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Pugh et al.

[11] **3,724,233**

[45] **Apr. 3, 1973**

[54] **MOLDED PLASTIC BASE PAN FOR ROOM AIR CONDITIONER**

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

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[21] Appl. No.: **227,487**

[52] **U.S. Cl.** **62/285**, 62/262, 62/280, 62/288

[51] **Int. Cl.**.....**F25d 21/14**

[58] **Field of Search**.....62/262, 280, 285, 288

[56] **References Cited**

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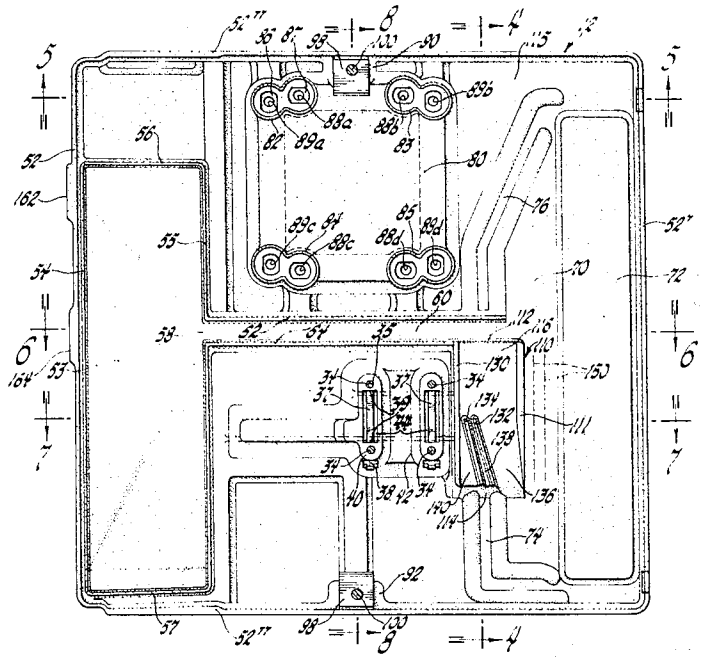
Primary Examiner—William J. Wye

Attorney—William S. Pettegrew et al.

[57] **ABSTRACT**

A molded one-piece plastic base pan for an air conditioner having a raised segmental trough configured to accommodate a notched opening in the air outlet ring portion of a condenser fan shroud. The trough segment has a concave upper surface closing the air outlet ring and is located partially in the depressed sump region of the base pan and includes a plurality of arcuate skewed flow channels for distributing condensate drain water to the condenser fan air stream and a diverting ramp which merges in a substantially tangential juncture with the trough segment upper surface for recirculating condensate to the sump area.

7 Claims, 11 Drawing Figures



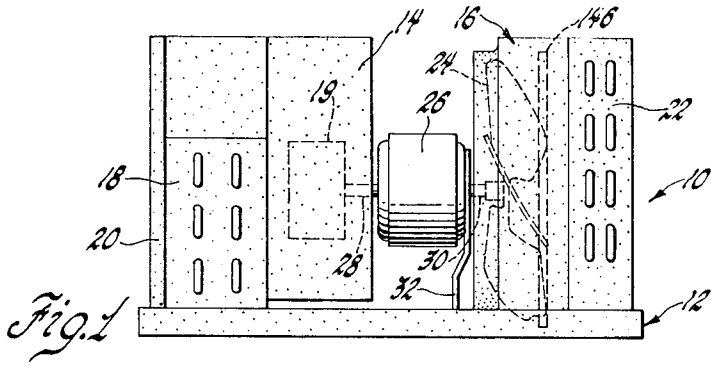


Fig. 1

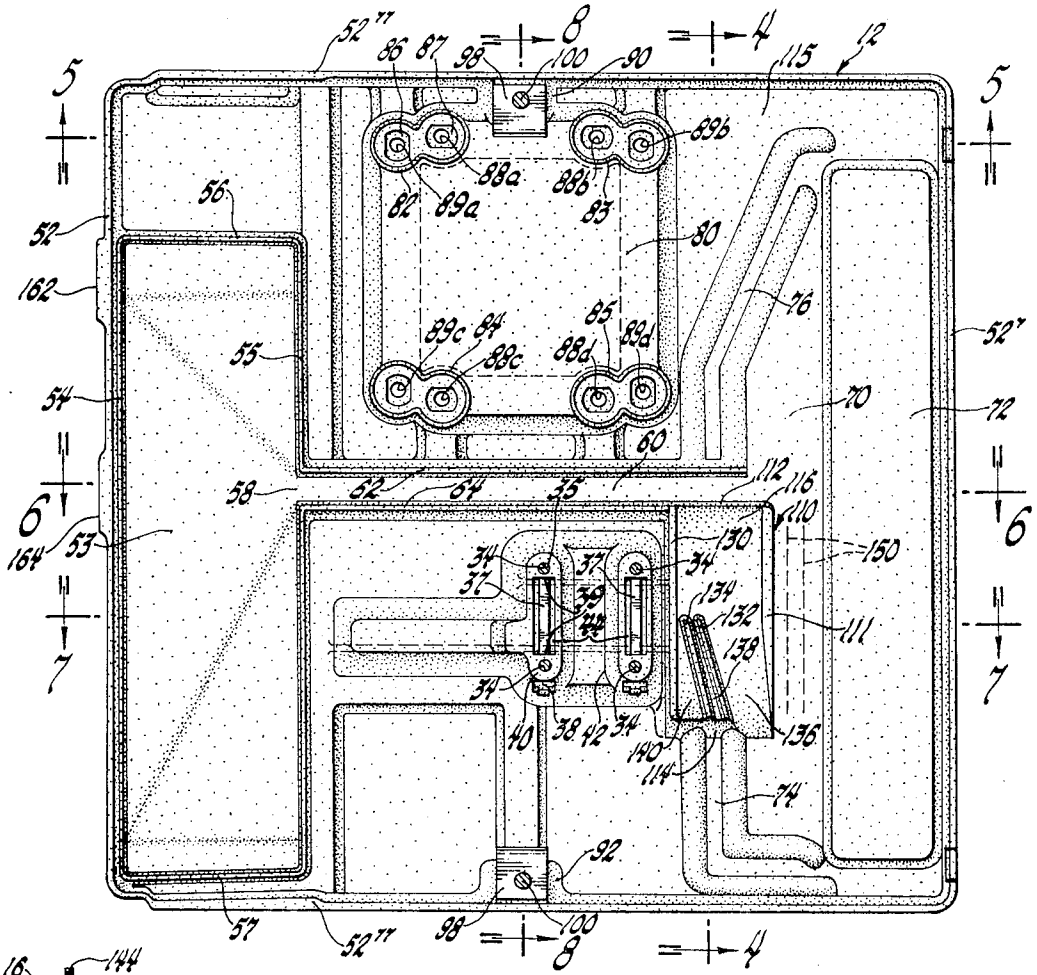


Fig. 2

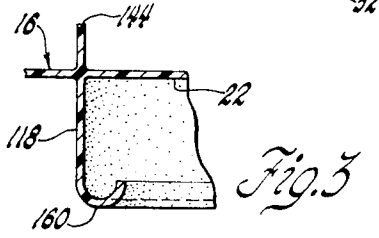


Fig. 3

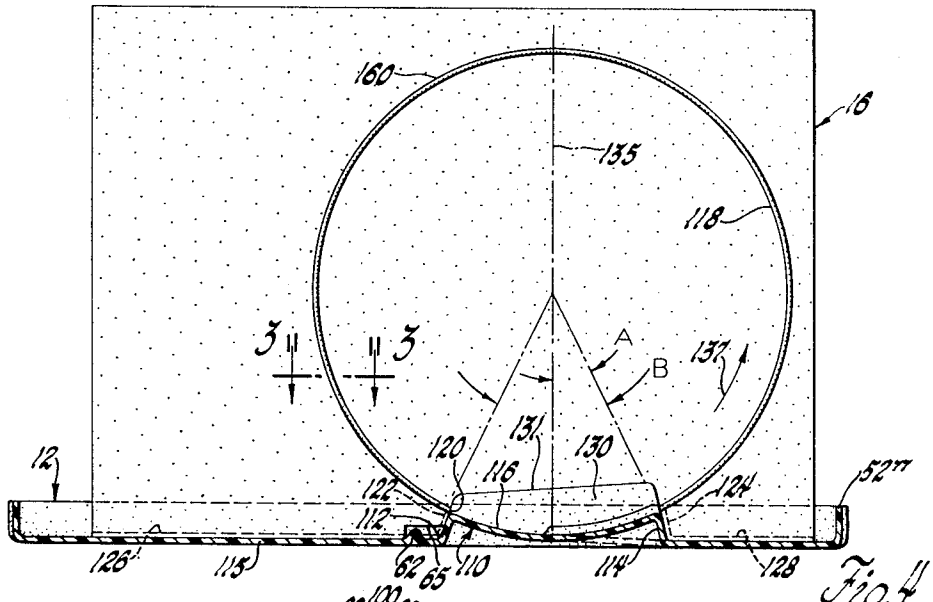


Fig. 4

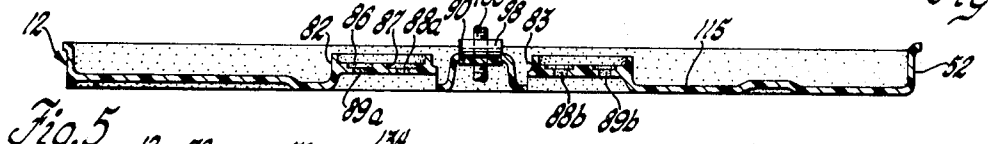


Fig. 5

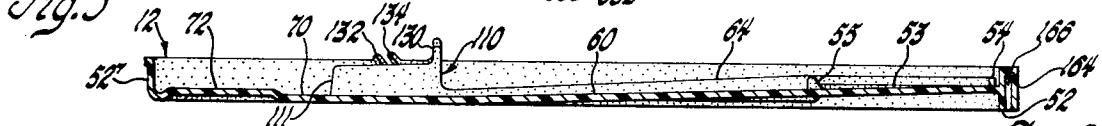


Fig. 6

Fig. 7

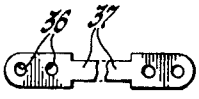


Fig. 8a

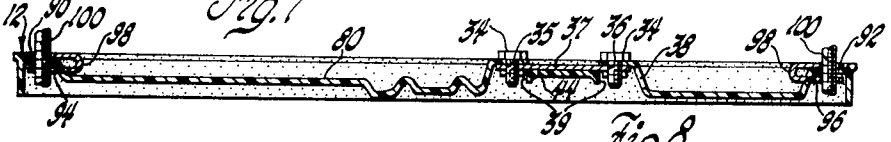


Fig. 8

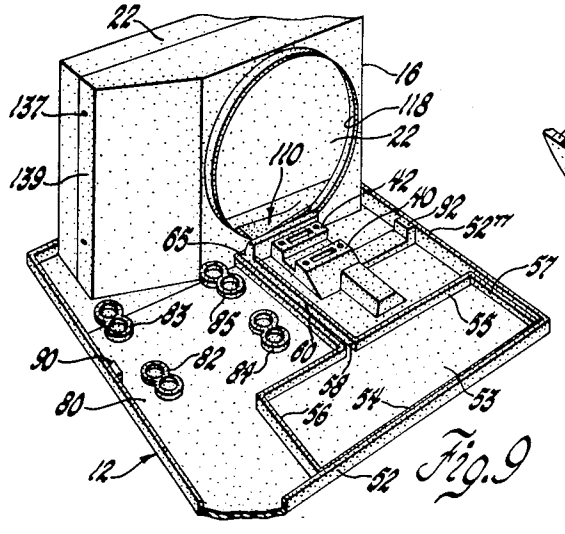


Fig. 9

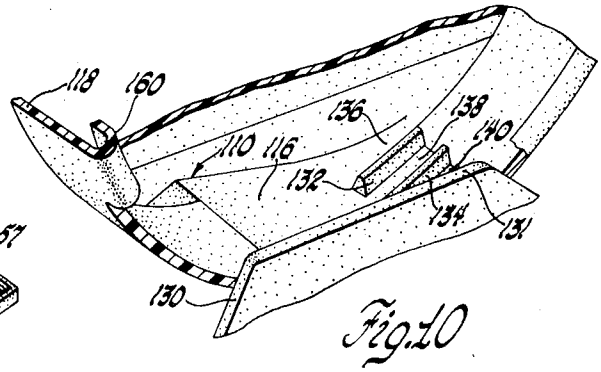


Fig. 10

MOLDED PLASTIC BASE PAN FOR ROOM AIR CONDITIONER

This invention relates to a room air conditioner and is specifically concerned with the provision of an integrally molded plastic base pan structure for such a room air conditioner.

It has been the practice to provide for a base pan for a room air conditioner unit fabricated of metal and including various structural elements needed for rigidity and strength. This arrangement makes for a base pan which is not only subject to corrosion by the condensate drain water but is costly and expensive to fabricate while adding to the total weight of the unit.

An object of this invention is to provide a new and improved one-piece molded plastic base pan for an air conditioning unit having an integral trough segment which cooperates to close a notched opening in a condenser fan shroud to effectively dispose of the condensate water while allowing the shroud to be readily removed from and replaced in the base pan.

Another object of this invention is to provide a one-piece plastic base pan for an air conditioning unit formed with an integral trough segment having a concave surface conforming with the flared notched opening of a condenser fan shroud completing a circular fan air outlet to provide an improved condensate water disposal arrangement which allows a portion of the condensate to flow down a sloped merging ramp directing a portion of the condensate to the base pan sump for pickup by the fan slinger ring while dividing the remaining condensate into a pair of skewed arcuate channels on the trough segment such that a portion of the condensate travels around the flared opening for partial dissipation into the air stream and the remaining portion is directed onto the fan blades.

These and other objects of the present invention will be apparent to one skilled in the art upon reading the following detailed description, reference being made to the accompanying drawings in which:

FIG. 1 is a side elevational view of an air conditioner having the condensate disposal arrangement of the present invention.

FIG. 2 is a top plan view of the base pan.

FIG. 3 is a fragmentary cross section taken on line 3—3 of FIG. 4.

FIG. 4 is a rear elevational view partially in section of the base pan and condenser shroud, looking in the direction of arrows 4—4.

FIG. 5 is a vertical cross section taken on the lines 5—5 of FIG. 2.

FIG. 6 is a vertical cross section taken on the lines 6—6 of FIG. 2.

FIG. 7 is a vertical cross section taken on the line 7—7 of FIG. 2.

FIG. 8 is a vertical cross section taken on lines 8—8 of FIG. 2.

FIG. 8*a* is an enlarged plan view of a retainer plate.

FIG. 9 is a perspective view of the base pan and condenser shroud.

FIG. 10 is an enlarged perspective view of the trough and shroud portion of FIG. 9.

Referring to the drawings, the air conditioning unit 10 is shown in FIG. 1 with its outer casing removed and includes a base pan 12 supporting a blower housing 14 and a condenser fan housing 16. The room air section contains a refrigerant evaporator 18 and a radial flow

blower 19 which propels air from the room being cooled through a front inlet 20 and over the evaporator 18. The outside section contains a condenser 22 for the refrigerating system of the unit and an axial flow fan 24 for propelling air through this section and over the condenser 22.

The outside air section also houses a conventional motor compressor (not shown) which circulates refrigerant through the condenser 22 and evaporator 18 to extract heat from the air passing through the room air section and to emit this heat to the outside air passing through the outdoor section.

The blower 19 and fan 24 are driven by an electric motor 26, positioned within the outside air section, where shaft extensions 28 and 30 connect to and support, respectively, the blower 19 and fan 24. The motor housing is supported by suitable bracket means 32 whose lower portion is removably secured to the base 12 by means of bolts 34 (FIG. 8) extending through base plate holes 35 and threadably inserted in holes 36 in an elongated mounting plate 37. Downwardly offset rectangular embossments 44 are formed in the raised mounting ribs 40 and 42 such that each embossment provides paired slits 39 which are aligned with a slotted end opening 38 to allow plates 37 to be inserted therein for support on its associated embossment 44. The base pan holes 35, end opening 38 and slits 39 are molded with a thin covering film of plastic approximately 0.005 to 0.010 inch in thickness forming knock-outs in the base pan to accommodate alternate size motor brackets while permitting the base pan to remain in watertight condition.

The rectangular base pan 12 is formed from a single sheet of plastic material which in the preferred form is thermal set plastic material such as reinforced polyester sheet plastic having a thickness of about 0.125 inch and manufactured by a suitable process such as thermoforming. The pan 12 has an upstanding continuous peripheral wall forming front 52, rear 52' and side walls 52'' and having a raised rectangular area 53 defined by side partitions 54, 55 and end partitions 56, 57 within which the indoor heat exchanger 18 is mounted.

A condensate exit 58 is provided in partition 55 communicating with longitudinal channel 60, defined by a pair of longitudinally extending partitions 62 and 64, with the channel 60 sloped rearwardly through notch 65 in housing 16 and joining depressed sump region 70 having rectangular raised area 72 for location of the outdoor heat exchanger 22. The transversely extending sump region 70 is positioned intermediate the raised area 72 and shroud mounting grooves 74 and 76. Elevated plateau region 80 defines the compressor motor mounting area bounded by four figure-eight bosses 82, 83, 84 and 85 each of which has a pair of sockets, represented by sockets 86, 87 of boss 82, which are normally closed by a molded knockout providing alternate inner and outer sets of four mounting holes 88*a*, 88*b*, 88*c*, 88*d* and 89*a*, 89*b*, 89*c*, 89*d* to accommodate either a small or large compressor-motor respectively. In this manner only a slight blow with a suitable tool is required to cause the knock-out to become disengaged and create the proper mounting hole arrangement while maintaining the base pan in watertight condition.

Raised rib areas **90** and **92** are formed with cooperating slots **94** and **96** respectively, to receive standard U-shaped speed nuts **98** therein (FIG. **8**) to allow the base pan **12** to be readily secured by shipping bolts **100** to the floor of a shipping crate. As seen in FIG. **2** the base pan **12** has an integral raised trough segment generally indicated at **110** formed at the forward boundary of the sump region **70** and straddling the raised condenser shroud mounting ridges **74, 76**. FIG. **2** shows the trough segment **110** having two transverse vertical front and rear walls **130** and **111**, and two outwardly pitched end walls **112** and **114** which extend upwardly and inwardly from the pan bottom wall **115** defining the trough segment **110**. The trough segment has an upwardly facing concave depressed arcuate surface **116** forming the segment of a cylinder which merges with the condenser shroud cylindrical type or flared air outlet orifice **118** by virtue of cut-out notched opening **120** of the shroud accommodating the trough segment **110** which closes the notched opening. The shroud orifice **118** has outer inclined flanges **122** and **124** having the same angle of inclination as that of the inclined trough end walls **112, 114** such that the exterior of the end walls **112, 114** of the trough segment are in intimate facial or surface contact with the interior surface of the shroud flanges **122** and **124**. The shroud **16** is formed with horizontally disposed flanges **126, 128** bearing on the recessed mounting groove portions **74** and **76** of the base pan on which it is mounted. The concave depressed segmental portion **116** and the notched opening **118** thus form a completed circular flared fan air outlet **118**.

As seen in FIGS. **4, 6** and **7**, the trough segment **110** includes a transverse front wall **130** extending shieldingly across and in front of the concave trough surface portion **116** to provide a barrier to dam condensate water in the sump region and on the concave trough surface **116** and thereby prevent condensate from flowing forwardly past the condenser shroud. The front wall **130** has its upper edge **131** sloped upwardly at an angle of approximately 3½° to the horizontal allowing condensate to pile-up in the channels **138** and **140** until it is distributed to the air stream or it is recirculated to the sump area via diverting ramp **136**.

The trough surface is formed with a pair of rearwardly skewed convolutions **132** and **134** commencing from the nadir portion of the concave trough segment and extending upwardly and rearwardly subtending an arc of the opening **118** indicated in FIG. **4** at A which in the embodiment is about 27°. In this regard it will be observed that the notched opening **120** and trough segment **110** both subtend a total arc B of the condenser shroud opening **118** of about 54° oriented in symmetrical fashion about vertical center line **135**. The rearmost arcuate rib or convolution **132** borders and defines the forward extent of a continuous condensate flow ramp or surface **136** which merges in a substantially tangential juncture with the concave trough surface **116** at its lowermost portion and extends downwardly with slight curvature toward the sump region and merges therewith.

In the present construction it will be appreciated that by having the shroud cylindrical duct orifice **118** notched at **120** the shroud is adapted to be readily removed from and replaced on the base pan. It has been found that for a shroud orifice of approximately 14½ inches in diameter an arcuate notch **120** subtending an angle of approximately 54° affords a minimum shroud notched opening, measured on the chord between flanges **122** and **124**, of the order of 6¼ inches provides sufficient clearance for passage of the motor housing **26** therethrough. Thus, to remove and replace the condenser shroud wall, all that is necessary to do is remove suitable attachment means, such as threaded bolts **137** affixing the shroud side walls **139** to the condenser and the condenser shroud is then tilted slightly toward the motor **26** so that the notched opening **120** is aligned correctly with the motor **26** and the shroud **16** pulled straight-off the base pan.

As best seen in FIG. **10**, the convolutions **132, 134** define the pair of parallel arcuate channels **138** and **140** in skewed relation to the transverse plane of orientation of the shroud orifice **118** at an angle of about 15°. The moisture which is condensed from the room air passing over the evaporator **18** falls into the concave trough segment **110** and is directed by the fan blades **24** in a counterclockwise circular path, indicated by arrow **137** in FIG. **4**. The condensate that is driven into forwardmost channel **140** is directed around the cylindrical orifice **118** of the shroud wall (FIG. **3**) such that a portion is picked up by the stream of air drawn through the orifice **118** and the remaining portion is redeposited in the trough segment **110**. The condensate that collects in skewed channel **138** is directed upwardly toward the trailing edge **144** of the shroud orifice **118** causing it to fly-off the edge thereof to be picked up either by the stream of air leaving the fan blades **24** or by being deposited on the fan blades. The condensate which completes the travel around the shroud opening or is not directed into either channel **138** or channel **140** flows down the ramp surface **136** into the sump region **70**.

As seen in FIG. **1** the fan **24** includes a conventional slinger ring **146** attached to the individual fan blades by suitable means such as disclosed in U.S. Pat. No. 2,941,382, for example. The parallel dashed lines **150** in FIG. **2** indicate the projected path of the slinger ring **146** intermediate the sump region **70** and segmental trough **110**. Condensate which collects in the lowest portion of the sump **70** under the fan **24**, which includes flow in channel **60** from area **53** and flow diverted down ramp **136** from the trough segment **110**, is continually picked up by the slinger ring **146** and thrown into the stream of air being blown outwardly through the condenser **22**. The relatively high speed of rotation of the fan blades **24**, however, imparts a rotating motion to the air stream flowing through the shroud orifice **118** causing the air stream to move the condensate away from the sump portion under the fan region to lessen contact with the slinger ring. By means of applicants' trough segment channels **138, 140** and diverting ramp **136** arrangement, however, the condensate water flow is continuously split-up and distributed to the fan blades, cylindrical shroud orifice **118**, and slinger ring **146** in a recirculated manner for efficient and complete disposal of the condensate into the condenser air stream.

It will be noted that the cylindrical type orifice **118** of the shroud presents a right cylindrical surface concentric with the fan blades **24** which allows a portion of the condensate to travel or recirculate substantially 360°

around the cylindrical orifice **118** and conforming trough arcuate surface **116** for return to the sump **70** by means of flow ramp **136**. The cylindrical orifice **118** has a reverse flanged lip **160** cylindrically shaped in cross section on its downstream or forward edge (FIG. 3) for preventing the condensate from escaping to the fan motor region by flowing or dripping off the cylindrical orifice downstream edge and thereby escaping into the fan motor region to cause corrosion and disposal problems.

It should be noted that front wall **52** is molded with a pair of double walled portions **162** and **164** as seen in FIG. **2** forming vertical passageways indicated at **166** in FIG. **6**. The passageways **166** serve as receptacles for the end portions of a suitable handle means (not shown) preferably formed of flexible plastic material causing the handle means to position itself flush with wall **52** except when being used to pull the air conditioner unit into the room on suitable guide rail mounting means conventional in the art.

It will be appreciated that applicants' air conditioning unit is designed for use with impellers providing an axial air flow from the intake side defined between housing **14** and housing **16** and discharged rearwardly through the condenser **22** to the outside air. The result is that because of the negative pressure and air turbulence on the intake side condensate normally tends to be drawn or sucked back through the cylindrical orifice **118** toward the motor **26**. Thus applicants' inventive arrangement described prevents the condensate from entering the motor area and thereby prevents corrosion and other moisture damaging effects on the unit.

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

We claim:

1. An integrally molded synthetic plastic base pan for an air conditioning unit comprising; a rectangular bottom wall having upwardly extending peripheral front, rear and side walls; means for supporting an evaporator on said base pan adjacent to said front wall, means for supporting a condenser on said base pan adjacent to said rear wall, a depressed sump region extending along and adjacent to said condenser supporting means, fan motor mounting means formed integrally in said base pan intermediate said evaporator supporting means and said condenser supporting means, a raised elongated trough segment molded integrally with said base pan in a transverse direction so as to be positioned intermediate said sump region and said fan motor mounting means, means disposed in said base pan and aligned at least initially in a transverse direction with said trough segment for receiving the bottom edge of a vertical shroud wall, the shroud wall having a notched cylindrical duct orifice therein for receiving the impeller portion of an air circulating fan, a portion of said trough segment having an upwardly facing concave depressed arcuate surface forming a segment of a cylinder of a configuration to be accommodated in the notched portion of the shroud wall orifice such that said trough segment arcuate surface snugly closes the orifice, said trough segment having an integrally molded condensate flow ramp portion which merges in a substantially tangential juncture with said concave trough surface at its lowermost portion and extends downwardly toward said sump region and merges therewith for removing condensate from said trough segment to said sump region.

2. An integrally molded synthetic plastic base pan for an air conditioning unit comprising; a rectangular bottom wall having upwardly extending peripheral front, rear and side walls; means defining a raised area along and adjacent to said front end wall for supporting an evaporator on said base pan, means defining a raised area along and adjacent to said opposite rear wall for supporting a condenser on said base pan, a depressed sump region extending along and adjacent to the inner boundary of said condenser area, means defining an inclined longitudinal condensate water channel in said base pan positioned intermediate said pan side walls connecting said raised evaporator area and said sump region to provide a condensate water flow path to said sump region, upwardly extending fan motor mounting rib means formed integrally in said base pan intermediate said evaporator area and said condenser area, a raised elongated trough segment molded integrally with said base pan in a transverse direction so as to be positioned intermediate said sump region and said fan motor mounting rib means, groove means disposed in said base pan and aligned at least initially in a transverse direction with said trough segment for receiving the bottom edge of a vertical shroud wall, the shroud wall having a notched central cylindrical orifice therein for receiving the impeller portion of an air circulating condenser fan, a portion of said trough segment having an upwardly facing concave depressed arcuate surface forming a segment of a cylinder of a configuration to be accommodated in the notched portion of the shroud wall orifice such that said trough segment arcuate surface snugly closes the orifice, said raised trough segment including a transverse front wall extending shieldingly across and in front of said concave trough surface forming a dam for preventing the flow of condensate water from said trough segment forwardly to said fan motor mounting rib means, said trough segment having an integrally molded condensate flow ramp portion which merges in a substantially tangential juncture with said concave trough surface at its lowermost portion and extends downwardly and rearwardly toward said sump region and merges therewith for removing condensate from said trough segment to said sump region, and said trough segment arcuate surface having channel means integrally molded thereon so as to extend upwardly and rearwardly in the direction of rotation of the condenser fan from the lowermost portion of said arcuate surface so as to direct a portion of the condensate to the rear edge of the cylindrical duct orifice to be removed therefrom by the air stream.

3. The base pan as defined in claim **1** wherein said trough segment arcuate surface having channel means integrally molded thereon extending upwardly and rearwardly from the lowermost portion of said arcuate surface in the direction of rotation of said fan impeller whereby a portion of the condensate in said trough segment is directed toward the rear edge of the cylindrical duct orifice as the condensate travels therearound.

4. In an air conditioning unit for conditioning the air within an enclosure, the combination comprising a heat exchange apparatus mounted on a molded plastic base pan supporting at least a fan for circulating a stream of

outside air through said apparatus, a sump for collecting condensate water from said apparatus molded in said base pan, said sump being positioned beneath said fan wherein an annular slinger ring attached to the periphery of said fan dips into said condensate sump for slinging water therefrom, means disposed in said base pan for receiving the bottom edge of a vertical shroud wall, said shroud wall including a notched cylindrical duct orifice partially enclosing a propeller fan for directing outside air through said orifice, a raised trough segment molded integrally with said base pan disposed beneath said fan, a portion of said trough segment having an upwardly facing concave depressed arcuate surface forming a segment of cylinder of a configuration to be accommodated in the notched portion of said orifice such that said trough segment arcuate surface snugly closes said orifice, said trough segment having an integrally molded condensate flow ramp portion which merges in a substantially tangential juncture with said trough segment arcuate surface at its lowermost portion and extends downwardly toward said sump region and merges therewith for removing a portion of the condensate on said trough segment to said sump region.

5. In an air conditioning unit for conditioning the air within an enclosure, the combination comprising a heat exchange apparatus mounted on a molded plastic base pan supporting at least a propeller fan for circulating a stream of outside air through said apparatus; a sump for collecting condensate water from said apparatus molded in said base pan, said sump being positioned beneath said fan wherein an annular slinger ring attached to the periphery of said fan dips into said condensate sump for slinging water therefrom, means disposed in said base pan and aligned in a transverse direction beneath said fan for receiving the bottom edge of a vertical shroud wall, said shroud wall including a notched cylindrical duct orifice partially enclosing a propeller fan for directing outside air through said orifice, said cylindrical duct orifice including a reverse flanged lip on the forward edge thereof for preventing condensate on said duct orifice from being blown forward by the air stream recirculated by said fan, a raised trough segment molded integrally with said base pan disposed beneath said fan, a portion of said trough segment having an upwardly facing concave depressed arcuate surface forming a segment of cylinder of a configuration to be accommodated in the notched portion of said orifice such that said trough segment arcuate surface snugly closes said orifice, said raised trough segment including a transverse front wall extending shieldingly across and in front of said concave trough arcuate surface forming a dam preventing the inward flow of condensate water, said trough segment having an integrally molded condensate flow ramp portion which merges in a substantially tangential juncture with said trough segment arcuate surface at its lowermost portion and extends downwardly toward said sump region and merges therewith for removing the condensate from said trough segment to said sump region, said trough segment formed with a pair of rearwardly skewed integrally molded ribs forming with said front wall a pair of channels extending from the lowermost portion of said concave trough arcuate surface upwardly and rearwardly in the direction of rotation of said fan, said pair of channels directing a portion of the condensate from said trough segment into said duct orifice such that said air stream flowing into said fan causes condensate to either travel around said cylindrical duct orifice and be recirculated to said sump or to be carried from the rear downstream edge of said orifice into the fan air stream.

6. The air conditioning unit as defined in claim 4 wherein said trough segment arcuate surface having channel means integrally molded thereon and extending upwardly and rearwardly in the direction of rotation of said fan from the lowermost portion of said arcuate surface thereby directing a portion of the condensate to the downstream rear edge of said cylindrical duct orifice and carried into the fan air stream as the condensate travels therearound under the influence of said fan air stream.

7. The air conditioning unit as defined in claim 4 wherein the notched portion of said orifice is oriented in symmetrical fashion about the vertical center line of said orifice such that said notched portion is of an extent to allow said fan motor to pass therethrough whereby said shroud wall may be readily lifted straight-off said base pan.

* * * * *