Dec. 28, 1965 I. KRAMER 3,225,562

ROOF TOP REFRIGERATION UNIT

Filed March 6, 1964 4 Sheets-Sheet 1

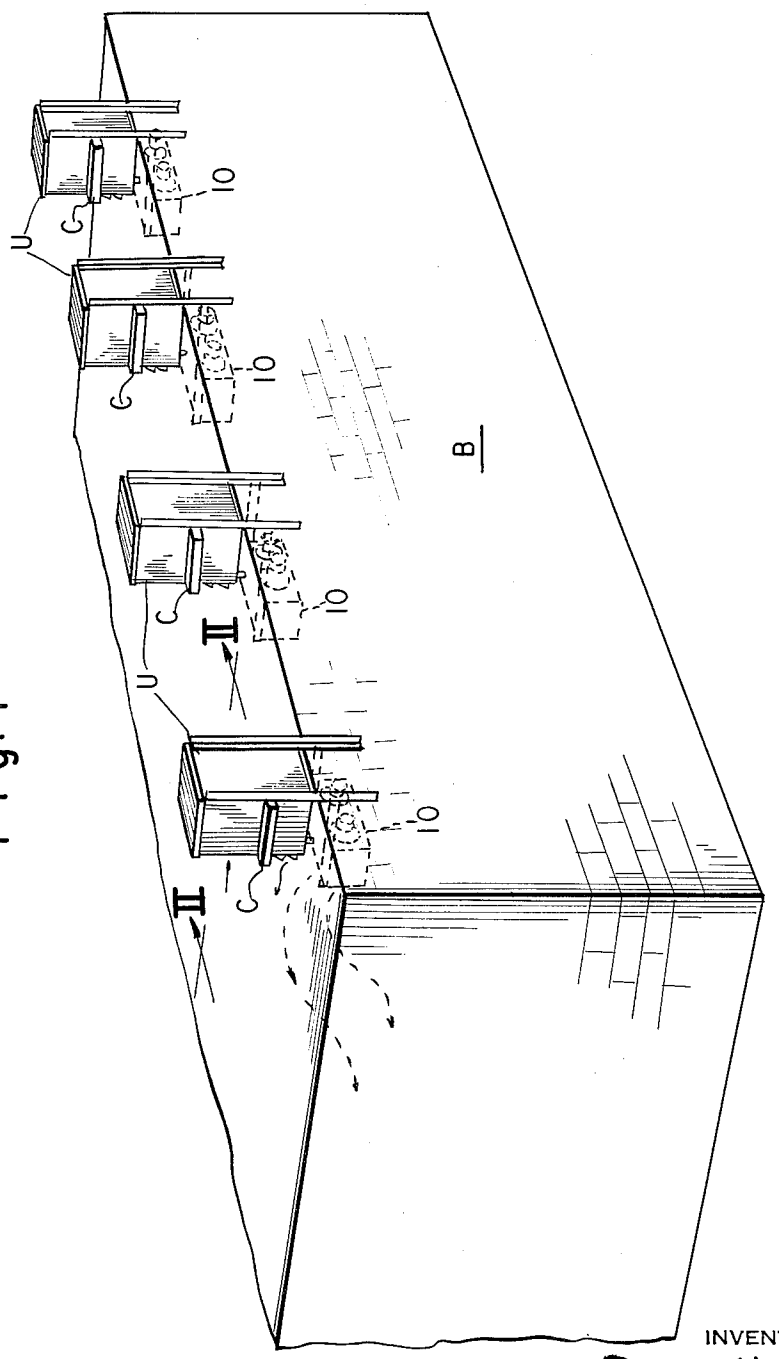


Fig. 1

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ROOF TOP REFRIGERATION UNIT

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Fig.3

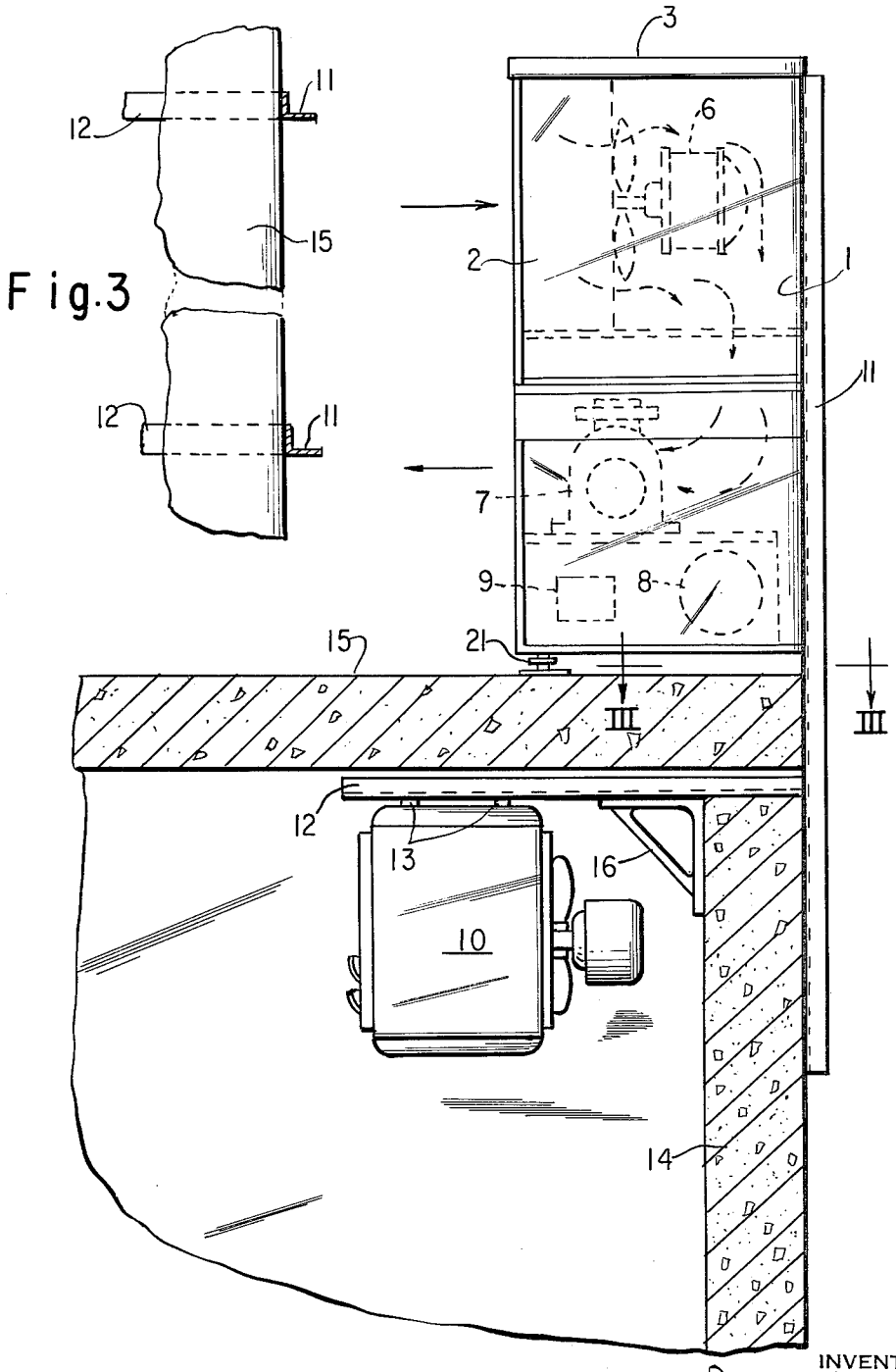


Fig.2

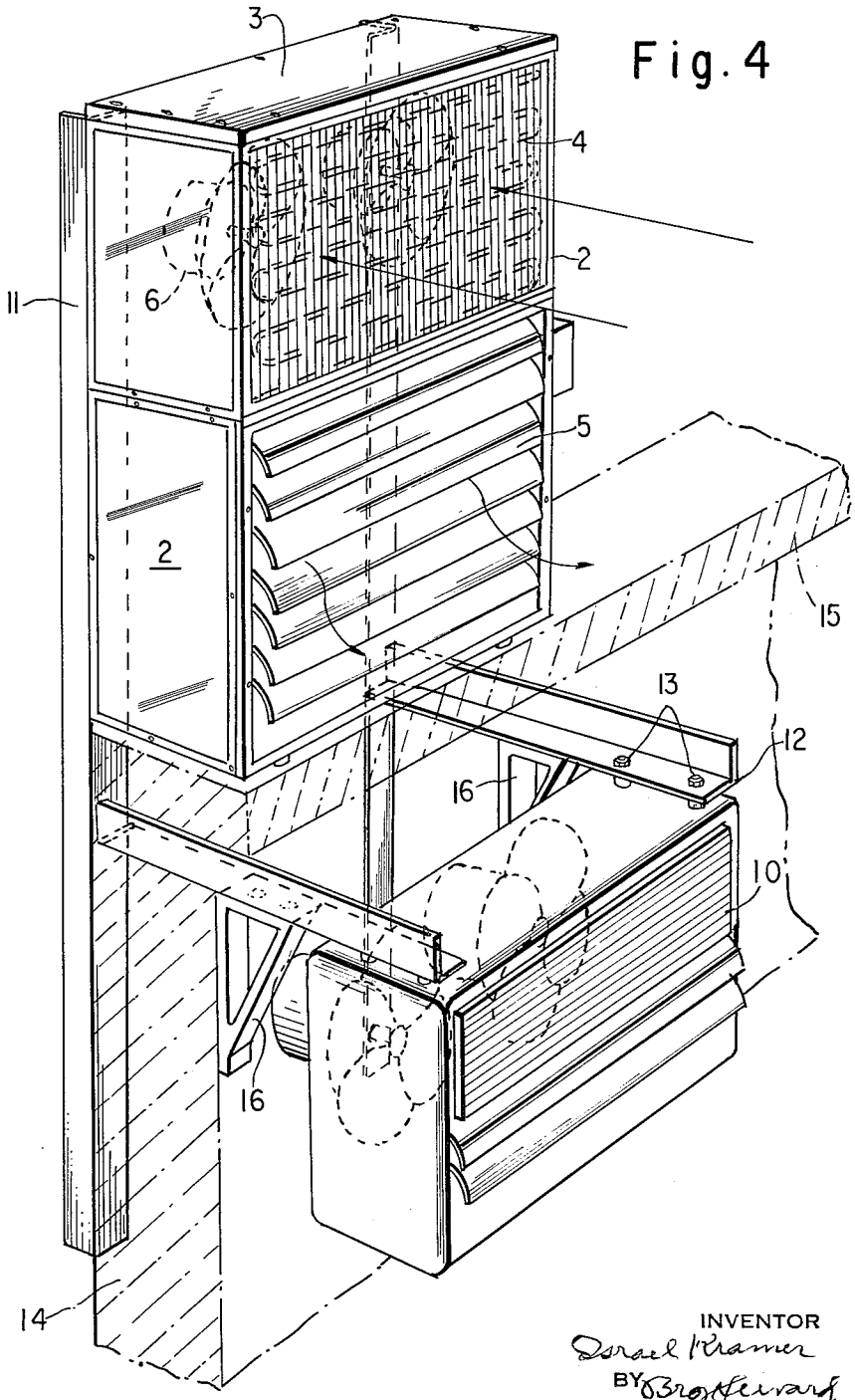
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Fig. 4



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ROOF TOP REFRIGERATION UNIT

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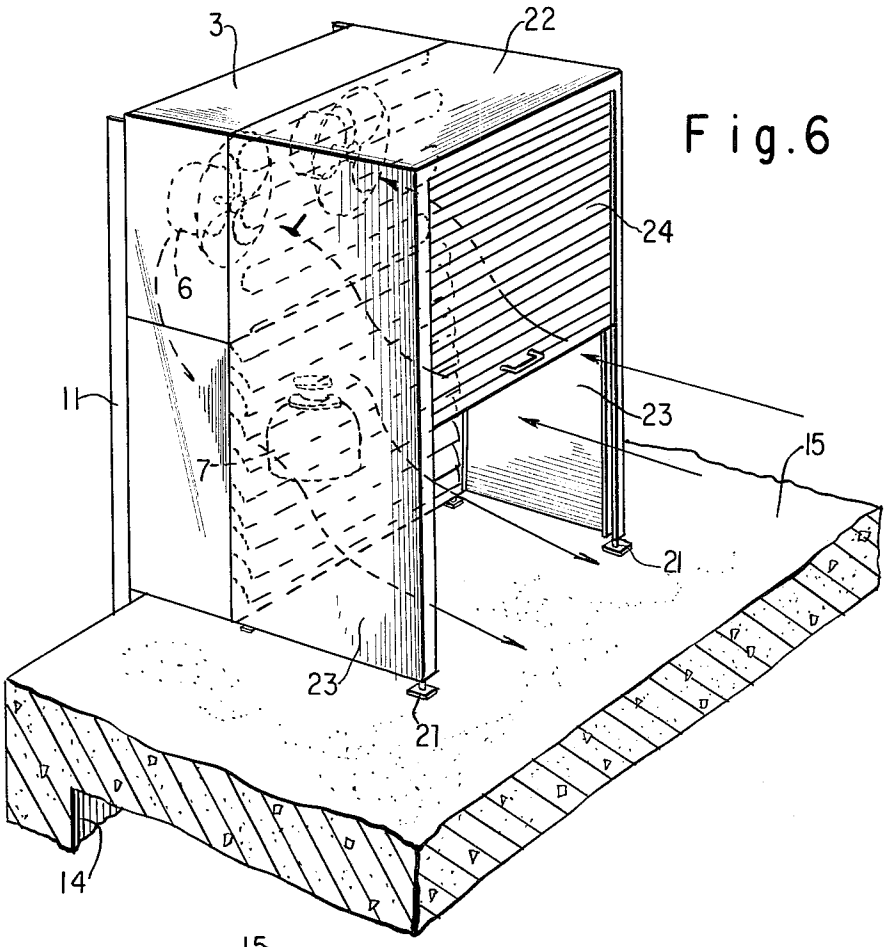


Fig. 6

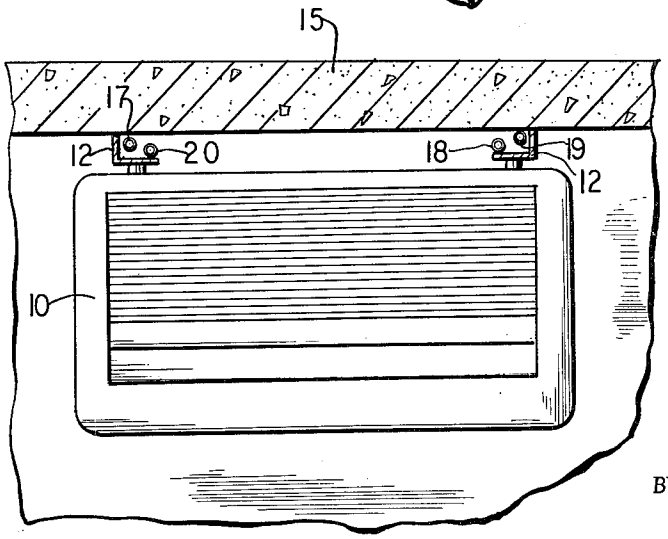


Fig. 5

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United States Patent Office 3,225,562 Patented Dec. 28, 1965

3,225,562

ROOF TOP REFRIGERATION UNIT

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15 Claims. (Cl. 62—263)

This invention relates to a roof top refrigerating or air conditioning unit or system with the object of providing such a product that includes all the operating elements sealed, charged and factory tested, together with the mounting for the same, in a single package entirely ready for year round operation in very low temperatures; that may be installed when constructing the building to be chilled and be put in use by the mere connecting of its electric control with the available source of energy; that may be of large horsepower; and that may have its high side serviced from the roof of the building, is supported wholly by a wall, and may not extend substantially laterally with the possibility of requiring invading or trespassing upon adjacent property in the servicing thereof.

Another object is to provide such a product that does not demand any special arrangements or structural additions to the building, nor any space to accommodate the high side member of the unit.

Another object is to provide such a product the installation of which dispenses with the need for the high level of skill normally required in field assembled refrigeration installations.

Another object is to provide such a product of which all the components or elements of the system, with the exception of the evaporator, are positioned upon the roof of the building while the evaporator is supported within and near the ceiling thereof; and which may be of relatively high power and adapted for operation in very low ambient temperature.

Another object is to provide such a product of which the high side member includes means for sheltering the person or persons servicing the same, and for partially restricting the inflow of ambient air under conditions of severly low tempertaure.

A further object consists in providing certain improvements in the form, construction and arrangement of the several parts, whereby the above named and other objects inherent in the invention are efficiently attained.

A practical embodiment of the invention is represented in the accompanying drawings, is which:

FIG. 1 perspectively represents four of the complete units or systems operatively installed upon and within a building to be chilled, the outdoor member of each unit being shown in full lines and the indoor member in broken lines;

FIG. 2, represents a greatly enlarged and more detailed view taken on the line II—II of FIG. 1, looking in the direction of the arrows;

FIG. 3, represents a broken, partial, sectional view taken on the line III—III of FIG. 2, looking in the direction of the arrows;

FIG. 4, represents on a scale larger than FIG. 1 but smaller than FIG. 2, a perspective view of the complete unit or system looking at the front thereof;

FIG. 5, represents on substantially the same scale as FIG. 4, a front view of the indoor member of the unit or system with its supporting means; and

FIG. 6, represents on a scale similar to FIG. 5, a perspective front view of a modified form of the outdoor member.

In brief summary, the invention contemplates a unitary structure composed of two encased members, the one including compressor, condenser, receiver and, if desired, a "Thermobank" device (two forms of which are fully

described in my U.S. Patent No. 2,440,146, issued April 20, 1948 and my U.S. Patent No. 2,718,764, issued September 27, 1955—Trademark Registration No. 534,945, issued December 19, 1950); and/or, if desired, the well known "Winterstat" arrangement for maintaining head pressure (see U.S. Patents Nos. 2,564,310, issued August 14, 1951; 2,761,287, issued September 4, 1956; 2,934,911, issued May 3, 1960; and 2,963,877, issued December 13, 1960; and also Trademark Registration No. 605,149, issued April 26, 1955) while the other member consists of the evaporator; all the said elements being connected, as in standard refrigeration and air conditioning systems, in a closed circuit by conduits from compressor to condenser, thence to receive, thence to evaporator with the inclusion of a pressure reducing device such as a thermostatic expansion valve, and finally back to the compressor with or without the interposition of a "Thermobank" and/or "Winterstat" arrangement. The members of the unitary structure are combined by a framework that is designed and adapted to rest upon the top of a vertical wall of a building to be chilled, with the high side member on the roof and the low side member supported from horizontal arms of the framework within and near the ceiling of the building; there being a possible minimum of lateral projection from the side of the building, and the high side member being serviceable by an attendant standing on the roof. The unitary structure may be completely charged with refrigerant and lubricant, sealed, factory tested and ready for operation by the connection of its electrical control with the available source of electricity, and it may be of high power and adapted for use under conditions of very low ambient temperatures.

In recent years I have caused to be placed on the market a system of this kind to which I have given the trade name or mark "straddle unit," because of its mounting at the top of a vertical wall of a building to be chilled, with the encased member of the unit containing the high side of the system, i.e. compressor, condenser, receiver and, if desired, a "Thermoband" device and "Winterstat" arrangement hanging down along and against the outside of he building wall; and the other encased member containing the evaporator with its usual thermostatic expansion valve or its equivalent, hanging down along but not in contact with the inside of the wall to perform its function of chilling the space within the building. There are two objections to this type of unit, (1) the servicing of the outside member requires the attendant with his tools dangerously to stand on a ladder, scaffold, or the like, and (2) the outside member may project into adjacent property and the servicing attendant be required to trespass where buildings are close to property lines.

The present invention eliminates the just named objections while retaining all the desirable features of a charged, sealed, and factory tested unit suited for year-round use regardless of the degree of ambient temperature, and which may be of high power.

Turning now to the drawings, in FIG. 1, is shown in perspective a portion of a building to be chilled such, of instance, as a warehouse for frozen foods, which is marked B, upon which are mounted four embodiments of this invention, the unitary structures being indicated by the letter U, and the purpose of this figure being to represent in a general way a practical installation of the invention. It will be observed that the encased high side of the system is out-of-doors and supported by a wall of the building, while the low side constituting the chilling member is within. The small boxes, denoted by C, on the high side casing house the electrical control panel for the system at hand for servicing, together with the high side elements, by an attendant standing on the roof. These may be located on either side or

the front of the casing at the option of the manufacturer.

A more detailed exposition is presented in FIGS. 2 and 4, in which the high side member of the system is shown as a casing having closed back, sides and top, marked respectively **1**, **2**, **2**, and **3**, while the front exposes the finned tubes **4** of the condenser near the top and has adjustable louvers **5** there-below. Within this member are fixed the condenser and its fans represented generally by the numeral **6**, in the upper portion, the compressor **7** below the condenser, the receiver **8**, and a "Thermobank" device **9** at the bottom. The direction of air flow induced by the condenser fans is indicated by the arrows on FIGS. 2 and 4, entering through the tubes **4** of the condenser, then turning downwardly around the compressor, and outwardly through the louvers **5** due to the fact that this high side member is fitted with integral top **3**, sides **2**, **2**, and back **1**. It should be explained that the particular arrangement of these elements within this member does not constitute a part of the present invention, which is directed to the mounting of the high side and low side members, as such arrangement is similar to that previously employed in my heretofore described "straddle units," though the direction of the air flow is a matter of consequence in the present structure as just indicated. It should also be noted that the closed back **1**, provides protection for the elements within the casing against wind blowing toward the back.

The low side member of the system is the evaporator which, together with its fans, bears the general reference numeral **10**. As this may be of any well known or approved construction and its particulars are not involved in this invention it is deemed unnecessary to describe the same; but it will be observed that it is positioned within the space to be cooled and near the ceiling and a side wall of the building.

The framework which connects the two members to form a unitary structure and also supports the same in operative positions constitutes the outstanding characteristic of this invention and will now be explained.

A pair of uprights **11**, **11**, which are preferably composed of angle or channel iron, the former being shown in the drawings, is fastened in any suitable manner, as by screws, bolts or welding to the back of **1** of the exterior, high-side member, the said uprights preferably being flush with the top **3** of the said member but projecting well below the bottom of the same as illustrated in the drawings. If preferred, these uprights could be fastened to the sides **2**, **2**.

From points in the said uprights **11**, **11**, sufficiently below the high side member to allow space for the interposition of the roof of the building, there project laterally and inwardly two arms **12**, **12**, which are firmly secured, as by welding or bolting, to the uprights and which may likewise be composed of angle or channel iron, the former being represented in the drawings. The low side member, i.e. the evaporator **10**, of this unit system is hung or suspended from the arms **12**, **12**, by four bolts or the like some of which are designed by the numeral **13**.

From the foregoing it will be seen that the entire refrigerating or air conditioning unit U may be placed in operative position during the construction of the building to be chilled by resting the arms **12** upon and extending inwardly from a wall marked **14**, with the lower portions of the uprights **11** against the outer face of the said wall. This is done, of course, before the roof, marked **15**, is put in place. If desired, the positioning of the unit structure may be reinforced by metallic braces **16**, suitably fastened to the arms **12** and bearing against the inner side of the wall **14**, but it should be made clear that the thickness of the wall may vary according to building preference and that these braces may be inserted after the unit structure is in operative position, so that there is complete flexibility of installation.

Following the foregoing, the roof **15** of the building is laid, there being sufficient space between the bottom of the high side member of the system and the arms **12** for its insertion. There is also opportunity for flexibility in this respect as the producer of the unit structure may vary the point of attachment of the arms **12** to the uprights **11** according to previously supplied information as the the building dimensions.

It will be understood that several elements of the system are interconected by the usual conduits, a partial showing of which appears in FIG. 5. Thus, the conduits which connect the compressor discharge with the condenser and the latter with the receiver are housed within the high side member of the system and are not illustrated, but the conduit which supplies liquid refrigerant from the receiver **8** to the evaporator inlet through the thermostatic expansion valve is nested within an arm **12**, as is indicated at **17** in FIG. 5. A similar description applies to the conduit connecting the evaporator outlet with the compressor intake through the "Thermobank" device **9** which is marked **18** in FIG. 5. Likewise, the conduit which leads from the compressor discharge to the evaporator inlet, by-passing the condenser and the thermostatic expansion valve, for defrosting purpose, bears the numeral **19** in this figure. And, finally, some of the electric wires connected with the control panel C are denoted by **20**. At the sides of the front lower edge of the high side member of the unit may be fixed a pair of screw adjustable supporting legs **21**, **21**, the function of which is properly to balance the said member upon the roof of the building as well as the uprights **11**, **11**.

It should be noted that the wall **14** and roof **15** may be of any appropriate thickness; that the same may be insulated when very low temperatures within the building are desired, or without insulation when the chilling is for human comfort; that the evaporator **10** could be replaced with one provided with a blower and connected with a ducting system to distribute the chilling effect to various portions of a partitioned building, or with a water chilling evaporator equipped with a water circulating system to service various rooms in a building each room having its separate air chiller, the arrangement of the unit system of this invention having the virtue of avoiding the exposure of water pipes to outdoor temperatures with possible freezing and eliminating the need of an anti-freezing chemical in the water which would reduce its heat transfer effect.

The just recited variations are not presented as per se modified forms of the invention, but rather as explanatory of its versatility and adaptability to a wide range of needs.

The modified form of the high side member illustrated in FIG. 6, is directed especially to the comfort of the servicing attendant during inclement weather. This is accomplished by extending the top **3** forwardly as indicated at **22**, and similarly extending the sides **2**, **2**, as is indicated at **23**, **23**. A closure or shuttering means **24**, which may be either manually or automatically operated as is well understood in the art, here represented as a vertically sliding device, such as the familiar garage door, may be fitted at the front of these extensions of the top and sides, thus providing an at least partially enclosed and protected space within which the servicing attendant or attendants may stand while working and be comfortable though on a roof top. The particular form of the shuttering means is not a matter of consequence as vertically hinged doors, or a sliding closure, or even a stiff curtain, or the like, could be substituted. The direction of the air stream within the high side member, as explained above, will serve to warm this servicing space and thus assure personal comfort, without interfering with the free movement of the air stream during normal operation of the system. If desired, the shuttering means **24** may be omitted with the extensions of the top and sides serving merely to provide protection from precipitation and/or lateral wind.

It should be added that the door **24**, or its alternative, may be partially closed, even when there is no servicing, in very low ambient temperatures, for the purpose of maintaining adequate head pressure without the provision of special means within the high side member for accomplishing this result.

Furthermore, this modification of the invention is not limited to a high side member mounted on the roof as herein represented, but is adapted to a high side member in any exposed location.

When in the claims there is used the expression "on the roof" it is not intended to limit the structure or arrangement to actual contact with the roof as the high side member may be spaced therefrom vertically and/or laterally provided the member may be serviced from the roof.

It will be understood that various changes may be resorted to in the form, construction and arrangement of the several parts without departing from the spirit and scrape of the invention, and hence, I do not intend the same to be limited to details herein shown or described except as the same way be included in the claims or be required by disclosures of the prior art.

What I claim is:

1. A complete refrigerating or air conditioning unit comprising, an outdoor high side member including compressor, condenser, and control panel, constructed, designed and adapted to be serviceable from the roof of a building, a low side member constructed, designed and adapted to be supported beneath the roof of and within the said building, and a framework connecting the two members, said framework comprising at least one upright portion fast to the high side member and extending downwardly therefrom and having at least one arm extending laterally and inwardly into the said building for connection to the low side member beneath the roof as well as for supporting the entire unit by resting upon the building wall.

2. A unit as defined in claim **1**, in which unit the upright portion of the framework extends downwardly to lie against the outside of the wall of the said building.

3. A unit as defined in claim **1**, in which unit the framework emobdies a pair of upright portions and a pair of laterally extending arms.

4. A unit as defined in claim **1**, which unit also includes conduits nested in the framework and connecting the high and low side members.

5. A complete refrigerating or air conditioning unit which includes an outdoor high side and an indoor low side with all the operating elements, at least partially charged with refrigerant, together with a framework mounting for the unit, the latter being ready for year round operation in low winter temperatures and adapted to be put into use when installed by the connection of its electric control with an available source of electric energy, the said framework being constructed, designed and adapted to support the high side in position to be serviced from the roof of a building and to be connected to the low side within the said building, and be supported by a wall of the said building.

6. A unit as defined in claim **5**, in which unit the framework is constructed, designed and adapted to lie along the outer face of the said wall of the said building and also be supported by the said wall.

7. A unit as defined in claim **1**, which unit is adaped for installation when constructing a building by the placing of its framework upon a wall of the building before the roof is put in place.

8. A unit as defined in claim **1**, in which unit the only partition between the high and low sides when in operative position consists of the roof and wall of the building.

9. A unit as defined in claim **1** in which the upright portion of the framework extends downwardly to lie against the outside of a wall of the building, and which also includes at least one brace fastened to an arm of the framework and lying against the inside of the said wall to secure the unit in position while the building roof is being constructed and placed in position.

10. An encased high side member of a refrigerating or air conditioning system intended for outdoor installation provided with a back, sides and top, the top and sides projecting forwardly from the said member to provide a partially sheltered space for servicing the elements within the said member.

11. A high sidemember as defined in claim **10**, which also includes a shuttering device adapted to at least partly close the said forward extensions of the top and sides.

12. A high side member as defined in claim **10**, in which a condenser and a compressor are located within the member and there is means for circulating incoming air from the sheltered space through the condenser, then substantially at right angles about the compressor, and finally outwardly to the sheltered space.

13. A high side member as defined in claim **10**, in which the condenser is positioned above the compressor and fitted with at least one cooling fan that provides the air circulation.

14. A framework designed, constructed and arranged for connecting and supporting the high side and low side members of a refrigerating or air conditioning unit with the high side serviceable from the roof of a building and the low side within the building, said framework comprising at least one upright portion designed to extend upwardly above the roof and be fast to the high side member, and also designed to extend downwardly below the roof against the outer face of the building wall, and at least one laterally projecting arm fast to the upright portion and extending into the building for connection to the low side member.

15. A framework as defined in claim **14**, which embodies two upright portions and two arms.

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