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E. W. BOTTUM ET AL
REFRIGERATION COMPONENT

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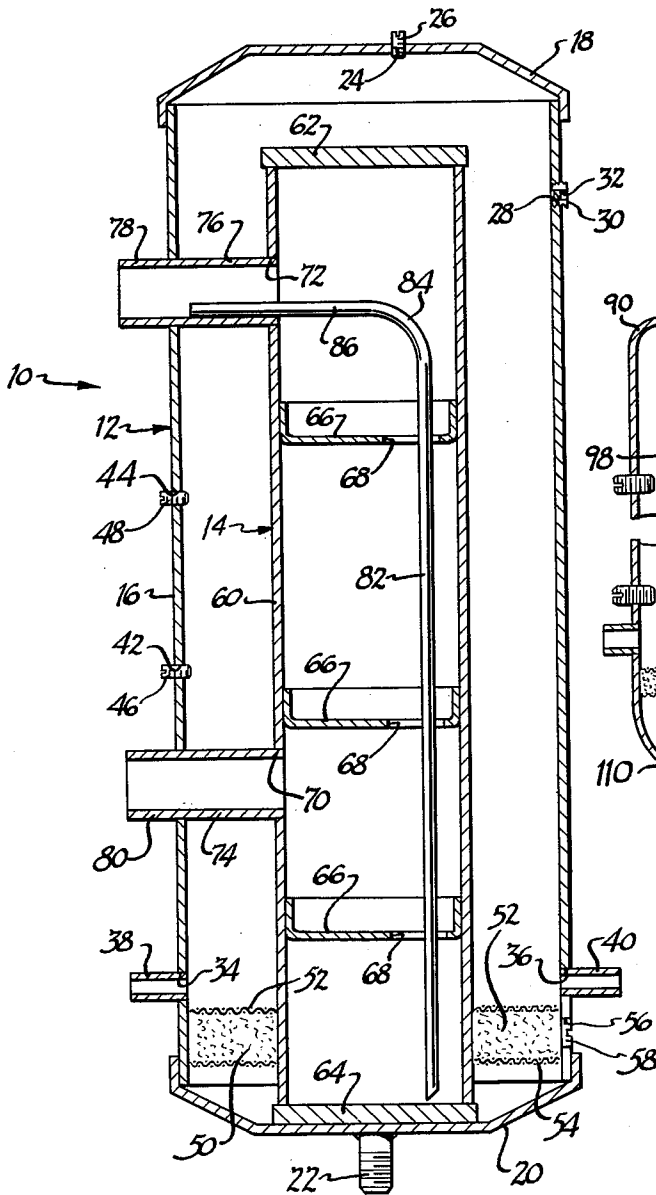


FIG. 1

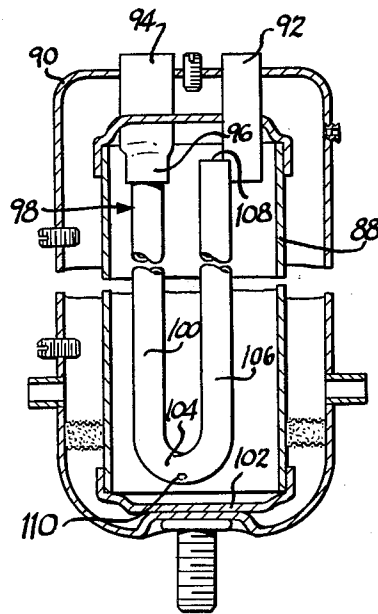


FIG. 2

INVENTORS
EDWARD W. BOTTUM
BY FRANK H. ROCKWELL
WILSON, SETTLE & CRAIG
ATTORNEYS

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REFRIGERATION COMPONENT

Edward W. Bottum and Frank H. Rockwell, Brighton, Mich., assignors to Refrigeration Research, Incorporated, Brighton, Mich., a corporation of Michigan
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The present invention relates to a refrigeration component, and more particularly to a refrigeration component combining a receiver, suction accumulator, muffler and heat exchanger in one integral unit.

It is an object of the invention to provide a combination of refrigeration components in one integral unit.

Another object of the invention is to provide a combination of components which results in a simplified structure of reduced cost, improved performance and increased efficiency.

A further object of the invention is to provide such a refrigeration component which is particularly useful in systems which are operated intermittently, such as heat pumps, air conditioning systems, and other commercial refrigeration systems.

A still further object of the invention is to provide a novel suction accumulator in the unit which acts to protect the compressor against undue shock resulting from the sudden injection of large amounts of liquid refrigerant which frequently results in broken valves, rods and the like.

Another object of the invention is to provide a novel muffling system to reduce the noise level of the system.

Another object is to provide an efficient heat exchange between the cool refrigerant in the low pressure side and the warm refrigerant in the high pressure side of a given system.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawing forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In the drawing:

FIGURE 1 is a side elevational view in section of one embodiment of the refrigeration component of the present invention; and

FIGURE 2 is a side elevational view in section of another embodiment of the invention.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawing, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

The refrigeration component of the invention includes as principal elements a liquid receiver for storage of liquid, a suction accumulator to prevent return of damaging amounts of liquid to the compressor, a muffler to reduce suction noise, and a heat exchange structure to provide heat exchange between the warm high pressure and cold low pressure sides of the system.

As shown in the figure, the component 10 includes an outer casing 12 and an inner casing 14. The outer casing 12 comprises an open ended tube 16 having an upper end closure 18 and a lower end closure 20 secured thereto. An externally threaded stud 22 is provided on the lower end closure 20 to facilitate mounting of the unit on a suitable support structure or other means of mounting may be used. A purge port 24 is provided in the upper end closure 18 to permit purging the receiver of air and non-condensable gases. The port 24 is normally closed

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by a threaded plug 26. A pressure release opening 28 is provided in the side wall of the tube 16. A fusible plug 30 is threadingly received in the opening 28 to normally seal the receiver. The plug 30 is hollow and has an interior wall member 32. The wall 32 will melt at a predetermined temperature and allow gas to escape to prevent explosion of the receiver. Instead of a fusible plug, a conventional pressure release valve may be used as desired.

A pair of openings 34, 36 are provided in the lower end of the tube 16 for the ingress and egress of refrigerant. These openings may, however, be located at any desired point on the casing. Externally threaded connector tubes 38, 40 are secured in the openings. In operation, the tube 38 may be connected to the condenser of a system and the tube 40 connected to the expansion valve, capillary, metering device, reversing valve or the like in which event high pressure liquid refrigerant would enter through the tube 38 and exit through the tube 40. However, the receiver may also be used in a reverse cycle system wherein the direction of flow is reversed.

Vertically spaced check ports 42, 44 are provided to serve as a liquid indicator, thereby eliminating the necessity for a sight glass. The ports 42, 44 are closed by threaded plugs 46, 48. The plugs 46, 48 may be loosened to determine the level of the liquid in the receiver. In operation, the lower plug 46 may be first loosened, and if no liquid is ejected from the receiver, it is known that the level is below the plug 46, this level representing the desired level. If liquid does exit from the port 42, then this port is closed and the plug 48 loosened. If liquid exits from the port 44, then it is known that the liquid level is at an undesired high point.

A desiccant material 50 may be provided adjacent the bottom of the receiver. The desiccant is retained between annular screens 52, 54. A filler port 56, closed by a threaded plug 58 is provided to permit refilling of the desiccant material. This refilling feature permits the entire assembly 10, including the various tubes and closure, to be permanently secured together to provide a unit which will not come apart in use. The various parts of the component 10 are preferably fabricated from metal which may be hydrogen-copper brazed, this process being the preferred method of securing the component parts together to produce a unit of high quality and which requires a minimum of cleaning operation after the brazing process.

The inner casing 14 serves as an accumulator for the compressor. The casing 14 includes an open ended tube 60 which is sealed by upper and lower closure plates 62, 64. The lower plate 64 is secured to the interior surface of the lower end closure 20. A plurality of vertically spaced cup-shaped baffle plates 66 may be provided within the casing 14. The plates 66 have openings 68 for the passage of fluid thereby. The plates 66 act to baffle the suction noises created in the accumulator.

An inlet port 70 and an outlet port 72 are provided in the side wall of the tube 60. Connector tubes 74, 76 extend from the ports 70, 72 and through openings in the outer casing 12. The tubes 74, 76 terminate at 78, 80 for attachment to conduits connecting the accumulator to, for example, a conduit leading from the tube 76 to the compressor and a conduit leading from the tube 74 to the evaporator.

A tube 82 of relatively small diameter extends from a point adjacent the lower end of the casing 14 upwardly through the openings 68. A right angle bend 84 is provided in the tube at the level of the outlet tube 76 and portion 86 of the tube 82 extends into the outlet tube 76 and is secured thereto.

In operation of the accumulator, cold refrigerant gas, having a small amount of entrained liquid refrigerant therein, normally enters through the tube 74 into the

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accumulator. The gas passes upwardly through the openings in the baffle plates and out through the tube 76 to the compressor. The compressor, which creates a suction, draws the gaseous refrigerant through the accumulator at a relatively rapid rate. Compressor pumping noises and valve noises are muffled by the baffle plates 66.

If an unusual amount of liquid refrigerant enters the accumulator through the tube 74, it will drop to the bottom of the accumulator and will be subsequently drawn through the tube 82 into the compressor. The tube 82 acts as a restriction and causes the liquid refrigerant to be metered into the compressor at a controlled rate. The accumulator thus acts to prevent large amounts of liquid refrigerant and oil to suddenly enter the compressor. Such sudden surges of liquid often result in seriously damaging the compressor.

FIGURE 2 illustrates another embodiment of the invention. As will be noted, the accumulator casing 88 is again mounted within a receiver 90. The receiver 90 is substantially the same as the receiver illustrated in FIGURE 1 and will not be again described at this point. The accumulator, however, has a somewhat different construction than the accumulator illustrated in FIGURE 1. As will be noted, an inlet tube 92 extends through the tops of the receiver and accumulator casings. The tube 92 terminates in the upper portion of the accumulator casing 88. An outlet tube 94 is positioned adjacent the inlet tube 92 and also extends through the accumulator and receiver casings. The inner end 96 of the tube 94 is of reduced diameter and receives one end of a U-tube 98. One leg 100 of the tube 98 extends from the outlet tube 94 downwardly to a point adjacent the bottom wall 102 of the accumulator casing. The tube is then provided with a bend 104 and the second leg 106 extends upwardly and terminates in an open end 108 adjacent the upper portion of the accumulator casing. A small metering opening 110 is provided in the tube bend 104.

In operation of the FIGURE 2 device, refrigerant gas, having entrained liquid refrigerant and oil therein, enters the accumulator casing 88 through the inlet tube 92. The refrigerant gas is drawn into the open end 108 of the U-tube 98, passes through both legs of the U-tube and exits through the outlet tube 94 and thence to the compressor.

As in the FIGURE 1 embodiment, liquid refrigerant which enters the accumulator will settle in the bottom of the accumulator. The liquid will subsequently be drawn into the U-tube at a metered rate through the small opening 110. Consequently, liquid refrigerant and oil will always pass to the compressor at a controlled rate and surges of liquid into the compressor are prevented.

The arrangement of the accumulator and receiver also provide an efficient heat exchange between the relatively cold low pressure refrigerant in the accumulator and the relatively warm high pressure refrigerant in the receiver. The walls of the accumulator casing act as the heat exchange medium. Such heat exchange is desirable for the efficient operation of a refrigeration system and in order to obtain full capacity.

Another important advantage residing in positioning the accumulator within the receiver casing is that the warm refrigerant in the receiver will prevent moisture in the atmosphere from condensing on the accumulator casing which contains cold refrigerant. If the accumulator were exposed directly to the atmosphere, it would be necessary to coat or plate the outer casing surface to inhibit corrosion. Also, the collection of moisture on the accumulator with subsequent dripping on the adjacent area would cause further problems.

Having thus described our invention, we claim:

1. A refrigeration component comprising first and second casings secured together in heat exchange relation-

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ship; said first casing defining a chamber to serve as a receiver in a refrigeration system; said first casing having an inlet and an outlet for refrigerant; said second casing defining a chamber to serve as a suction accumulator for the compressor of a refrigeration system; said second casing having an inlet and an outlet; a conduit within the second casing having a portion extending from a point adjacent the bottom of the second casing to the casing outlet; said conduit having an opening in the portion adjacent the second casing bottom; said conduit acting as a suction tube to draw liquid through said opening from the bottom of the second casing and expel it into the casing outlet at a metered rate.

2. A refrigeration component comprising a pair of casings, one of which is positioned within the other; one of said casing defining a chamber to serve as a receiver; said receiver casing having an inlet and an outlet for refrigerant; said other casing defining a chamber having a top and bottom to serve as a suction accumulator for the compressor of a refrigeration system; said accumulator casing having an outlet positioned adjacent the top thereof and an inlet; a conduit within the accumulator casing having a portion with an opening extending from a point adjacent the bottom of the casing to the accumulator casing outlet; said conduit acting as a suction tube to draw liquid from the bottom of the accumulator casing and expel it into the accumulator casing outlet at a metered rate.

3. A refrigeration component comprising an outer casing defining a chamber to serve as a receiver in a refrigeration system; said outer casing having an inlet and an outlet for refrigerant; an inner casing positioned within the outer casing in heat exchange relationship therewith and defining a chamber having a top and bottom to serve as a suction accumulator for the compressor of a refrigeration system; said inner casing having an outlet positioned adjacent the top thereof and an inlet; a conduit within the inner casing extending from a point adjacent the bottom of the casing to the inner casing outlet; said conduit acting as a suction tube to draw liquid from the bottom of the inner casing and expel it into the inner casing outlet at a metered rate.

4. A refrigeration component comprising an outer casing defining a chamber to serve as a receiver; said outer casing having an inlet and an outlet for refrigerant; an inner casing positioned within the outer casing defining a chamber having a top and bottom to serve as a suction accumulator for the compressor for a refrigeration system; said inner casing having an outlet positioned adjacent the top thereof and an inlet; a conduit within the inner casing extending from a point adjacent the bottom of the casing to the inner casing outlet; said conduit acting as a suction tube to draw liquid from the bottom of the inner casing and expel it into the inner casing outlet at a metered rate; and a plurality of spaced apart baffles within the inner casing; said baffles having openings therein from the passage of refrigerant thereby and serving to muffle sound.

5. A device as claimed in claim 4 and further characterized in that the openings in said baffle are in registry; said conduit comprising a tube extending through said openings.

6. A refrigeration component comprising an outer casing having a top and bottom defining a chamber to serve as a receiver; said outer casing having an inlet and an outlet for refrigerant; a desiccant material positioned within said outer casing; an inner casing positioned within the outer casing defining a chamber having a top and bottom to serve as a suction accumulator for the compressor of a refrigeration system; said inner casing having an outlet positioned adjacent the top thereof and an inlet positioned below the outlet; and a conduit within the inner casing extending from a point adjacent the bottom of the casing to the inner casing outlet; said conduit acting as a suction tube to draw liquid from the bottom of the inner

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casing and expel it into the inner casing outlet at a metered rate.

7. A refrigeration component comprising an outer casing defining a chamber to serve as a receiver; said outer casing having an inlet and an outlet for refrigerant; an inner casing positioned within the outer casing in heat exchange relationship with the contents of the outer casing; said inner casing defining a chamber having a top and bottom to serve as a suction accumulator for the compressor of a refrigeration system; said inner casing having an outlet positioned adjacent the top thereof and an inlet positioned below the outlet; a plurality of baffle plates provided within the inner casing and having registering openings therethrough for the passage of fluid thereby; said baffle plates serving to muffle the sound of compressor noise; a conduit within the inner casing extending from a point adjacent the bottom of the casing through the openings in the baffle plates to the inner casing outlet; said conduit acting as a suction tube to draw liquid from the bottom of the inner casing and expel it into the inner casing outlet at a metered rate.

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8. In a refrigeration component having an accumulator positioned within a receiver, the improvement comprising an accumulator having a casing; an inlet to the casing; an outlet from the casing positioned adjacent the upper end thereof; a generally U-shaped tube having a first leg connected to and extending from said outlet towards the lower portion of the casing and a second leg extending from the first leg towards the upper portion of the casing and terminating in an open end for the passage of gas through the U-shaped tube; said U-shaped tube having an opening therein adjacent the lower portion of the casing to draw liquid from the casing and expel it into the casing outlet at a metered rate.

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