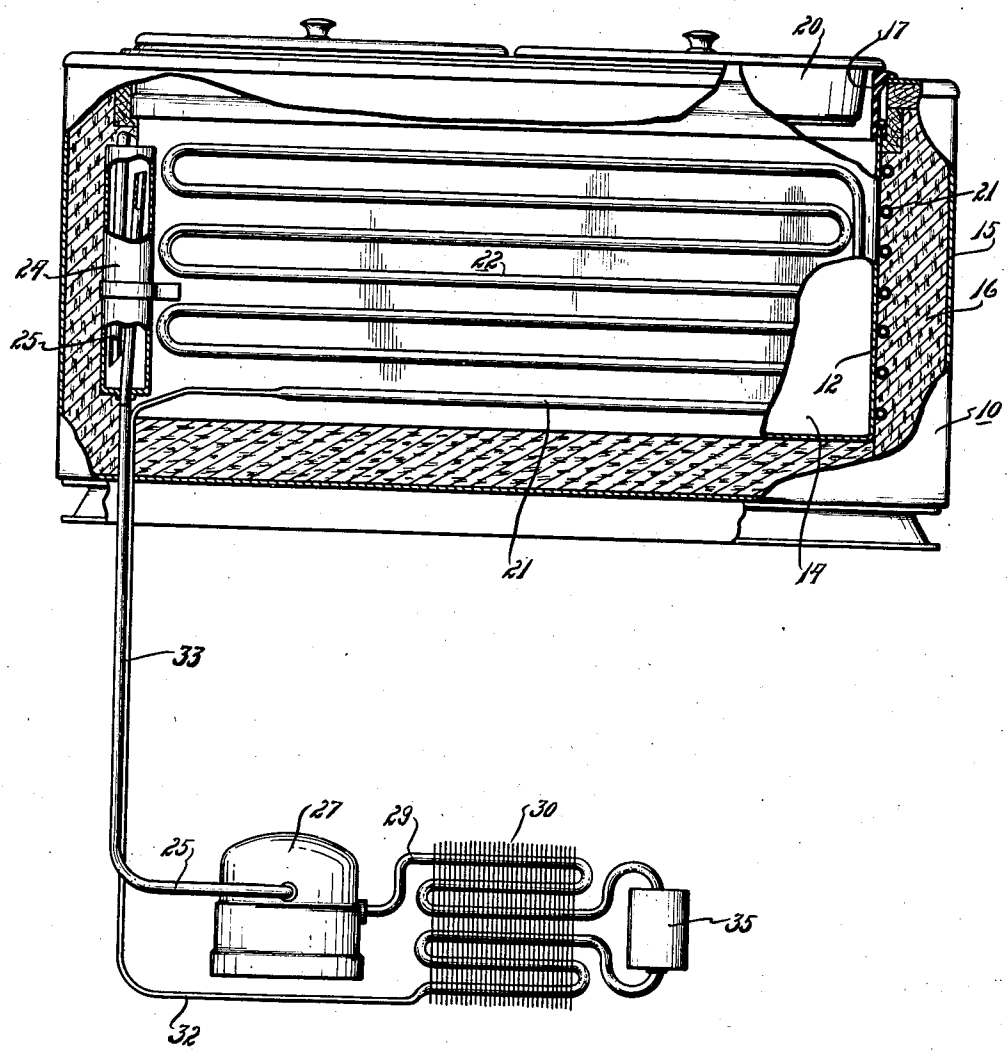
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REFRIGERATING APPARATUS

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REFRIGERATING APPARATUS

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1 Claim. (Cl. 62—115)

The present invention pertains to an improved refrigerating system.

It is an object of the present invention to provide in a refrigerating system, employing a small diameter conduit for metering and regulating the flow of refrigerant to an evaporator, with a tank or receiver which will receive surplus refrigerant for storage only during long continuous operations or during abnormal cycling operations of the compressor where the pressure differential between condenser and evaporator does not permit a normal flow of refrigerant through the small diameter conduit to the evaporator causing a flood back of the surplus refrigerant.

It is another object of the present invention to interpose the tank or receiver at an intermediate point between the inlet and outlet connections of a condenser.

The invention itself, however, both as to its organization and its method of operation together with additional objects and advantages thereof, will best be understood from the following description of specific embodiments when used in conjunction with the accompanying drawing.

The figure in the drawing schematically illustrates the present invention used in a refrigerating system with a cabinet.

In the drawing the present invention is shown adapted for use with a refrigerator cabinet 10 of a type commonly used for storage of ice cream, frozen foods and the like. It will be readily apparent from the following description that the present invention is also adaptable for use in various types of coolers, household and commercial type cabinets.

The cabinet 10 comprises an inner shell 12 defining a food storage compartment 14, and an outer shell 15 spaced therefrom. Suitable insulation material 16 is interposed between shells 12 and 15 to form insulated bottom, sides and top walls of the cabinet. An access 17 is provided in the top wall of the cabinet to compartment 14 and is closed by lids 20.

Securely affixed to each of the side walls of shell 12 on its outer side and bonded in thermal relation therewith are serpentined coils 21 connected together in series to comprise the evaporator coil 22 for the cooling of compartment 14 by the passage of refrigerant therethrough. Secured to the exterior wall of shell 12 is a tank or accumulator 24 into which terminates the outlet end 25 of the evaporator coil 22. Connected with accumulator 24, so as to withdraw the contents from the top thereof, is conduit 25 whose opposite end is connected to the suction side of a motor compressor unit 27. The outlet or discharge side of unit 27 is connected by conduit 29 to a condenser 30 whose outlet is connected by a small diameter or capillary conduit 32 with the evaporator coil 22. The small diameter conduit 32 and the return conduit 25 are bonded together a portion of their length in thermal heat exchange relation as at 33.

Interposed intermediate the inlet and outlet of condenser 30 is a tank or receiver 35.

During normal short cycling operations the heat laden refrigerant is withdrawn from the evaporator coil 22 into the accumulator 24 where the liquid and vaporized refrigerant are separated to permit the vaporized refrigerant to be withdrawn through conduit 25 into the motor-compressor unit 27. The heat laden refrigerant is compressed within the unit 27 to be discharged under pressure into the condenser 30 to be cooled and liquefied in its passage therethrough. The upper and lower sections of the condenser are finned and are very effective for dissipating heat. The tanks 35 functions as part of the condenser but is ineffective for cooling and liquefying the refrigerant as it flows therethrough from the upper to the lower portion of the condenser due to its large diameter and construction. The cooled liquid refrigerant is then metered through the small diameter conduit 32 to the evaporator coil 22. The heat exchange section 33 permits the returning refrigerant vapors in conduit 25 to cool the refrigerant flowing in conduit 32 before entering the evaporator coil 22. This aids in insuring the flow of liquid only to the evaporator.

Occasionally the passageway of conduit 32 becomes restricted offering a greater resistance to the normal flow of refrigerant therethrough due to the entrance of oil or other foreign particles of matter. To clear the passageway and maintain a normal flow therethrough requires an increase of pressure within the condenser. This can easily be effected where there is no tank or receiver between the condenser's outlet and the small diameter conduit 32 for this additional resistance offered by the conduit unbalances its ability to pass refrigerant into the evaporator relative to the compressor's capacity to pump refrigerant into and be condensed by the condenser. Consequently, the surplus liquid refrigerant accumulates and tends to flood back into the lower portion of the condenser 30 thereby reducing its capacity to condense refrigerant and builds up a back pressure to a value which is sufficient to clear or overcome the resistance offered in the passageway of conduit 32 to again

maintain a normal flow of refrigerant therethrough. It will be noted that it is difficult to determine any appreciably accurate fixed pressure value necessary to overcome the resistance of the passageway in conduit 32 for each cycle due to the uncertainty of the resistance offered by the impediments passing therethrough.

By permitting a flooding back into the condenser there is easily and quickly effected the desired increase in pressure necessary to overcome the resistance and clear the passage thereof. The flood back is limited to the receiver thus reserving sufficient area of condenser to perform its condensing function. Thus this arrangement offers the advantage of a steady, uniform flow of refrigerant to the evaporator.

It is to retain this arrangement and its advantages in refrigerating systems charged with a large volume of refrigerant where it is necessary that a tank or receiver is incorporated in the system provided with a small diameter conduit for metering the refrigerant flow to the evaporator that the present invention is directed.

In setting into operation such systems as for example an ice cream cabinet whose compartment temperature is relatively high or equivalent to room temperature, it is necessary for the compressor to operate continuously for a considerable length of time before the desired low temperature within the compartment is obtained. Initially and for a considerable period therefrom the suction pressure will be sufficiently great to result in a compressor performance where the volume compressed and coupled with the rate of its condensation in the condenser will be greater than the ability of the small diameter conduit 32 can pass to the evaporator. Further this inability to pass all of the condensed refrigerant at the rate of its condensation will prevail until the condenser pressure will be greater than the pressure in the evaporator 22 to provide a pressure differential necessary to overcome the resistance offered by the small diameter conduit 32. By the present invention the surplus liquid refrigerant tends to flood back through the lower coils of condenser 30 into the tank or receiver 35. The tank serves as a receiver for the refrigerant until the desired pressure differential is attained. When the normal desired flow to the evaporator is attained and the temperature is as desired within compartment 14 with the compressor operating at normal cycles the tank 35 functions as part of the condenser as previously described.

It will be noted that by the present arrangement there is provided a refrigerating system having the advantages of a receiver for long pull down operations, or abnormally long cycles, with the advantages of a refrigerating system employing no receiver where a small diameter conduit is used to meter and regulate the flow of refrigerant to an evaporator. By interposing of the tank or receiver at an intermediate point in the condenser there is provided the advantage of appreciably checking the rise of head pressure of the compressor, while at the same time assuring a section of the condenser of being able to receive and condense compressed refrigerant. During normal cycling operations the position of the tank gives no interference to a slight rise in head pressure by flood backs into the condenser to produce the necessary pressure differential necessary to allow a normal flow through the small diameter conduit 32.

While I have described the preferred forms of my invention I do not wish to limit myself to the precise details as shown but wish to avail myself of such variations and modifications as may come within the scope of the appended claim.

I claim:

A refrigerating system comprising a refrigerant evaporating element, a refrigerant condensing element exposed to environment air and adapted to store liquid refrigerant in the lower part thereof in accordance with changes in environmental temperature to thereby vary the effectiveness of said condenser, a small diameter tube for controlling the flow of liquid refrigerant from said condenser to said evaporator, means for conducting refrigerant vapor from said evaporator in heat exchange with said small diameter tube and a refrigerant receiver disposed in said condenser above the level of liquid refrigerant stored therein during periods of normal operation and being arranged to receive liquid refrigerant stored in said condenser as the level thereof rises during periods of abnormal operation.

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