Sept. 11, 1934. J. A. GRIER 1,973,063

COMPRESSION OR VACUUM MACHINE

Original Filed Jan. 25, 1924 3 Sheets-Sheet 1

Fig. 2.

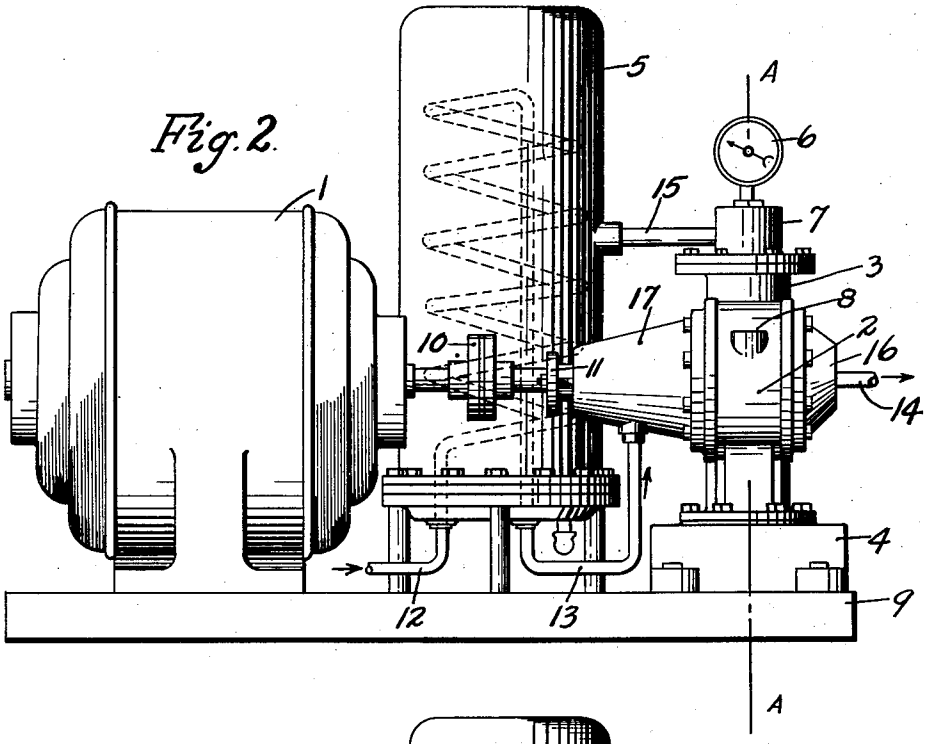
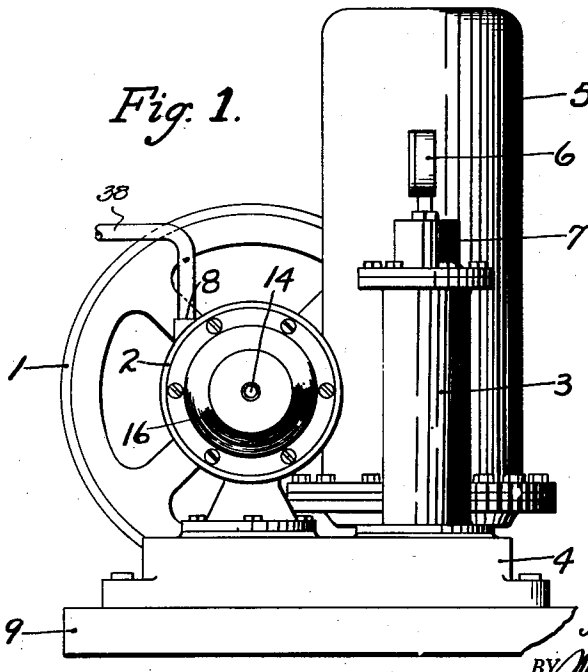


Fig. 1.



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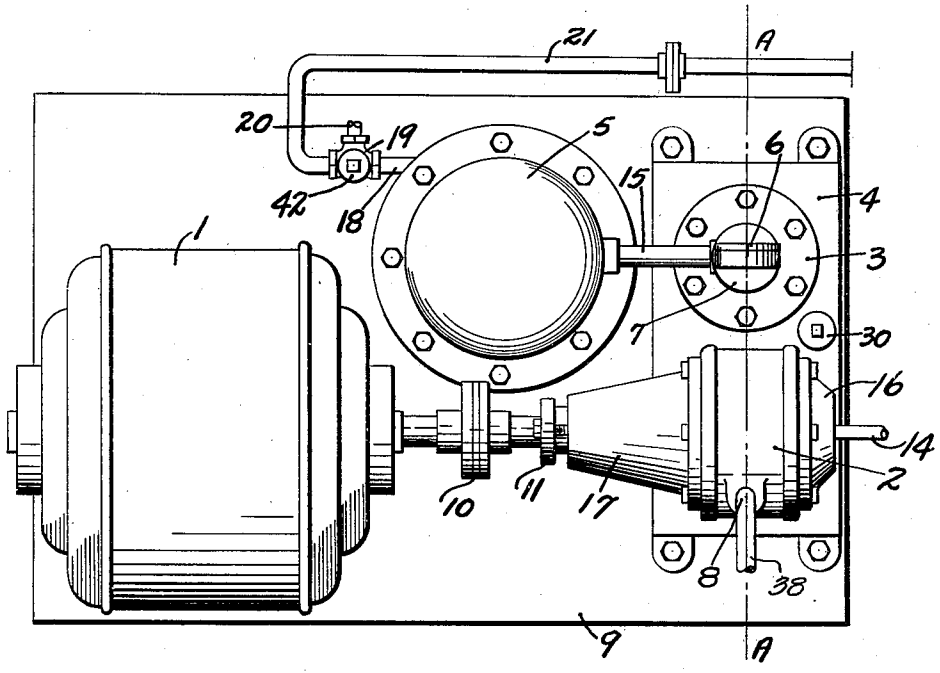

Fig. 3.

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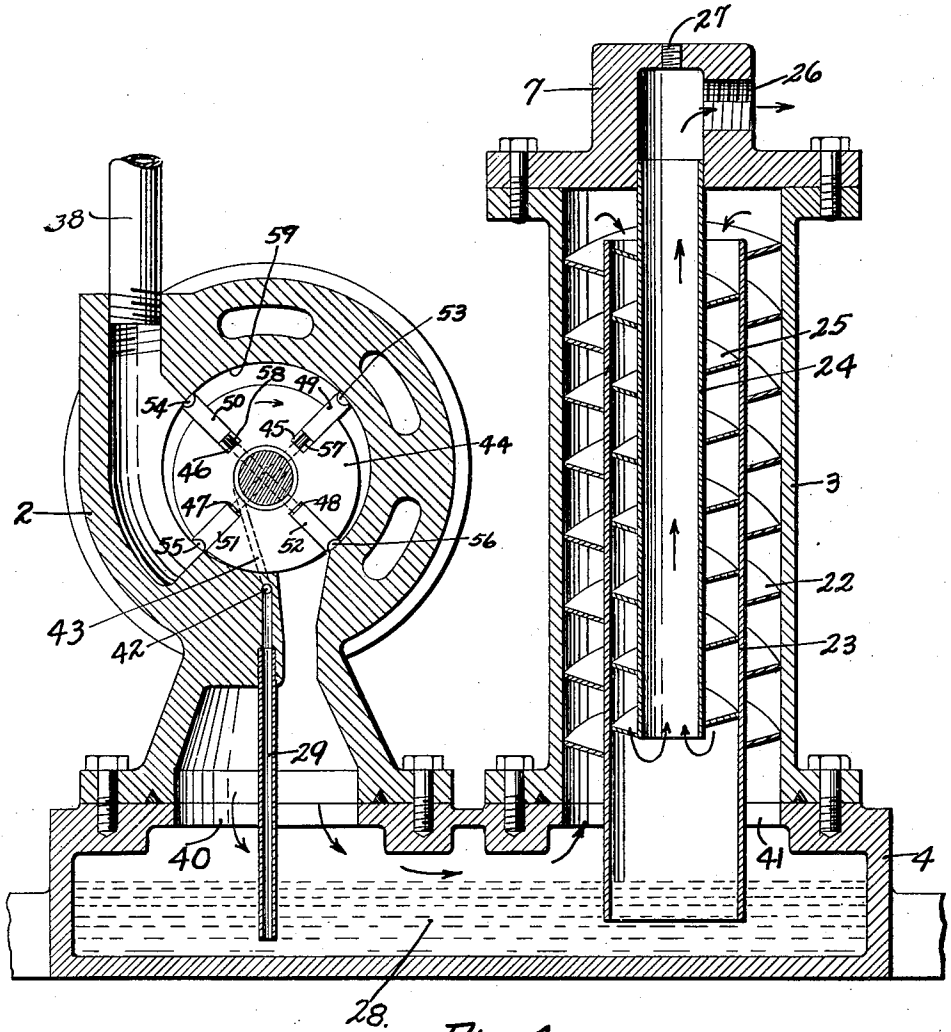

Fig. 4.

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UNITED STATES PATENT OFFICE

1,973,063

COMPRESSION OR VACUUM MACHINE

John Alfred Grier, New York, N. Y.

Original application January 25, 1924, Serial No. 688,539. Divided and this application August 12, 1929, Serial No. 385,178

4 Claims. (Cl. 230—207)

This invention relates to improvements in compression or vacuum machines and has for its primary object the production of a compact, highly efficient and "fool proof" apparatus that is especially adapted to many commercial uses such as refrigeration systems, supplying large volumes of air or gases, and the many uses in the arts using pressures less than the atmospheric.

This application is a division of my Patent No. 1,724,874, issued August 13, 1929, application filed January 25, 1924.

Among the objects of this invention are: (1) To provide a lubricating system whereby the moving parts are thoroughly and automatically lubricated; (2) To provide a lubricant separator to remove all of the lubricant from the compressed air or gas (hereinafter called gas), and return it to the main body of the lubricant adjacent the outlet therefrom; and to make a machine which is very compact, yet has every part accessible so that, in case of trouble, no other parts would have to be torn down to get to the part needing attention. Further objects will sufficiently appear from the detailed description which follows.

In order to move a large volume of air or gas at a relatively low pressure, I have adopted a certain novel grouping and arrangement of the parts and have specially designed some of the parts of the apparatus so that the gas as it comes out of the compressor is fed downwardly into and through a reservoir and up through a separator and thence by piping to the point where it is to be used. In some cases a storage or reservoir tank is desirable and in some cases I prefer to mount this on the same base with the other apparatus. A rotary compressor is employed because it will move a greater volume of gas for its size than any other kind of compressor, and also it makes a very good vacuum pump if properly lubricated.

The compressor may be driven by any suitable motor, preferably a rotary motor and specifically described herein as an electric motor. The compressed gas passes down through a large exhaust opening in the bottom of the compressor into a lubricant chamber from which it passes along the surface of the lubricant and upward through a specially constructed separator, which takes out all of the oil and throws it down into the lubricant chamber. The compressed gases pass from the separator to the point of use in some cases, and to the storage tank in other cases, while the pressure maintained on the lubricant forces it up a pipe provided for the purpose in constant circulation through the bearings and working parts of the compressor. The machine is made compact by having the motor, compressor, separator and (in some cases) the storage tank, all mounted on the same base, but as separate units so that any unit is accessible without disturbing the others. The base, moreover, contains the lubricant chamber or reservoir which forms a part of the circuit for the compressed gas.

As a part of my invention, which I shall claim as novel herein, I construct my lubricant reservoir as a support for both the compressor and the separator, the lubricant feeding up into the compressor and down with the compressed gas, the gas carrying some lubricant moving horizontally above the main body of lubricant and upward through the separator where (after separation) the lubricant drains down to the main body of lubricant again—the gas passing out of the top of the separator.

Other forms of separators may be used. However, I provide a novel construction of separator which has a column with communicating up and down paths for the gases, having spirals therein, the lower end of the column draining into the lubricant chamber, so that centrifugal force, as well as the force of gravity, will operate to separate the lubricant from the gases as the latter pass up and down through the spirals, and up again through the length of the column.

One embodiment of my invention is illustrated in the accompanying drawings in which like parts are indicated by the same numerals.

Figure 1 is an end elevation,

Figure 2 is a front elevation, and

Figure 3 is a plan view showing relation and location of the parts of my compressor machine, and

Figure 4 is a partial section of compressor base showing separator and compressor in section, taken on the line A—A of Fig. 2.

Referring to the drawings: 1 is an electric motor, 2 is a rotary compressor, 3 is a lubricant separator, 4 is a hollow base for the compressor and the separator which forms a container for lubricant. 5 is the condenser or reservoir which stands vertical in this case although I may mount it horizontally or otherwise as may best suit the circumstances of particular cases. When used as an air compressor it is some times desirable to have a storage tank for air and in such cases I mount an air tank in the place of the condenser. This makes a very compact unit and in the small sizes makes an ideal portable air supply.

The pipe or conduit 15 leads the compressed gases from the separator 3 to the condenser 5, or the air storage tank in cases where air storage is desired.

The pipe 21 leads liquid refrigerant to an expansion valve or air to the point desired and the return gas from the evaporator, or air in cases where used as an air pump, enters the compressor at 8. (In cases where used as a vacuum pump, the suction side 8 of the pump 2 is connected to the apparatus in which the vacuum is desired, allowing the air to discharge from the separator 3 directly into the open atmosphere.)

The pipe 13 leads the water from the condenser into the stuffing box end 17 of the compressor 2 where it passes through covered openings (in the compressor) to the head 16 and out through the pipe 14. In cases where the compressor is used for air the water may be led directly into the stuffing box end 17 and out through the pipe 14 in some cases, and in the smaller units as mentioned above I may use air or water cooled compressors.

The base 4 which forms a lubricant reservoir has circular openings 40 and 41 over which are mounted the compressor 2 and the lubricant separator 3 respectively (see Fig. 4). The quantity of lubricant 28 in the system is so regulated that there will always be a space between its surface and the upper wall of the reservoir 4 for the gases to pass from the compressor through the separator 3 to the system. The gases pass through pipe 38 into the intake 8 of the compressor 2 and after being compressed, they are discharged through the opening 40 into the lubricant reservoir 4 where they pass along the surface of the lubricant and into the separator through the opening 41. The separator may consist of one or more spirals or a plurality of baffle plates but in the machine shown I use two spirals. The tube 23 has a spiral 22 around its outside of such diameter as to fit tightly inside the cylinder which forms the body part of 3. The lower end of the tube 23 projects below the surface of the lubricant 28 in the reservoir, just clearing the bottom of the inside of the base 4. The lubricant keeps this end of the tube closed so that the gases have to pass around the spiral to get out, and the deeper this tube projects into the liquid the lower the liquid level may become before the seal is broken. The compressor gases pass up the spiral 22 which gives them a rapid rotary motion. The particles of lubricant which may have become mixed with the gases in the compressor are thrown out by centrifugal force against the inner wall of the tube and drain back down to the lubricant in the reservoir below. The gases on arriving at the top have no other outlet than along the spiral 25. The gases arriving at the bottom of the spiral 25 again turn upward through the tube 24 and pass out the opening 26 through the pipe or conduit 15 into the condenser or reservoir 5. The inner spiral 25 is wound around the tube 24. This tube 24 has its upper end fitted tightly into the head 7 of the separator 3 and its lower end at a sufficent distance above the surface of the lubricant 28 so that a surge would not force the body of the lubricant up the tube. The supply of lubricant may be replenished by removing the plug 30, and pouring in lubricant.

The pressure on the surface of the lubricant 28 in the reservoir forces lubricant constantly up a feeder pipe or duct 29, whence it goes through the cross duct 42. The end plates 16 and 17 have grooves 43 in their inner surfaces adjacent to the ends of the rotor 44 leading to the bearings of the compressor. The lubricant passes from the duct 42, along the grooves 43 to the bearings, some of the lubricant passing into the blade slots 45, 46, 47, 48 where it lubricates the blades 49, 50, 51, 52, the wipers 53, 54, 55, 56, the spacing pins some of which are shown at 57, 58, and the cylinder wall 59—thus all moving parts of the compressor are thoroughly lubricated.

The motor 1 drives the compressor 2 directly through a flexible coupling 10.

What I claim and desire to secure by Letters Patent of the United States is:

1. In a compression machine, a compressor comprising a hollow frame with enclosing end plates and moving parts therebetween, a hollow flanged cylinder having a separator therein, a rectangular base forming a lubricant reservoir having two circular openings side by side in the upper surface thereof, said frame being secured to said reservoir and communicating therewith through one of said openings, said cylinder being secured to said reservoir and communicating therewith through the second of said openings, whereby either the compressor or the separator may be independently removed without disturbing the other and without losing the lubricant.

2. In a compression machine, a base, a lubricant reservoir in said base having two circular openings in the upper surface thereof communicating therewith, a compressor mounted upon said base and closing one of said openings, a cylinder also mounted upon said base and closing said other opening, a lubricant separator in said cylinder, and a vertical pipe supported by and extending below said compressor adapted to conduct lubricant to moving parts in the compressor.

3. In combination, a rotary pump having a center casting with a horizontal cylindrical hole therein, a rotor unit supported within the cylindrical hole by end plates secured to said casting, an intake passage communicating with the interior of said casting, a discharge passage extending downwardly within said casting, a circular flange integral with said casting surrounding a portion of said discharge passage, a lubricant reservoir having a circular boss with an opening therein, bolts securing said flange to said boss with the discharge passage communicating with said reservoir through said opening, a second circular boss also having an opening therein, a vertical cylinder bolted to said second boss and communicating with said reservoir, a separator in said vertical cylinder, a body of lubricant in said reservoir, and a thin horizontal passage above the surface of said lubricant adapted to pass gases from the discharge passage to the interior of said cylinder.

4. In a compression machine, a hollow rectangular base having two bosses in the upper surface thereof with openings therein communicating with the hollow interior of the base, a compressor mounted on one of said bosses having its drive shaft at right angles to the major axis of said base, a hollow vertical cylinder mounted on the second of said bosses and forming a closure for the opening therein, a separator within the cylinder adapted to separate oil from compressed gases passing therethrough, and means for securing the compressor and the cylinder to the respective bosses so that each may be removed without disturbing the other.

JOHN ALFRED GRIER.