Dec. 14, 1926. 1,610,503

S. W. C. FITTS

GAS COMPRESSOR

Filed Jan. 5, 1926

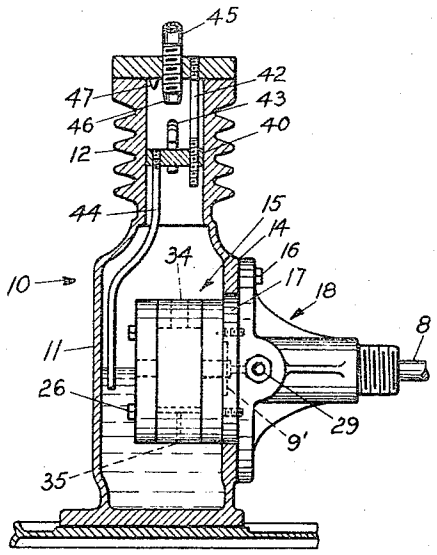

Fig. 1

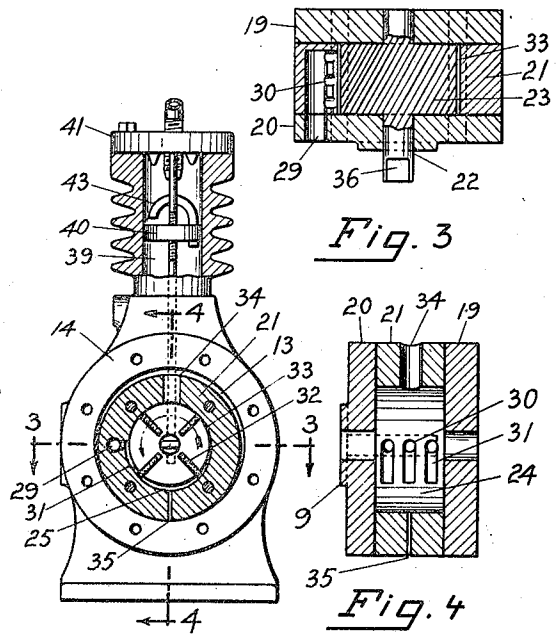

Fig. 3

Fig. 4

Fig. 2

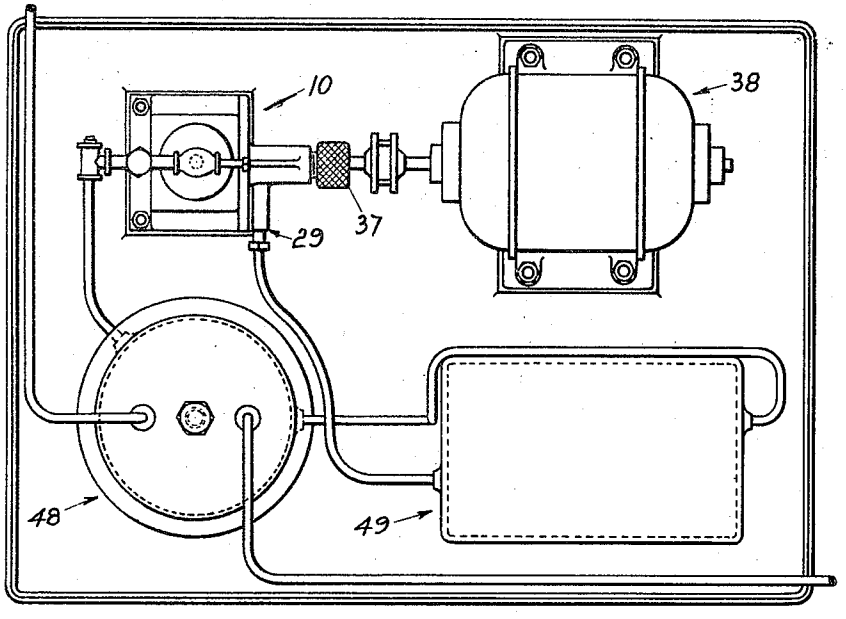

Fig. 5

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Patented Dec. 14, 1926. 1,610,503

UNITED STATES PATENT OFFICE.

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GAS COMPRESSOR.

Application filed January 5, 1926. Serial No. 79,303.

My invention relates to gas compressors adapted for use in refrigerating systems, and it has special reference to compressors used in connection with refrigerant liquids, which at atmospheric pressure absorb heat from their surroundings and thereby change into gas.

In the majority of compressors used in domestic refrigerating systems, the compressor element is of the rotary type and revolving at a high rate of speed. It has therefore been found necessary either to immerse the compressor element in oil or to feed the oil to the element in order to prevent overheating of the latter. While this method keeps the compressor element comparatively cool, it has the defect that, on account of the compression of the gas, some of the vapory oil is forced into the condenser coils connected with the compressor, so that the oil, as it accumulates, will in time interfere with the efficiency of the refrigeration. This defect is very serious, as practically the whole refrigerating system has to be dismantled in order to free it from the collected oil.

The principal object of my invention is to provide means for collecting in a gas compressor such particles of the liquid lubricant that have been carried in a vapory state above the compressor element, and thereby preventing vapory oil from escaping with the compressed gas from the compressor, so that the refrigeration will be maintained at a maximum efficiency over a very long period of time.

A second object of my invention is to provide adjustable means for returning the collected oil to the oil reservoir to a level below the established level of the liquid lubricant in the compressor housing, so as to prevent the gas from following the returning oil and thereby avoiding any tendency of the lubricant to foaming. By such means I thus virtually conserve the entire supply of oil and substantially eliminate service calls for this heretofore serious defect of removing oil from the condenser tubes.

A further object of the invention is to facilitate assembling and disassembling of the compressor and its parts. These are factors that favor a reduced cost of production with a consequent lowering of the selling price of the compressor.

Still further objects and advantages of my invention will be understood from the following detailed description of a preferred embodiment of my invention and from the accompanying sheet of drawings illustrating the said embodiment, and in which:

Figure 1 is a side elevation of a gas compressor constructed according to the principle of my invention. In this view the compressor housing and its extension are shown in vertical midsection, and a liquid lubricant is shown in the housing up to the median horizontal plane of the compressor unit.

Fig. 2 is an elevation of the compressor as seen from the right of Fig. 1. The flanged head of the compressor unit has been removed, and the interior parts of the unit are shown in transverse vertical section, as is also a part of the extension of the compressor housing.

Fig. 3 is an enlarged and horizontal sectional view taken along the line 3—3 of Fig. 2, and shows the various parts of the compressor unit.

Fig. 4 is an enlarged and vertical sectional view taken along the line 4—4 of Fig. 2, and shows primarily the casing with its gas inlet and the interior peripheral channels leading from the inlet, and also the outlet for the compressed gas from the casing. The rotor has been removed.

Fig. 5 is a diagrammatic plan of the compressor as mounted and connected with a motor, a condenser and expansion coils for service.

In the drawings the numeral 10 represents a gas compressor to which the principle of my invention is applied. The compressor comprises a housing 11 provided with an upward extension 12, and with an opening 13 in a side wall 14 that has a plane outer face.

A casing 15 of a compressor unit extends through the opening and is secured to a projecting hub 17 on the flanged head 18, and which head is adapted to have a gas-tight connection with the wall 14 and is secured to the latter by any suitable means, such as bolts 16. Preferably, the part of the casing that is within the housing is composed of two end plates 19 and 20, and an intermediate shell 21. Each of the plates 19 and 20 has a bore for rotatably receiving therein

the shaft 22 of a rotor 23, and the shell 21 has therethrough a bore 24, which is positioned eccentric to the shaft bore in the plates 19 and 20 so as to leave a space 25 between the rotor and the cylindrical wall of the intermediate shell portion at the bottom of the bore, as shown in Fig. 2. The parts 19, 20 and 21 are firmly secured to the flanged head 18 by any suitable means, such as tap bolts 26 extending through holes in the said parts and into the corresponding screw-threaded holes in the head. In order that the eccentricity of the bore in the shell 21 may be placed in the proper position, the inner plate 20 may have on its outer face, as shown in Fig. 4, an eccentric boss 9, adapted to engage the corresponding but concentric recess 9′ in the hub 17 of the head.

A gas-intake passage 29 leads from the outside of the flanged head 18 and through the plate 20 and into the intermediate shell 21. Ducts 30, communicating with the intake passage, are adapted to lead the incoming gas therefrom to peripheral grooves 31, over which the vanes 32, slidable in the rotary element, are adapted to travel in the direction indicated by the curved arrow in Fig. 2 towards and beyond the space 25. During the rapid rotary movement of the rotor, the vanes are, by centrifugal action, caused to contact with the cylindrical wall of the shell and will thereby compress the gas delivered thereto in the narrowing space as is indicated at 33 in Fig. 3, until finally the compressed gas is forced through the outlet passage 34 in the top of the shell and therefrom into the extension above the compressor housing.

In order to provide proper lubrication for the rotary element 23, a liquid lubricant is supplied to the housing, preferably so that even under pressure it reaches up to the median horizontal plane through the element and its shaft, as shown in Fig. 1. By this arrangement the lubrication of the inner end of the shaft is assured, while oil to the rotary element within the casing is drawn through a capillary hole 35 in the bottom of the shell 21. Although the shaft of the rotary element may be unitary, it preferably comprises an inner and an outer section, the inner section having a flat end portion 36 adapted to be received in a socket (not shown) in the inner end of the outer section 8. In order to prevent leakage of oil around the shaft the flanged head is provided with the usual stuffing box, packing means and a gland 37 for tightening the packing around the shaft. The shaft at its outer end preferably has a flexible coupling connection with the shaft of a motor 38, as shown in Fig. 5.

The housing extension 12 has therein a cylindric bore 39 in which slidably fits a disk 40, and the extension has secured to its top a cover 41, and into which is screwed the upper end of a rod 42, while the lower end of the rod has screw connection with the disk, so that a certain range of vertical adjustment for the disk is possible in the extension. A tube 43 is also fitted in the disk and extends therethrough and this tube has above the disk and spaced therefrom a downward turned end, as is most clearly shown in Fig. 2. Another tube 44 is fitted in the disk and extends downward therethrough and between the casing 15 and a wall of the housing 11 to a level below the level of the liquid lubricant. In order to adjust the tube 44 to the desired depth in and relative to the liquid lubricant, the cover is removed and the disk turned one or more complete turns on the rod 42, and the disk and tube parts connected thereto will rise or lower accordingly, and it is also to be noted that when the cover 41 is removed the interior of the housing is wholly free for inspection.

In the cover is fitted an outlet pipe 45, which may have a conical end 46 for collecting thereon and efficiently dropping such drops of oil as may have been carried with the compressed gas as vapory oil through the tube 43 to the outlet chamber and pipe. For a similar purpose the cover may have therein downward conical projections 47. The condensed oil collected on the conical end and the projections will drop onto the disk 40 and flow back into the liquid lubricant reservoir through the tube 44, and any tendency of the oil to be carried with the compressed gas into the outlet pipe and thence into the condenser 48 and the expansion coils 49 of the refrigerating system is thereby checked.

It should be observed that the arrangement of the tube 43 in the disk is such that the vapory oil is forced downward and upon the disk 40, and from which the collected and condensed oil flows through the pipe 44 to the level of the liquid lubricant, so that foaming of the liquid is made impossible, and also gas is thereby prevented from rising upward through the pipe 44. It should further be observed that the level of the lubricant in the housing 11 is below the top of the casing, so that oil is prevented from flowing into the casing at the gas outlet passage 34 thereof. Also, since the hole 35 in the casing is of a small diameter as compared with the gas outlet passage 34, the oil will flow into the compressor unit only in such quantities as are adapted to maintain the rotary element in an efficient running condition.

Having thus described my invention, I claim as new and desire to secure by Letters Patent of the United States the following:

1. In a gas compressor, a housing having therein a compressor unit comprising a casing which extends through one wall of the housing and is detachably mounted therein and provided with a gas-intake passage leading from the outside of the housing and with a gas-outlet passage through its top, and a compressor element rotatably mounted in the casing, the casing provided with a capillary bore in its bottom, and the housing being adapted to hold a liquid lubricant therein to a level below the top of the casing and having an extension above the casing; a disk removably mounted and slidably adjustable in the extension; a tube extending through the disk and having a downward turned end above the disk and spaced therefrom; another tube extending downward through the disk and between the casing and a wall of the housing; and a gas-outlet pipe leading from the extension above the disk.

2. In a gas compressor, a housing having therein a compressor unit comprising a casing which extends through one wall of the housing and is detachably mounted therein and provided with a gas-intake passage leading from the outside of the housing and with a gas-outlet passage through its top, and a compressor element rotatably mounted in the casing, the casing provided with a capillary bore in its bottom, and the housing being adapted to hold a liquid lubricant therein to a level below the top of the casing and having an extension above the casing; a disk removably mounted and slidably adjustable in the extension; a tube extending through the disk and having a downward turned end above the disk and spaced therefrom; another tube extending downward through the disk and between the casing and a wall of the housing to a level below the level of the liquid lubricant, and a gas-outlet pipe leading from the extension above the disk.

3. In a gas compressor, a housing having therein a compressor unit comprising a casing which extends through one wall of the housing and is detachably mounted therein and provided with a gas-intake passage leading from the outside of the housing and with a gas-outlet passage through its top, and a compressor element rotatably mounted in the casing, and the casing provided with a capillary bore in its bottom, and the housing being adapted to hold a liquid lubricant therein to a level below the top of the casing and having an extension above the casing; a disk removably mounted and slidably adjustable in the extension; a tube extending through the disk and having a downward turned end above the disk and spaced therefrom; another tube extending downward through the disk and between the casing and a wall of the housing; downward projections in the extension from the top thereof; and a gas-outlet pipe leading from the extension above the disk.

4. In a gas compressor, a housing having therein a compressor unit comprising a casing which extends through one wall of the housing and is detachably mounted therein and provided with a gas-intake passage leading from the outside of the housing and with a gas-outlet passage through its top, and a compressor element rotatably mounted in the casing, and the casing provided with a capillary bore in its bottom, and the housing being adapted to hold a liquid lubricant therein to a level below the top of the casing and having an extension above the casing; a disk removably mounted and slidably adjustable in the extension; a tube extending through the disk and having a downward turned end above the disk and spaced therefrom; another tube extending downward through the disk and between the casing and a wall of the housing; downward projections in the extension from the top thereof; and a gas-outlet pipe leading from the extension above the disk, the outlet pipe having a conical end.

In testimony whereof, I affix my signature.

SILAS W. C. FITTS.