

[54] WINDOW AIR CONDITIONER ASSEMBLY

[75] Inventor: J. D. Livesay, Tipp City, Ohio

[73] Assignee: General Motors Corporation,
Detroit, Mich.

[22] Filed: Sept. 15, 1972

[21] Appl. No.: 289,660

[52] U.S. Cl. 62/262, 62/289, 62/298

[51] Int. Cl. F25d 23/12

[58] Field of Search 62/262, 289

[56] References Cited

UNITED STATES PATENTS

2,951,760	6/1956	Williams	62/289
2,939,297	6/1960	Karger	62/262
3,007,323	11/1961	Millington et al.	62/244
3,289,433	12/1966	Abbott	62/262

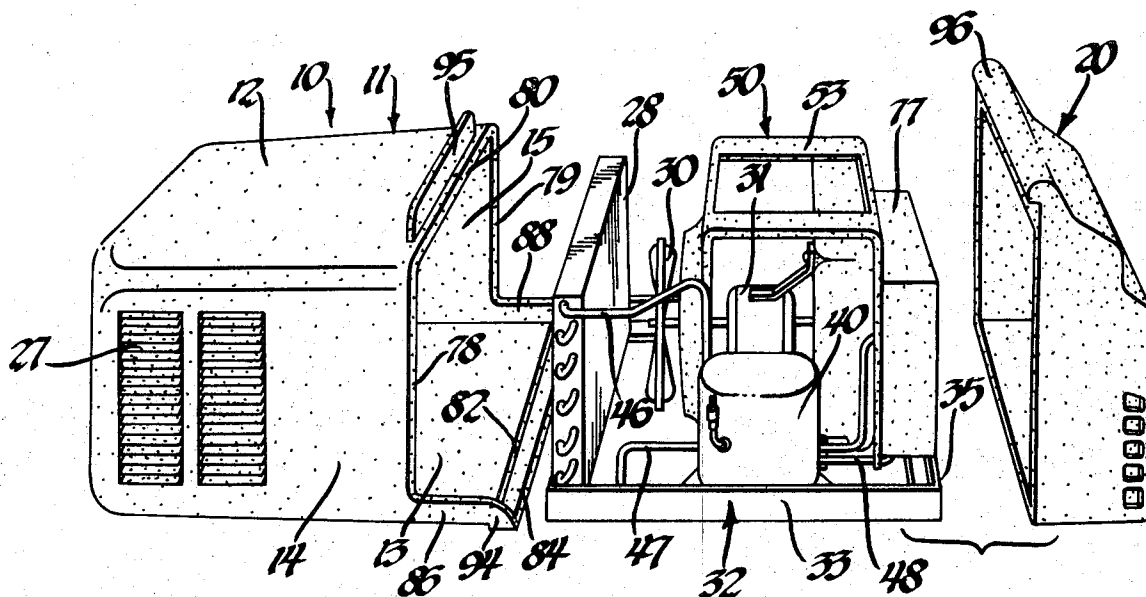
Primary Examiner—William J. Wye
Attorney—William S. Pettigrew et al.

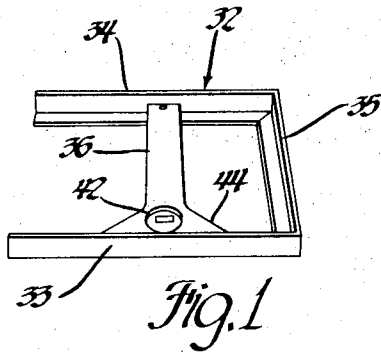
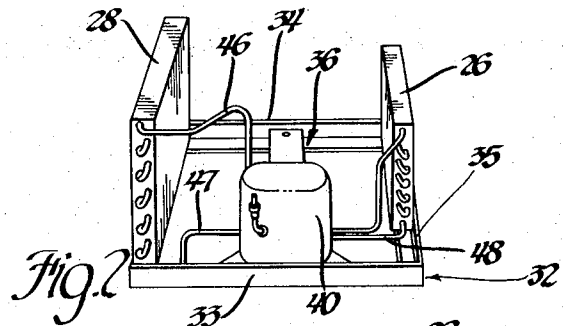
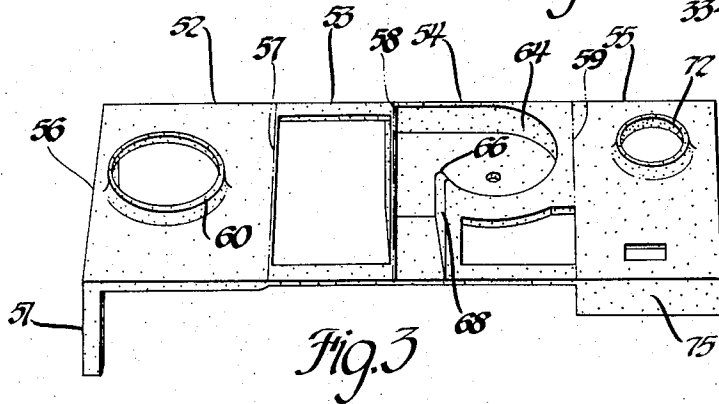
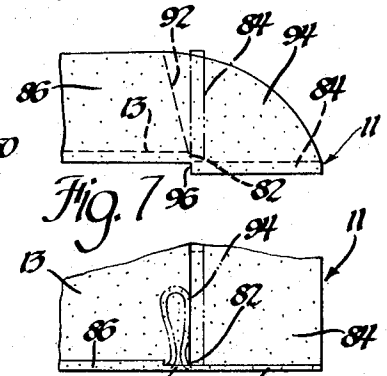
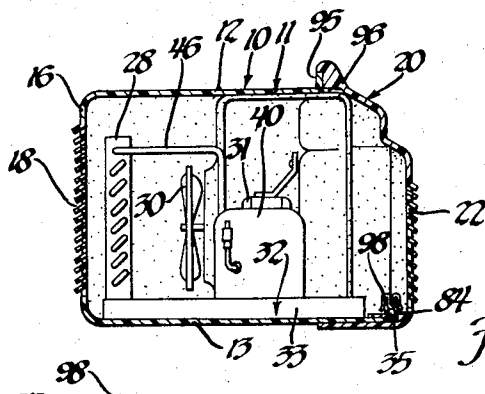
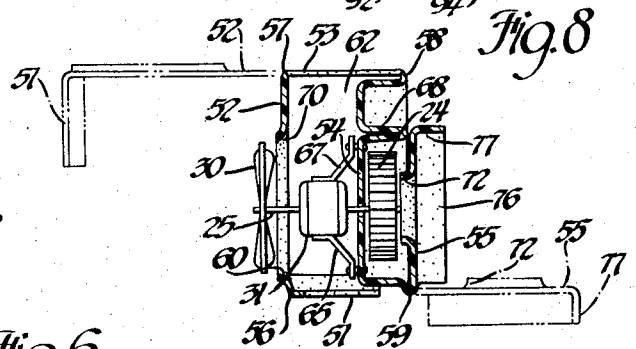
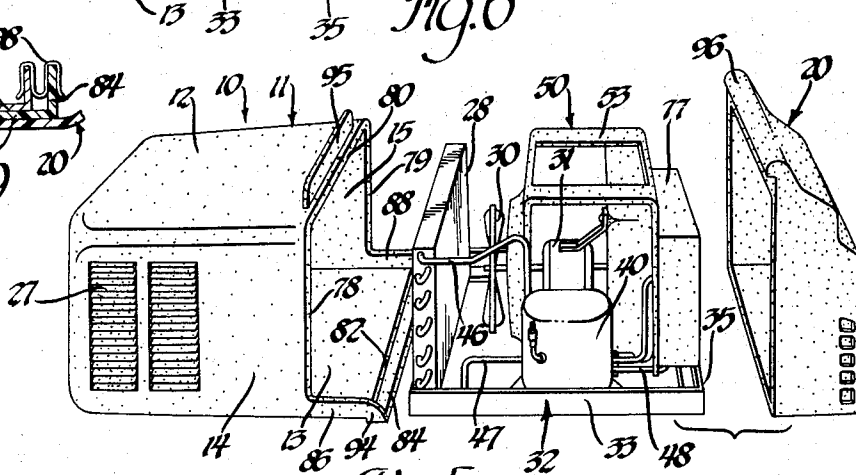
[57]

ABSTRACT

A window air conditioning unit having a structural frame member supporting refrigeration and air handling sub-assemblies which may be slidably placed in the open front end of a box-shaped molded outer casing by folding down an integral end flap, hingedly connected to the protruding transverse edge of the casing bottom wall. The flap has corner gussets in the form of flexible webs integral with bottom wall side flanges such that upon the upward folding movement of the front flap the webs bulge inwardly to form a fluid-tight condensate sump in the bottom portion of the casing. The air handling system is enclosed in a housing formed from a molded one-piece blank having integrally hinged panels.

5 Claims, 9 Drawing Figures





WINDOW AIR CONDITIONER ASSEMBLY

This invention relates to room air conditioners and more particularly to means for constructing room air conditioning units so as to facilitate their manufacture and subsequent maintenance.

It has become increasingly important that the design of air conditioning units lend itself to the ease in manufacturing and assembly line production together with the use of relatively low cost materials. The prior art is replete with the disclosure of air conditioner construction methods involving structural members designed to support all of the components of their refrigeration and air circulating systems on a common support frame for placement in a non-structural appearance outer casing. Examples of such air conditioning units are U.S. Pat. No. 3,289,433 issued Dec. 6, 1966 to Abbott, U.S. Pat. No. 3,022,647 issued Feb. 27, 1962 to Mullin and U.S. Pat. No. 2,751,760 issued June 26, 1956 to Williams, Jr.

It is the object of the present invention to provide an air conditioning unit including a structural member designed to support all the components of the refrigeration and air circulating systems and a non-structural appearance casing which consists of a hollow box-like one-piece housing and a closure member which is telescoped over the front of the housing such that an offset end flap integrally hinged to the bottom wall extension of the housing allows refrigeration and air circulating systems supported on a common structural frame to be slidably received in the housing after which the end flap is hinged-up such that integral corner gussets in the form of flexible webs are looped inwardly along a beveled edge to provide a liquid-tight condensate base pan.

A further object of the invention is to provide a unitary air handling sub-assembly for a room air conditioner molded in the form of an integral blank having a plurality of panels whose lines of juncture therebetween comprise flexible hinges such that the blank can be folded to enclose an evaporator blower wheel scroll housing and condenser fan shroud wall for support on a common frame with a refrigeration sub-assembly for insertion in a non-structural molded outer casing.

These and other objects are attained in the form of the invention illustrated in the drawings in which a room air conditioner has an air handling housing integrally molded in blank form comprising a plurality of generally rectangular panels separated by flexible hinge lines such that certain of the panels may be folded at right angles to form the condenser fan shroud wall, a horizontal connecting panel member and a vertical partition panel member including a scroll housing for the evaporator blower wheel while an end panel is folded substantially 180° providing a closure side wall for the scroll housing including the air inlet orifice for the blower wheel. A box-shaped molded outer cover has an extended flanged bottom wall including an integral front end flap flexibly hinged thereto such that the end flap is hinged-up after permitting a unitary air handling and refrigeration sub-assembly to be received in place in the front opening of the casing. The end flap has integral flexible webs joined to the respective side flanges which when folded inwardly prevent liquid leakage at the corner junctures to form a condensate sump in the lower portion of the outer cover. An integrally molded louvered front closure completes the unit by being telescoped over the front opening of the casing and secured in a releasably retained manner thereto.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the Drawings:

FIG. 1 is a perspective view of the metal base support assembly of the unit;

FIG. 2 is a perspective view of the refrigeration sub-assembly;

FIG. 3 is a perspective view illustrating the integral blank for the air circulating system with the panels joined by transverse flexible hinges;

FIG. 4 is a side elevational view of the air handling sub-assembly with the endmost panels shown in their pre-folded blank position in phantom lines and their folded position enclosing the air handling system;

FIG. 5 is an exploded perspective view of the outer casing and front closure positioned to receive the combined refrigeration and air handling sub-assemblies;

FIG. 6 is a vertical sectional view of the assembled casing and front closure with the refrigeration and air circulating systems shown in side elevation;

FIG. 7 is a partial vertical sectional view, shown in enlarged dimension, of the end flap of FIGS. 5 and 6;

FIG. 8 is a partial horizontal elevational view, shown in enlarged dimension, of the end flap of FIG. 7;

FIG. 9 is an enlarged fragmentary view, partly in section, of the end flap clip of FIG. 6.

Referring now to the drawings and particularly to FIGS. 5 and 6, there is shown one embodiment of the present invention in the form of a self-contained air conditioning unit generally indicated by the numeral 10 adapted to be mounted in a window opening and comprising an integrally molded casing 11 having respective top and bottom walls 12 and 13, left and right side walls 14 and 15, and an outdoor rear wall 16 provided with louvered air passages 18. The indoor or front open end of the weather casing 11 is closed by a front closure 20 having a decorative louvered grill or air passages 22 to provide openings for the circulation of room air by means of a blower wheel 24 over the evaporator 26 (FIG. 2). The left hand wall 14 is provided with side louvers 27 through which the outside air drawn through the condenser 28 by propeller fan 30 is discharged to the outdoors. The fan 30 and blower wheel 24 are mounted on a common shaft 25 of motor 31.

The structural U-shaped frame member 32 includes longitudinal angle members 33 and 34 and a single transverse base angle member 35 providing a U-shaped open frame together with a T-shaped transverse cross member 36 positioned to lie substantially above the outer edge of a window sill. The U-shaped frame member 32 and T-shaped cross member 36 provide the structural support for the components of a refrigeration system which include a compressor 40 mounted in a depression 42 in the cross-head 44 of the T-shaped member 36. The evaporator 26 is mounted on the base angle 35 while the condenser 28 spans the open end of the U-shaped frame 32 for location adjacent the outdoor rear wall 16 of the outer casing. The compressor 40, condenser 28, suitable flow restricting means, and evaporator 26 are connected in closed, series-flow relationship by tubing members 46, 47 and 48 whereby refrigerant vapor is withdrawn by the compressor from the evaporator 26 and compressed refrigerant discharged into the condenser 28.

The casing 11 and closure 20 form a non-structural enclosure for the components of the refrigeration system and air circulating system which are composed or molded plastic material which can be suitably formed into the disclosed configuration and provide a decorative appearance to the unit.

The air circulating housing is disclosed in FIG. 3 as a single blank or sheet 50 to successively provide a first condenser shroud wall panel 52 including a downwardly extending bottom member 51, a second top panel 53, a third blower wheel scroll housing panel 54 and a fourth scroll housing front cover panel 55. The integrally molded blank is formed of suitable plastic material which is molded by any desired molding method to the finished shape. In the preferred embodiment each of the panel sections have a generally rectangular form with first 57, second 58 and third 59 transverse fold lines between panels 52, 53, 54 and 55, respectively, which are relatively thin in section as compared to the remainder of the molded blank so as to function as the pivotal axis forming the fold lines or flexible hinges about which the four panels can be moved.

The panel 52 has a bell-shaped orifice 60 formed for the reception of the condenser fan 30 therein such that when panel 52, including member 51 molded in substantially normal relation thereto at corner juncture 56, is folded about fold line 57, member 51 is oriented in parallel relation to top panel 53 to underlie outer condenser air chamber 62. The panel 54 has on one side thereof a blower scroll housing depression 64 molded therein, including an upper outlet opening 66 in the lower deck 68 of a room air discharge duct, such that when panel 54 is folded downwardly about fold line 58 it is positioned generally parallel to panel 52 in its assembled condition. After the motor 31 is suitably secured to the panel 54 by means of angle bracket 65 and 67 the blower wheel 24 is mounted on shaft 25 so as to be asymmetrically arranged with the scroll housing 64.

Thus the condenser section is formed by successively folding each of the first, second and third panels about fold lines 57 and 58 in a common first direction through an angle of about 90° after which the panel 55 is reverse folded in a second direction about fold line 59 through an angle of about 180° to a position in superposed relationship against panel 54 completing the scroll housing 64 with its bell-shaped orifice 72 concentric with blower wheel 24. Depending side walls 75 and 76 integrally molded along the side edges of the panel 55 function together with top wall 77 to confine the air flow from the room being conditioned.

As shown in the exploded view of FIG. 5, the one-piece casing 11 forms a non-structural housing for slidably receiving the assembled refrigeration and air circulating sub-assemblies, supported on frame 32, through its open front portion. Both casing side walls 14 and 15 and its top wall 12 have their respective forward edges 78, 79 and 80 in a common vertical plane set back a defined distance from the forward edge 82 of the bottom wall 13 which extends outwardly therefrom.

As seen in FIG. 7 the bottom wall forward edge 82 has an integral downwardly offset rectangular end flap 84 pivotally secured by a flexible hinge to the lower corner portion of edge 82. The bottom wall extension has upstanding side flanges 86 and 88 coextensive respectively with the casing side walls 14 and 15 which

terminate in integrally molded corner gussets or webs 94 of reduced thickness hingedly connected to the rear mitered edges of the side flanges 86, 88 and to the side longitudinal edges of the end flap 84 shown at 92 in FIG. 7 for the left hand flange 86.

The corner webs 94 are generally triangular in shape and extend through an included angle of about 115° from respective rearwardly sloped side flange indented edges 92 to their respective longitudinal side edges of the end flap 84 maintaining the end flap in a horizontal folded-down position to provide sufficient vertical clearance for receiving the assembled sub-assemblies within the box-like casing 11. As can be viewed in FIG. 8 each flexible web 94 is a relatively thin membrane and formed so that in response to the upwardly hinged movement of end flap 84 it is foldable along diagonal lines of weakness such that it will bulge inwardly to its phantom-line looped position (FIG. 8) thereby allowing the end flap 84 to attain a substantially vertical or erect position. As seen in FIG. 7 by virtue of the downwardly offset feature of the end flap 84 its rearwardly facing edge 96 is substantially co-planar with the bottom surface of casing wall 13 when the end flap is in its erected position. In this way the inwardly deformable webs 94 establish fluid-tight corner junctures to provide a base pan or sump in the bottom of the casing 11 for retaining condensate received from the refrigeration system until disposed of by suitable means well known in the art.

It will be appreciated from FIG. 6 that by applicant's unique arrangement the open front wall of the hollow casing 11 can be molded with an inner vertical dimension just sufficient to clear the upper panel 53 of housing blank 50 with the flap 84 in its horizontal hinged-down position. By virtue of indented edge 92 being sloped upwardly and rearwardly the flexible triangular webs 94 are displaced rearwardly in superposed relationship lying against the end flap 84 allowing the end flap to assume a substantially vertical position. Suitable retaining means, which in the disclosed form consist of double U-shaped clips 98, are provided to engage both the base angle 35 and the flap 84 to hold the flap 84 in its erected position suitably spaced from the cross angle to accommodate the inwardly bulged gussets 94 therebetween.

The front closure 20 is adapted to telescope over the open front wall such that transverse ridge flange 95 will abuttingly engage raised projection 96 of the front closure 20 while an undercut portion flexes slightly to snap over the ridge flange 95 and fixedly position the one-piece casing 11 and the front closure 20 in interlocked fashion.

While the embodiment of the present invention constitutes a preferred form, it is to be understood that other forms might be adopted.

I claim:

1. In an air conditioning unit the combination of support frame means for supporting a refrigeration system subassembly therein, including a compressor having a condenser and an evaporator, an air handling system sub-assembly supported on said support frame means intermediate said condenser and said evaporator, said air handling sub-assembly including an integrally molded blank member in the form of a plurality of panels flexibly interconnected along their common transverse edges by integral hinges; impeller motor means mounted on said air handling sub-assembly and having

a common drive shaft for driving a condenser propeller fan and an evaporator blower wheel, said blank member operative for forming a condenser air handling section and an evaporator blower wheel scroll housing by folding said plurality of panels about their respective transverse fold lines, a two piece molded outer cover for enclosing said refrigeration and air handling sub-assemblies including a box-like casing and a louvered room side closure member, said box-like casing including top, bottom, side and rear walls and an open front; said casing bottom wall extending outwardly from said open front such that its free edge is formed with an integral transverse end flap, said bottom wall including upstanding side flanges coextensive with said casing side walls each of which terminate in an integral web joining the free edge of its respective side flange and to one side edge of said end flap, said end flap in its downwardly hinged position allowing sufficient vertical clearance for insertion of said combined refrigeration and air handling sub-assemblies, and said webs being of reduced thickness so as to be inwardly foldable in response to the upward hinged movement of said end flap whereby a liquid tight condensate sump is formed in the bottom portion of said casing bottom wall, and means for retaining said end flap in a vertical position whereby said room side closure member may be telescopically received on the open front end of said box-like casing.

2. In an air conditioning unit the combination of a horizontal U-shaped support frame having parallel longitudinal angle members positioned at either end of a transverse base angle member, an intermediate T-shaped transverse cross member bridging said longitudinal angle members, a refrigeration system sub-assembly supported on said U-shaped frame including a compressor having a condenser and an evaporator, said condenser extending transversely between the free end of said longitudinal angle members, said evaporator supported on said frame base angle member, said compressor supported on the head end portion of said T-shaped cross member, an air handling system sub-assembly supported on said support frame intermediate said condenser and said evaporator, said air handling sub-assembly including an integrally molded blank member comprising a first condenser shroud wall panel, a second top panel, a third blower wheel scroll housing panel, and a fourth scroll housing front cover panel having a blower wheel inlet orifice therein; said panels being serially arranged in the order named so as to be flexibly interconnected along their common transverse edges by first, second and third integral hinge fold lines; said second condenser shroud wall panel having a condenser propeller fan orifice there-through, motor means including a common drive shaft for driving a condenser propeller fan and an evaporator blower wheel at opposite ends thereof, said blank member formed into a condenser air handling section by

folding each of said first, second and third panels through angles of substantially ninety degrees about their respective first and second fold lines, said blank member operative for forming said blower wheel scroll housing by folding said fourth scroll housing front cover panel through an angle of substantially 180°, a two piece molded outer cover for enclosing said refrigeration and air handling sub-assemblies including a box-like casing and a louvered room side closure member, said box-like casing including top, bottom, side and rear walls and an open front; said casing bottom wall extending outwardly from said open front such that its free edge is formed with an integral transverse end flap, said bottom wall including upstanding side flanges coextensive with said casing side walls each of which terminate in an integral web joining the free edge of its respective side flange and to one side edge of said end flap, said end flap in its downwardly hinged position allowing sufficient vertical clearance for insertion of said combined refrigeration and air handling sub-assemblies, said webs being of reduced thickness so as to be inwardly foldable in response to the upward hinged movement of said end flap whereby a liquid tight condensate sump is formed in the bottom portion of said casing, and clip means engaging said U-shaped frame for retaining said end flap in a vertical erect position whereby said room side closure member may be telescopically received on the open front end of said box-like casing.

3. The air conditioning unit as claimed in claim 1 wherein said retaining means are in the form of double U-shaped clips engaging both said end flap and said support frame so as to retain said end flap in its hinged-up position a defined distance from said frame whereby said inwardly folded webs are received in the space therebetween.

4. The air conditioning unit as claimed in claim 1 wherein each said integral web being generally triangular in shape in its unfolded condition such that the included angle between the downwardly folded end flap and its respective side flange edge is of the order of 115 degrees.

5. The air conditioning unit as claimed in claim 1 wherein said plurality of panels comprising a first condenser shroud wall panel, a second top panel, a third blower wheel scroll housing panel and a fourth scroll housing front cover panel, said blank member being formed into said condenser air handling section by folding each of said first, second and third panels in a common first direction through an angle of substantially ninety degrees about their respective transverse integral hinges, and said fourth scroll housing front cover panel completing said blower wheel scroll housing by being reverse folded in a second direction through an angle of substantially 180 degrees to a position in superposed relationship against said third panel.

* * * * *