

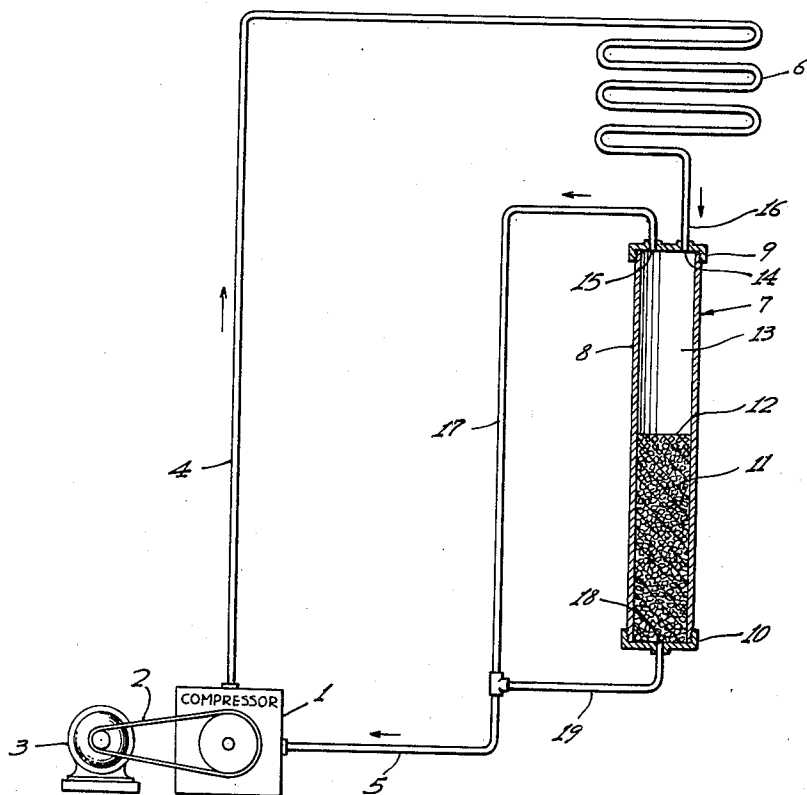
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REFRIGERANT GAS DRYING APPARATUS

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REFRIGERANT GAS DRYING APPARATUS

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This invention relates, as indicated, to refrigerant gas drying apparatus, and, more particularly, to an improved arrangement of such apparatus comprising a device which may be conveniently connected in the gas circulating conduit of a refrigerating system for removing moisture or entrained water from the gas circulating through the conduit.

One of the most common troubles encountered in refrigerating systems wherein a gas is employed as the refrigerant comes from moisture collecting in the circulating conduit through which the gas flows. Collection of moisture in the system results in corrosion of the metal parts and reduces the operating efficiency of the system. If sufficient water collects in the system, it may be rendered inoperative.

When moisture has collected in a gas refrigerating system, it is necessary to take steps to remove such moisture in order to restore the efficiency of the system and to prevent deterioration of the parts of the system. For this purpose, the connection in the gas circulating conduit of cartridges containing dehydrating material has been proposed. These cartridges have been connected in the circulating conduit in such manner that the gas is caused to flow through the dehydrating material in the cartridge. These cartridges have in many cases proven unsuccessful due in part to the dehydrating material becoming clogged and thus interfering with the normal operating pressures of the system. The clogging in many cases is caused by collection of the lubricant carried by the refrigerant in the dehydrating material. The collection of the lubricant in the dehydrating material in this manner presents an additional objectionable feature in that its removal from the gas being circulated interferes with the lubrication of the compressor.

One of the principal objects of this invention is to provide an improved drying apparatus which may be connected in the circulating conduit of a gas refrigerating system for the purpose of removing moisture from the gas being circulated.

A further object is to provide an improved arrangement of such apparatus which will not clog or interfere with the circulation of gas, which will not remove the lubricant from the gas being circulated, and which is simple in construction and may be manufactured and installed at a minimum cost.

To the accomplishment of the above and related ends, there is provided a container in the nature of an elongated cylinder having dehydrating material in its lower portion and an un-

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obstructed chamber in its upper portion. The upper portion of the cylinder is provided with a pair of openings for connection in the gas circulating conduit so that the gas being circulated will flow through the chamber in the upper end of the cylinder. The openings by which the cylinder is connected in the gas circulating conduit are positioned out of alignment with each other so that the path of movement of the gas will be changed as it travels from one opening to another. This arrangement has been found effective to separate moisture out the gas being circulated which falls by gravity to the bottom of the chamber where it contacts the dehydrating material. Any lubricant deposited in the cylinder along with the moisture flows downwardly through the dehydrating material by gravity and out of an opening provided in the bottom of the cylinder. The opening in the bottom of the cylinder is provided with a conduit for returning the lubricant to the refrigerant circulating system. The moisture deposited in the cylinder is absorbed by the dehydrating material and is thus prevented from being returned to the circulating conduit. The opening in the bottom of the cylinder and its connection with the gas circulating conduit, in addition to providing for the return of lubricant, is effective to prevent the formation of any pressure condition in the bottom of the cylinder which would otherwise be effective to trap lubricant therein.

Other objects and advantages will become apparent from the following description.

In the drawing, the single figure illustrates diagrammatically a gas refrigerating system having connected therein a drying apparatus constructed in accordance with the principles of this invention, the drying apparatus being shown in vertical section.

Referring to the drawing, the numeral 1 designates a compressor having a belt drive 2 for driving it from a motor 3. The compressor 1 is provided with high pressure outlet and low pressure inlet openings (not shown) which are connected respectively with delivery and return conduits 4 and 5. The conduits 4 and 5 constitute part of a gas conduit or circulating system by which the gas refrigerant is fed from the compressor to refrigerating coils 6 and returned to the compressor through the return conduit 5. The refrigerating system may be any conventional system in which gas is employed as the refrigerant and which is provided with conventional controls (not shown) commonly provided in such systems.

The apparatus for removing moisture from the

refrigerant is indicated as a whole by the numeral 7 and is connected between the high pressure outlet and low pressure inlet of the compressor 1. The drying apparatus 7 comprises an elongated cylinder 8 having a closure cap 9 at its upper end and a closure cap 10 at its lower end. The cylinder 8 with its caps 9 and 10 constitute a container which is approximately half filled with dehydrating material 11. The dehydrating material 11 is preferably calcium chloride although silica gel or other suitable dehydrating materials may be employed for the purposes of this invention. The upper surface 12 of the dehydrating material 11 defines the lower end of a compartment or unobstructed chamber 13 in the upper portion of the cylinder 8. The cap 9 is provided with a pair of openings 14 and 15. The opening 14 is connected by a conduit 16 and the refrigerating coils 6 to the high pressure conduit 4. The opening 15 is connected by a conduit 17 with the low pressure intake of the compressor 1 through the conduit 5. In this manner, gas being circulated through the system by the compressor 1 is caused to flow through the chamber 13 in the upper portion of the cylinder 8.

The openings 14 and 15 are placed in positions out of alignment with each other so that the direction of travel of the gas will be reversed in its movement through the chamber 13. In this manner, moisture contained in the gas moving through the chamber 13 will be deposited in the chamber 13 and will fall by gravity into the dehydrating material 12.

The cap 10 at the lower end of the cylinder 8 is provided with an opening 18 which is connected by a conduit 19 to the return conduit 5 and the low pressure side of the compressor 1. The opening 18 and conduit 19 are for the purpose of returning lubricant deposited in the container 8 to the gas circulating system. Particles of lubricant which are deposited in the chamber 13 by the gas passing therethrough flow downwardly by gravity through the dehydrating material 11. The particles of water which are deposited in the chamber 13 are prevented from passing to the opening 18 by the dehydrating material 11 which absorbs the moisture but permits the oil to pass therethrough. In addition, the conduit 19 being connected with the conduit 5 prevents the formation of pressure conditions in the lower end of the container 8 which would otherwise be effective to interfere with the flow of lubricant through the dehydrating material 11. When installing the cylinder, it is positioned with its base vertically above the intake to the compressor so that an oil trap will not be formed between it and the compressor. As pointed out above, the dehydrating material 11 is preferably calcium chloride in a granulated form so that the lubricant may flow by gravity therethrough. Any other dehydrating material may be employed which will permit the flow of lubricant by gravity therethrough, and, for this purpose, a removable cartridge containing dehydrating material may be inserted in the lower end of the cylinder 8 in place of dehydrating material in bulk form as illustrated.

In operation, the refrigerant gas upon leaving the cooling coils 6 flows through the opening 14 into the chamber 13. In flowing through the chamber 13, its direction of travel is reversed as it passes through the outlet opening 15 to the low pressure side of the compressor 1. Moisture contained in the gas is deposited in the chamber 13 and falls by gravity into contact with the de-

hydrating material 11 which absorbs such moisture. Oil deposited in a similar manner in the chamber 13 flows downwardly by gravity through the dehydrating material 11 and out of the cylinder 8 through the opening 18, and is returned by the conduit 19 to the gas circulating conduit 5.

From the foregoing, it will be apparent that the device 7 is operative to remove moisture from a gas refrigerant circulating conduit. Attention is particularly directed to the fact that the removal of the moisture is accomplished without passing the gas through any dehydrating material and without any possibility of clogging the circulating system or preventing movement of the gas through the compressor 1. Attention is also particularly directed to the fact that the removal of the moisture is accomplished without removing the lubricant from the circulating gas and without interfering with the lubrication of the compressor 1.

While I have illustrated and described one specific embodiment of my invention, it will be understood that this is merely by way of illustration, and that various changes and modifications may be made therein within the contemplation of my invention and under the scope of the following claims.

I claim:

1. A drier for insertion in a gas refrigerant conduit having high and low pressure ends comprising a container having an upper portion with a first opening therein for connection to the high pressure end of the conduit and a second opening for connection to the low pressure end of the conduit, said openings being out of direct alignment so that the gas will not travel in a direct line through said upper portion as it moves from said first to said second opening, a lower portion with a third opening therein for connection to said low pressure end through which lubricant may return by gravity from said container to said conduit, and moisture absorbing material in said lower portion for preventing the flow to said third opening of moisture separated out of gas flowing from said first to said second opening.

2. A drier for insertion in a gas refrigerant conduit to remove moisture from gas flowing therethrough comprising a container having water absorbing material in its lower portion, its upper portion providing an unobstructed chamber through which gas may flow, said container having a pair of openings in said upper portion by which it may be connected in said conduit so that the gas flowing through said conduit will flow through said chamber, said openings being in positions out of alignment with each other to reverse the direction of movement of the gas as it passes through said chamber, the moisture deposited in said chamber by gas flowing therethrough falling by gravity to said material for absorption thereby, said container having an opening in its lower portion through which lubricant deposited in said container by the gas may drain by gravity, and a conduit connected with said opening for returning the lubricant to said refrigerant conduit.

3. In refrigerating apparatus having a compressor with a high pressure outlet and a low pressure intake for refrigerant gas, and a refrigerating system including a circulating conduit connecting the compressor outlet with its intake, the invention which comprises a device for removing moisture from gas circulating through

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said conduit and including a container having a lower portion with moisture absorbing material therein, an upper portion defining an unobstructed chamber above said material, said upper portion having a pair of openings for connection in said conduit to circulate the gas through said chamber, the moisture deposited in said chamber by the gas flowing by gravity to contact said water absorbing material, said container having an opening in said bottom portion through which lubricant deposited in said container by the gas may flow by gravity.

4. In refrigerating apparatus having a compressor with a high pressure outlet and a low pressure intake for refrigerant gas, and a refrigerating system including a circulating conduit connecting the compressor outlet with its intake, the invention which comprises a device for removing moisture from gas circulating through said conduit and including a container having a lower portion with moisture absorbing material therein, an upper portion defining an unobstructed chamber above said material, said upper portion having a pair of openings for connection in said conduit to circulate the gas through said chamber,

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the moisture deposited in said chamber by the gas flowing by gravity to contact said water absorbing material, said container having an opening in said bottom portion through which lubricant deposited in said container by the gas may flow by gravity, and a conduit connected with said opening for returning the lubricant to said circulating conduit.

5. Apparatus as claimed in claim 4 wherein said opening is positioned vertically above the compressor inlet so that the lubricant may return to the compressor by gravity.

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