Dec. 26, 1967 C. P. WOOD, JR 3,360,127

OIL SEPARATOR FOR REFRIGERATION SYSTEMS

Filed Nov. 23, 1964 3 Sheets-Sheet 1

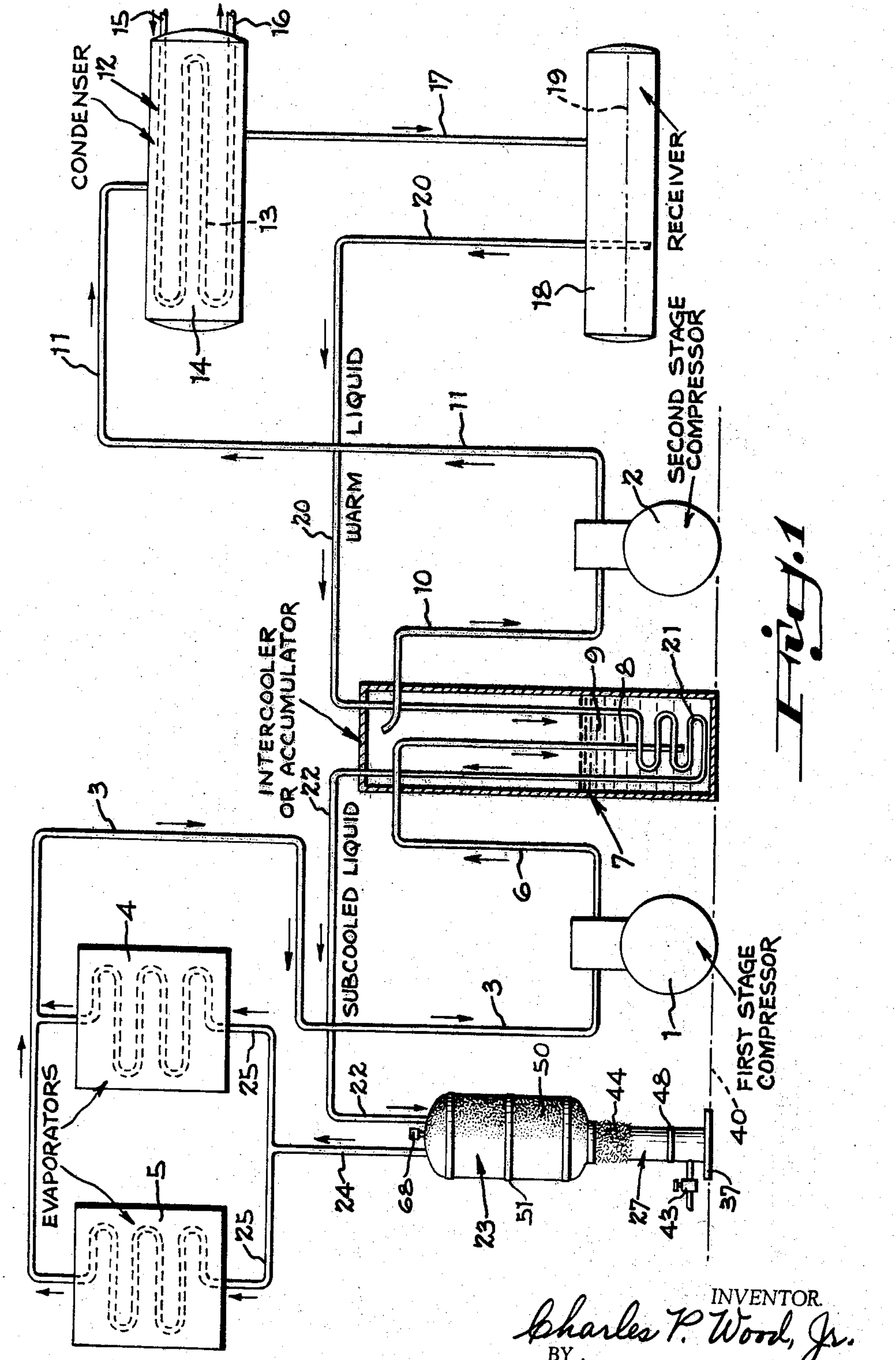

Fig. 1

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3 Sheets-Sheet 2

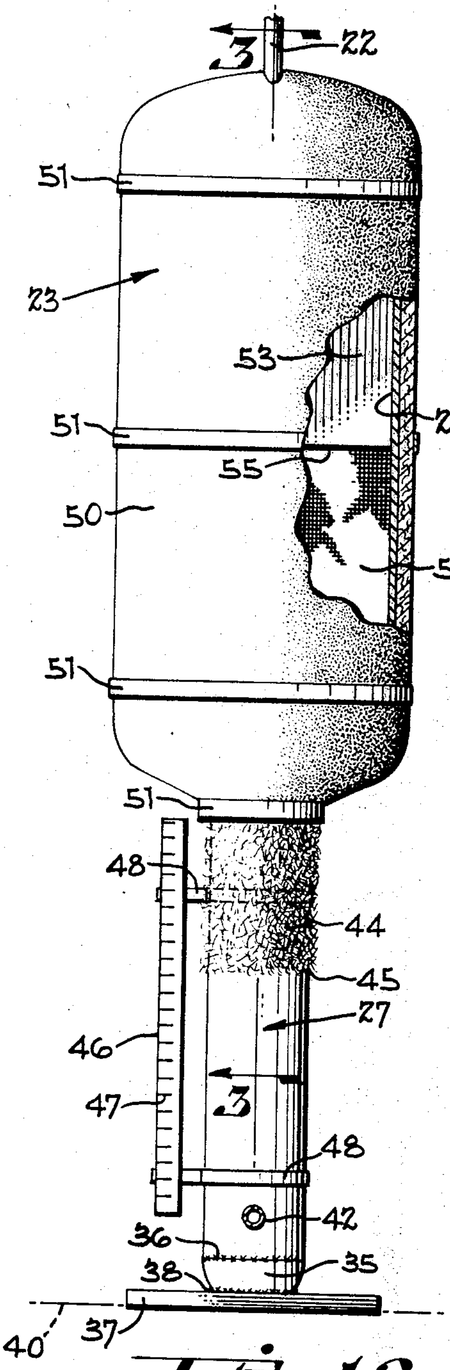

Fig. 2

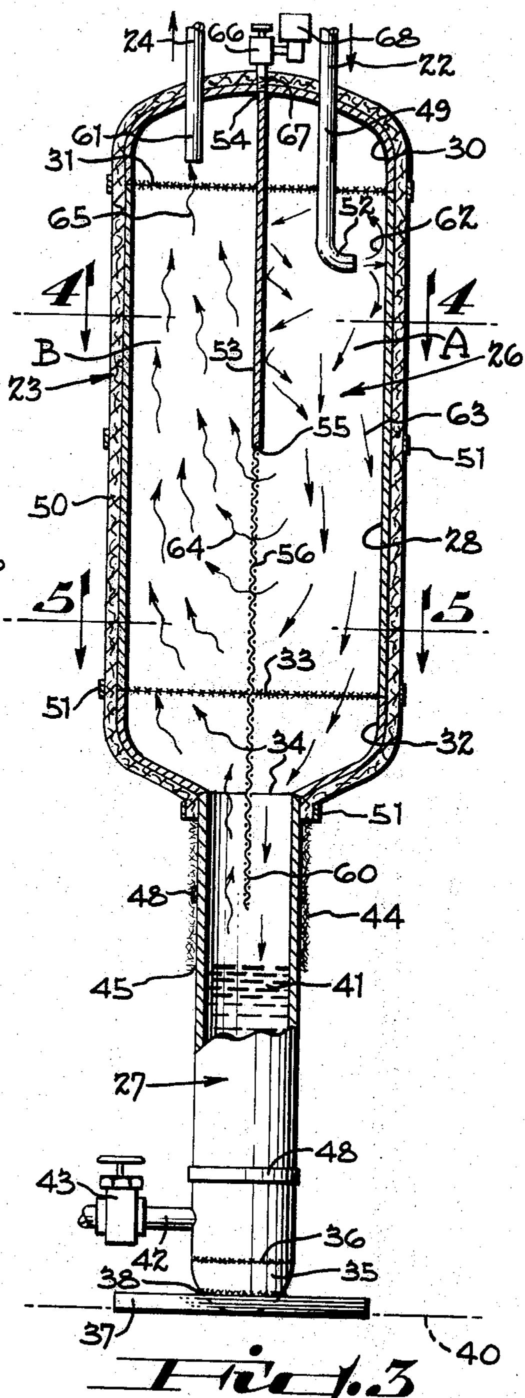

Fig. 3

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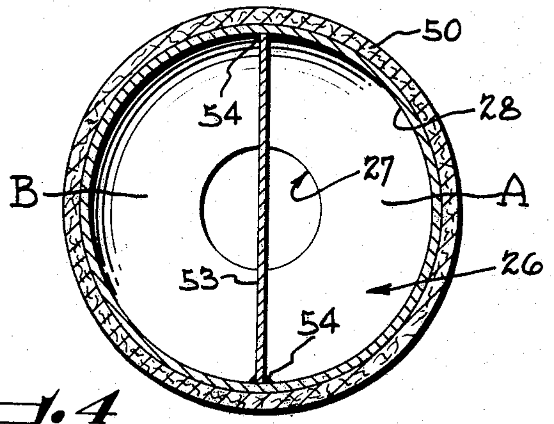

Fig. 4

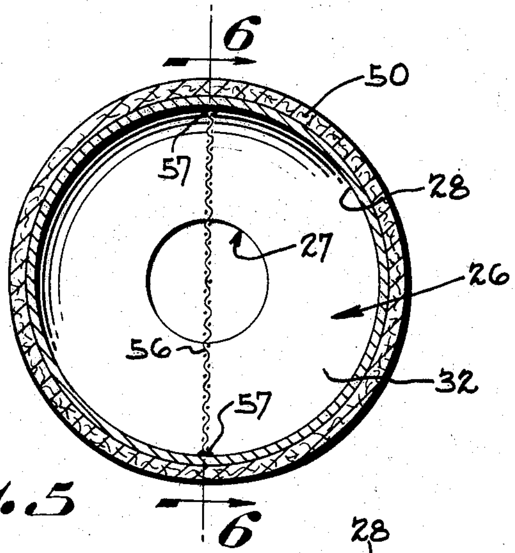

Fig. 5

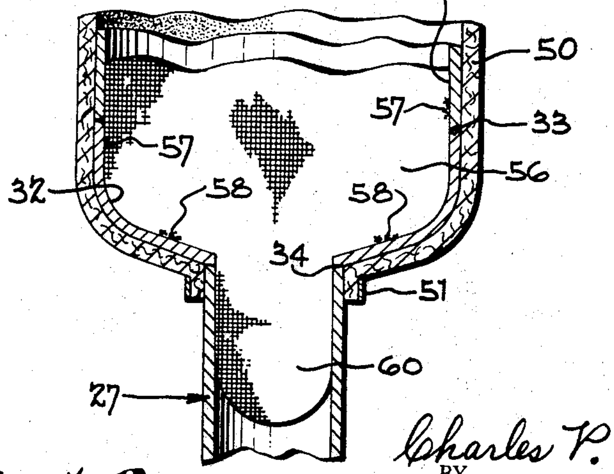

Fig. 6

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3,360,127
OIL SEPARATOR FOR REFRIGERATION SYSTEMS

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4 Claims. (Cl. 210—86)

This invention relates generally to refrigeration systems of the type which are powered by motor-driven compressors; the invention is directed particularly to an oil separator for removing the lubricating oil which becomes entrained in the refrigerant through operation of the compressor or compressors.

The oil separator of the present invention is intended for refrigeration systems of the commercial type wherein the system may chill one or a number of rooms or compartments. Commercial refrigeration systems of this type are extensively used industrially, for example, in meat packing plants, poultry dressing plants, breweries and many other operations in which the product must be chilled.

Refrigeration plants of this character usually employ liquid ammonia as the refrigerant, the liquid ammonia being supplied to the evaporators which are located in the refrigerated compartments or rooms. Upon being advanced to the evaporators, the liquid refrigerant expands and consequently absorbs heat to chill the compartment or compartments.

After passing through the evaporators, the refrigerant, now in the form of gas, possibly with entrained droplets of liquid refrigerant, advances to one or more power-operated compressors wherein the gas is compressed and forced under pressure through a condenser to be cooled and liquified. The liquid refrigerant usually passes to a receiver; from the receiver, and possibly through other components, the liquid refrigerant is recirculated toward the evaporators to repeat the cycle.

In the system which has been selected to bring out the principles of the present oil separator, the warm liquid refrigerant advances from the receiver to an intercooler, wherein the temperature of the liquid refrigerant is reduced approximately to the freezing temperature of water. From the intercooler, the subcooled liquid refrigerant passes through the oil separator of this invention then to the evaporators.

The compressors which power the refrigeration system usually are of the piston type and necessarily require lubrication. Since the pistons are in direct contact with the vaporized refrigerant flowing from the evaporators, small quantities of lubricating oil become entrained with the refrigerant. The amount of oil entrained at any given time may be minute; nevertheless, there is a cumulative effect after prolonged service, causing the oil to form a film upon the internal surfaces of the refrigeration system. Such a film detracts greatly from the efficiency of the system.

One of the primary objectives of the invention has been to provide a simplified, efficient oil separator which is inserted in one of the liquid refrigerant lines of the system and which is capable of separating and collecting the droplets of entrained lubricating oil in a continuous manner, permitting it to be withdrawn periodically without interrupting the operation of the system.

The oil separator of the invention is intended particularly for use with refrigeration systems utilizing liquid ammonia as the refrigerant. The oil separator takes advantage of the fact that the lubricating oil, which may become entrained, is heavier than the liquid ammonia refrigerant. As a consequence, the entrained lubricating

oil, in passing through the oil separator, may be precipitated, at least in part, by gravity, while other portions of the oil may be separated by impingement or by entrapment, as explained below.

A further objective of the invention has been to provide an oil separator which includes a separation chamber which is connected directly with the liquid refrigerant supply line leading to the evaporators, whereby the rate of flow of the liquid refrigerant (which passes through the separator) moves at a sufficiently slow rate to permit a substantial amount of the entrained oil to be precipitated by gravity.

According to this aspect of the invention, the oil separator, in general, comprises a separation chamber which has a large diameter in relation to the supply line which conducts the liquid refrigerant to the separator. By way of example, the relationship is such that the liquid refrigerant passes through the supply line at several hundred feet a minute; however, upon reaching the upper portion of the separation chamber, the liquid descends at a rate somewhere in the neighborhood of one foot per minute. At this rate of flow, a large percentage of the entrained oil precipitates downwardly by gravity from the slowly moving liquid and is collected in a column or well having a diameter which is a fraction of the diameter of the separation chamber.

In addition, the separation chamber includes a baffle plate, bisecting the diameter of the chamber and extending downwardly from the upper end of the chamber to a point approximately midway along the length of the chamber. The lower end portion of the baffle plate includes a separation screen, also bisecting the chamber, and extending downwardly to the lower end of the separation chamber to the oil collector column or well.

The subcooled liquid refrigerant is introduced by an inlet fitting into the upper end of the separation chamber and flows through a tortuous path downwardly along the baffle plate, through the separation screen, then upwardly to an outlet fitting which leads to the evaporators. Generally speaking, the oil droplets are separated from the liquid refrigerant by the combined operation of the separation chamber (gravity precipitation), (impingement against the wall of the vessel) and operation of the separation screen (entrapment).

Thus, as the liquid refrigerant enters the upper end of the separation chamber it is projected against the internal surface of the chamber, causing a certain percentage of lubricating oil to impinge upon and adhere to the chamber wall and to flow by gravity down the wall into the collector column. In the second place, a further percentage of the oil precipitates by gravity toward the column from the downwardly flowing liquid refrigerant at one side of the baffle plate and also from the upwardly flowing refrigerant on the opposite side of the baffle plate, due to the extremely slow rate of flow of the refrigerant through the separation chamber. Thirdly, practically all of the liquid refrigerant passing through the separator necessarily is forced through the screen which depends downwardly from the lower edge of the baffle plate. The screen operates to entrap droplets of lubricant from the flowing refrigerant. The entrapped oil adheres to the screen and flows by gravity into the oil column. As a consequence, the refrigerant flowing from the upper end of the separation chamber towards the evaporators is substantially free of entrained oil.

A further objective of the invention has been to provide an oil separator which indicates the quantity or level of the oil which is collected in the well or collector column for periodic withdrawal without requiring a sight gauge or other indicating device.

According to this aspect of the invention, the separation chamber preferably is insulated to prevent loss of refrigeration, while the column or well, which collects the separated oil, is devoid of insulation. The separator unit preferably is installed in a relatively warm area and the liquid refrigerant passing through the separator and through the upper portion of the column is chilled to a temperature below the freezing point of water. The quantity of oil in the lower portion of the column prevents the liquid lubricant from chilling the external wall of the column, while the refrigerant above the oil level reduces the temperature of the column to a temperature below the dew point of the air surrounding the column. Accordingly, a coating of frost forms upon the external metallic surface of the column, providing a visual reference line indicating the quantity of oil which is accumulated in the lower portion of the column.

The lower end portion of the column includes a drain valve which permits the accumulated oil to be withdrawn periodically in response to the level of the frost line of the column.

As the unit is mounted in relatively warm surroundings, the oil assumes a temperature higher than that of the liquid refrigerant above it in the collector column and thus flows easily through the drain valve.

The various features and advantages of the present invention will be more fully apparent to those skilled in the art from the following detailed description taken in conjunction with the attached drawings.

In the drawings:

FIGURE 1 is a diagrammatic view illustrating a commercial, two-stage refrigeration system including the oil separator of the present invention.

FIGURE 2 is an enlarged side view of the oil separator, with the wall partially broken away to illustrate its internal construction.

FIGURE 3 is a longitudinal sectional view taken along line 3—3 of FIGURE 2, detailing the internal construction and operation of the oil separator.

FIGURE 4 is a cross sectional view taken along line 4—4 of FIGURE 3, further illustrating the internal construction of the oil separator, particularly the deflector or baffle plate which is mounted in the upper portion of the separator.

FIGURE 5 is a cross sectional view taken along the line 5—5 of FIGURE 3, illustrating the screen which depends from the baffle plate.

FIGURE 6 is a sectional view taken along the line 6—6 of FIGURE 5, further detailing the relationship of the separator screen with respect to the oil collector column at the lower portion of the oil separator.

Refrigeration system generally

The two-stage refrigeration system shown in FIGURE 1 has been selected to illustrate, in a general way, the principles of the oil separator of the present invention in relation to a commercial refrigeration system which may chill a number of compartments or rooms, each having its own evaporator. Liquid ammonia is most widely used as a refrigerant in commercial or industrial refrigeration systems for which the oil separator is particularly intended. It will be understood that the pinciples of the invention may be utilized in refrigeration systems other than the two-stage system which has been selected to illustrate the operation of the oil separator.

The refrigeration system illustrated diagrammatically in FIGURE 1 is powered by two motor-driven compressors, comprising a first stage compressor **1** and a second stage compressor **2**. The heat-laden refrigerant is supplied in the form of a gas (which may include entrained liquid refrigerant) to the first stage compressor **1** by way of a line **3** which extends from the evaporators **4** and **5**. The evaporators are of conventional design and are installed in the compartments or rooms of the refrigerated plant.

The compressor or compressors, which power the refrigeration system, necessarily require lubrication; as a consequence, small quantities of lubricating oil becomes entrained in the refrigerant passing through the compressor. Although the degree of oil contamination may be very slight at any given moment, nevertheless there is a cumulative effect which becomes apparent after a period of service. The entrained oil has a tendency to collect upon the internal surfaces of the refrigeration system (particularly the evaporators), forming an insulating film which gradually builds up to the point where it interferes seriously with the efficiency and performance of the system.

From the first stage compressor **1**, the compressed refrigerant, such as ammonia gas and entrained liquid; is advanced under pressure by way of the line **6** to an intercooler or accumulator, which is indicated generally at **7**. The intercooler comprises a closed vessel adapted to confine the compressed gas under pressure and permits the compressed gas to liquify, at least in part. As shown in FIGURE 1, the line **6** includes a downwardly projecting section **8** leading from the compressor **1** to the lower portion of the intercooler **7**. The intercooler **7** may include a liquid level valve (not shown) interposed in supply line **6** to regulate the level of liquid refrigerant in the vessel **7**.

The accumulator is intended to maintain a supply of liquid refrigerant **9** and also to act as a collector for the expanded and unevaporated liquid refrigerant gas returning from the evaporators **4** and **5** and passing through the first stage compressor **1**. The liquid refrigerant accumulated in the intercooler **7** is maintained under relatively low pressure and at a low temperature so as to subcool the liquid refrigerant returning from the receiver, as explained later.

The low temperature liquid refrigerant **9** in the intercooler, being under low pressure, evaporates at a given rate, thereby absorbing heat from the subcooling coil **21** of the intercooler **7**. The evaporated gas is carried from the upper portion of the intercooler **7** by a supply line **10** which leads to the second stage compressor **2**. The second stage compressor **2** is also motor-driven, and is arranged to compress the refrigerant gas to its final operating pressure.

From the second stage compressor **2**, the compressed refrigerant is advanced by way of the line **11** to a condenser indicated at **12**. The condenser **12**, in the present example, is of the water-cooled type, comprising a coil **13** enclosed in a vessel **14**, cold water being circulated through the coil **13** by way of the lines **15** and **16** so as to carry off heat from the high pressure ammonia gas passing through vessel **14**. As the ammonia gas passes through the vessel **14** of the condenser, it is cooled and converted to liquid ammonia which flows by way of the line **17** to a high pressure receiver vessel **18**.

In the present example, the pressure within the receiver **18** may be in the neighborhood of 185 p.s.i., the liquid ammonia having been reduced by the condenser **12** to a temperature in the neighborhood of 85° F.–95° F. The high pressure receiver **18** is partially filled with liquid refrigerant, as indicated by the broken line **19**, and its upper portion acts as a gas cushion or head, to maintain the liquid refrigerant under pressure.

The high pressure, relatively warm liquid refrigerant is advanced from the receiver **18** to the intercooler or accumulator **7** by way of the line **20** which communicates with the lower portion of the receiver **18**, so as to pick up liquid refrigerant as low as possible in the receiver. The line **20** is connected to the upper end of the subcooling coil **21**, which is submerged in the chilled liquid refrigerant **9** confined in the intercooler or accumulator **7**. The lower end of the subcooling coil **21** communicates with a line **22** which advances the subcooled liquid refrigerant to the upper end of the oil separator of this invention, which is indicated generally at **23**.

In the ammonia refrigeration system selected to illustrate the invention, the compressed refrigerant, together with the oil which escapes from the compressors reaches a relatively high temperature, for example a temperature between 200° F. and 250° F. Oil in this condition cannot be separated from the refrigerant in an efficient manner. However, after passing through the condenser **12** to the line **17**, where a portion of the heat is carried away, the refrigerant is reduced to a liquid state at a much lower temperature, for example 85° F.

As noted earlier, the lubricating oil is heavier than the liquid ammonia and precipitates to the lower portion of the receiver **18**, where it is advanced, with the liquid ammonia, by way of the line **20** to the subcooling coil **21**. After passing through the intercooler **7**, the liquid refrigerant is reduced to a temperature below the freezing point of moisture and the entrained lubricating oil is in a viscous state. At this lowered temperature, the entrained oil is in a condition to be more readily removed from the refrigerant by operation of the oil separator **23**.

Generally speaking, the liquid refrigerant (contaminated with entrained oil) passes from subcooling coil **21** through the line **22** to the oil separator **23** at a rate between 100 and 500 feet per minute, depending upon the particular type of system. Upon reaching the oil separator, as explained later in detail, the rate of flow is decreased to approximately one foot per minute. At this rate of flow, the entrained oil, which is now in a viscous state, may be separated from the liquid refrigerant in a highly efficient manner.

After having passed through the oil separator **23**, the uncontaminated liquid refrigerant flows by way of the line **24** to the branch lines **25—25** which lead to the evaporators **4** and **5**. In passing trough the evaporators the liquid ammonia is allowed to expand, thereby to absorb heat. The expanded refrigerant gas, with liquid refrigerant entrained therein, then passes by way of line **3** to the first stage compressor **1** to repeat the cycle.

It will be understood at this point, that the leakage of lubricating oil from the compressors into the refrigerant lines is a very common problem, since the power unit, such as the compressor cylinder (which is in direct contact with the refrigerant gas) necessarily must be lubricated. Ordinarily, the lubricating oil is forced along with the high pressure, high temperature refrigerant discharged from the compressor and passes through the several components, such as the accumulator, condenser and receiver to the evaporators, at which stage it is reduced to a viscous state.

Upon reaching the evaporators, (in the absence of an oil separator) the entrained, now viscous oil, collects upon the internal surfaces of the evaporators, thereby forming an insulating film, which interferes with the evaporation of the refrigerant and with the efficiency of the system. In other words, in the absence of an oil separator, the evaporator itself tends to act as an oil trap. The presence of oil in the refrigerant also interferes with the proper operation of the other components of the refrigeration system and may require periodic shutting down of the system for cleaning and maintenance.

Oil separator

As best shown in FIGURES 2–6, the oil separator **23** comprises, in general, a liquid refrigerant separation chamber **26** and a column or well **27** which forms an oil trap. The chamber **26** comprises a shell **28** formed of sheet metal, preferably cylindrical in configuration (FIGURES 2 and 3). The upper end of shell **28** includes a closure head **30** which is preferably welded as at **31** to the upper edge of the shell **28**. The lower end of shell **28** includes a bottom closure **32** which is welded as at **33** to the lower edge of the shell.

The bottom closure **32** includes the vertical column or well **27**, in the form of a cylindrical tube welded as at **34** to the bottom closure **32**. Tube **27** has a diameter which is a small fraction of the diameter of shell **28**. The lower end of column **27** includes a closure cap **35** which is welded as at **36** to the lower end of tube **27**. The shell **28** and its column **27** thus provides a composite pressure vessel having sufficient strength to withstand the pressure of the subcooled liquid refrigerant which it confines.

A mounting plate **37** is welded as at **38** to the cap **35** to provide a supporting base for the oil separator. As shown in FIGURE 1, the plate **37** may rest directly upon the floor **40** of the plant to support the oil separator.

It will be understood at this point, that the column **27** serves as a reservoir for the lubricating oil **41** (FIGURE 3) which is separated from the subcooled refrigerant which passes in a liquid state through the oil separator **23**. In order to provide for periodically draining the trapped lubricating oil **41**, the lower end of column **27** includes a drain pipe **42** which includes a hand-operated valve **43**. During operation of the system, a coating of frost **44** (FIGURE 2) collects upon the external surface of the column **27** above the trapped lubricating oil **41** in the column. The trapped pool of lubricant **41** prevents the formation of frost and thereby provides a frost reference line **45** at the level of the lubricating oil **41**.

The operator of the plant drains the trapped lubricating oil **41** periodically in response to the level of the frost line **45**. The trapped lubricant is drained as required, simply by opening the drain valve **43**. The column or well **27** may include an oil level gauge **46** (FIGURE 2) having graduations **47** which indicate the quantity of oil in the column in gallons or fractions thereof with reference to the frost line **45**. The oil level gauge **46** is mounted upon brackets **48—48** which are clamped to the column **27**.

As best shown in FIGURES 3–6, the shell **28** preferably is provided with a covering of heat insulating material **50** which may be formed of any conventional sheet material suited for the purpose. The sheet of insulating material is clamped in place about the shell by means of the bands **51** (FIGURES 2 and 3) or is applied with an adhesive and extends about the top closure **30** and around the bottom closure **32** to the upper end of the column **27**. The metal column **27** is devoid of insulation to provide for the formation of the frost coating **44**, as noted above.

The subcooled liquid from the intercooler **7**, as previously explained, flows by way of the line **22** to the separation chamber **26** of the oil separator (FIGURE 1). The subcooled liquid from line **22** passes into chamber **26** by way of a fitting **49** (FIGURE 3), which passes through the closure head **30** and which is sealed in place, for example, by welding or brazing. The lower end of the fitting **49** is curved to provide a right angular nozzle **52** which directs the flow of subcooled liquid refrigerant against the shell **28** of chamber **26**.

The separation chamber **26** includes a vertical baffle plate **53** which bisects the cylindrical shell **28** (FIGURE 4) and which extends from the closure head **30** downwardly to approximately a mid-point along the length of the chamber (FIGURE 3). The side edges and top edge of the baffle plate **53** preferably are welded as at **54** to the internal surface of the shell **28** and to the closure head **30**. The baffle plate divides the separation chamber into two sections, indicated at A and B (FIGURE 3).

Depending from the lower edge **55** of baffle plate **53** is a relatively small mesh separator screen **56** having its side edges welded or otherwise secured as at **57** to the internal surface of shell **28** (FIGURE 5). The lower edge of the screen **56** is similarly welded as at **58** (FIGURE 6) to the bottom closure **32**. The lower edge of the screen **56** includes a depending portion **60** (FIGURE 6) which interfits the upper portion of the column **27**.

After passing through the chamber **26**, the subcooled liquid passes by way of an outlet fitting **61** (FIGURE 3), which is sealed with respect to the closure head **30**, similar to the inlet fitting **49**. The outlet fitting **61** is connected to the line **24** which leads to the evaporators **4** and **5**. After passing through the oil separator, the liquid refrigerant is substantially free of contamination, the entrained lubricating oil having been separated and collected in the column 27, as explained below.

Operation

As noted earlier, the entrained lubricating oil in the system is heavier than the liquid refrigerant and collects on the bottom of the receiver 18 to be carried with the warm refrigerant liquid by way of the line 20 through the intercooler 7. After passing through intercooler 7, the refrigerant is reduced to a temperature below the freezing point of water and the droplets of refrigerating oil in the subcooled refrigerant become more viscous because of the drop in temperature.

The subcooled liquid refrigerant flowing from the intercooler 7 by way of line 22 to the oil separator 23 moves at a flow rate usually between 100 and 500 feet per minute, depending upon the particular refrigeration system in which the oil separator 23 is installed. The subcooled liquid refrigerant entering the oil separator from line 22 passes through the fitting 49 (FIGURE 3), and is projected from the right angular nozzle 52 against the surface of shell 28, as indicated by the arrows 62.

According to the principles of the present invention, the diameter of the shell 28 is so related to the flow rate of the liquid refrigerant through line 22 (100–500 feet per minute) to provide a flow rate through the chamber 26 of approximately one foot per minute. The liquid refrigerant thus flows from nozzle 52 downwardly through section A (after impinging against the surface of the shell 28), as indicated by the arrows 63, by operation of baffle 53. After passing beyond the lower edge of baffle 53, the liquid refrigerant flows through the screen 56, as indicated by the arrows 64, then upwardly through section B toward the outlet fitting 61, as indicated by the arrows 65. In passing at this relatively slow rate through the oil separator 23, the entrained droplets of lubricating oil are separated from the liquid refrigerant, as explained below, and are collected in the column 27, subsequently to be drained from the system.

The oil separator 23 carries out its function through the combined operation of the chamber 26, the baffle plate 53, and the screen 56 as follows:

Firstly, the oil entrained in the liquid refrigerant impinges against the interior surface of shell 28, as indicated by the arrows 62 (FIGURE 3). In striking the shell surface, a certain percentage of the oil droplets adhere to the surface, then drain by gravity downwardly into the column 27.

Secondly, as the liquid refrigerant travels downwardly below nozzle 52, as indicated by the arrows 63, a further percentage of the entrained oil precipitates by gravity from the slowly moving liquid refrigerant and also collects in the column 27.

Thirdly, in passing around the lower edge of baffle plate 53 and through the screen 56, as indicated by the arrows 64, the remaining entrained lubricating oil becomes entrapped by the screen, which is of relatively fine mesh. The entrapped oil which collects upon the screen also flows downwardly by gravity until it reaches the depending portion 60 (FIGURE 6), at which point it drops into the column 27.

Should any residual percentage of oil pass through the screen, the slow upward flow rate (Section B) permits this remaining oil to precipitate and drop down to the column by gravity. When the upwardly flowing refrigerant reaches the outlet fitting 61, it is substantially free of oil contamination. From this point the purified refrigerant is conducted directly through evaporators 4 and 5.

The volumetric capacity of the chamber 26 is calculated in accordance with the amount of liquid passing through the system. In other words, a system having a greater flow rate requires a chamber having a relatively large diameter in order to achieve the low velocity flow rate of approximately one foot per minute through the chamber. By way of example, a typical installation may require a chamber having a diameter in the neighborhood of 30 inches. The diameter of the column 27 is not critical since the column acts primarily as a reservoir or well for the precipitated oil. In the example cited above (30 inch diameter chamber), the diameter of the column may be in the neighborhood of 8 inches.

The oil separator preferably is installed in a relatively warm area of the plant, for example, in the engine room, such that the ambient temperature warms the column 27 and the lubricating oil which is confined in it. This facilitates withdrawing the oil periodically from the column, since the warmed oil is in a readily flowable state. The chilled liquid lubricant above the oil level reduces the temperature of column 27 to a point below the dew point of the air surrounding the uninsulated column so as to form the frost coating 44 (FIGURES 2 and 3). Since the accumulated oil 41 insulates the lower portion of column 27 from the liquid refrigerant, the frost coating 44 forms the visual reference frost line 45, indicating the quantity of accumulated oil.

The covering 50 of heat insulating material is applied to shell 28 in order to avoid loss of refrigeration in view of the fact that the separator is mounted in a warm atmosphere. However, the covering may be omitted under certain operating conditions, in which case the frost 44 will cover the entire shell 28 and the upper portion of the column.

As best shown in FIGURE 3, the closure head 30 includes a hand-operated vent valve 66 including a fitting 67 communicating with the interior of chamber 26. This valve normally remains closed and is utilized only for maintenance purposes. In addition, there is provided a safety valve 68, also communicating with fitting 67 and arranged to relieve excess pressure within the oil separator. Both the vent valve and safety valve are conventional in refrigeration systems and have not been disclosed in detail.

Having described my invention, I claim:

1. An oil separator adapted to be interposed in the liquid refrigerant supply line of a refrigeration system, said liquid refrigerant being subcooled to a temperature below the freezing point of water, said oil separator adapted to separate entrained lubricating oil from the liquid refrigerant, said oil separator comprising:
    an upright cylindrical oil separator chamber having an upper end wall and a lower end wall,
    a vertical baffle in the form of a solid flat plate extending transversely in said separator chamber and bisecting the said cylindrical separator chamber, the opposite side edges of said baffle being secured to the internal surface of the cylindrical oil separator chamber,
    said baffle extending vertically from the upper end wall of the separator chamber downwardly to an intermediate plane along the length of the separation chamber, thereby dividing the chamber into a first section and a second section which are sealed relative to one another,
    an inlet fitting communicating with the upper end wall of said first section,
    said inlet fitting extending vertically through the upper end wall of the oil separator and including a horizontal nozzle projected toward the internal surface of the separation chamber,
    said nozzle adapted to project the incoming liquid refrigerant against the internal surface of the separation chamber in the upper portion of said first section, whereby droplets of entrained oil impinge against said surface and collect thereon to flow by gravity along said surface to the bottom portion of the separation chamber,
    an outlet fitting communicating with the upper end wall of the second section,
    the area of the inlet fitting being a fraction of the transverse area of said first and second sections,

whereby the liquid refrigerant passes downwardly through the first section and upwardly through the second section to the outlet fitting at a retarded rate of flow sufficiently slow to cause a portion of the enrained oil to precipitate by gravity from the liquid refrigerant to the lower portion of the separation chamber,

a flat vertical screen extending downwardly from the lower edge of said baffle to the lower portion of the separation chamber and forming a continuation of said first and second sections, whereby the liquid refrigerant passing from the first section to the second section is forced through said screen,

said screen adapted to entrap residual lubricating oil entrained in the refrigerant passing through said screen, causing the entrapped oil to adhere to the screen and to flow by gravity along said screen to the lower portion of the separation chamber.

2. An oil separator as set forth in claim 1 in which the oil separation chamber includes an oil collecting column having a transverse area substantially less than the transverse area of the separation chamber and depending downwardly below the lower end of the separation chamber,

said screen including a depending portion having a reduced width which interfits the upper portion of the oil collecting column, said screen thereby forming a continuation of said first and second sections and extending said sections downwardly into the upper portion of the oil collecting column,

and means for withdrawing the entrapped oil from the oil collector column.

3. An oil separator as set forth in claim 2 in which the external surface of the separation chamber includes heat insulating cover and in which the oil collecting column is devoid of insulation, whereby the subcooled liquid refrigerant in the collector column above the oil accumulated therein forms a coating of frost upon the external surface of the collecting column, the top of the said coating of frost forming a visual reference line indicating the level of the oil accumulated in the column.

4. An oil separator as set forth in claim 3 in which the oil collecting column includes an oil level gauge extending parallel with the oil collecting column, said gauge including graduations indicating the quantity of oil accumulated in the column in accordance with the reference line provided by said coating of frost.

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