

Feb. 7, 1950

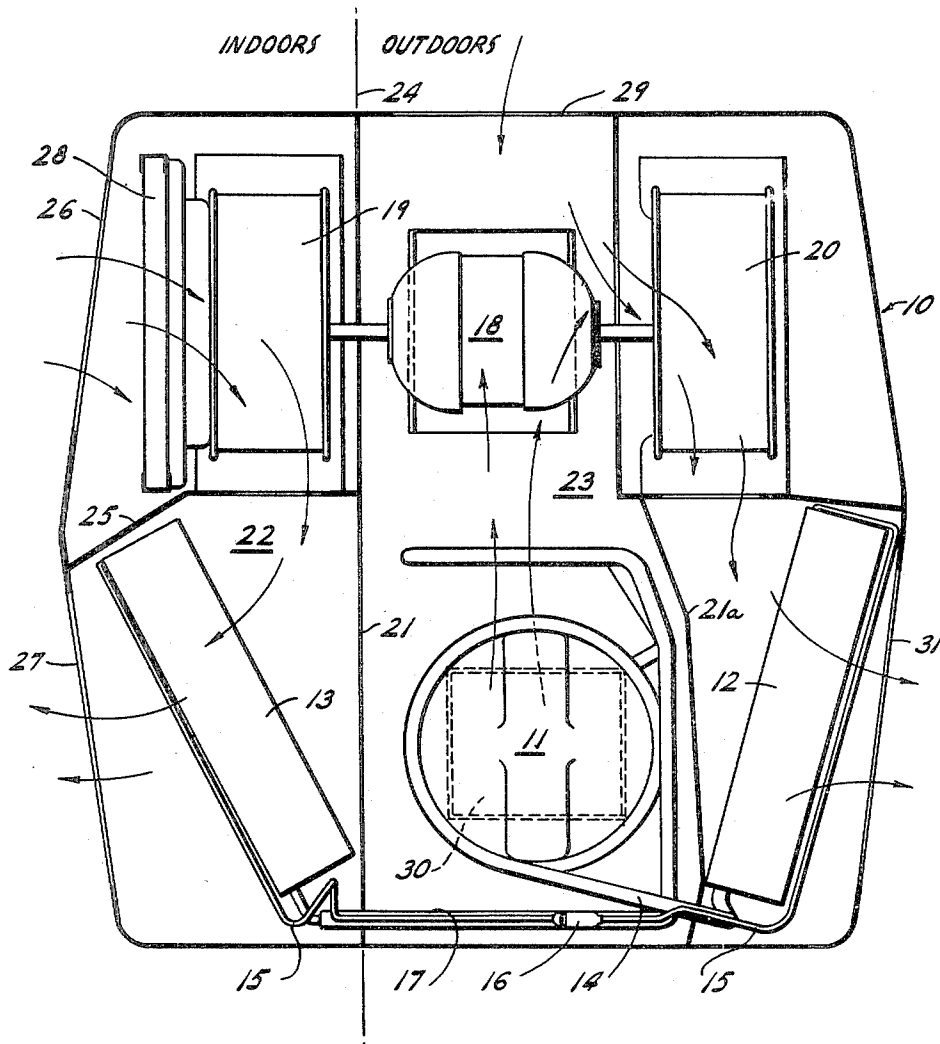
F. D. PELTIER ET AL
AIR CONDITIONING APPARATUS

2,496,355

Original Filed March 4, 1948

4 Sheets-Sheet 1

FIG. 1.



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4 Sheets-Sheet 2

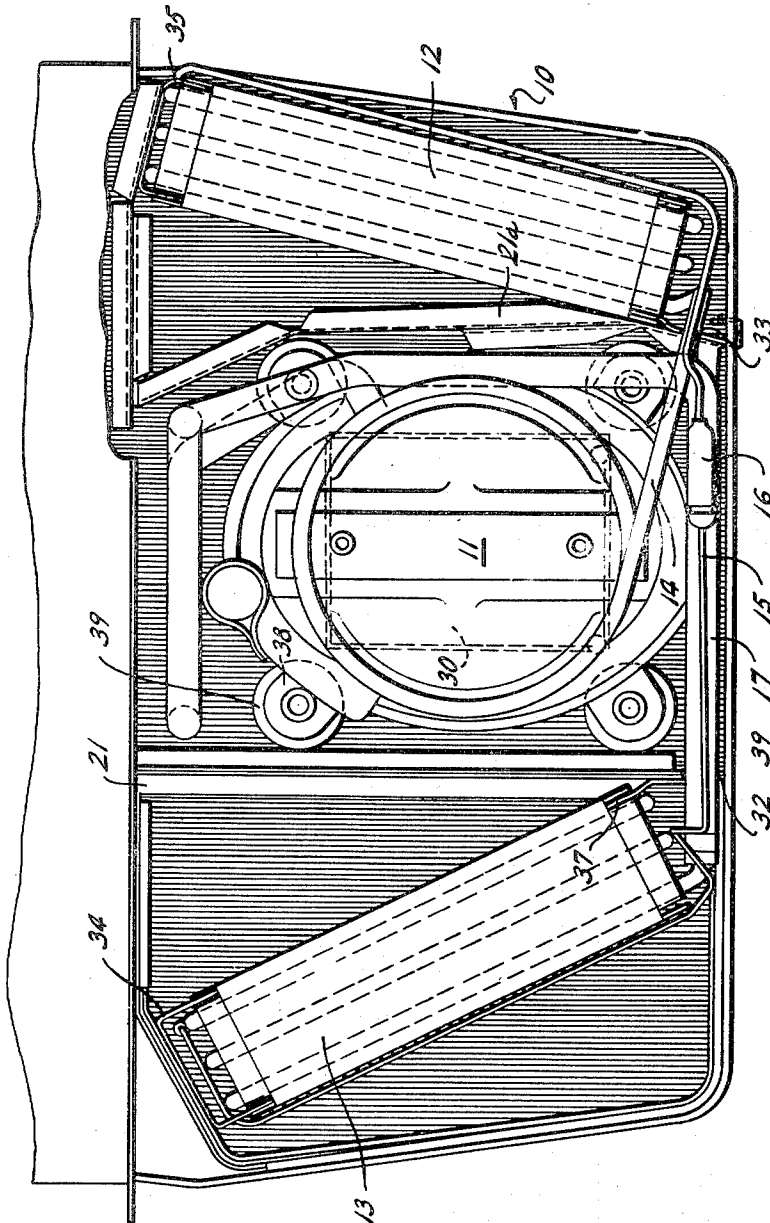


FIG. 2.

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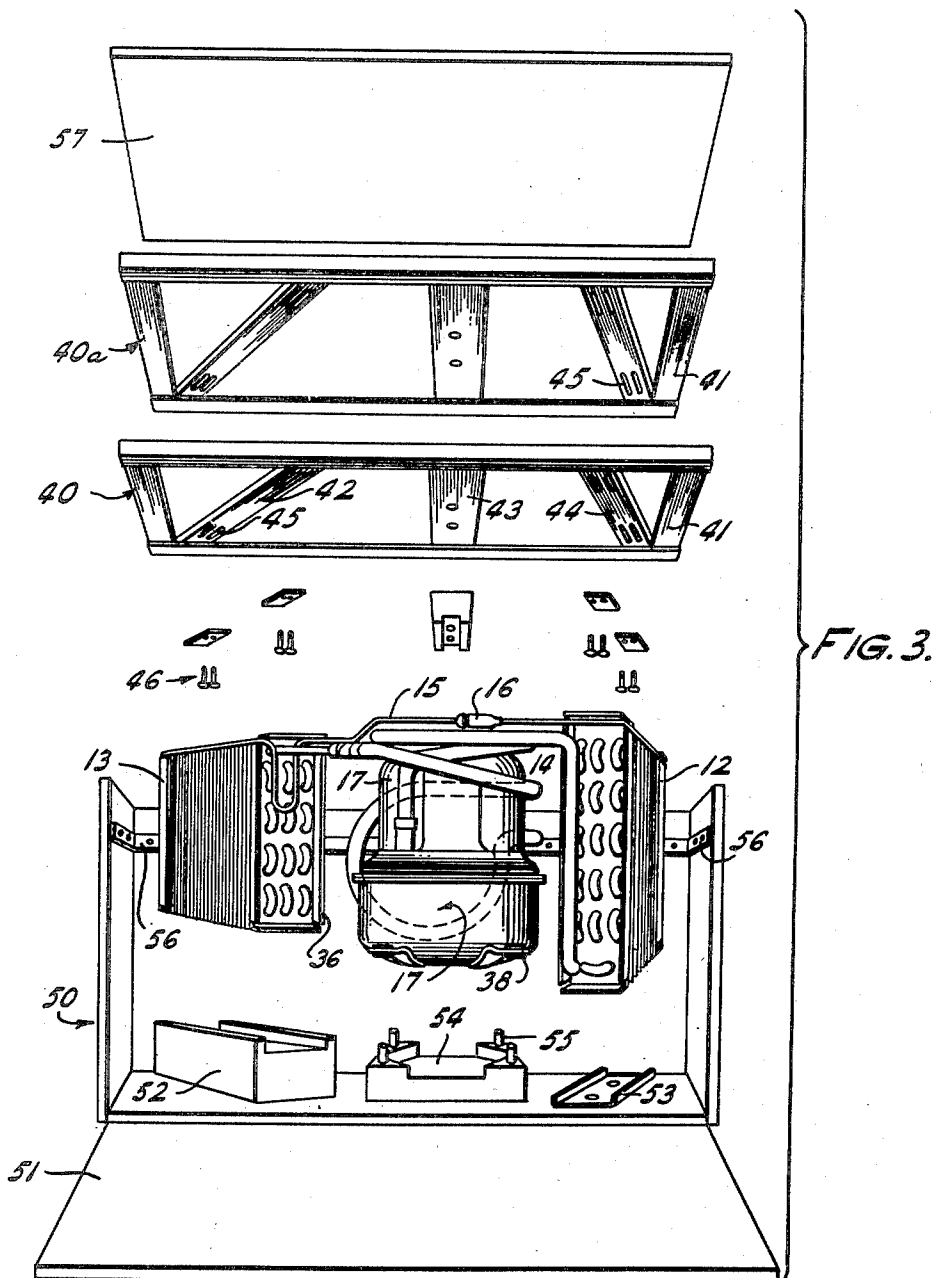
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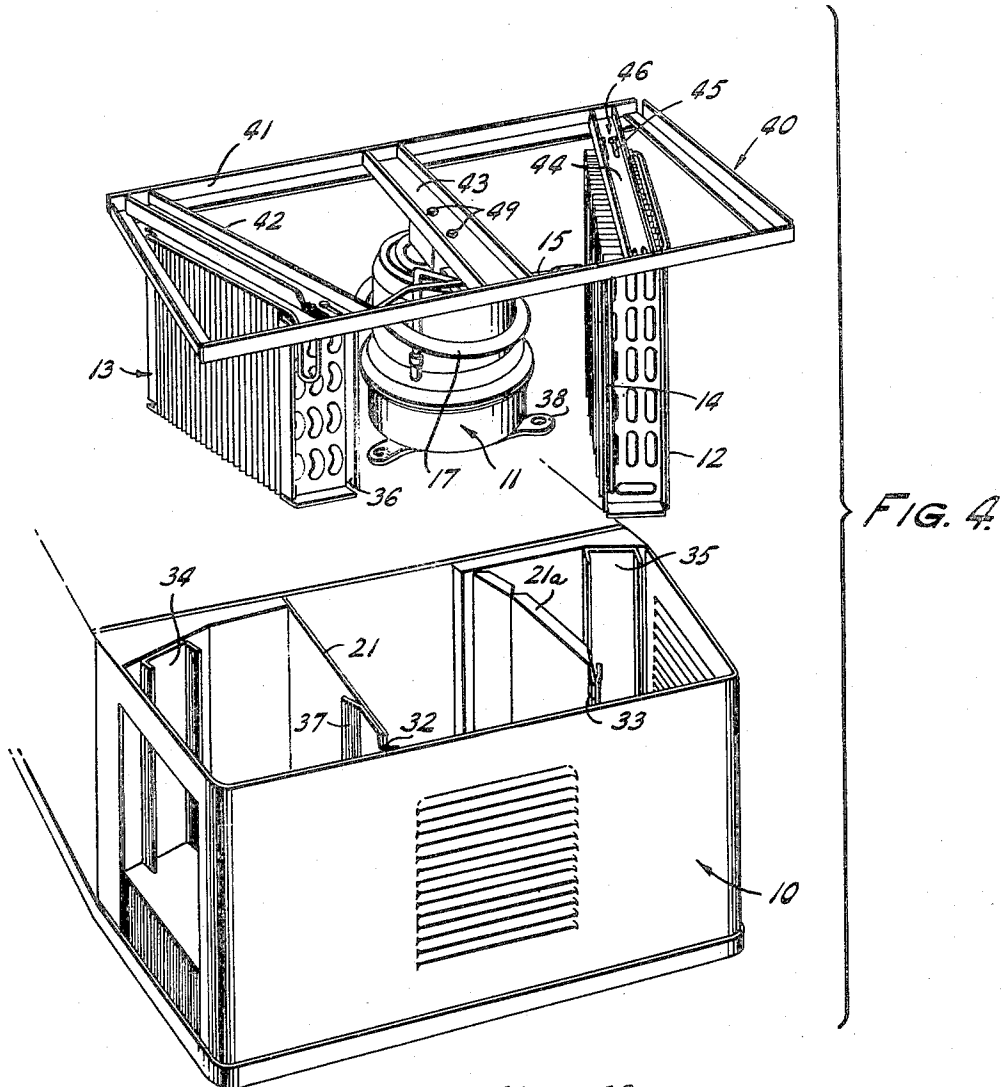


FIG. 4.

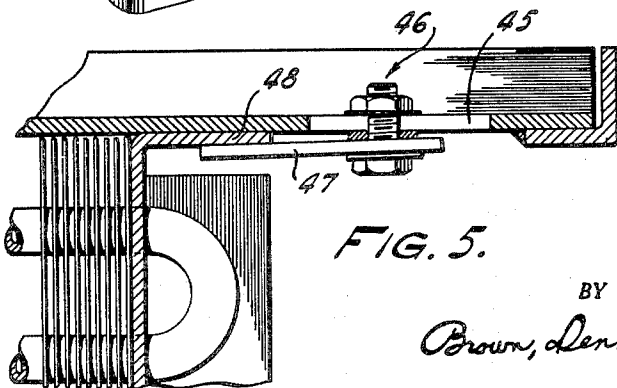


FIG. 5.

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UNITED STATES PATENT OFFICE

2,496,355

AIR CONDITIONING APPARATUS

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Original application March 4, 1948, Serial No. 13,037. Divided and this application February 3, 1949, Serial No. 74,362

3 Claims. (Cl. 62—129)

1

The present invention relates to refrigeration apparatus, and is a division of our copending disclosure bearing Serial No. 13,037, filed March 4, 1948. A method of and apparatus for shipping and handling such refrigeration apparatus is claimed in the said copending disclosure.

More particularly, this invention has to do with improvements in refrigeration systems, of the type used for example in air conditioning units, which improvements greatly facilitate repair and replacement of such systems. As set forth in the copending disclosure above referred to, the procedures involved in handling and servicing air conditioning apparatus have been unduly complex, particularly in view of the fact that it has not been possible readily to disassociate the sealed refrigerating system from the cabinet, independently of the fan motor and its associated blowers, which latter components do not generally require removal. Frequently, such independent removal could only be accomplished by uncoupling certain of the refrigerant flow conduits which connect the compressor, condenser and evaporator in series flow circuit. Then too, in many instances removal of the refrigerating system required virtually complete dismantling of the cabinet.

In general, with apparatus and procedures of the kind heretofore available, it has frequently proven that removal of an air conditioning system from the cabinet, for repair purposes, was practicable only at the factory, or at some well equipped service depot.

Broadly, it is an object of this invention to overcome the aforesaid difficulties and disadvantages, by the provision of a novel sealed refrigeration system—including a compressor, condenser and evaporator arranged in series flow circuit—which may be removed from its cabinet without the necessity of breaking the tubing connections between the elements, and without movement of, or disturbance to, other major elements of the air conditioner unit.

It is also an important object of the present invention to provide novel apparatus of such a nature as to facilitate assembly and disassembly of the system with the cabinet, associated blowers and the like included in said cabinet, as well as serving to support the system during shipping.

To the foregoing general ends, the invention contemplates the provision of a separable frame or "skeleton" adapted to be superimposed across the top of an air conditioning unit, after the cover has been removed therefrom, and including means through the agency of which the sys-

2

tem may be releasably coupled with the said frame for removal from the casing or housing.

Practice of the concepts of the said copending case, and utilization of the apparatus claimed herein result in a number of significant advantages, among the more important of which are the following:

A. The number of components to be inspected and reconditioned at the factory is reduced to a minimum.

B. The weight of parts and components to be shipped is similarly reduced, resulting in a less expensive crate and in lowered transportation charges.

C. Extremely rapid restoration of air conditioning service is possible, on the customer's premises, without the necessity of replacing the entire apparatus.

D. The inventory of service parts maintained in distributors' and dealers' warehouses is reduced to a minimum.

E. The risk of damage to the decorative casing of the refrigerator or air conditioning unit is eliminated, since the system is removed while the decorative casing—as well as the fan motor and associated blowers—may be left on the customer's premises.

F. The overall apparatus is considerably more attractive, from the sales point of view, since it lends itself particularly well to deferred payment purchases. Companies financing such purchases desire that the unit be serviced on the customer's premises, and prefer that a casing or cabinet remain with the purchaser, which cabinet carries a serial number serving as the identification on the deferred payment agreement.

The manner in which the foregoing and other objects and advantages of our invention are realized, will be understood from the following description and claims taken in conjunction with the accompanying drawings, forming a part of this application, and in which:

Figure 1 is a diagrammatic plan view of air conditioning apparatus adapted for use with the present invention;

Figure 2 is a plan view, in greater detail and on an enlarged scale, illustrating those portions of the apparatus which can all be simultaneously removed without uncoupling any of the interconnecting tubing;

Figure 3 is an exploded, perspective illustration showing a shipping crate which may advantageously be employed in accordance with the broader teaching of our invention, and in the

3

manner claimed in the application of which this is a division;

Figure 4 is an exploded perspective view illustrating the system supported by one of the aforesaid frames and indicating the manner in which said system may be introduced into or withdrawn from an air conditioner casing; and,

Figure 5 is a sectional view illustrating the manner in which the skeletal frame may be readily secured to the refrigerating system.

Now making more detailed reference to Figure 1 which, by way of example, illustrates air conditioning apparatus with which the invention is particularly useful, it will be seen that the apparatus comprises a casing, designated generally by the reference numeral 10, which casing encloses a refrigerating system comprising a motor-compressor 11, a condenser 12, an evaporator 13, and associated conduits through the agency of which said compressor, condenser and evaporator are coupled in series flow circuit. These conduits include a discharge line 14, through which compressed refrigerant is delivered to the condenser 12, a feed line 15 which, as shown, comprises a continuously open restricted connection, through which the liquified refrigerant is fed to the evaporator for expansion therein. As illustrated, a strainer 16 may be included in the feed line, and a suction conduit 17—a portion of which is provided with suitable thermal insulation—serves to return the volatilized refrigerant to the compressor 11. Disposed in generally axial parallelism with the above-described sealed system is air-moving apparatus including a motor 18, and a pair of blowers 19 and 20 which, respectively, are adapted to cause circulation of air across the said evaporator 13 and the condenser 12.

As indicated at 21, the cabinet is provided with a partition serving to divide the same into an evaporator chamber 22 and a condensing chamber 23, that portion of the cabinet which comprises the evaporator chamber (the portion lying to the left of dashed line 24 in Figure 1) is adapted to extend into a room or zone to be conditioned, while the portion of the cabinet lying to the right of said dashed line 24 extends outwardly of said room, preferably through a window opening thereof.

The evaporator chamber 22 is, in turn, subdivided by means of a partition 25, into a section housing the blower 19 and a portion within which is disposed the evaporator 13. Suitable air ingress and egress openings indicated at 26 and 27, respectively, provide for circulation of room air into the casing 10, through a filter 28, thence into the blower 19, which is preferably of the centrifugal type, from whence it is forced through evaporator 13 and subsequently redelivered to the room or space to be conditioned. The condensing unit is cooled by outside air flowing into the chamber 23 through inlet openings 29 and 30, from whence it is directed through the condenser 12 by the blower 20, and finally delivered to the outside atmosphere through a port represented at 31.

Insofar as the present invention is concerned, further and more detailed description of the construction and operation of the air-controlling means is not necessary herein. However, if desired, reference may be had to the copending application of Edward L. Hart, bearing Serial No. 15,383, and filed March 17, 1948, wherein are fully disclosed and claimed certain features of the apparatus illustrated in Figure 1.

As will now be described, the compressor, con-

4

denser and evaporator which comprise the refrigeration system are so relatively disposed, and oriented with respect to the air flow-controlling means, that said system may be disassociated from the housing 10 without interfering with either the said flow-controlling means, or requiring the disconnection of any refrigerant flow conduits, or necessitating dismantling of the cabinet.

To these general ends, and to realize the objects and advantages enumerated above, the invention provides for ready and convenient removal of said system from the cabinet or housing, as a unitary assembly, and for introduction of a replacement unit or system, in which connection reference will be had to Figures 2 to 4, inclusive.

As clearly appears in Figures 2 and 4, the partition 21, and a corresponding partition 21a which serves to subdivide that portion of the cabinet which houses the condensing unit, are both provided with reentrant portions or notches shown, respectively, at 32 and 33, which notches immediately underlie the top wall or cover of the cabinet (not illustrated) and through which pass the refrigerant flow conduits when the system is introduced within the cabinet. Thus, of the cabinet elements, only the top wall or cover need be removed. Further, a supporting channel 34 is disposed within the evaporator chamber and a similar channel 35 within the condenser chamber, said channels being so dimensioned and disposed as to provide support for the evaporator 13 and the condenser 12, respectively. Cooperable with the channel 34, and effective to support forward flanging 36 of evaporator 13, is a vertically extending flange 37. As is apparent from consideration of Figures 2 and 4, the evaporator is firmly but removably supported within the housing 10 with its rear face engaged within the channel 34 and one of its forward edges supported by the vertically extending flange 37. The condenser is supported within the condenser chamber in a similar manner and, accordingly, such support need not be described in detail.

As appears to best advantage in Figure 2, the compressor 11 is provided with laterally extending feet 38, which feet are resiliently supported upon the floor of the cabinet through the agency of resilient springs or washers, which appear at 39 in Figure 2. The described system may be withdrawn from the cabinet as a unit, and, as best illustrated in Figure 4, without disturbing the refrigerant flow conduits or necessitating removal of the blowers or the blower motor.

To facilitate such removal, as well as subsequent handling of the system, the invention provides the aforementioned skeletal frame which is designated, generally, at 40. This frame and the manner in which it is adapted to support the system is described in what follows, and it should be borne in mind that two such frames may advantageously be employed during practice of this invention, as will be fully set forth hereinafter.

The skeleton or frame 40 comprises rigid angle sections 41 disposed peripherally of the frame area, and three cross channels 42, 43 and 44, each of which spans the width of the frame and is suitably secured to the peripheral framing elements 41. The channel members 42 and 44 are so disposed and relatively arranged as to overlie the evaporator and the condenser, respectively, when the frame is placed upon the open top of the cabinet 10. Each of said channels 42 and 44 is provided with a pair of apertures, one of which is best illustrated at 45, in Figure 5, through which

apertures extend fastening assemblies 46, said assemblies being slidable within apertures 45 and each carrying a laterally projecting support member 47 disposed for engagement beneath a horizontally disposed flange 48 extending from the coil to be supported. The center channel 43 is also apertured to accommodate mounting elements 49, which latter are employed in support of the compressor 11.

As will now be understood, the system to be removed is coupled to the channels 42, 43 and 44 through the agency of the elements 46 and 49, after which the system may be readily removed from the cabinet. During such removal the refrigerant flow conduits are withdrawn from the notches 32 and 33 formed, respectively, in the upper edges of partitions 21 and 21a.

To provide a full understanding of the present invention, an advantageous shipping and handling procedure is now described. It is to be understood, of course, that the construction and relative association of the supporting skeleton 40, and of the components of the system to be supported thereby, are such as to accommodate a variety of service and handling operations which may be encountered in practice. However, the following example well illustrates the advantages of our invention.

In manufacture, the units or systems to be shipped are "built up" on a temporary shop base which holds the compressor, condenser and evaporator in the relative positions illustrated in Figures 3 and 4. When the assembly has been completed, and charged, and is ready for shipment, one of the skeletal frames 40 is attached to the system in the manner fully described above, and the resultant unitary assembly is then lowered within a crate of the type illustrated at 50, in Figure 3. For purposes of illustration, the forward side 51 of the shipping crate is shown as removed from said crate, and it will be seen that the crate is provided with support structures 52 and 53 adapted, respectively, to support the evaporator 13 and the condenser 12, when the system is packed for shipment. Intermediate said support structures 52 and 53 the crate carries a block 54 having upwardly extending fastening elements 55 adapted to be received within the laterally extending feet 38 of compressor 11. When introduced within the crate, the system is supported by the elements 52, 53 and 54, and by cleats 56 which extend around the interior of the crate, in the upper portion thereof, and against the upper surfaces of which bear the downwardly presented surfaces of the frame 40; said frame being of a size to fit snugly within the crate. Thus the frame serves the dual function of supporting and unitarily connecting the components of the system, and of maintaining the system within the crate in spaced relation with the walls of said crate.

As will be evident, the unit is now supported for shipment. However, prior to such shipment, an additional frame (shown at 40a, in Figure 3) is preferably inserted within the crate, being carried by the upper surface of frame 40 and securely positioned by the overlying cover 57. After fastening of the crate cover 57, the unit or system is shipped, for example, to the home of a customer whose apparatus is in need of service.

Upon arrival, the service operation is very rapidly and simply accomplished by removing the frame 40a from the crate, coupling said frame to the unit to be serviced, after which the said unit is withdrawn from the cabinet. The re-

placement unit is then inserted in said cabinet, with the condenser and evaporator supported in the manner set forth above, and the apparatus is again ready for operation. As will be evident, the unit to be repaired is then placed within the shipping crate 50 and the frame 40—which provided support for the replacement unit—is placed within the crate upon the upper surface of frame 40a which now supports the unit to be repaired.

From the foregoing description it will now be understood that the novel apparatus of this invention results in substantial simplification of service procedures and additionally, greatly increases the number of service operations which may be carried out on the customer's premises, without opening any refrigerant flow conduits. The latter feature is particularly advantageous where hermetically sealed systems are concerned, since such systems are not ordinarily provided with service shut-off valves.

We claim:

1. In air conditioning apparatus: evaporator, compressor and condenser elements; a housing having an open top; partition means within said housing defining evaporator, compressor and condenser chambers; means releasably supporting said evaporator, compressor and condenser elements each within a corresponding one of said chambers, said partition means having reentrant portions opening toward said open top, said evaporator, compressor and condenser elements being provided with flow conduits interconnecting said elements in refrigerant flow circuit, said conduits extending across said partition means and through said reentrant portions; and a support member extending across and releasably secured to each of said elements to provide a rigid unitary assembly, said assembly being removable from said housing through said open top without interference from said partition means and without disconnection of said flow conduits.

2. In air conditioning apparatus: a top-access housing; upstanding partition means within said housing dividing the same into evaporator and condenser chambers; an evaporator element within said evaporator chamber; a compressor element and a condenser element within said condenser chamber, air propelling means and associated duct work within said housing cooperable to direct cooling air in heat exchange relation with said condenser element and air to be cooled in heat exchange relation with said evaporator element; support structure spanning said evaporator, compressor and condenser elements and detachably secured thereto to provide a rigid unitary assembly in which said elements are maintained in predetermined relation with respect to said air propelling means and said duct work; and refrigerant flow conduits interconnecting said elements and extending across said partition means, said assembly including said conduits being withdrawable through the top of said housing independently of said air propelling means and said duct work.

3. In air conditioning apparatus: a top-access housing; upstanding partition means within said housing dividing the same into evaporator and condenser chambers; an evaporator element within said evaporator chamber; a compressor element and a condenser element within said condenser chamber, said elements having upwardly presented surfaces lying substantially in a common plane; air propelling means and associated duct work within said housing cooperable to direct cooling air in heat exchange relation with

said condenser element and air to be cooled in heat exchange relation with said evaporator element; a support member overlying the upwardly presented surfaces of said elements and detachably secured thereto to provide a rigid unitary assembly in which said elements are maintained in predetermined relation with respect to said air propelling means and said duct work; and refrigerant flow conduits interconnecting said elements and extending across an upper edge portion of said partition means, the construction and relative disposition of said unitary assembly, said air propelling means and said duct work being such that said assembly—including said con-

duits—is withdrawable through the top of said housing independently of said air propelling means and said duct work.

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REFERENCES CITED

The following references are of record in the file of this patent:

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