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3,411,569

PULL-OUT COOLING SECTION FOR COMBINED HEATING-COOLING UNIT

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4 Sheets-Sheet 1

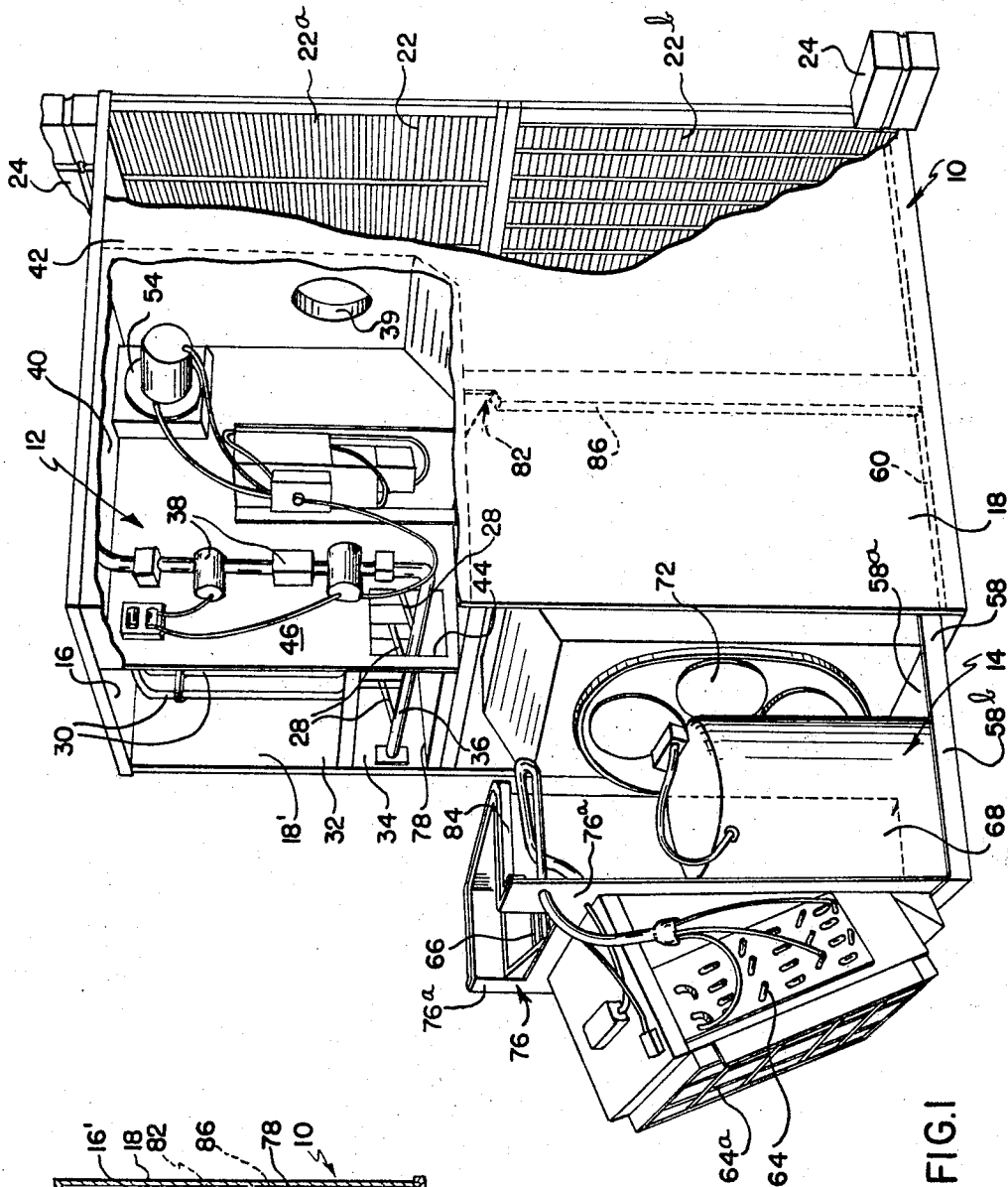


FIG. 1

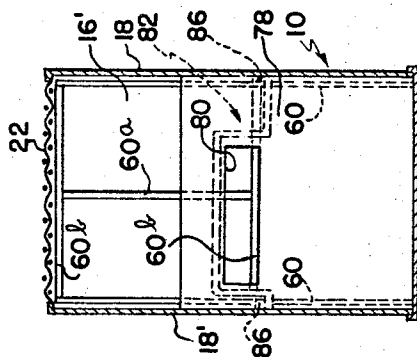


FIG. 4

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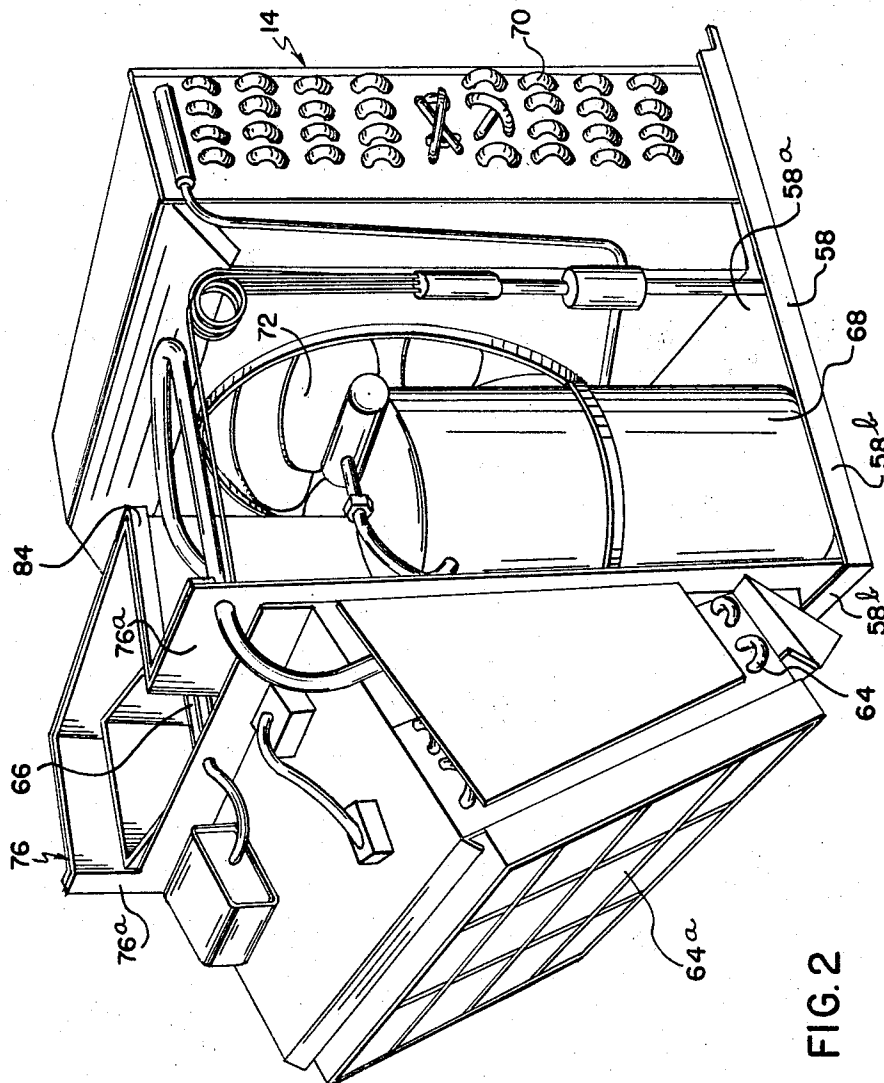
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4 Sheets-Sheet 2



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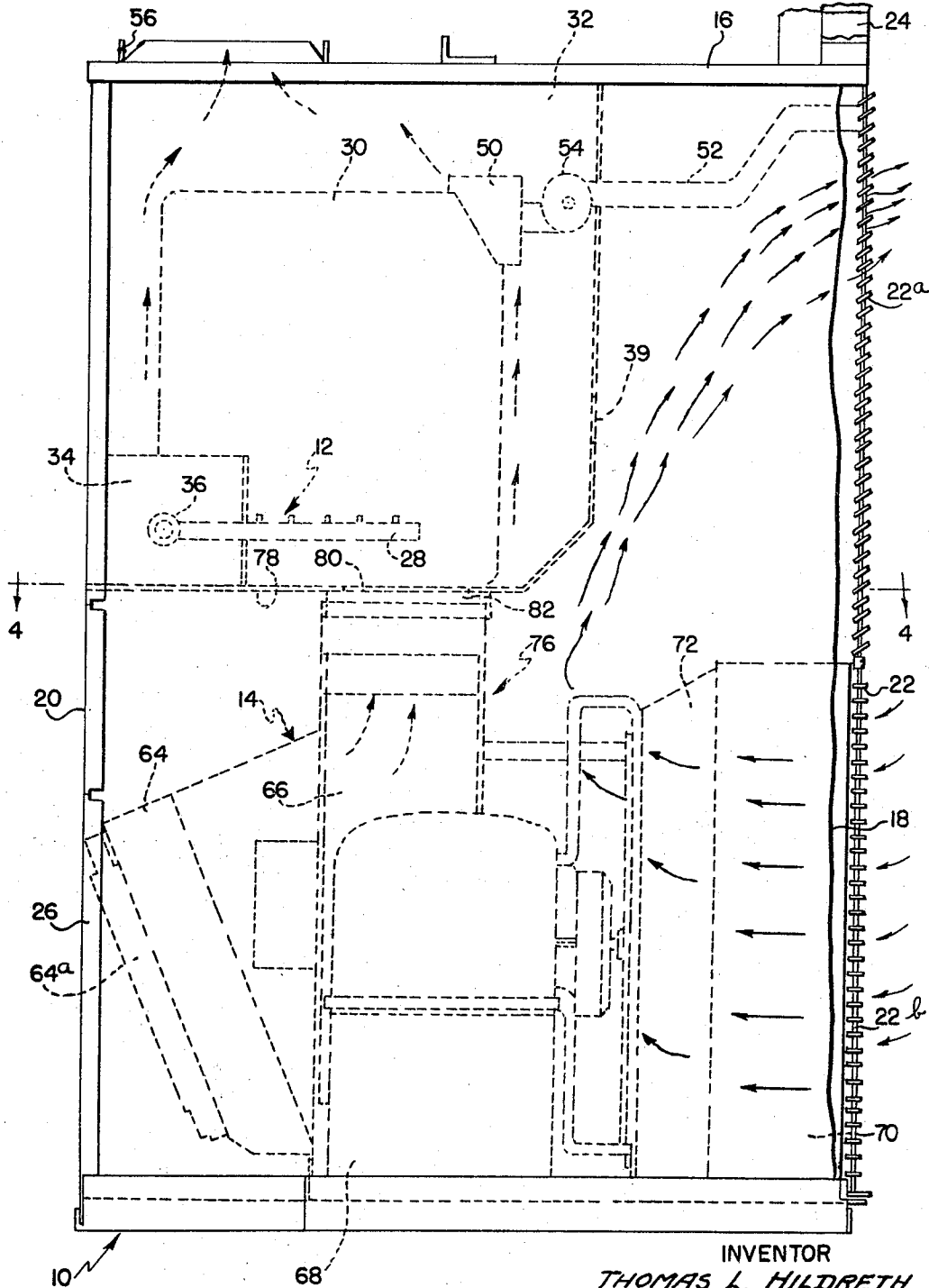
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4 Sheets-Sheet 4

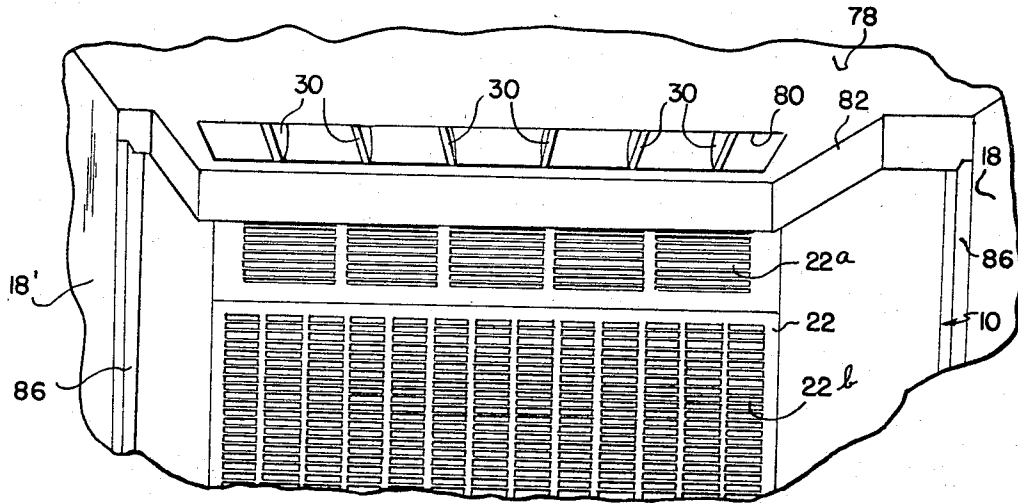


FIG. 5

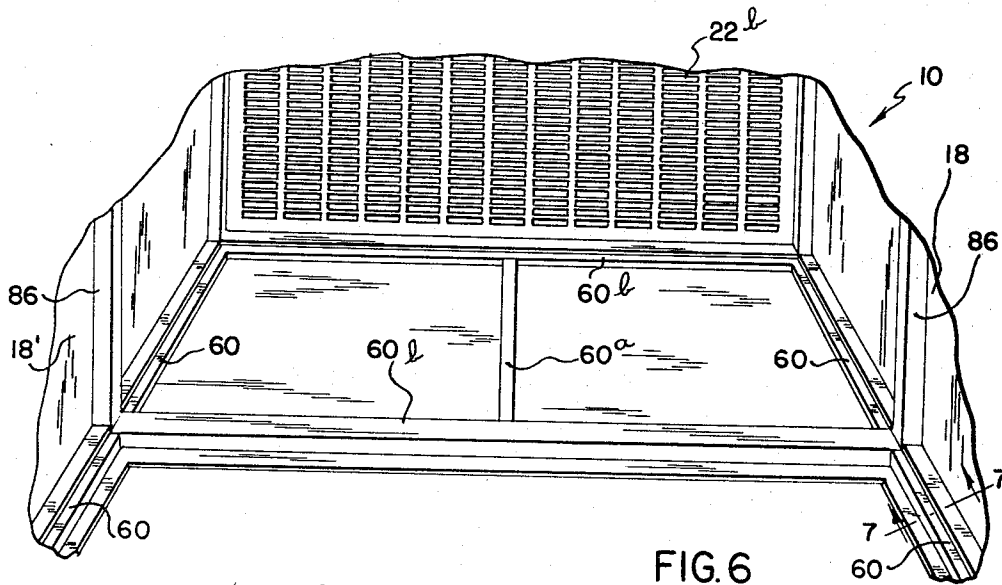


FIG. 6

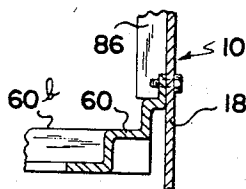


FIG. 7

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PULL-OUT COOLING SECTION FOR COMBINED HEATING-COOLING UNIT

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ABSTRACT OF THE DISCLOSURE

A combined heating-cooling unit comprising a housing having a cooling section and a heating section disposed in the housing with the cooling section being mounted on a movable chassis which is readily slidable into and out of the housing for expeditious replacement and/or repair of the cooling section. The cooling section includes an air channeling or directing chute extending generally vertically upwardly from the chassis and transversely of the chassis, which chute is adapted for coaction with an opening in an upper air receiving chamber to which the air from the cooling section is adapted to pass, prior to movement of the air from the housing to the predetermined area to be cooled. The air channeling or directing means is adapted for coaction with the side walls of the housing and with said opening, for separating the cooling coils of the cooling section from the condenser coils of the cooling section, both of which are mounted on the chassis on opposite sides of the air channeling or directing chute, so that when the cooling section is disposed in operative position in the unit's housing, the cooled air from the cooling coils of the cooling section is directed upwardly through said opening to the upper air receiving chamber, and the cooled air is maintained separate from the condenser coils.

This invention relates in general to improvements in heating and cooling units, and more particularly to a combined heating-cooling air conditioner unit, for selectively heating or cooling an enclosed area within a building space, and wherein the cooling section of the combined heating-cooling unit is readily removable for repair or replacement thereof.

Combined heating and cooling units for selectively heating or cooling an apartment or the like are known in the art. However, such prior art combined units are such that repair or replacement of the cooling section thereof is difficult. The manufacture of heating mechanisms has advanced to such a degree that ordinarily, the heating section of such a combined unit needs relatively little maintenance thereon. However, the cooling section of such combined units usually require more maintenance, and heretofore maintenance on the cooling section of such a combined unit has entailed considerable labor and effort, due in part to the compactness of the structures, and because the removal of the cooling section for repair or replacement necessitated major work operations, and resulted in the combined unit being disabled until such time as the cooling section was repaired and returned to its proper position in the housing of the unit.

The present invention provides a combined heating-cooling unit for heating and cooling a space in a building or the like, and wherein the cooling section is readily and expeditiously removable from the combined unit for cleaning and/or repairing, and wherein another cooling section can be easily moved into place in the housing of the unit, thus resulting in substantially no "down time" for the combined unit.

Accordingly, an object of the invention is to provide a novel combined heating and cooling unit for a building or the like.

Another object of the invention is to provide a novel

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compact combined heating and cooling unit wherein the cooling section thereof is readily removed from and placed back into the combined unit's housing, and where another cooling section may be readily substituted for a removed cooling section in the combined unit.

A further object of the invention is to provide a combined heating and cooling unit for heating apartments or other building space and wherein the cooling section of the unit is readily removed from the unit's housing and is movably mounted on track means in the unit's housing for ease of removal from and insertion back into the housing.

A still further object of the invention is to provide a combined heating and cooling unit for heating and cooling an enclosed area, and wherein the passageway means for passing the air from the cooling section into the conventional upper air chamber of the combined unit is so constructed and arranged that the cooling section of the combined heating-cooling unit may be readily removed and replaced by another similar cooling section with substantially no "down time" being occasioned by such removal and replacement.

Other objects and advantages of the invention will be apparent from the following description taken in conjunction with the accompanying drawings wherein:

FIGURE 1 is a generally perspective front and side view of the heating-cooling unit with portions of the unit's housing being broken away, and illustrating the cooling section of the combined unit having been moved outwardly with respect to the unit's housing preparatory to complete removal of the cooling section from the housing;

FIGURE 2 is a perspective, generally diagrammatic enlarged illustration of the cooling section per se, after removal from the housing of the combined unit;

FIGURE 3 is a side elevational, partially broken, generally diagrammatic view of the combined heating and cooling unit, and showing in particular with solid line arrows the flow of intake air through the condenser portion of the cooling section and with phantom line arrows the flow of cooled air to the upper air chamber for distribution into the building space to be cooled;

FIGURE 4 is a reduced size diagrammatic, horizontal sectional view taken generally along the plane of lines 4—4 of FIGURE 3 showing in particular the flange means in the unit's housing adapted for coaction with means on the cooling section for providing duct work from the cooling section up to the upper air chamber of the combined heating-cooling unit for distribution of cooled air to the building space to be cooled, and also diagrammatically showing the track means in the unit's housing for receiving in movable relation the removable cooling section; the cooling section has been removed in the interests of clarity and simplicity;

FIGURE 5 is a fragmentary, generally perspective view illustrating in greater detail the aforementioned flange means of FIGURE 4, and showing the sealing means on the sides of the unit's housing coacting with the aforementioned flange means, and adapted for sealing the cooling air from the condenser air;

FIGURE 6 is a fragmentary, generally perspective view looking downwardly into the heating-cooling unit's housing, and illustrating the track means for removably supporting the cooling section thereon, whereby the cooling section can be readily slipped out from the heating-cooling unit's housing; and

FIGURE 7 is an enlarged sectional view taken generally along the plane of line 7—7 of FIGURE 6, looking in the direction of the arrows.

Referring now again to the drawings, the heating-cooling unit generally includes a housing or cabinet 10 in which the heating section 12 and the cooling section 14

are assembled, with such housing being conventionally made of sheet metal or the like, and in the embodiment illustrated being of generally rectangular construction. The housing 10 may include top and bottom walls 16, 16' side walls 18, 18', and a front or inner wall surface 20 (FIGURE 3) and a rear or outer wall surface 22.

The combined heating-cooling unit is adapted for installation within a room of a building and may be mounted substantially as shown in FIGURE 1. Reference numeral 24 refers to an exterior wall of the building and this exterior wall may be provided with an opening, which is preferably of the same general height and width as the height and width of the housing 10 whereby the unit fits into the wall opening, with the rear outside wall surface 22 of the housing preferably being substantially flush with the outer surface of the building structure. Rear surface 22 of the unit may be provided with a foraminous or louvered upper section 22a, and a lower foraminous or louvered section 22b, which sections may be removable with respect to the remainder of the unit's housing. The front surface 20 of the unit's housing may also be provided with openings having removable panels or doors associated therewith, to give convenient access to the interior of the housing. In this connection and referring to FIGURE 3, panel 26 covers the opening in surface 20 through which cooling section 14 is adapted for insertion and withdrawal from the housing 10. The louvers in aforementioned upper section 22a of surface 22 are preferably tipped upwardly with respect to the horizontal, as shown in FIGURE 3, while the louvers or grille work in the lower section 22b are preferably substantially horizontal.

The heating section 12 of the combined unit is preferably disposed in the upper portion of the housing 10 and may include laterally spaced gas burners 28 (FIGURES 1 and 3) each of which may be enclosed in an upstanding, hollow preferably metallic heat transfer member 30 all of which extend upwardly relative to the housing for disposal in upper air chamber 32 and at their lower ends communicate with an air-gas mixing chamber 34 containing a gas supply pipe 36 through which a flow of gas to burners 28 is controlled by gas valve mechanism 38.

The air to support the gas combustion is drawn through opening 39 in inner panel 42 of enclosed chamber 40 (FIGURE 1) disposed laterally of upper air chamber 32. The combustion air then passes from chamber 40 through opening 44 in inner panel 46 (FIGURE 1) and into chamber 34 where it combines with the ignited gas issuing from the burners 28. The air-gas mixture combustion at the burners and the pilot light combustion are confined within the burner enclosing hollow heat transfer members 30, which at their upper ends communicate with a manifold 50 (FIGURE 3) which in turn is coupled to a vent 52 which discharges to atmosphere through the upper section 22a of the outside wall surface 22. A motor driven fan 54 (FIGURE 1) may be provided in communication with the vent pipe 52, for causing the flow of air into the air-gas mixing chamber 34, through the hollow heat transfer members 30, and out the vent 52. The air which is discharged into the room or area to be heated is of course maintained separate from the outside air and gas combustion, since it flows around the outside of the heat transfer members in upper air chamber 32, and then out, for instance opening 56, for transmittal as for instance by duct work or the like to the desired building area.

The cooling section 14 of the combined unit is preferably contained within the lower portion of the housing 10 and may be mounted on a chassis 58 which may include bottom wall 58a and upstanding side flanges 58b. Wall 58a is adapted for sliding coaction with rails or supports 60 (FIGURES 4, 6 and 7) on the inner-sides of the lower portions of side walls 18, 18' of the housing, for supporting the cooling section in the housing, and

for ready removal of the cooling section from the housing. Intermediate rail structure 60a and transversely extending rail structure 60b merging with and tying together rails 60 may be provided to aid in supporting the cooling section chassis in housing 10. It will be seen that the cooling section may be removed from the housing by sliding the cooling section out of housing 10 on rails 60, after manually disconnecting a conventional multi-circuit plug (not shown) electrically connecting the cooling section circuitry into circuit with the electrical circuitry of the heating unit.

The cooling section may include conventional cooling coils 64 (FIGURE 1) positioned at the inner end of the chassis of the cooling section, with the outer surface 64a of the cooling coil portion 64 being foraminous or open to permit entrance of room or returned air, which may be drawn in between the cooling coils by operation of an electrically driven blower 66. The cooling section may also include a conventional compressor 68, and condenser coils 70 adapted for disposal adjacent the foraminous lower portion 22b of the outer wall surface 22 of the housing. Condenser fan 72 may be provided inwardly of coils 70 and conventional connections of the coils 64, 70 to the compressor together with electrical connections and controls for the blower 66 and fan 72 may be provided.

The condenser fan 72 is adapted to draw air in from the outside through the foraminous lower portion 22b of the housing outer wall surface which air passes over and around the condenser coils 70, extracting heat therefrom, and then this air is discharged back to the outside through the upper foraminous portion 22a of the outside wall surface. The path of travel of the outside cooling air for the condenser coils 70 is illustrated by full line arrows in FIGURE 3 and it will be seen that such outside air is maintained separate from the cooled air (phantom line arrows) produced by the cooling section for cooling the building space. In this connection, the chassis of the cooling section 14 has a vertically extending passageway or chute means 76 projecting upwardly from bottom plate 58a of the chassis and in which chute means is disposed the aforementioned blower 66. Chute 76, in the embodiment illustrated is at its upper end of generally inverted U-shaped configuration in plan view (FIGURES 1 and 2) and extends from the bottom wall of the chassis 58 to a predetermined height above such bottom wall and in downwardly spaced relation to the intermediate wall 78 defining the bottom of upper air chamber 32. Side flanges 76a of the chute extend laterally a sufficient amount and into closely spaced relation to the confronting side walls 18, 18' of the unit housing 10, when the cooling section is disposed in operative position in the housing.

Horizontal wall 78 has an opening 80 (FIGURES 4 and 5) therein which communicates the upper air chamber 32 with the lower portion of housing 10, and chute means 76 is adapted to be disposed beneath opening 80 when the cooling section 14 is disposed in operative position in housing 10, thus communicating the blower 66 with opening 80, to cause the intake air cooled by coil portion 64 to be moved up through opening 80, around members 30 and out for instance opening 56 to the building area to be cooled.

In order to seal the chute means 76 with respect to the wall 78 and the side walls 18, 18' of the housing 10, in the embodiment illustrated there is provided a depending flange 82 (FIGURES 4 and 5) projecting downwardly from wall 78 and formed generally complementary to the plan configuration of chute means 76. As can be seen, flange 82 is of generally inverted U-shaped configuration in plan view and is adapted to receive the upper portion of chute means 76 therein in generally embracing relation. A strip 84 of resilient sealing material, such as for instance polyurethane plastic foam, may be secured to the upper portion of chute 76, and as best shown in FIGURE 2, to seal the chute with respect to the flange 82.

Also, strips 86 of sealing material may be provided on side walls 18, 18' of housing 10, adapted for sealing coaction with side flanges 76a of the chute 76, when the cooling section 14 is in proper operating position in housing 10. It will be seen therefore that the incoming outside cooling air entering portion 22b of outer wall surface 22 for cooling condenser coils 70 is positively sealed from the air being cooled by the cooling section for distribution to the building area (i.e. the air designated by the phantom line arrows). The cooling section may be removed by sliding the chassis 58 outwardly on the rail supports 60, and when the same cooling section or a replacement cooling section is reinserted back into proper operating position in the housing 10, the chute 76 is again automatically sealed with respect to panel 78 and walls 18, 18', by the sealing strips 84 and 86.

From the foregoing discussion and accompanying drawings it will be seen that the invention provides a novel combined heating-cooling unit wherein the cooling section is readily and expeditiously removable from the combined unit for replacement and/or repair thereof, resulting in a much more economically desirable arrangement for a combined unit.

The terms and expressions which have been used are used as terms of description and not of limitation, and there is no intention in the use of such terms and expressions of excluding any equivalents of any of the features shown or described, or portions thereof, and it is recognized that various modifications are possible within the scope of the invention claimed.

I claim:

1. In a combined heating-cooling unit for a building comprising a housing, a heating section in said housing, said heating section including heating means for heating air, a cooling section in said housing, said heating and cooling sections being oriented generally vertically with respect to one another, said cooling section including a movable chassis supported in removable relation in said housing whereby said cooling section can be readily removed as a unit from and inserted back as a unit into said housing, said chassis supporting cooling elements of said cooling section thereon and separating said cooling section from said heating section upon removal of said chassis from said housing, said housing including a chamber therein adapted for receiving air from said cooling section during operation of the latter and adapted for receiving air via said cooling section for exposure to said heating means of said heating section during operation of the latter, prior to passage of the air from the housing to a predetermined area, said chamber communicating with said cooling section via opening means in said chamber, generally vertically-oriented means on said chassis for directing air from said cooling section to said chamber via said opening means, said directing means extending generally transversely of said chassis, for sealing coaction with said housing, said cooling elements of said cooling section including cooling coil means and coacting blower means disposed on said chassis on one side of said directing means and condenser coil means and coacting blower means disposed on said chassis on the other side of said directing means, said directing means coacting with said housing and with said opening means in the operative inserted position of said cooling section in said housing, for separating cooled air produced by said cooling coil means from said condenser coil means and directing the cooled air placed in motion by the first mentioned blower means through said opening means, said first mentioned blower means being adapted to be operative during both heating and cooling of air by respectively said heating and said cooling sections.

2. A unit in accordance with claim 1 wherein said housing comprises a generally horizontally disposed member dividing said housing into said air receiving chamber and a lower air cooling chamber, said air receiving chamber being disposed above said air cooling chamber, said cool-

ing section being disposed in said air cooling chamber, said upper air receiving chamber communicating with said lower air cooling chamber by means of an opening in said horizontal member forming said opening means, and means coacting with said opening and adapted for coaction with said directing means for directing cooled air from said cooling section through said opening into said air receiving chamber.

3. A unit in accordance with claim 2 wherein said heating means comprises a plurality of laterally disposed hollow heat-transfer members in said upper chamber for causing heating of air in said upper chamber, said first mentioned blower means being disposed intermediate said cooling coil means and said one side of said directing means for forcing air through said opening means into said upper chamber.

4. A unit in accordance with claim 2 including sealing means coacting between said directing means and said means coacting with said opening, for preventing egress of cooled air laterally of said lower chamber.

5. A unit in accordance with claim 2 wherein said directing means comprises a generally vertically extending chute, said first mentioned blower means communicating at its output end with said chute and communicating at its intake end with said cooling coil means, said chute having means on the upper end thereof adapted for coaction with said opening coacting means for detachably coupling said chute to said opening means.

6. A unit in accordance with claim 5 wherein said opening coacting means is of generally channel shaped configuration in plan view disposed in partially encompassing relation to said opening, and said means on the upper end of said chute being of generally channel shaped configuration in plan view adapted for nesting relation with said channel shaped configuration of said opening coacting means when said cooling section is disposed in operative position in said housing.

7. A unit in accordance with claim 1 including resilient strip sealing means coacting between said housing and said directing means for detachably sealing said directing means with respect to said housing.

8. A unit in accordance with claim 1 wherein said housing comprises divider means therein separating said housing into said air receiving chamber and a lower air cooling chamber, said air receiving chamber communicating with said air cooling chamber by said opening means disposed in said divider means, said directing means including generally laterally extending wings adapted for coaction with the confronting side walls of said housing, and sealing means on said housing extending into coaction with said wings for removably sealing said directing means with respect to said housing.

9. A unit in accordance with claim 1 including means in said housing for supporting said cooling section chassis and comprising laterally spaced track means extending generally linearly in the directions of movement of said chassis for respectively removing said cooling section from and inserting said cooling section into said housing.

10. A unit in accordance with claim 9 wherein said housing includes spaced side walls, said track means being disposed along respective of said side walls adjacent the lower extremities of the latter, and means extending above said track means and spacing said track means from the respective side wall and being attached to the respective track means and to the respective side wall.

11. A unit in accordance with claim 9 wherein said chassis comprises a flat bottom wall adapted for sliding engagement with said track means during removal of said cooling section from or insertion of said cooling section into said housing, and side flange means extending upwardly from said bottom wall.

12. In a combined heating-cooling unit for a building comprising a housing, a heating section in said housing, a cooling section in said housing, means removably mounting said cooling section in said housing whereby said cooling

section may be readily removed from and inserted back into said housing, said housing comprising a generally horizontally disposed member dividing said housing into an upper air receiving chamber and a lower air cooling chamber, said upper air receiving chamber communicating with said lower air cooling chamber by means of an opening in said horizontal member, said cooling section including means for channeling cooled air from said cooling section towards said opening, means coacting with said opening and adapted for coaction with said channeling means for passing cooled air from said cooling section through said opening into said upper chamber for distribution of cooled air to the building area to be cooled, said cooling section comprising a chassis supporting cooling elements of said cooling section thereon, said channeling means including a generally vertically extending chute of generally channel-shape configuration in plan view, said chute having laterally spaced flange portions extending transverse of said chassis and adapted for sealing coaction with side walls of said housing when said cooling section is disposed in operative position in said housing, said opening coacting means being of generally channel-shaped configuration in plan disposed in partially encompassing relation to said opening and in depending relation to said horizontally disposed member, said chute being adapted at its upper end to be received in nesting relation in said opening coacting means when said cooling section is disposed in operative position in said housing, said cooling section including cooling coil means and a blower disposed on said chassis on one side of said chute with the output end of said blower communicating

with said chute and the input end of said blower communicating with said cooling coil means for directing cooled air through said chute and into said opening and upper air receiving chamber, and condenser coil means and coacting fan means disposed on said chassis on the other side of said chute for cooling said condenser coil means.

13. A unit in accordance with claim 12 including sealing means coacting between said housing and said flange portions and between said opening coacting means and said chute for sealing said one side of said chute from said other side thereof, said sealing means being automatically deactivated upon movement of said cooling section from said operative position and being automatically reactivated upon return of said cooling section back to said operative position.

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