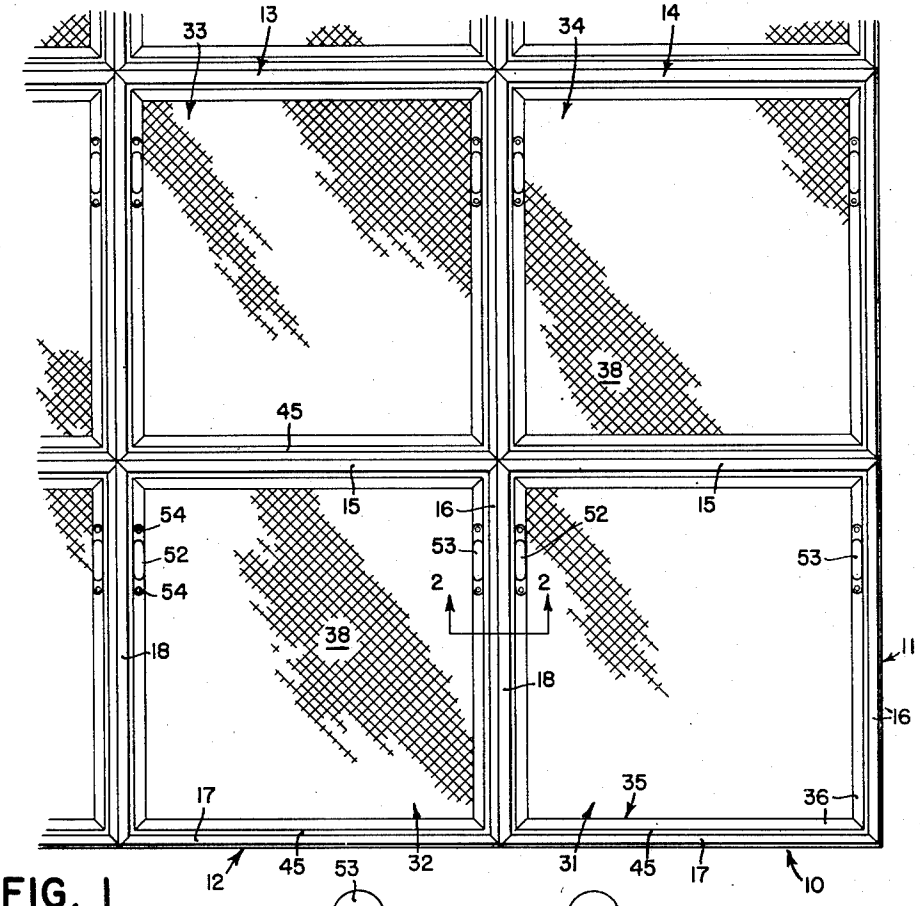


FIG. 1

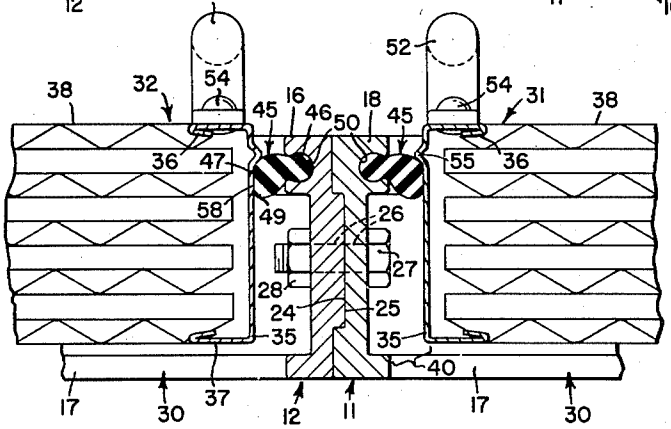


FIG. 2

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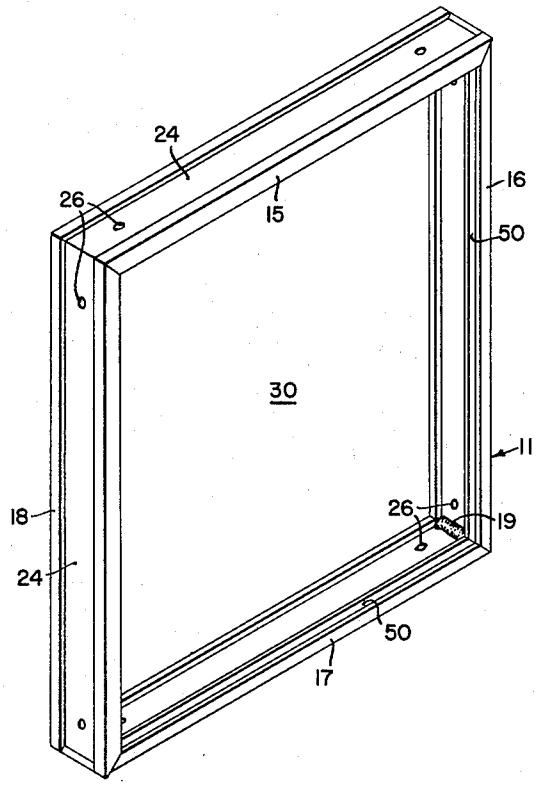


FIG. 3

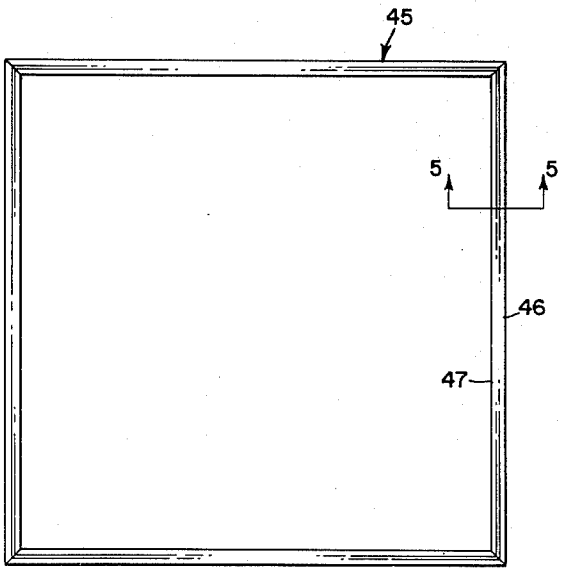


FIG. 4

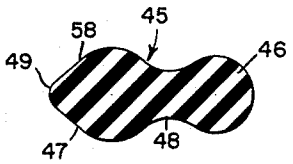


FIG. 5

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SUPPORT FOR AIR FILTER UNITS AND THE LIKE

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4 Claims. (Cl. 183—44)

The present invention relates generally to air filters and more particularly to that class of filters used to filter air for ventilating purposes. Filters of this class frequently comprise assemblies of a number of filter units mounted in a supporting frame, each filter unit being separately mounted and individually removable for cleaning and maintenance. The conventional supporting frame comprises a series of rectangular frame sections, each adapted to receive a filter unit, with hooks, bolts or the like for securing the filter unit frames within their respective supporting frame sections and a gasket or other sealing element for preventing leakage of unfiltered air between the filter units and their supporting frame sections.

The principal object of the present invention relates to the provision of a combined supporting and sealing element between the supporting frame and the filter unit, which is the sole supporting element and retains the unit in the frame without bolts, hooks or latches and from which the unit can be withdrawn easily.

A further object relates to the provision of a simple and inexpensive device for supporting the filter units, which effectively prevents leakage of air between the units and the frame.

More broadly, it is still another object of the present invention to provide a combined supporting and sealing element for retaining any panel or framed closure within a framed opening.

In the accomplishment of this object, the inner frame or panel is made slightly smaller than the opening defined by the outer frame providing a peripherally extending space therebetween, within which is disposed a flexible, resilient element which is deformed during the insertion of the inner panel or frame into the outer frame. The resilient element is preferably fixed to one of the frames and is compressed or deformed to fit closely against the other frame to seal the peripheral space therebetween.

In addition to its application to filter units this invention can be applied to other uses, such as, for example, supporting storm windows, porthole windows, and the like within their casings, as well as hatches and other panel closures.

These and other objects and advantages of this invention will be apparent to those skilled in the art after consideration of the following description of one embodiment of the invention, in which reference is had to the drawings appended hereto, in which

Fig. 1 is a front elevational view of an air filter comprising multiple filter units, embodying the present invention.

Fig. 2 is an enlarged fragmentary sectional view taken along a line 2—2 in Fig. 1.

Fig. 3 is an isometric view of one of the supporting frame sections.

Fig. 4 is an elevational front view of one of the sealing elements; and

Fig. 5 is an enlarged sectional view of the sealing element, taken along a line 5—5 in Fig. 4.

Referring now to the drawings, the supporting frame is indicated in its entirety by reference numeral 10 and comprises an assembly of frame sections 11, 12, 13, 14, etc., which are rigidly fixed together by interfitting ridge and groove construction and by bolts to form a rigid framework, as will be described more in detail.

Each of the supporting frame sections 11, 12, etc. comprises top and bottom frame members 15, 17 and two side members 16, 18. These frame members can be made of any suitable shape and material, but preferably they are extruded aluminum bars with 45° mitered corners which interfit to form a rigid integral frame secured by welds 19 at the four inner corners.

The frame members are formed in two different sections, as best shown in Fig. 2. The top members 15 and left side members 18 are formed with a longitudinally extending groove 24 in their outer surfaces, while the right side member 16 and bottom member 17 are formed with a longitudinally extending ridge 25 in their outer surfaces adapted to closely fit within the groove 24. Thus, when the frame sections are assembled to form the multiple opening supporting frame 10, the ridges 25 on the right side and bottom members 16, 17 interfit with the grooves 24 in the top and left side members 15, 18, respectively, thereby providing effective sealing and rigidity between the frame sections 11, 12, 13, 14, etc.

Bolt holes 26 are provided near each end of each frame member, which holes fall into alignment with corresponding holes in the adjacent frame sections, permitting them to be rigidly bolted together by bolts 27 and nuts 28. Each peripheral frame section 15, 16, 17, 18, etc. defines an opening 30, which is square in the embodiment shown herein, although it could be of various other shapes within the scope of this invention.

Telescoped within the peripheral frames 11, 12, 13, 14 are filter units 31, 32, 33, 34, respectively. Each filter unit comprises a peripherally extending sheet metal square frame 35, preferably of aluminum, with the edges turned inwardly to form front and rear flanges 36, 37 adapted to retain the filter element 38 therein. The filter element 38 can be of any suitable conventional type, which need not be described here in detail.

The filter frames 35 are slightly smaller than the supporting frames 11, 12, 13, 14, etc. in order that each filter frame can be inserted telescopically within a supporting frame, leaving a narrow peripheral space 40 between the outer surfaces of the filter frame and the inner surfaces of the supporting frame.

Disposed within the peripherally extending space 40 is a combined sealing and supporting element 45. Referring more particularly to Figs. 4 and 5, this element is preferably of molded rubber or the like, formed integrally in the general shape of the peripheral space 40, which is square in the embodiment shown herein. The element 45 is deformable and resilient and has a cross-section shaped generally as a figure 8 with an outer circular bead portion 46 and an inner circular bead portion 47 of slightly greater diameter, the two bead portions being connected by a web portion 48 of a thickness less than the diameter of either of the bead portions 46, 48. The inner bead portion 47 has a bead extension 49 or ridge on its inner periphery.

The inner surfaces of the frame members 15, 16, 17, 18 are formed with a groove 50, the opening of which is slightly narrower than the inside of the groove, which is substantially the size of the outer bead 46 of the sealing element. This outer bead 46 can be forced into the groove 50 which then firmly retains the sealing element within the inner periphery of the supporting frame section with the inner bead 47 and its extension 49 extending into the opening 30 and defining an opening that is smaller than the peripheral frame 35 of the filter unit.

Each filter unit has a pair of handles 52, 53 secured to the front flange 36 at opposite sides of the frame 35 by suitable means such as rivets 54. By grasping these two handles, the operator can push the filter unit into telescoping relation with the supporting frame, forcing it into the peripheral sealing element 45, and causing it to roll in the direction of movement of the filter unit, thus compressing and deforming the sealing element between the inner and outer telescoped frames 11, 35. The filter frame is formed with an outwardly pressed flange 55 extending peripherally around the outer surface of the filter frame 35. This flange 55 engages the sealing element 45 to limit the telescoping movement of the filter frame into the supporting frame, as illustrated in Fig. 2. In this position the inner bead 47 has rolled rearwardly and the bead extension 49 provides a flat surface 58 in compression against the outer surface of the filter frame 35.

The filter frame does not contact the supporting frame at any point but is solely and entirely supported on the combined sealing and supporting element 45. Therefore, it is evident that the element 45 cushions the filter unit and absorbs any vibration instead of transmitting vibration between the filter and the frame. Since the rubberlike sealing element is an electrical insulator, the filter is insulated from the frame. The deformation of the sealing element in compression against the filter unit effectively prevents leakage of air therebetween, regardless of minor dents and irregularities in the filter unit frame 35.

No special care is required in inserting the filter unit into the frame, for the flexibility and resilience of the sealing element permits minor misalignment but guides the filter into proper position. The square corners of the element provide positive alignment without bolts or dowels. The filter frame can be of any reasonable depth or thickness of filter element 38 and still be effectively supported in the outer frame.

It is evident that no accessory bolts, locks or latches are needed to hold the filter unit in place. It can be removed by simply grasping the two handles 52, 53 and pulling it out of the supporting frame. It will now be evident to those skilled in the art that this sealing and supporting element can be used to hold storm windows or screens in window casings. It can, in fact, be used for a great variety of closures, hatches, portholes and the like.

It is not the intention to limit the present invention to the particular details shown and described herein except as set forth in the following claims.

I claim:

1. In an air filter, the combination of an outer peripheral supporting frame having a groove on the inner surface thereof, a peripherally extending rubberlike element comprising inner and outer bead portions joined by a reduced web section, said outer bead portion being received and retained within said groove and said inner bead portion extending inwardly of said frame and defining an opening, a filter unit having an outer peripheral surface larger than said opening and slidably insertable into the latter, thereby causing said inner bead portion to roll into a deformed position and stretched into firm contact with the outer surface of said unit serving both as a peripheral seal between said unit and said frame and as the sole support of said unit on said frame.

2. In combination, an outer peripheral supporting frame having means on the inner surface thereof defining a groove, a peripherally extending rubberlike element having a cross section resembling a figure eight, comprising inner and outer bead portions joined by a reduced web section, said outer bead portion received and retained within said groove and said inner bead portion extending inwardly of said frame and defining an opening, an inner frame having an outer peripheral surface smaller than the inside dimensions of said outer frame but larger than said opening defined by said element, said inner frame being slidably insertable into said opening, so constructed and arranged that said inner bead portion is caused to roll into a deformed position embracing said peripheral surface wherein said inner bead portion is stretched into firm contact with said surface of said inner frame and serving as the sole support therefor.

3. In an air filter, the combination of an outer peripheral supporting frame, a peripherally extending rubberlike element having an outer portion secured to the inner side of said frame and an inner bead portion extending inwardly of said frame and defining an opening, a filter unit having an outer peripheral surface larger than said opening but smaller than said supporting frame, said inner frame being slidably insertable into said opening, so constructed and arranged that said inner bead portion to roll into a deformed position and stretched into firm sealing contact with the periphery of said filter unit and serving as the sole support therefor, said filter unit having a peripherally extending flange engageable with said rubberlike element to limit the extent to which said filter unit can be pressed into said opening.

4. In an air filter, the combination of an outer peripheral supporting frame, a peripherally extending rubberlike element having an outer portion secured to the inner side of said frame and an inner bead portion extending inwardly of said frame and defining an opening, a filter unit disposed in said opening, said inner bead portion being rolled into a deformed position and stretched into tight embracing relation with the outer peripheral surface of said unit for supporting the latter from said outer frame, said unit being slidably removable from said element responsive to a force generally normal to the plane of said element.

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