March 23, 1965 A. E. KRAUSZ 3,174,594

HOUSING CONSTRUCTION

Filed June 30, 1961 2 Sheets-Sheet 1

Fig. 1

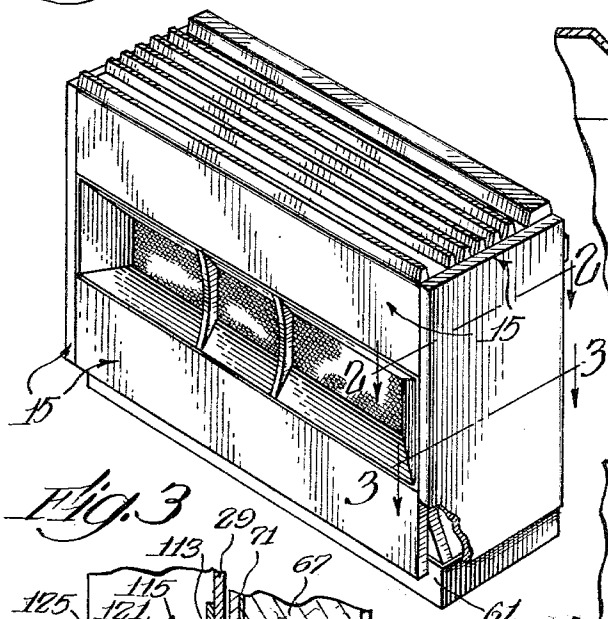


Fig. 2

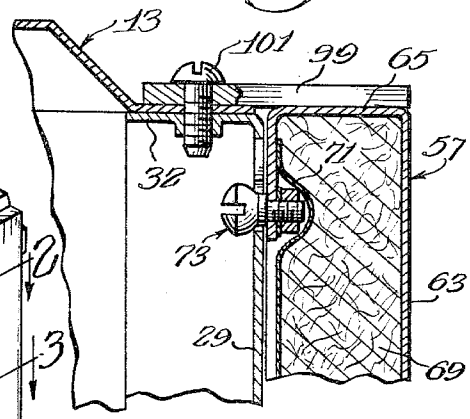
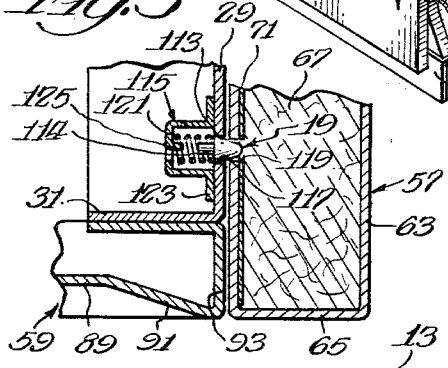
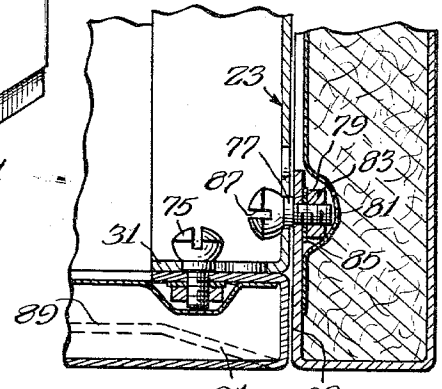


Fig. 3





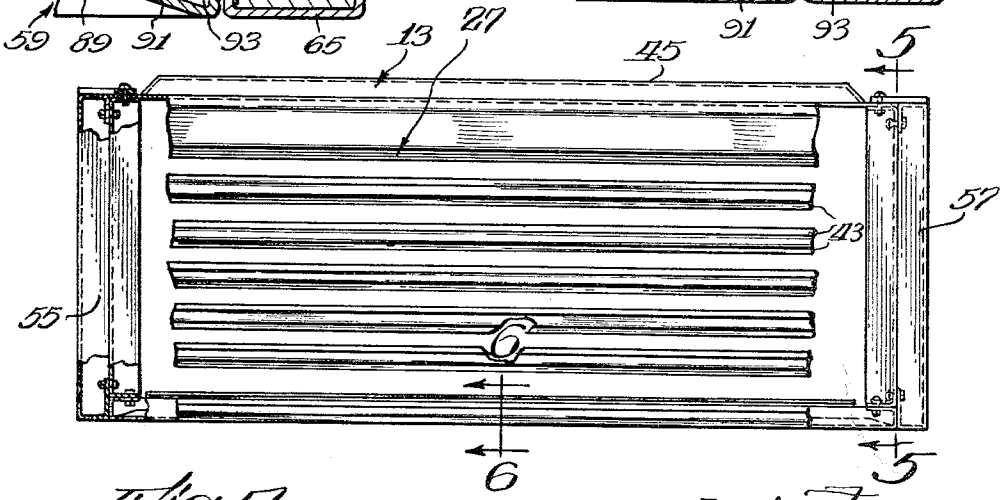


Fig. 4

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Fig. 5

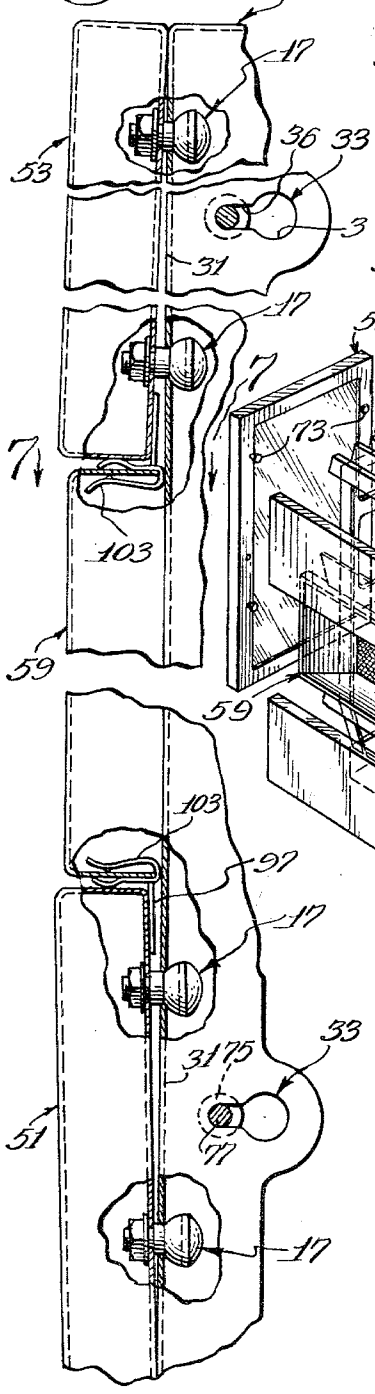


Fig. 6

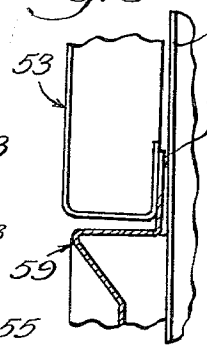


Fig. 7

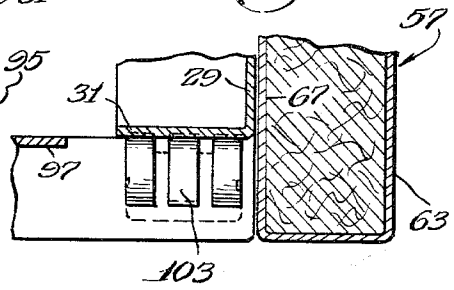


Fig. 8

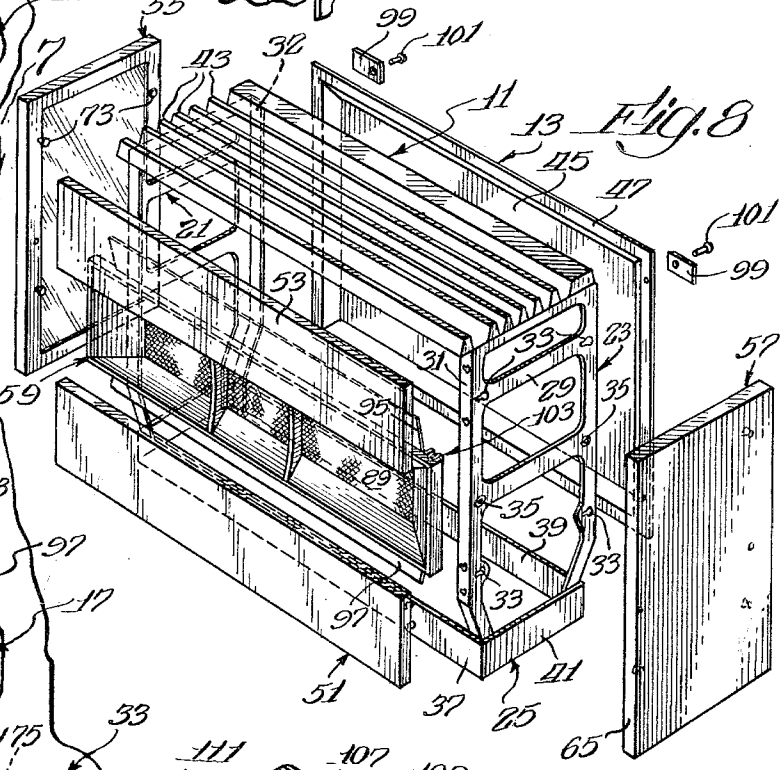
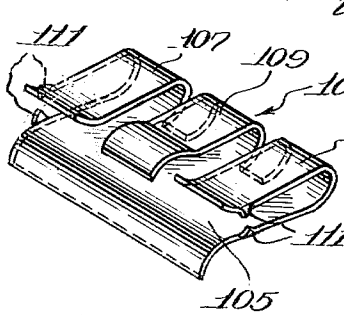


Fig. 9



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3,174,594

HOUSING CONSTRUCTION

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Filed June 30, 1961, Ser. No. 121,169
6 Claims. (Cl. 189—85)

This invention relates to space heaters, and in particular, it relates to an improved housing construction for the heat exchanger of such heaters.

A space heater normally comprises a heat exchanger formed generally of cast iron, a means for heating the heat exchanger, and a housing of some form which surrounds the heat exchanger so as to prevent individual contact with the heated surface of the heat exchanger, and to enhance the appearance of the heater. The housing usually includes a rigid metal frame which surrounds the heat exchanger and provides support therefor, and a series of panels bolted or otherwise rigidly fastened to the frame. The panels are generally coated with a porcelain rather than paint, since porcelain is more capable of withstanding the heat generated within the housing.

Space heaters generally weigh several hundred pounds, due principally to the weight of the heat exchanger and to the fact that it is generally of an all-metal construction. Despite this fact, the heaters are normally shipped to dealers in an assembled form in a heavy carton or the like. This practice makes it unnecesary for the dealer to unpack the heater prior to delivery to a particular customer, with sales of such heaters generally being made from demonstration models in the dealer's place of business.

It has been found that in the shipment of space heaters in the assembled form, stresses, and particularly twisting stresses, are set up in the housing. Due to the fact that the panels are rigidly attached to the housing frame, these stresses are transferred directly to the panels and frequently are sufficiently severe so as to cause the porcelain coating to chip.

The principal object of the present invention is to provide a space heater housing construction which has sufficiently flexibility therein to enable the housing to absorb stresses which have heretofore caused damage to housings. Another object of the invention is to provide a housing construction for space heaters in which panels are secured to a housing frame in a manner which will permit limited movement therebetween, but in which sufficiently rigidity is maintained to prevent rattling. A further object of the invention is to provide a housing in which panels are fixedly secured to a housing frame, and yet easily removable therefrom.

Other objects and advantages of this invention will become apparent with reference to the following description and accompanying drawings.

In the drawings:

FIGURE 1 is a perspective view of a space heater incorporating the present invention;

FIGURE 2 is a fragmentary sectional view taken along line 2—2 of FIGURE 1;

FIGURE 3 is a fragmentary sectional view taken along line 3—3 of FIGURE 1;

FIGURE 4 is a partially broken away top view of the heater shown in FIGURE 1;

FIGURE 5 is a partially broken away fragmentary sectional view taken along line 5—5 of FIGURE 4;

FIGURE 6 is a fragmentary sectional view taken along lines 6—6 of FIGURE 4;

FIGURE 7 is a partially broken away fragmentary sectional view taken along line 7—7 of FIGURE 5;

FIGURE 8 is an exploded view of the heater shown in FIGURE 1; and

FIGURE 9 is a perspective view of a biasing means inserted between adjacent panels of a housing in accordance with the present invention.

Very generally, a housing in accordance with the present invention comprises a rigid frame 11 to which is rigidly secured a rear plate 13, and to which are flexibly secured forward and end panels 15 by fastening means 17 which permits removal of the panels by lateral displacement thereof relative to the frame and allows for sufficient flexibility so that stresses set up in the frame 11 will not result in damage to the panels. Means 19 are further provided to urge the panels away from the frame to prevent contact between the frame and the panels and the noises incident thereto.

Referring now to the drawings, the frame 11, seen most clearly in FIGURE 8, is of a generally elongated rectangular construction and includes a pair of opposing end walls 21 and 23, a base 25, and a top wall 27. The walls and base are rigidly interconnected and define a space somewhat larger than that occupied by the heat exchanger (not shown) which is disposed within the housing.

Each of the end walls 21 and 23 comprises a generally rectangular plate 29 having an inwardly turned flange 31 disposed along the forwardmost of each of its side edges, and a similar flange 32 disposed along the rearward side edge. Both flanges are generallly normal to the plane of the plates. The plate 29 is generally rectangular, but is tapered slightly at its lower end for reasons which will become apparent shortly.

The plate 29 and flanges 31 of each end wall are adapted to have secured thereto one of the panels 15. In this regard, both the plate and flanges are provided with plurality of horizontally disposed keyhole slots 33 to facilitate the attachment of these panels in a manner which will be described in detail shortly. The slots 33 are of standard form having a generally circular opening 34 and an elongated opening 36 extending from the opening 34 toward the left when facing the outer surface of the flange or plate. A pair of biasing elements 35 is provided in each of the plates 29 and constitute part of the means 19 which urges the end panels away from the frame 11. The means 19 will also be described in further detail hereinafter.

The end walls 27 are interconnected at their lower ends by the base 25 which comprises a forward plate 37, a rearward plate 39, and a pair of opposing end base plates 41. The plates are secured to one another at their ends so as to form a rectangular loop and one of the end walls 21 and 23 are suitably fastened to the inner surface of each of the end base plates 41.

The top wall 27 of the frame 11 serves also as the top wall of the housing and includes a plurality of ribs or vanes 43 which facilitate dissipation of the heat generated within the housing, and which also contribute to the sturdiness of this wall. The top wall 27 overhangs the forward flanges 31 of the end walls 21 and 23 a short distance to form a protective ledge (FIGS. 1 and 8) for the upper edge of the panel 15 which serves as the forward panel of the housing.

In order to strengthen the frame 11 and cause it to be more rigid, the rear plate 13 is fixedly secured to the rearward flanges 32 of the end walls 21 and 23. The rear plate 13 is generally shell-shaped, having an inner portion 45 which projects outwardly somewhat to accommodate various of the interior components of the heater, for example, the fan motor and fuel conduits (not shown). A flange 47 encircles the perimeter of the inner portion 45 and is suitably fastened to the rearward flanges 32 of the end walls 21 and 23 by fasteners (not shown).

The panels 15 are flexibly secured to the frame 11 by the fastening means 17, soon to be described. There is

provided generally a lower forward panel 51, an upper forward panel 53, and left and right end panels 55 and 57, corresponding to their positions when facing the forward wall of the housing. The lower and upper forward panels 51 and 53 extend the width of the frame 11 and have their ends flush with the outer surfaces of the plates 29 of the end walls 21 and 23. The forward panels are relatively narrow in height and, when in position on the frame 11, define an area between them in which is disposed a central panel 59, referred to in more detail shortly.

It will be noted in FIGURE 1 that the lower forward panel 51 overhangs somewhat the forward tapered portion of the end walls 21 and 23, thereby providing a gap 61 through which air may pass, or be forced by means of a fan (not shown), this arrangement thereby providing a flow of heated air adjacent the floor of the room.

The end panels 55 and 57 are rectangular in shape and extend from the upper edge of the end base plates 41 to the lower edge of the top wall 27. The end panels are wider than the end walls 21 and 23 and, although flush with the rear flanges 32 of the walls, extend forwardly past the side edges of the forward panels and are flush along their forward edges with the forward surface of the forward panels 51 and 53. Hence, the end panels, when in position, prevent extensive lateral movement of the forward panels incident to their removal, and thus maintain them in place. However, sufficient lateral movement is permitted to provide for some flexibility incident to stresses set up in the housing.

Each of the panels 15 includes an outer plate 63, an edge wall 65, and an inwardly directed flange 67 which is generally parallel to the outer plate 63 and separated therefrom by the width of the edge wall 65. The outer plates 63 are shown as being generally continuous, but may include for various reasons, windows, openings, or grill work of some kind.

An insulating material 69, such as fibre glass, is disposed between the flange 67 and the outer plate 63 and maintains the panel in a somewhat cooler condition so that it will not be a hazard should it be accidentally contacted by an individual. The inner side of the insulating material i.e., the side adjacent the frame, is preferably provided with a foil or similar reflecting material 71 to further add to the insulating properties of the material 65. As previously mentioned, the outer surface of each of the panels is coated with a porcelain which provides an attractive appearance to the housing, and yet is durable enough to withstand the heat to which the housing is subjected.

Each of the flanges 67 of the panels 15 is provided with four outwardly projecting fasteners 73 which cooperate with the keyhole slots 33 to form the fastening means 17. The fasteners 73 comprise a head portion 75, a neck portion 77, a shoulder 79, and a threaded shank 81 which cooperates with a hexagonal nut 83 and a lock washer 85. The head portion 75 is substantially spherical in shape and includes a slot 87 which facilitates the assembly of the fastener of the flange 67.

The neck 77 extends inwardly from the head 75 and is of a length somewhat greater than the thickness of the plates 29 and flanges 31 of the end walls 21 and 23 so as to permit limited outward movement of the panels relative to the frame 11. The neck is somewhat narrower than the head so that it will slide freely into the elongated portion 36 of the keyhole slot 33 and maintain the fastener within the slot. The neck is somewhat narrower than the opening 36 to permit limited vertical movement of the panels relative to the frame 11. The shoulder 79 abuts the outer surface of the panel flange 67 and insures that the neck portion 77 will be of a given fixed length when the fastener is assembled. The threaded shank 81 is of standard form and sufficiently long to extend through the plate and accommodate the hexagonal nut 83 and the lock washer 85.

The fasteners 73 are caused to cooperate with the slots 33 by insertion of the head 75 of the fastener in the circular opening 34 of the slot and movement of the panel transversely to the left until the neck 77 abuts the end of the elongated opening 36. The panels are removed by sliding movement toward the right followed by outward movement away from the frame.

While the particular construction of the fastening means 17 is shown to have a slot 33 provided in the frame and a fastener 73 projecting from the panels, it should be clear that the slots 33 could be provided in the panels and the fasteners 73 attached to the frame. Also, it is not necessary that a keyhole slot and spherical headed arrangement be used, and it would be possible to use, for example, an L-shaped slot and a correspondingly shaped fastener which would cooperate with this slot. Various other fasteners of this general type are known in the art and need not be described in detail.

As previously mentioned, the lower forward panel 51 and the upper forward panel 53 define an area between them in which is disposed the central forward panel 59. The panel comprises generally a central plate 89 which, when in position between the upper and lower panels is inset somewhat to provide a more attractive appearance. An outwardly inclined flange 91 encircles the plate 89 and is connected along its outer perimeter to an edge wall 93 which is generally normal to the plate 89. That portion of the rearward edge of the edge wall 93 which is adjacent the forward flange 31 of the end walls 21 and 23 of the frame 11 is in generally abutting relation to the flange 31 when the central panel 73 is in position.

In order that the central panel 59 may be maintained in position adjacent the frame 11 and intermediate the upper and lower forward panels 53 and 51, a generally vertical retaining flange 95 extends upwardly from the rearward edge of the upper portion of the edge wall 93, and a similar flange 97 extends downwardly from the lower portion of the edge wall so as to extend behind, in each case, the upper panel 53 and the lower panel 51 respectively. The flanges 95 and 97 do not extend the full width of the central panel, but are disposed intermediate the end walls 21 and 23 and are inset forwardly slightly so that they will thereby urge the upper and lower panels away from the frame (FIG. 6), and thereby take up some, but not all, of the slack provided by the fastening means 17. The flanges, while relatively rigid, are yet sufficiently flexible to permit limited movement of the panels 51 and 53 rearwardly incident to stresses set up within the housing. This arrangement maintains the central panels in a relatively tight-fitting relation to the frame, and prevents rattling between the panels and the frame.

The housing is assembled by initially fastening in place the rear plate 13, and then securing the lower forward panel 51 by inserting the heads 75 of the fasteners 73 in the circular openings 34 and moving the panel transversely toward the left (FIG. 4). The forward central panel 59 is then positioned above the lower forward panel, with the retaining flange 97 thereby urging the upper edge of the lower forward panel 51 outwardly from the frame 11. The upper forward panel is then secured in place in a manner similar to that of the lower forward panel, the upper flange 95 of the center forward panel thereby urging the lower edge of the upper forward panel 53 outwardly from the frame 11.

The end panels 55 and 57 are then secured in place by inserting the heads in corresponding circular openings 34 and moving the panels also to the left (FIG. 8), the left edge of the end panels thereby overlapping the ends of the forward panels. Since the forward panels must be moved to the right (FIG. 4) to be removed, the right end panel 57 which is in overlapping relation to the right ends of the forward panels thus prevents their removal when it has been secured in place.

In order that the end panels will not be inadvertently

displaced from the frame **11**, a locking strip **99** is disposed in overlapping relation to the rearward edge of the end panels, and secured in place by a fastener **101**. The strip **99** is preferably formed of a generally rigid yet somewhat flexible material such as fibre board which will prevent extensive movement of the end panels **55** and **57** to the right incident to disengagement of the fastening means **17** and removal of the panels, and yet permit limited movement incident to stresses set up in the housing. When the housing is completely assembled therefore, disengagement of all of the panels is prevented.

As has been previously set forth, the fastening means **17** permit limited vertical movement of the forward panels **51** and **53**. In order to maintain some rigidity in the forward wall, and particularly between the upper and lower forward panels **53** and **51** and the central forward panel **59**, a biasing clip **103** is provided which urges the upper and lower panels from the central panel. The clip **103** is shown most clearly in FIGURE 9 and includes a lower plate **105**, a pair of engaging arms **107** which cooperate with the plate **105** in gripping a flange of the panels, and a central biasing finger **109**. The outer edges of the clip **103** are provided with a plurality of triangular teeth **111** which engage the surface of the panels to which the clip is fastened and prevent its inadvertent dislocation.

The clip **103** is disposed adjacent the retaining flange **95** of the central forward panel, and may be fastened either to the upper or lower panel or the central panel. Four such clips are provided so that each of the upper and lower edges of the central panel **59** will be in contact with two such clips. The biasing fingers **109** function to urge the panels away from one another.

As has been shown, flanges **95** and **97** are provided on the central forward panel **59** and besides retaining the central forward panel in place, serve to take up a portion of the slack provided in the fastening means **17**. To provide a similar effect for the end panels **55** and **57**, the means **19** is provided to bias the end panels away from the frame and comprise generally a spring-loaded member **113** which is held in place by a bracket **115** and urged through an opening **117** in the frame **11** and into engagement with a detent **119** in the flange **67** of the end panels by a biasing spring **121**. The bracket **115** is generally U-shaped and includes a flange **123** projecting outwardly from each of the end edges of its legs whereby it is secured to the inner surface of the plates **29** of the end walls **21** and **23**. The bracket **115** houses the spring **121**, which is maintained in place by an ear **125** projecting inwardly toward the spring.

The spring-loaded member **113** may be spherical in shape, but is shown as having an elliptical forward end disposed with its major axis generally normal to the plane of the opening **117** and a neck **114** which fits within the coils of the spring **121**. Such a construction provides a more effective engagement between the detent and the spring-loaded member. As can be seen in FIGURE 8, the means **19** is disposed so as to contact the panels **53** and **55** intermediate their upper and lower ends and thereby insures a generally uniform pressure urging the panel from the frame.

The manner in which the panels are secured to the housing thus provides a flexibility which enables the housing to withstand considerably more stress than is possible with a construction in which the panels are rigidly secured, due to the relatively loose fit of the fastening means which secures the panels in place. The biasing means provided, however, insure that the flexibility will not result in distracting vibrational noises which would detract from the advantages of this construction and also serves to absorb the stresses of the frame. The above described structure further permits convenient and rapid removal of the panels, such as for servicing purposes, or if it is desired to replace any of the panels.

While a particular embodiment of a space heater housing in accordance with the present invention has been described in some detail, it should be apparent that various modifications might be made in the construction without departing from the scope of the present invention.

Various of the features of the invention are set forth in the following claims.

What is claimed is:

1. A housing to enclose the heat exchanger of a space heater, which housing comprises a rigid frame, the edges of which define a space including that occupied by the heat exchanger, panel members disposed adjacent said frame, and means fastening said panel members to said frame while permitting limited relative movement therebetween in response to stresses set up in said housing, said fastening means being disengageable by sliding movement of said panel member relative to said frame, each of said fastening means comprising a slot and a fastener adapted to engage said slot, one of which slot and fastener is provided on said frame and the other of which is provided on said panel, and means biasing said panel members away from said frame.

2. A housing to enclose the heat exchanger of a space heater, which housing comprises a rigid frame, the edges of which define a space including that occupied by the heat exchanger, a pair of end panels secured to opposite ends of said frame by releasable fastening means and disengageable by sliding movement of said panel relative to said frame, an upper panel and a lower panel, each of which is secured to the forward portion of said frame by releasable fastening means, said upper and lower panels being spaced from one another so as to define an opening therebetween, a central forward panel adapted to occupy said opening, each of said releasable fastening means comprising a slot and a fastener adapted to engage said slot, one of which slot and fastener is provided on said frame and the other of which is provided on said panel, said fastener and said slot being proportioned to permit limited movement between said panels and said frame in response to stresses set up in said housing, and means for biasing said central panel from each of said upper and lower forward panels.

3. A housing to enclose the heat exchanger of a space heater, which housing comprises a rigid frame, the edges of which define a space including that occupied by the heat exchanger, a pair of end panels secured to opposite ends of said frame by releasable fastening means disengageable by sliding movement of said panel relative to said frame, an upper panel and a lower panel, each of which is secured to the forward portion of said frame by releasable fastening means, said upper and lower panels being spaced from one another so as to define an area therebetween, and a central forward panel disposed in said defined area in abutting relation to said frame and including a flange along each of its upper and lower edges engageable with the rearward surfaces of said upper and lower forward panels and adapted to urge said panels away from said frame, each of said releasable fastening means comprising a slot and a fastener adapted to engage said slot, one of which slot and fastener is provided on said frame and the other of which is provided on said panel, said fastener and slot being proportioned to permit limited movement between said panels and said frame in response to stresses set up in said housing, and means biasing said central panel from each of said upper and lower forward panels.

4. A housing to enclose the heat exchanger of a space heater, which housing comprises a rigid frame, the edges of which define a space including that occupied by the heat exchanger, an upper forward panel secured to a forward portion of said frame, a lower forward panel secured to a forward portion of said frame and spaced from said upper forward panel so as to define an area between said panels, said upper and lower forward panels being secured to said frame by reelasable fastening means disengageable by sliding movement of said panels relative

to said frame, a central forward panel disposed in said defined area between said upper and lower forward panels and in abutting relation to said frame, said central forward panel including a flange along each of its upper and lower edges engageable with the rearward surface of said upper and lower panels respectively and adapted to urge said panels away from said frame, means for biasing said central panel from each of said upper and lower forward panels, a pair of end panels secured to opposite ends of said frame by releasable fastening means and disposed on said frame in overlapping relation to the edges of said forward panels so as to prevent extensive sliding movement thereof, each of said releasable fastening means comprising a slot and a fastener adapted to engage said slot, one of which slot and fastener is provided on said frame, and the other of which is provided on said panel, said slot and fastener being proportioned so as to permit limited movement between said panels and said frame in response to stresses set up in said housing, fastening means for preventing extensive sliding movement of said end panels, and means biasing said end panels away from said frame.

5. A housing to enclose the heat exchanger of a space heater, which housing comprises a rigid frame, the edges of which define a space including that occupied by the heat exchanger, panel members disposed adjacent said frame, and means connecting said panel members se-

curely to said frame while permitting limited relative movement therebetween in response to stresses set up in said housing, said interconnecting means including means biasing said panels away from said frame.

6. A space heater comprising a heat exchanger, a rigid frame surrounding said heat exchanger and rigidly connected thereto, panel members positioned adjacent sides of said frame, means connecting said panel members to said frame while permitting limited movement relative thereto in response to stresses set up in said space heater, said means comprising slot and stud arrangement in which the length of the neck of the stud is greater than the thickness of the material defining the slot, and the neck is narrower in cross-section than the width of the slot, and means biasing said panels away from said frame.

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