PUBLISHED
APRIL 27, 1943.
BY A. P. C.

R. HINTZE
MOTOR-DRIVEN REFRIGERATING APPARATUS
OF THE COMPRESSION TYPE
Filed May 29, 1940

Serial No.
337,854

Fig. 1

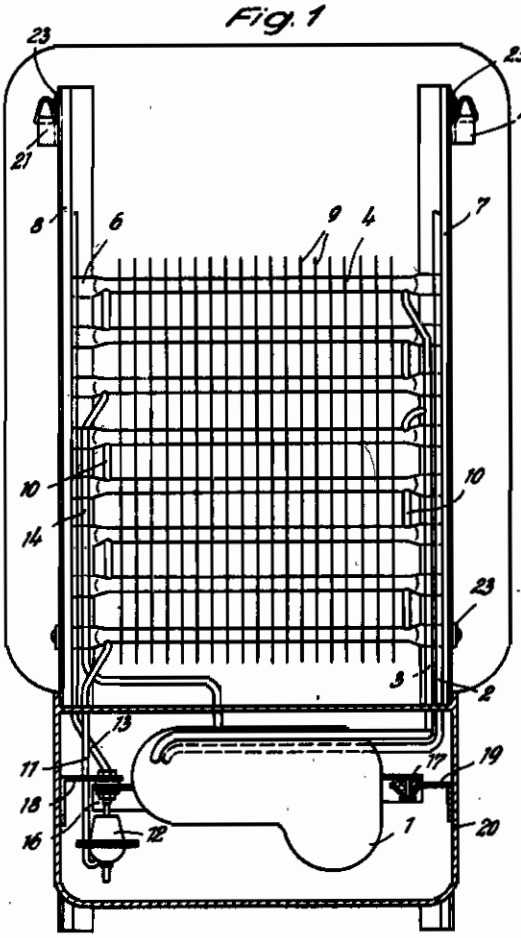


Fig. 2

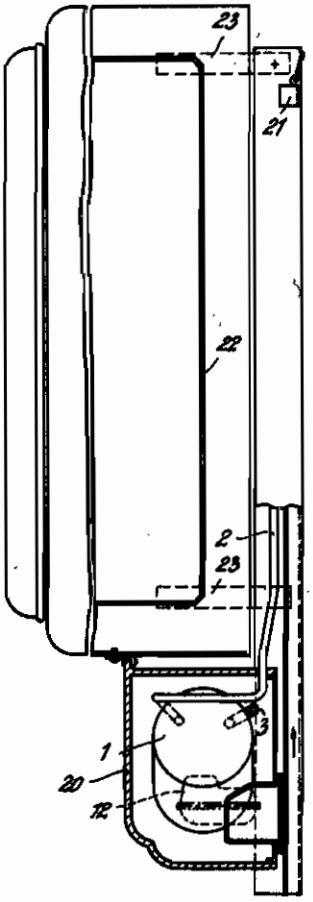
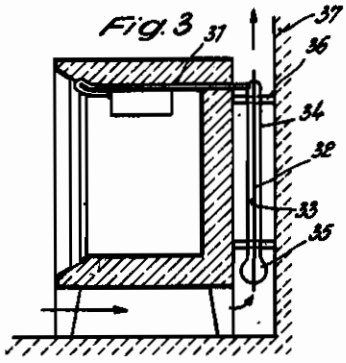


Fig. 3



Inventor
Rudolf Hintze
by Knight Bros
Attorneys

Published Apr. 27, 1943

Serial No. 337,854

ALIEN PROPERTY CUSTODIAN

MOTOR-DRIVEN REFRIGERATING APPARATUS OF THE COMPRESSION TYPE

Rudolf Hintze, Berlin-Charlottenburg 9, Germany; vested in the Alien Property Custodian

Application filed May 29, 1940

This invention relates to improvements in motor-driven refrigerating apparatus of the compression type.

In developing electric motor-driven refrigerating apparatus of the compression type, particularly of such apparatus designed for domestic refrigerators, endeavors have already been made to keep the weight thereof as small as possible. A possibility of reducing the weight of the compressor-motor set, the motor output being equal, consists in employing a high-speed compressor-motor set. This, however, gives rise to trouble, particularly when employing sets operating with piston compressors in that the reciprocating parts of the compressor are the more difficult to balance, the higher the speeds will be, so that it had hitherto not been usual to operate driving motors directly coupled to the compressor at speeds higher than 1500 r. p. m. The dimensions of a compressor-motor set operating at a speed of 1500 r. p. m. correspond to predetermined dimensions of the refrigerator cabinet.

The object of the present invention is to provide an electric motor-driven refrigerating apparatus of the compression type, in which a motor-compressor set is employed having considerably smaller dimensions and therefore a correspondingly less weight. This may be accomplished according to the invention by employing as a driving motor a single-phase induction motor directly coupled to the compressor whose speed when connected to a 50-cycle current supply circuit amounts to 3000 r. p. m. By the use of a compressor-motor set of considerably smaller dimensions and therefore of less weight it is possible to design the refrigerator cabinet in a manner far more advantageous than has hitherto been the case. In the refrigerator cabinets hitherto known a considerable space is, as a rule, required below or above the cooling chamber for the accommodation of the compressor-motor set. Only absorption refrigerating apparatus could hitherto be built so flat as to be mounted on the rear or on one of the lateral walls of the cabinet. Since the compressor-motor set according to the invention has small dimensions it may be mounted as is the case with absorption refrigerating apparatus on the rear or on one of the lateral walls of the cabinet, without it being necessary to provide too large a space for this set. By mounting the compressor-motor set, for instance, on the rear wall of the cabinet, the great advantage is presented in that the heat radiating parts of the apparatus may effectively be cooled by exposing them to the strong natural draught of an air duct acting as a chimney and extending at the rear of the cabinet in the upward direction without the necessity of employing a fan for cooling the heat radiating parts. The compressor-motor set and the condenser may be arranged as separate units. However, it is also possible to combine the condenser with the compressor motor set. To this end, for instance, the housing for the compressor-motor set and condenser is made of two metal sheets secured together around their edges by welding to form a pressure-tight container, in which are indented channels which form the refrigerant conduits for the condenser as well as recesses forming the space for the reception of the compressor-motor set. Owing to the small dimensions of the compressor-motor set it is therefore easily possible to mount such a plate condenser combined with the set on the rear or the lateral wall of the refrigerator cabinet without the indented portions of the metal sheets, necessary for the compressor-motor set, taking up substantially more space than is necessary for an unobjectionable flow of cooling air for the condenser. By mounting the compressor-motor set on the rear or lateral wall of the refrigerator cabinet, the further advantage is obtained over the known refrigerators equipped with a refrigerating machine of the compression type in that a considerable saving in material is attained, since the upper or lower machine compartment of the cabinet may be dispensed with.

To dissipate the heat from the compressor-motor set in an effective manner it is particularly advantageous, especially in the case of the high-speed compressors employed according to the invention to carry off indirectly to cooling surfaces the waste heat from the compressor-motor set with the aid of a liquid available in the apparatus, i. e., with the aid of the lubricant or refrigerant.

The invention may also be employed for motors operating at higher speeds than 3000 r.p.m. Higher speeds may, for instance, be attained, if the motor is connected to a 50-cycle current supply circuit through suitable frequency changers.

In the accompanying drawings are shown two embodiments of the invention in diagrammatic form.

Fig. 1 is the rear elevation and

Fig. 2 is a side elevation, partly in section of a domestic refrigerator cabinet equipped with a refrigerating apparatus of the compression type.

Fig. 3 shows another embodiment of the invention, in which the refrigerating apparatus of the

compression type is secured to the rear wall of a domestic refrigerator cabinet.

Referring to the drawings, 1 denotes the housing of the compressor-motor set. The refrigerant passes from the evaporator (not shown) through a conduit 2 into the compressor. The compressed refrigerant is forced into the upper pipe 4 of the condenser through the pressure conduit 3. This condenser consists of a plurality of parallel-arranged pipes 4, the ends of which are pressed together, then sealed and welded to the supports 7 and 8. The cross pipes 4 are provided with perpendicular cooling ribs 9 which enlarge the heat radiating surface of the condenser. The end portions of the pipes 4 are connected with one another by means of cross tubes 10 and are thus combined to form the condenser. 11 denotes the refrigerant conduit extending from the lower part of the condenser to the float-operated valve 12, to which is connected the conduit 13 extending to the evaporator.

In the embodiment shown, the compressor-motor set is cooled with the aid of the liquid refrigerant. To this end, the upper three condenser pipes 4 are combined to form a cooler so that the refrigerant liquified in the same is supplied to the upper part of the compressor-motor housing 1 through a conduit 14. The lower five condenser pipes thus form the condenser proper, from which the liquid refrigerant passes into the evaporator through the float-operated valve 12.

To the compressor-motor housing 1 are welded angle irons 16 and 17 secured by interposition of rubber layers to corresponding angle irons 18 and 19. The last-mentioned angle irons are welded to the vertical angle irons 7, 8 serving as supports. The compressor-motor housing is arranged together with the float-operated valve 12 beneath the cooling chamber. Since the compressor-motor set is cooled in this case indirectly by the liquid refrigerant, the housing 1 may be enclosed by a hood 20 in the manner as shown in Fig. 2 so that the parts of the set arranged below the cooling chamber cannot directly be viewed from outside. The hood serves at the same time to damp the noise produced in the housing 1. In the embodiment shown in Figs. 1 and 2, the refrigerator cabinet is so designed that it may be mounted on the wall. To this end, eyes 21 are attached to the supports 7 and 8.

The inner casing 22 is secured in this method with the aid of the supports 23 to the frame consisting of the condenser pipes 4 and the vertical angle irons 7 and 8. The cooling air enters the refrigerator in the direction as indicated by the arrow through the air duct extending at the rear of the refrigerator cabinet so that the heat may be dissipated without the use of a fan.

Fig. 3 shows another embodiment of the invention in diagrammatic form in which the refrigerating apparatus of the compression type is secured to the rear wall of a domestic refrigerator cabinet 31. In this case the housing of the compressor motor set and condenser of the refrigerating apparatus is made of two metal sheets 32, 33 secured together around their edges by welding to form a pressure-tight container. In the latter are indented channels 34 which form the refrigerant conduits for the condenser as well as recesses 35 forming the space for the reception of the compressor-motor set. In this case the compressor-motor set is preferably resiliently supported within the housing thus formed. Also in this case the set may be cooled by the liquid refrigerant which flows from a part of the condenser back into the upper part of the compressor-motor housing so as to be evaporated again. Owing to the small dimensions of the refrigerating apparatus according to the invention it is possible to locate such a condenser-motor set in a comparatively narrow air duct, spacing members 36 being arranged between the rear wall of the cabinet and the wall 37 to provide the necessary space for the cooling air. In this embodiment a very strong air draught is brought about as indicated by the arrows so that the heat developed may be easily dissipated to the atmosphere with the aid of the cooling surface of the set without the necessity of employing a fan.

RUDOLF HINTZE.