April 30, 1968 J. MADL, JR 3,380,219

UNIT-MOUNTING AND CIRCULATION-SEALING FRAME

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Fig. 1.

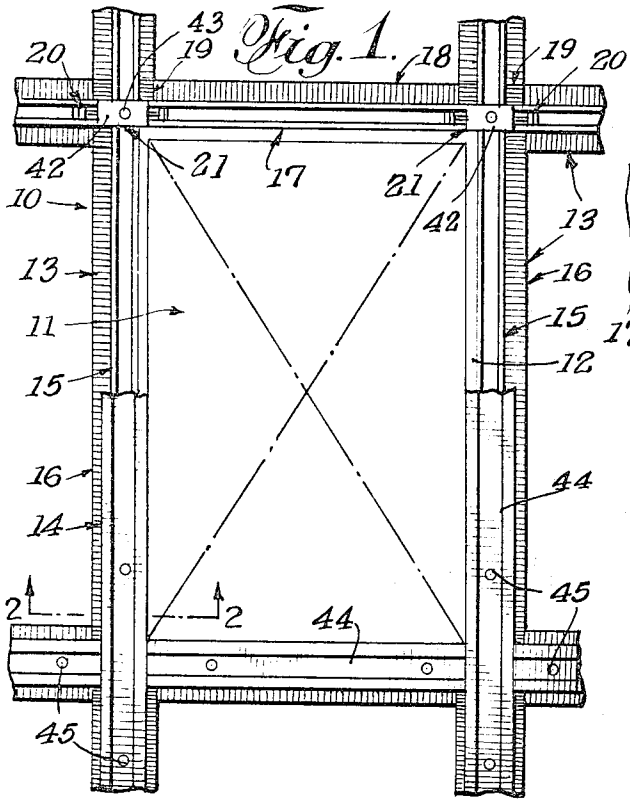


Fig. 3.

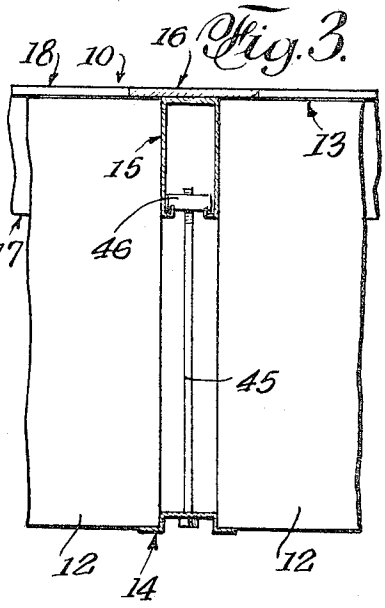


Fig. 4.

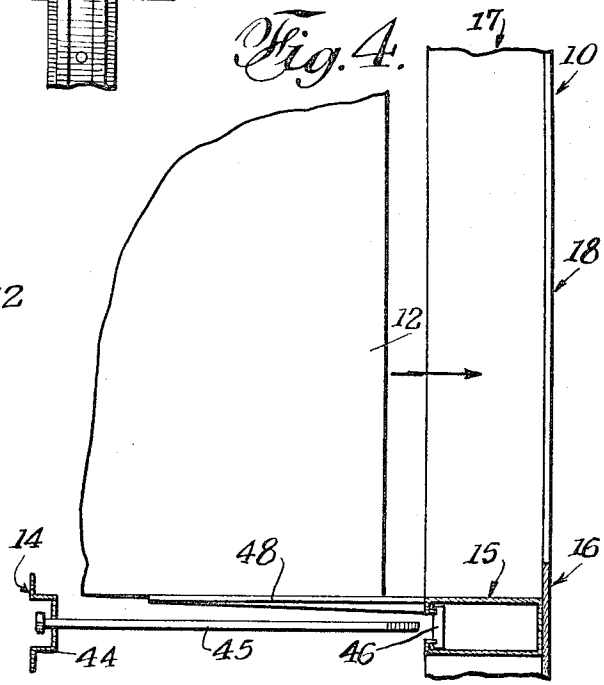
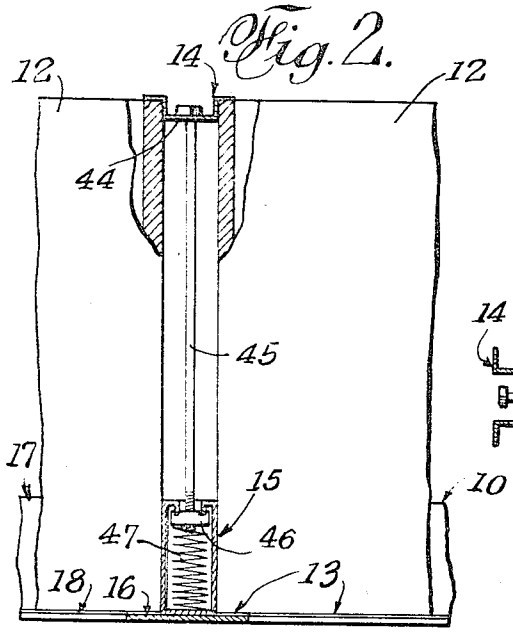


Fig. 2.



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Fig. 5.

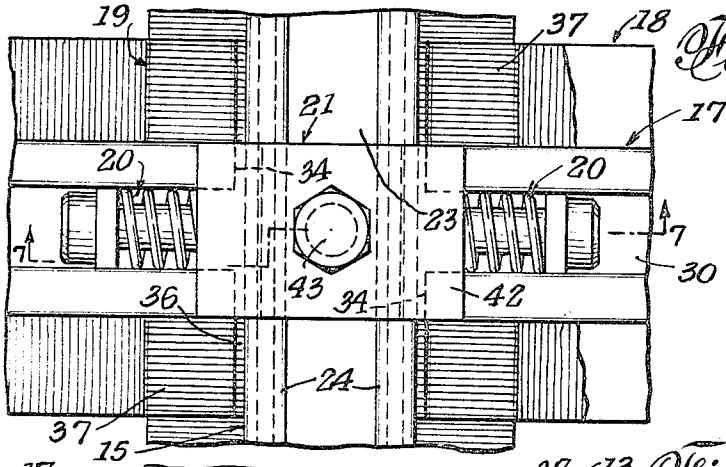


Fig. 6.

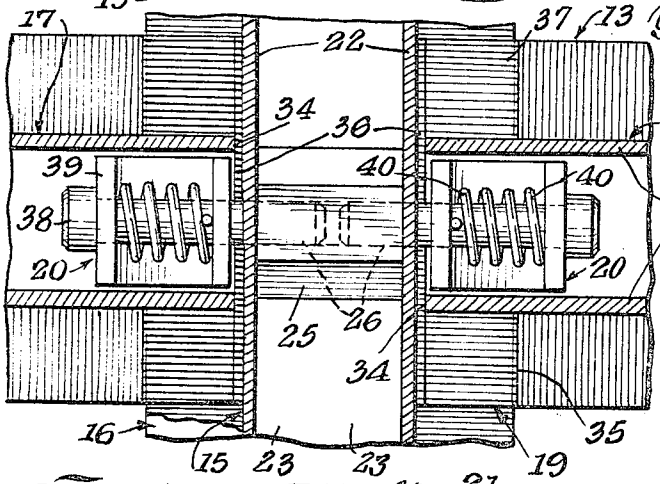


Fig. 8.

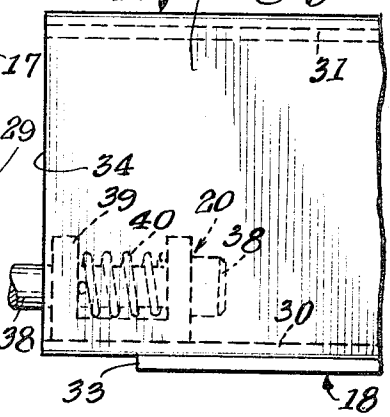


Fig. 7.

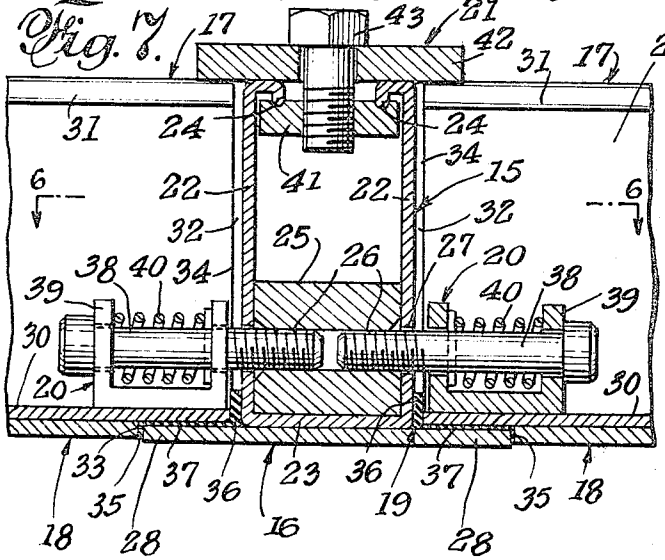
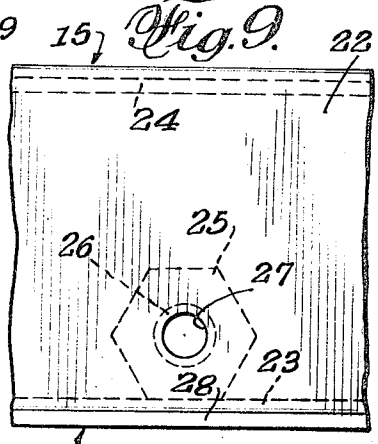


Fig. 9.



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3,380,219

UNIT-MOUNTING AND CIRCULATION-SEALING FRAME

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Filed May 16, 1966, Ser. No. 550,535
10 Claims. (Cl. 52—664)

This invention relates to a unit-mounting and circulation-sealing frame that has general application but more particular usefulness in "clean room" installations to insure that only sterile and/or specially treated air may enter a room or other space from atmosphere or another area or space, such as a plenum above the room.

An object of the present invention is to provide a frame for mounting air-filtering and/or -treating units so that the only circulation of air from the space on one side of the frame to the space on the opposite side will pass only through said units.

Another object of the invention is to provide a frame, as characterized, that is so constructed and its components so assembled as to preclude circulation of air therethrough, whereby filter units fitted into said frame will provide the only air-circulating means from one side of the frame to the other, and air-intercepting units fitted into the frame will cooperate with the frame to prevent such air-circulation. Air-intercepting units may comprise dummy panel units, lighting fixtures, and other units or means required to service a room with light, heat and/or power.

This invention also has for its objects to provide such means that are positive in operation, convenient in use, easily installed in a working position and easily disconnected therefrom, economical of manufacture, relatively simple, and of general superiority and serviceability.

The above objects are realized in a frame that is fabricated of spaced, parallel longitudinal channels, longitudinally spaced transverse channels extending between the longitudinal channels, flange members wider than the channels and affixed to the webs of said channels with the ends of the flange members on the transverse channels fitted against the opposite edges of the flange members of the longitudinal channel members, air-intercepting seals at the places where such fit of the flanges occurs and also applied to the portions of the flange members that extend beyond the sides of the channels, said seal-lined flange portions forming ledges against which units, as above mentioned, are fitted, and means to clamp said units in place against said seals to prevent air flow from one side of the frame to the other. The fabricated frame, as above, is retained in firm, yet demountable assembly, by means of screws carried by the ends of the transverse channels in threaded engagement with fixed nuts in the longitudinal channels. This means placing the seals between the flange members in compression.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description and which is based on the accompanying drawings. However, said drawings merely show, and the following description merely describes, preferred embodiments of the present invention, which are given by way of illustration or example only.

In the drawings, like reference characters designate similar parts in the several views.

FIG. 1 is a plan view of a portion of a unit-mounting and circulation-sealing frame embodying the construction according to the present invention.

FIG. 2 is an enlarged cross-sectional view as taken on the line 2—2 of FIG. 1.

FIG. 3 is a cross-sectional view showing the frame of FIGS. 1 and 2 in an inverted position of use.

FIG. 4 is a similar cross-sectional view showing the frame vertically disposed for holding laterally applied units.

FIG. 5 is a further enlarged plan view of the frame where the longitudinal and transverse members thereof are joined.

FIG. 6 is a plan sectional view of said joint, as taken on the line 6—6 of FIG. 7.

FIG. 7 is a vertical sectional view as taken on the line 7—7 of FIG. 5.

FIG. 8 is a side elevational view of one of the ends of a transverse frame member.

FIG. 9 is a fragmentary side view of one of the longitudinal frame members.

The present unit-mounting and circulation-sealing frame comprises, generally, a grid-like frame structure **10** framing at least one space **11** and, preferably, a plurality of such spaces receptive of units **12** totally spanning said spaces, means **13** to seal between each said unit and the frame structure, and means **14** for removably and fixedly securing said units to said frame structure.

The frame structure **10** comprises, generally, a plurality of spaced, parallel and longitudinal channels **15** each provided with a flange member **16** permanently attached to the base of each channel **15** or integrally formed therewith, a plurality of spaced, parallel and transverse channel members **17** each provided with a flange member **18** integral with or permanently attached to the base of each channel **17**, air seals **19** interposed between the channels **15** and their flange members **16**, on the one hand, and the channels **17** and their flange members **18**, on the other, means **20** to laterally secure the ends of the channels **17** to middle portions of the channels **15**, and means **21** to hold the longitudinal and transverse channels in coplanar alignment and place the air seals **19** in compression between overlapping portions of the longitudinal and transverse components of the frame structure.

Each channel **15**, preferably of steel or aluminum alloy, is formed to have parallel flanges or walls **22**, a base web **23** connecting said walls along the edges at one end and inbent and down-turned ends **24** along the opposite edges of said walls. FIG. 7 best shows this sectional configuration of the channels **15**. It will be understood that these channels **15**, at their ends and, possibly, at spaced intermediate points, may be supported from beneath or hung from above in any desirable manner. The same may be disposed with the web **23** down, inverted with the web up, as in FIG. 3, or rotated ninety degrees with the web in a lateral position, as in FIG. 4. At one or more intermediate places of each channel may be provided a nut **25**, preferably of hexagonal stock, the same being fixed in place and having a screw seat **26** that extends transversely and is open to clearance holes **27** in the channel walls **22**.

The flange members **16** comprise lengths of flat stock substantially wider than the channel webs **23**, the same when fixedly attached to the channels **15**, forming flange portions **28** that are disposed laterally of the walls **22** of the channels.

The transverse channels **17** have the same cross-sectional configuration as the channels **15** with parallel flanges or walls **29**, webs **30**, and turned-in wall ends **31**. The lengths of these transverse channels are such as to provide a spaced fit, as at **32**, relative to the walls **22** of the longitudinal channels between which they fit.

The flange members **18** of the channels **17** comprise lengths of flat stock similar in width and thickness to the flange members **16**. The ends **33** of said flange members **18** terminate from the wall edges **34**, as best seen in FIG. 7, so that they pinch or bind against the portions **35** of the seals **19** that are disposed between said edges **33** and

the side edges of the flange members **16**. This engagement of the longitudinal and transverse channels **15** and **17** also causes the ends **34** of the latter to pinch thickened portions **36** of the seals **19** therebetween. Intermediate portions **37** are sandwiched between the flange portions **28** of the flange members **16** and the webs **30** of the channel members **17**. Thus, seals **19** effectively seal at the joints where the channel members **15** and **17** are joined, the means **20** and **21**, by creating pressure on the seals, insuring against air leakage at said joints from one side of the frame to the other. Compressible plastic material, as, for instance urethane foam rubber, may be used for such seals.

The means **20** is shown as a bolt **38** guided in a bracket **39** with its threaded end directed toward and extending beyond the wall edges **34**, a spring **40** biasing said bolt in said direction. Retraction of the bolt clear of said wall edges **34**, enables assembly of the channel members, as above indicated. Release of the bolt so the same may be projected, effects an aligned engagement between the bolt and the screw seat in nut **26**. Said bolt may now be threaded into said seat until the end of channel member **17** is drawn tightly toward the channel member **15**, thereby laterally compressing the seal portions **35** and **36**, as explained.

The means **21**, best seen in FIGS. 5 and 7, comprises a nut **41** engaged with the down-turned portions of the ends **24** of the walls **22** of channel member **15**, a clamp plate **42** disposed upon said channel wall ends **24** and extended to bear on the same ends of the walls **29** of the channel members **17**, and a bolt **43** extending through a clearance hole in said clamp plate and threadedly engaged with the nut **41**. The head of said bolt **43**, thereby bears down on the plate **42** which, in turn, is drawn tightly against the tops of the channel members **15** and the extensions of said plate bear down on the tops of the channel members **17**, causing compressing of the intermediate portions **37** of the seals **19** between the webs **30** and the flange portions **28**.

The frame **10**, as shown in the upper portion of FIG. 1, is assembled as above, forming the rectangular spaces **11**, which, according to the lengths of the channel members **17** and the longitudinal spacings of these members along the channel members **15**, are sized to have a sliding fit for the units **12**. In most instances, a plurality of the units fitted to the spaces **11** comprises filters **12** that are seated on the sealing means **13** which, in this case, is shown as liners applied to the upper, lower or side faces, as the case may be, of the flanges against which the seals **19** are pressed. Whether the units **12** are filters or other rectangular utility or dummy units, the same seat on the sealing means **13** to prevent air passage between the flanges **16** and **19** and the units **12**.

The means **14** comprises clamp members **44** that, by means of elongated bolts **45**, are drawn against the outer edges of the units **12** when engaged with nuts **46**, similar to nuts **41** but offset from the corners or joints where the channel members **15** and **17** are connected. Where required, as in FIG. 2, springs **47** may support the nuts **46** so the bolts **45** may engage them. The lateral application of units **12**, as indicated in FIG. 4, may be facilitated by providing the channel members, that are horizontal, with slide brackets **48**.

While the herein-described frame **10** seals against air leakage or air movement from one side of the frame to the other, the same may be watertight and, by careful machining of the edges of the members **16** and **18** and portions contacting them, may be made to be light-tight even in instances where the seals **19** and the liner means **13** are omitted. The metal-to-metal contact of the latter form, while requiring accuracy of construction, has improved facility as a structure, by avoiding imposition of stresses on the frame as may result from a rigid tie-in to the support walls, studs or girders. By providing expansion joint connection of the frame with its support, the same has the ability to float as a unit so minimum transmission of earth tremors, sonic booms and other shocks results.

While the foregoing has illustrated and described what is now contemplated to be the best mode of carrying out the invention, the constructions are, of course, subject to modification without departing from the spirit and scope of the invention. Therefore, it is not desired to restrict the invention to the particular forms of construction illustrated and described, but to cover all modifications that may fall within the scope of the appended claims.

Having thus described this invention, what is claimed and desired to be secured by Letters Patent is:

1. A unit-mounting and circulation-sealing frame comprising:

(a) a plurality of elongated, transversely spaced channel members having sides and a connecting web and provided with flange portions extending from the longitudinal sides of said members across the web thereof,

(b) a plurality of transverse channel members spanning between the longitudinal channel members and provided with flange portions extending from the sides of said members across the webs thereof and terminating in spaced relation to the ends of the latter channel members,

(c) air-sealing members interposed between the said ends of the transverse channel members and the sides of the longitudinal channel members and adjacent portions of the flanges of the latter members, and

(d) means to connect the ends of the transverse channel members to the longitudinal channel members and to place the air-sealing members in compression laterally therebetween.

2. A unit-mounting and circulation-sealing frame according to claim **1** in which the last-mentioned means comprises:

(a) a fixed nut in each longitudinal channel member and having a transverse threaded seat, and

(b) a resiliently retractable bolt carried by each end of the transverse channel members directed toward each longitudinal member,

(c) said bolts being aligned with and, when projected, being engageable in said seats.

3. A unit-mounting and circulation-sealing frame comprising:

(a) a plurality of elongated, transversely spaced channel members having sides and a connecting web and provided with flange portions extending from the longitudinal sides of said members across the web thereof,

(b) a plurality of transverse channel members spanning between the longitudinal channel members and provided with flange portions extending from the sides of said members across the webs thereof and terminating in spaced relation to the ends of the latter channel members,

(c) air-sealing members interposed between the said ends of the transverse channel members and the sides of the longitudinal channel members and adjacent portions of the flanges of the latter members,

(d) means to connect the ends of the transverse channel members to the longitudinal channel members and to place the air-sealing members in compression laterally therebetween, and

(e) means to align and clamp the longitudinal and transverse channel members in coplanar relation.

4. A frame according to claim **3** in which the latter means includes a clamp plate carried by the longitudinal channels and having extensions overlapping on and being in bearing engagement with the adjacent end portions of the transverse channel members.

5. A frame according to claim **4** in which the air-sealing members have portions that are interposed be-

tween the mentioned ends of the transverse channel members and the portions of the flanges of the longitudinal channel members which they overlie, the channel member-aligning means placing said interposed portions of the air-sealing means in compression.

6. A frame according to claim 5 in which the flange portions of both the longitudinal and transverse channel members are provided with air-intercepting liners to engage units inserted into the spaces formed by said channel members, and means to clamp said units against said liners.

7. A frame according to claim 6 in which the latter clamping means is threadedly connected to the channel members and is engaged with the sides of the units opposite to the sides engaged with the liners.

8. A frame according to claim 3 in which the mentioned air-sealing members have the same length as the width dimension of the flange portions of the transverse channel members, the flange portions of the longitudinal channel members, beyond said air-sealing members, and the flange portions of the transverse channel members, being provided with air-sealing layers adapted to be engaged by units fitted into the spaces formed by said frame members.

9. A unit-mounting frame comprising:

(a) a plurality of elongated, transversely spaced channel members having sides and a connecting web and provided with flange portions extending from the longitudinal sides of said members across the web thereof,

(b) a plurality of transverse channel members spanning between the longitudinal channel members and provided with flange portions extending from the sides of said members across the webs thereof and terminating in spaced relation to the ends of the latter channel members, and

(c) means to connect the ends of the transverse channel members to the longitudinal channel members and to effect tight light-sealing engagement of said ends with the longitudinal edges of the longitudinal channel members.

10. A unit-mounting frame according to claim 9 in which the last-mentioned means comprises:

(a) a fixed nut in each longitudinal channel member and having a transverse threaded seat, and

(b) a resiliently retractable bolt carried by each end of the transverse channel members directed toward each longitudinal member,

(c) said bolts being aligned with and, when projected, being engageable in said seats.

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