

June 24, 1930.

C. A. BULKELEY

1,767,279

FAN HOUSING

Filed April 8, 1929

2 Sheets-Sheet 1

Fig. 2.

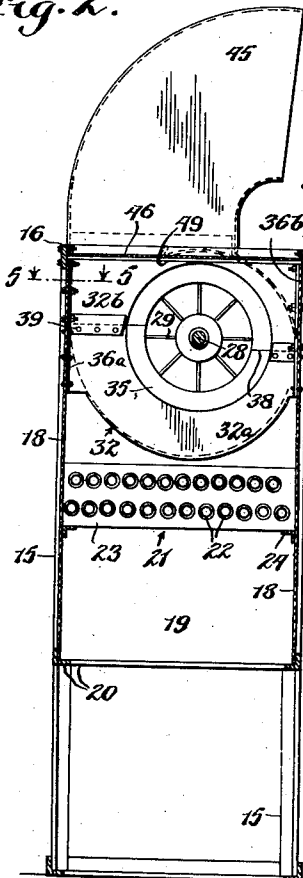


Fig. 1.

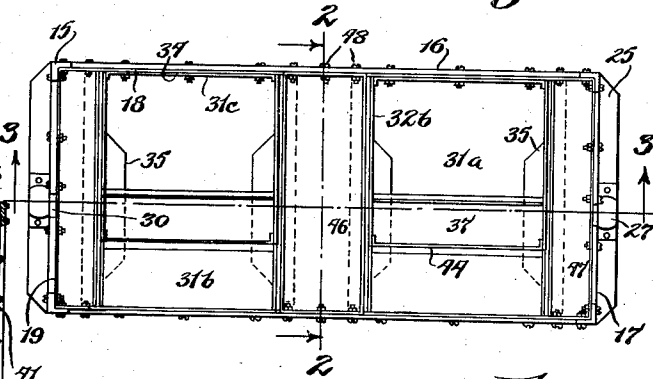


Fig. 3.

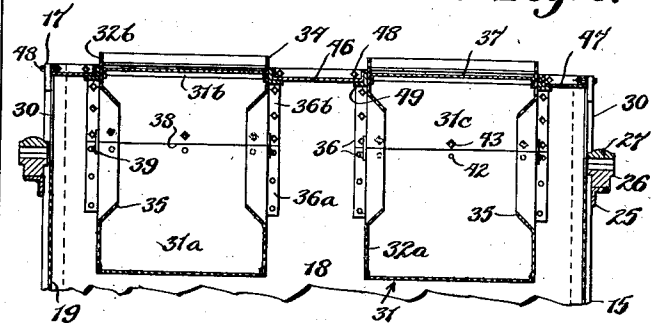


Fig. 6.

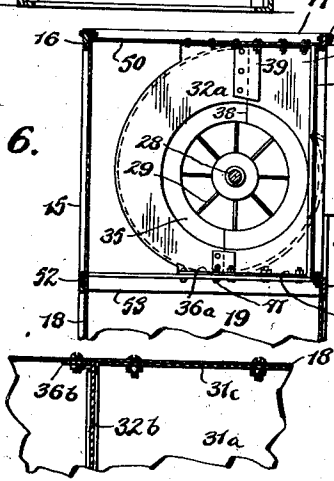


Fig. 4.

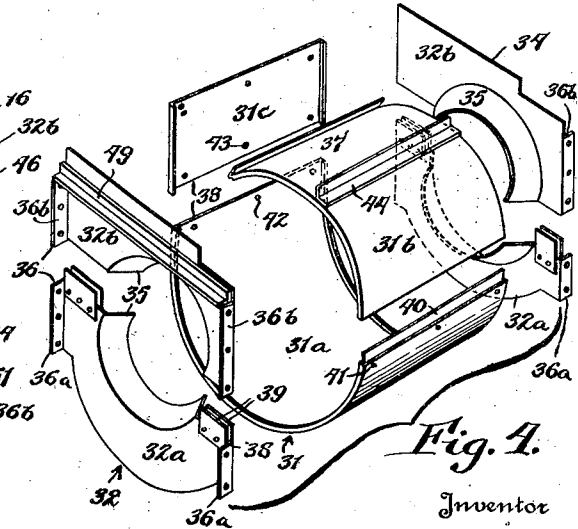
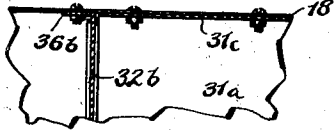


Fig. 5.



Inventor
Claude A. Bulkeley

By Poppe & Powers

Attorneys

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2 Sheets-Sheet 2

Fig. 8

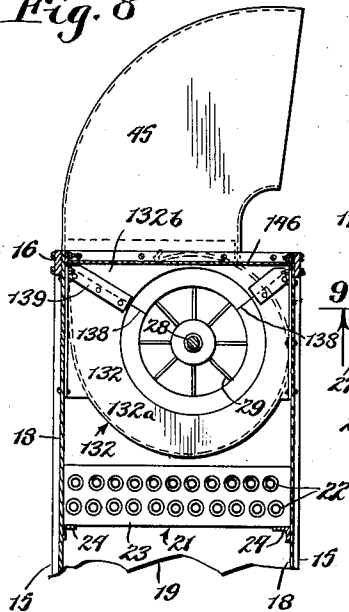


Fig. 7.

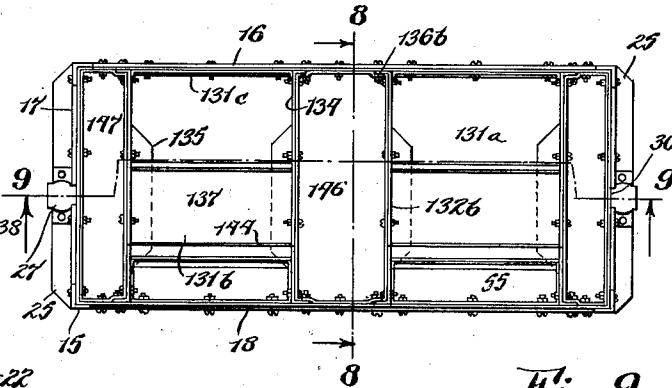


Fig. 9.

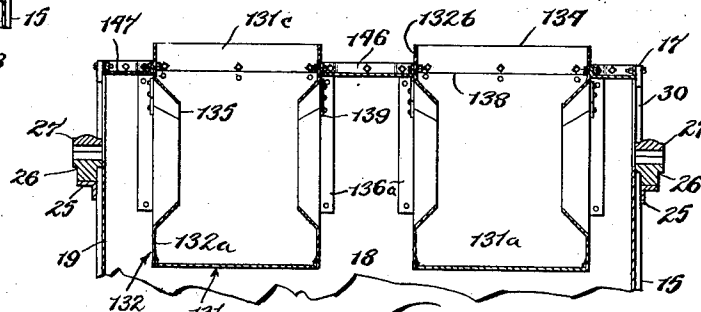


Fig. 10.

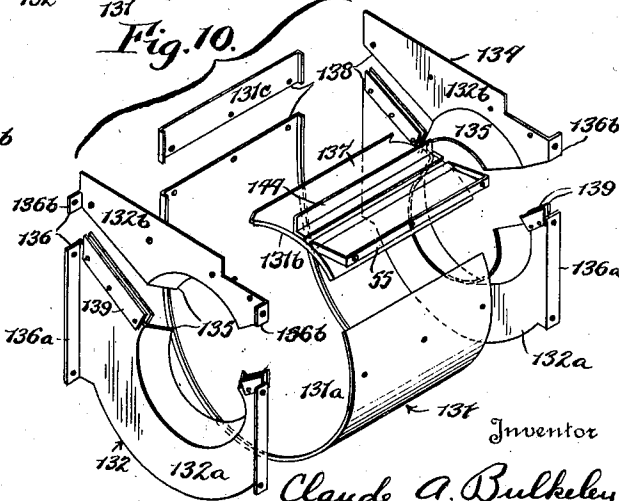
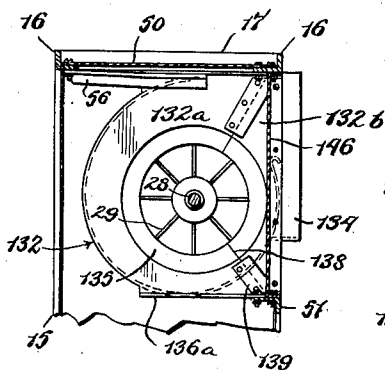


Fig. 11.



334

Inventor
Claude A. Bulkeley
Popp & Powers

Attorney

UNITED STATES PATENT OFFICE

CLAUDE A. BULKELEY, OF KENMORE, NEW YORK, ASSIGNOR TO NIAGARA BLOWER COMPANY, OF BUFFALO, NEW YORK, A CORPORATION OF NEW YORK

FAN HOUSING

Application filed April 8, 1929. Serial No. 353,530.

This invention relates to a fan housing construction and method of making the same and more particularly to such a fan housing which is adapted for use in a multi-fan unit in an air heater, air conditioner or the like.

The principal object of this invention is to provide such a fan housing construction which permits of assembling and removing the fan shaft and the fan wheels carried thereby as a unit and in which the shaft and fans are removed sidewise or laterally from the housings. By this means it is possible to balance the fan wheels and fan shaft and then insert the balanced fan assembly as a unit in the housings and remove the same when repairs are required.

A further object is to provide such a housing construction in which the fan housing members which are required to be removed to permit of the insertion of the fan assembly can be easily and quickly removed and replaced and when in place form a rigid and strong fan housing structure.

A further aim is to provide such a structure in which the joints between the removable members and the stationary members are adequately seated so as to eliminate the danger of air leaks through the fan housing which would impair the efficiency of the fan.

Another purpose is to provide such a fan housing in which the removable parts fit or are accurately matched to the stationary parts thereby facilitating both the removal and the replacement of the fan housing.

Another object is to reduce the number of bolts which secure the removable parts of the fan housing to a minimum and to so arrange these bolts that they are entirely accessible to the person assembling or taking apart the fan housing. These bolts are also so arranged that they materially stiffen the entire heater structure and provide a strong and rigid unit.

A further object is to provide such a fan housing construction which can be manufactured and assembled at low cost thereby permitting of marketing the same at a lower price.

In the accompanying drawings:—

Figure 1 is a top plan view of a two fan unit heater embodying my invention.

Figure 2 is a vertical transverse section thereof taken on line 2—2, Fig. 1, and showing the same equipped with an outlet elbow for directing the heated air horizontally.

Figure 3 is a fragmentary vertical longitudinal section thereof taken on line 3—3, Fig. 1.

Figure 4 is a perspective view of the different sections composing the fan housing, the same being separated to illustrate the structural details.

Figure 5 is a fragmentary horizontal section through the heater casing and a corner of the fan housing, the same being taken on line 5—5, Fig. 2.

Figure 6 is a fragmentary transverse section showing the manner in which the form of fan housing shown in Figs. 1—5 can be mounted so as to discharge horizontally from the side of the heater casing.

Figure 7 is a view similar to Fig. 1 showing a modified form of fan housing and filler pans.

Figure 8 is a vertical transverse section similar to Fig. 2 but showing the modified form of fan housing shown in Fig. 7, this section being taken on line 8—8, Fig. 7.

Figure 9 is a fragmentary vertical longitudinal section similar to Fig. 3, but showing the modified form of fan housing shown in Figs. 7 and 8, this section being taken on line 9—9, Fig. 7.

Figure 10 is a perspective view of the separated sections of the modified form of fan housing shown in Figs. 7—9.

Figure 11 is a fragmentary transverse section showing the manner in which the modified form of fan housing shown in Figs. 7—10 can be mounted so as to discharge horizontally from the side of the heater casing.

Similar reference numerals refer to like parts in each of the several views.

The fan housings are shown as mounted in a heater casing, although it will be understood that fan housings embodying the present invention can also be used in connection with air conditions or any other analogous devices. In the form shown the heater casing is open at its bottom and a removable heater is arranged in this casing. Air from the

room is drawn through the opening at the bottom of the heater casing and past the heating surface of the heater by a plurality of fan wheels which are mounted on a single fan shaft. Each fan is housed in a fan housing forming the subject of the present invention and operates to discharge the air by centrifugal force through the outlet of the fan housing and back to the room being heated. The fans are generally driven by an electric motor (not shown) which is suitably carried on the exterior of the heater casing.

In its general organization each form of the present invention is directed to a fan housing, one or more of which are adapted to be mounted in a heater casing, each of the fan housings being composed of two sections, the lower one of which is permanently secured to the heater casing and the other of which is removably secured thereto so that upon removing the removable section, the fan shaft and the fans carried thereby can be removed or inserted transversely as a unit. In constructing these fan housings, which are made of sheet metal, the fan housing is first constructed as a unit and is then cut into two sections by means of an oxyacetylene torch or in any other suitable manner and after the provision of means to seal the joint at this cut, the two sections are mounted as described in the heater casing. Provision is also made to insure the rigidity and strength of the fan housings and the housing is also designed so that all bolts or other fastenings which hold down the removable fan housing section are readily accessible. The invention also comprehends a simple arrangement of filler pans between the fan housing sections and the heater casing which insure against the leakage of air into the heater casing.

As shown, the heater casing includes vertical angle irons 15 at the corners of the casing, which are extended downwardly to form legs, longitudinal bars 16 between the upper ends of the vertical corner bars 15, and transverse bars 17 at the ends of the casing. To these bars are secured side panels 18 and end panels 19, these panels being supported at their lower edges by angle bars 20. The heating unit 21 may be of any suitable type, that shown comprising a series of finned hair-pin tubes 22 which are secured at their ends to a tube sheet 23 which also carries the headers (not shown). The heater unit is preferably removably supported by angle irons 24.

At each end of the heater casing bearing supporting angles 25 are provided to each of which a lower half bearing 26 is bolted. The upper half bearing 27 is preferably secured to the lower half bearing and in these bearings is journaled the fan shaft 28 to which the fan wheels 29 are secured. To permit of the removal and insertion of the fan shaft

and fans as a unit slots 30 are provided at either end of the heater casing which may be covered by any suitable removable closure.

The preferred form of fan housing, illustrated in Figs. 1-6, is preferably made of sheet metal, the permanent connections between the several sections thereof being welded or bolted together in any usual and well known manner. As there shown, the fan housing consists of a sectional scroll indicated generally at 31 and two sectional side plates 32, 32. The scroll 31 and side plates 32 are formed to provide a rectangular outlet 34 for the fan housing and the sectional side plates are formed to provide the usual inlet openings or cones 35.

In the construction of the fan housing, in accordance with the present invention, each of the sectional side plates is pressed from a single piece of sheet metal, the inlet cones 35 being formed by the same operation. At the same time each side plate is formed at its vertical edges with outwardly extending vertical flanges indicated generally at 36 and suitable bolt and rivet holes are also provided in these flanges. The scroll indicated generally at 31 is also made of a single piece of metal and is suitably flanged at its edges so as to permit of welding to the side plates 32. The scroll is then welded at its edges to the side plates in the usual manner, one end 31^a of the scroll forming one wall of the rectangular outlet 34, and the other end 37 curling around and forming an overhang which projects into the rectangular outlet.

The fan housing is then cut into two sections along the line 38 by means of an oxyacetylene torch or in any other suitable manner. This cutting line is preferably on two horizontal planes, one cutting line being above the axis of the inlets 35 and cutting through the scroll and the adjacent parts of the side plates 32 to the inlets 35 below the outlet 34 and the other cutting line being arranged below the axis of the inlets 35 and extending through the scroll 31 and adjacent parts of the side plates 32 to the inlets 35 on the opposite side of the fan housing. It will thus be apparent that by this means the entire fan housing is divided into two sections which part along a horizontal line substantially at the axis of the fan shaft and that the side plates are each divided into two sections 32^a and 32^b, the flanges 36 of each side plate into flanges 36^a and 36^b and the scroll into three sections 31^a, 31^b, and 31^c. It is also apparent that the two sections of the fan housing will necessarily fit exactly when the same are brought together.

In order to insure against the leakage of air, strips 39 are riveted or welded to the sides of the lower section 32^a of each side plate and project upwardly therefrom to form channels which receive the corresponding edges of the upper side plate sections 32^b. In a similar

manner, a strip 40 is secured to one edge of the lower scroll section 31^a by rivets 41 which also serve to permanently secure the lower fan housing section to the heater casing as hereinafter described. Rivet holes 42 are also provided at the opposite edge of the lower scroll section 31^a and holes 43 are provided in the scroll section 31^c for bolting the fan housing section to the heater casing. An angle 44 is also welded to the outside of the scroll section 31^b and completes the rectangular outlet 34 and permits of connecting this outlet to a conduit of the heating system or to an elbow 45 for deflecting the heated air horizontally as shown in Fig. 2.

In mounting the fan housing or housings in the heater casing, the lower fan housing section is permanently secured in place in the same while the upper section thereof is removably secured therein so that upon removing the upper fan housing sections the fan shaft and its fan wheels can be removed or inserted as a unit through the slots 30 in the ends of the heater casing. This is required since the fan wheels 29 are considerably larger than the outlets of the fan housings or the inlets thereof and hence the fan housing must be made sectional to permit of its removal. By the provision of means to insert the fan shafts and fan wheels as a unit the fans and fan shaft can be dynamically balanced in a balancing machine and can then be placed in the heater, such balancing not being conveniently possible after the fan wheels and fan shaft are placed in the heater casing and fan housings.

The lower fan housing section is secured to one panel 18 of the heater casing by rivets which pass through the holes 42 in the lower scroll section 31^a and by rivets which pass through the adjacent flanges 36^a on the lower side plate sections 32^a. The rivets passing through the holes 42 also serve to hold the lower scroll section 31^a tightly against the heater casing and thereby prevent air leakage between the interior of the heater casing and the interior of the fan housing at this place.

On the opposite side the lower section of the fan housing is secured to the other side panel 18 of the heater casing by rivets passing through the adjacent flanges 36^a and by the rivets 41 which also serve to secure the sealing strip 40 to the lower scroll section 31^a. These rivets 41 also draw the scroll section against the heater casing panel 18 so as to prevent air leakage.

The upper or removable fan housing section is removably secured by bolts or other suitable removable fastenings to the side panels 18 of the heater casing. These bolts all pass through the side panels 18 and on one side these bolts pass through the flanges 36^b of the upper side plate sections 32^b and also through the openings provided in the section 34^c of the scroll. On the opposite side of the fan housing, the upper fan housing section

is supported wholly by bolts passing through the flanges 36^b. On this side of the fan housing the sealing strip 40 is relied on to prevent leakages of air between the scroll sections 31^b and 31^a since bolts at this point would be inconvenient to get at. It is apparent that all the bolts are accessible either through the rectangular outlet 34 or from the exterior of the fan housing.

In order to fill the spaces between the fan housings, pans 46 are provided and between the fan housings and at the ends of the heater casing similar pans 47 are provided. Each of these pans is made of sheet metal with an up-turned rim at its margin and the rims of the several pans are secured to the heater casing by bolts 48 which pass through the rim of each pan and through the panels 18 and 19 and upper bars 16 and 17 of the heater casing. In order to prevent air leakage between fan housings and these filler pans, angles 49 are riveted to the upper side plate sections 32^b of the fan housings and the filler pans rest on these angles. It will be observed that there is no connection between the filler pans 46 and 47 and the fan housings, these pans merely resting on the angles 49. By this means the housings are completely assembled and mounted and the pans are then independently mounted which greatly facilitates the assembly of the heater unit.

In the modified arrangement shown in Fig. 6, the identical fan housing shown in Figs. 1-5 is employed, the same merely being mounted in the heater casing to discharge horizontally. For this purpose the heater casing is provided with a top horizontal panel 50 and a horizontal angle bar 51 and bar 52 are arranged along the sides of the heater casing and secured to the upright bars 15. These horizontal bars 51 and 52 carry a plurality of cross bars 53 which extend across the interior of the heater casing and are so spaced as to support the flanges 36^a and 36^b of the fan housing and be respectively riveted and bolted thereto. On the opposite side the stationary section of the fan housing is riveted, and the removable section thereof is bolted to the top panel 50 in the same manner as it is secured to the panel 18 of the heater casing in the preferred construction. In this modified construction the removable sections of the fan housings are removable from the side of the heater casing and hence the filler pans 46 and 47 are arranged at the side of the heater casing. These filler pans are mounted in the same manner as in the preferred construction except that they are bolted to the bar 51, top panel 50 and upright bars 15 instead of to the upper rim of the heater casing as in the preferred construction.

In the modified form of fan housing shown in Figs. 7-11, the fan housing is initially constructed substantially as in the preferred construction, i. e. the scroll 131 is formed in a

single piece and is welded at its edges to the side plates 132 each of which is formed of a single piece of metal. The side plates of the housing, however, instead of being cut in a horizontal plane or planes are each cut along radial lines which incline upwardly and outwardly, the scroll being cut horizontally as indicated in Fig. 10. This manner of cutting divides the fan housing into the same number of sections as in the preferred construction, but the removable section of the fan housing instead of being a half section is of segmental or wedge form. To seal the joint between the two sections 132^a and 132^b of the side plates, strips 129 are secured to the stationary section as in the preferred construction which form channels for the reception of the edges of the removable section. An angle bar 144 is also provided for completing the rectangular outlet 134, the other sides of which are formed by the sections 132^b and 131^c of the housing.

This form of fan housing is mounted in the heater section in the same manner as the preferred construction i. e., the side flanges 136^a are riveted to the opposite side panels 18 of the heater casing and the lower scroll section 131^a is riveted to these panels 18 at the points at which it contacts therewith. The removable fan housing section is then fitted over the stationary fan housing section and is bolted to the side panels 18 of the heater casing by the flanges 136^b and by bolts passing through the panels 18 and the section 131^c of the scroll.

In order to prevent leakage of air between the sections 131^a and 131^b of the scroll and the atmosphere, a horizontal pan 55 is welded to the outside of the scroll section 131^b and is provided with a rim which is adapted to be bolted to the adjacent panel 18 of the heater casing and thereby seal the space between this panel 18, the lower scroll section 131^a and the scroll section 131^b. In this construction, the angle bars 49 in the preferred construction are eliminated and the pans 146 and 147 are directly bolted to the sides of the fan housings and also to the heater casing as in the preferred construction. In bolting the filler pans in place the same bolts may be used to secure both the removable fan housing section and the corners of the pans, these bolts, as indicated in Fig. 9, passing through the corners of the filler pans, the flanges 136^b of the removable fan housing section, and the bars 16 and panels 18 of the heater casing.

In Fig. 11, the modified form of fan housing shown in Figs. 8-10 is shown as mounted to discharge the heated air horizontally from the side of the heating unit. In this construction the fan housing is made identical with the housing shown in Figs. 8-10 and to the stationary section of the fan housing an angle bar 56 is welded. The heater casing is made similar to the form shown in Fig. 6 with

a top panel 50, and an opening at the side the lower edge of which opening is bounded by an angle bar 51. At the top the stationary section of the fan housing is riveted to the bar 16 and the top panel 50 at the front side of the heater casing and the outer end of each of the angle bars 56 is riveted or otherwise secured to the other bar 16. At its bottom, the stationary section is secured to the bar 51.

The removable fan housing section is bolted at opposite sides to the bars 16 and 51 so as to be conveniently removable. In this form the filler pans 146 and 147 are bolted to the sides of the fan housings and to the heater casing as in the mounting shown in Figs. 7-9.

As a whole all of the forms of the present invention provide a strong and durable fan housing which permits of the convenient removal and insertion of the fan wheels and shaft as a unit. The housing is also sealed against leakage and materially strengthens the heater casing. It can also be constructed and assembled inexpensively and marketed at a low cost.

I claim as my invention:

1. In an apparatus of the character described, an open ended sheet metal casing, a sheet metal fan housing arranged in said casing, said fan housing being composed of two sections removable through the open end of said casing, each of said sections being independently attached to and exclusively supported by said casing in cooperative relation to one another.

2. In an apparatus of the character described, an open ended sheet metal casing, a sheet metal fan housing arranged in said casing, said fan housing being composed of two segmental sections, said sections being removable through the open end of said casing and fastenings extending through each of said fan housing sections and opposite walls of said casing and independently and exclusively supporting said housing sections from said casing, in cooperative relation to one another.

3. In an apparatus of the character described, a casing, a sheet metal fan housing arranged in said casing, said fan housing being composed of two segments and each of said segments being provided with flanges at opposite sides, said flanges being adapted to be secured to opposite walls of said casing, means for permanently securing the flanges of one of said segments to said casing and removable fastenings extending through the other segment and said casing and removably supporting said last named segment in cooperative relation to said permanently secured segment.

4. In an apparatus of the character described, an open ended sheet metal casing, a sheet metal fan housing arranged in said casing, said fan housing being composed of two sections, said sections being removable

through the open end of said casing, means for permanently attaching one of said sections to opposite walls of said casing remote from the open end thereof, means for removably attaching the other section to said opposite walls of said casing in cooperative relation to said first section and between said first section and the open end of said casing, and filler pans removably secured to said casing and filling the spaces between said fan housing and said casing, said filler pan resting on shoulders provided on the removable section of said fan housing.

5. In an apparatus of the character described, an open ended sheet metal casing, a plurality of sheet metal fan housings arranged in said casing, said fan housings being each composed of two sections, said sections being removable through the open end of said casing, means for permanently attaching one section of each fan housing to opposite walls of said casing remote from the open end thereof, means for removably attaching the other section of each fan housing to said opposite walls of said casing in cooperative relation to said first section and between said first section and the open end of said casing, an angle bar secured to opposite sides of each of said removable fan housing sections, filler pans arranged in the spaces between said fan housings and between said fan housings and said casing, said filler pans each resting on said angle bars and bolts extending through the rim of each of said filler pans and the adjacent part of said casing.

In testimony whereof I hereby affix my signature.

CLAUDE A. BULKELEY.