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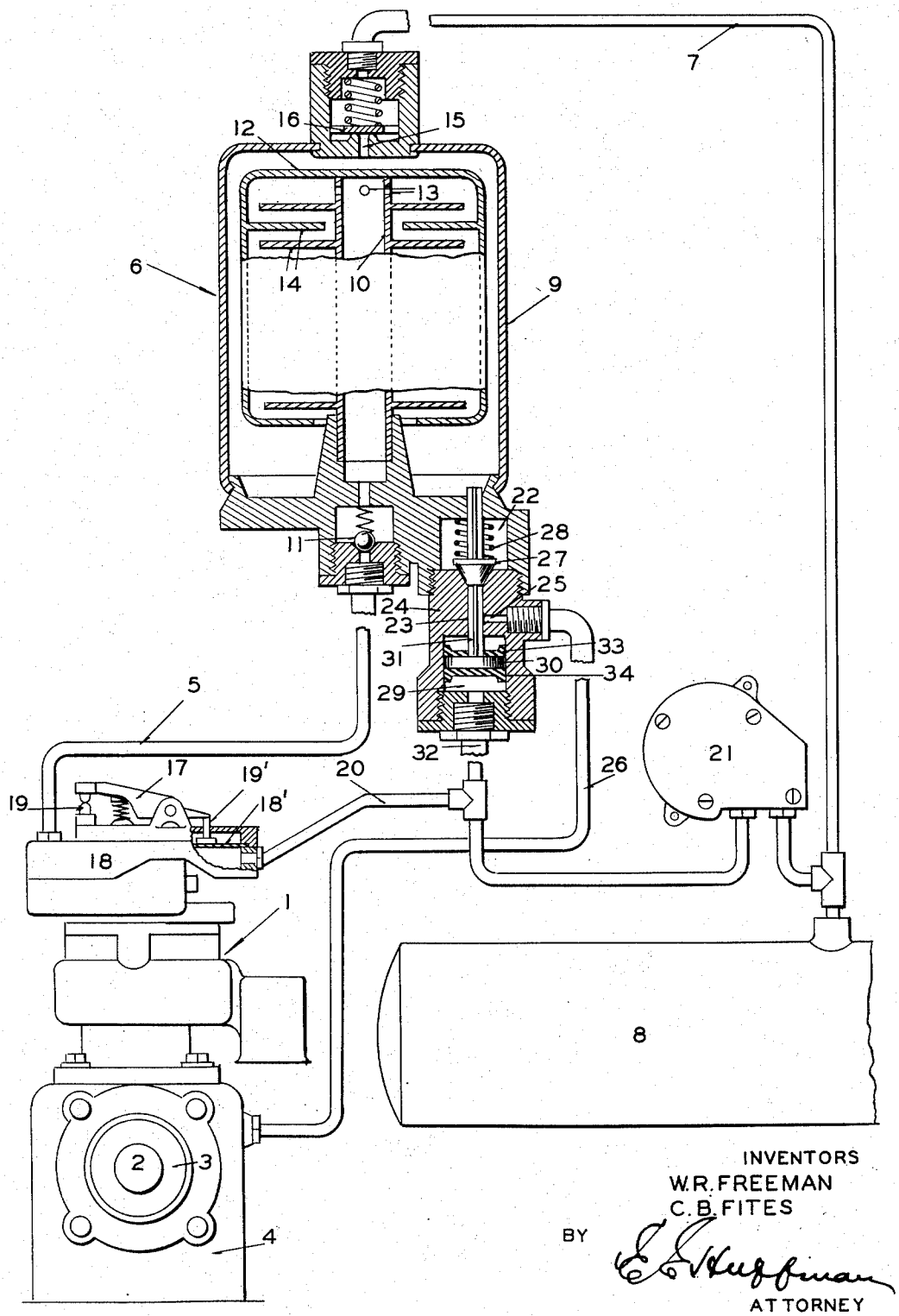

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OIL SEPARATING SYSTEM FOR COMPRESSORS

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7 Claims. (Cl. 230—30)

Our invention relates to fluid pressure systems and more particularly to an oil separating system for association with a fluid compressor having an oil reservoir which is subject to atmospheric pressure.

One of the objects of our invention is to provide an oil separating system for removing oil from the discharged compressed fluid of a compressor and enabling it to be returned to the compressor oil reservoir only when the compressor is unloaded.

Another object of our invention is to provide an oil separating means for association with a fluid compressor having an oil reservoir subject to atmospheric pressure which will remove oil carried by the compressed fluid discharged by the compressor and return said oil to the reservoir for re-use.

Still other objects of our invention will become apparent from the following description taken in connection with the accompanying drawing in which the single figure is a view of an air compressor and associated oil separating means embodying our invention, parts being shown in section.

Referring to the figure in detail, we have shown our oil separating system as being associated with a reciprocating compressor having an oil reservoir subject to atmospheric pressure but it is to be understood that it can be associated with other types of compressors, if desired, as the compressor and system disclosed are by way of example only.

The reciprocating compressor 1 is driven by a shaft 2 having a pulley 3, said shaft extending through the chambered base portion 4 which also forms the oil reservoir. The discharge port of the compressor is connected to a pipe 5 which leads to an oil separator 6. This separator has its outlet connected to a conduit 7 which leads to the receiver or storage tank 8.

The oil separator 6, shown by way of example, comprises a housing 9, the base portion of which carries a tube 10 extending up into the housing, the lower end of said tube being in communication with the pipe 5 leading from the compressor. A check valve 11 is interposed between tube 10 and pipe 5 in order to prevent compressed air from returning to the compressor from the separator. Surrounding tube 10 is an inverted cup-shaped member 12, the upper closed end of which is in communication with the tube by openings 13 in the wall of said tube. Associated with the tube and the wall of the cup-shaped member are baffles 14 positioned in spaced apart relation and so alternately arranged that the compressed air discharged by the compressor must pass back and forth over the baffles. The oil carried by the compressed air (picked up during the compressing operation of the compressor) will be collected on the baffles and flow down into the bottom of the separator housing. The compressed air, which has been freed of oil by its passage around the baffles, can now pass through the outlet port 15 at the upper end of the separator housing 9 and then to the tank 8 through conduit 7. A check valve 16 is associated with the outlet port 15 in order to prevent any return of compressed air from the tank to the separator.

The compressor has associated therewith an unloading valve which is controlled by a lever 17, said valve being enclosed in the housing 18 associated with the compressing end of the compressor. The valve is opened by means of the pin 19 which is engaged by the lever. The lever 17 is actuated by fluid pressure, the fluid motor for operating said lever being enclosed within the housing 18 and comprising a diaphragm 18' which acts on a pin 19' for engaging and moving lever 17. The pressure for operating the lever by the fluid motor and opening the unloading valve is derived from the compressed air in the receiver through a conduit 20. Interposed in this conduit 20 is a governor valve 21 of known construction, said valve being so constructed that when the air pressure in the tank reaches a predetermined value, say one hundred pounds per square inch, the governor valve will be opened and thereby place the air tank in communication with the fluid motor for actuating lever 17 and opening the unloading valve, all in a well-known manner.

In association with the means for operation of the unloading valve to unload the compressor, we have provided means whereby the oil which has accumulated in the oil separator 6 may be returned under certain conditions to the oil reservoir for re-use. Since the oil reservoir is not sealed, it is apparent that the lower end of the separator in which the oil accumulates cannot be directly connected to the oil reservoir by an open pipe because under such conditions the compressed air which enters the separator would be lost through the oil reservoir. In accordance with our invention, the bottom of the oil separator is formed with a valve chamber 22 which communicates with a passage 23 in a member 24 screwed into the open end of the valve chamber 22. Connected with passage 23 is a second passage 25 which is also connected to the oil reservoir of the compressor by a conduit 26. The

passage 23 is normally closed by a valve 27 which prevents oil from flowing to the oil reservoir. This valve is biased to closed position by a spring 28. In order that the valve 27 may be opened simultaneously with the unloading of the compressor, there is provided a cylinder 29 in member 24 and slidable in this chamber is a piston 30 connected to the valve by a fluted rod 31 projecting through passage 23. A conduit 32 places the cylinder on the side of the piston opposite the valve in communication with the conduit 20. The piston is provided with packing elements 33 and 34 on opposite faces thereof, thus preventing air from passing the piston in one direction and preventing oil from passing the piston in the opposite direction.

In operation, assuming that the compressor is functioning to compress air, this air will pass through the separator to the tank and any oil which is mixed with the compressed air will be removed by the separator. When the pressure in the tank reaches the predetermined value, the governor valve will be operated and the compressor unloaded by the lever 17 which is operated by compressed air flowing through conduit 20 as a result of the opening of the governor valve 21. The air pressure admitted to conduit 20 will also be effective in cylinder 29 to move the piston 30 upwardly and open the valve 27. Any oil which has accumulated in the bottom of the separator is now free to flow back into the oil reservoir of the compressor for re-use. At the time that the valve 27 is unseated, there will be air under pressure in the separator due to the check valve 11 preventing air under pressure from flowing back through pipe 5 to atmosphere (unloading valve open) and this air under pressure in the separator will be effective to force the oil back into the reservoir. Once the air under pressure in the separator has been relieved, no additional air under pressure can enter the separator because of the outlet port check valve 16. When the pressure in tank 8 falls to a lower value than the predetermined pressure at which the compressor is unloaded, the governor valve will close and thus permit the compressor to again operate. The valve 27 will again close as the air pressure on piston 30 is relieved. The air being compressed will again enter the tank after passing through the oil separator.

Being aware of the possibility of modifications in the particular structure herein described without departing from the fundamental principles of our invention, we do not intend that its scope be limited except as set forth by the appended claims.

Having fully described our invention, what we claim as new and desire to secure by Letters Patent of the United States is:

1. An oil separating system for association with a fluid compressor having an oil reservoir in which the oil therein is subjected at all times to atmospheric pressure and also having means for unloading the compressor, said system comprising an oil separator having an oil accumulating chamber, conduit means for connecting the separator to the discharge outlet of the compressor so that the discharged compressed fluid will pass therethrough, and automatically operable means for permitting oil in the oil accumulating chamber of the separator to flow back to the reservoir only when the compressor is unloaded.

2. An oil separating system for association with a fluid compressor having an oil reservoir in which the oil therein is subject at all times to atmospheric pressure and also having valve means for unloading the compressor, said system comprising an oil separator having an oil accumulating chamber, conduit means for connecting the separator to the discharge outlet of the compressor so that the discharged compressed fluid will pass therethrough, conduit means for conducting the oil from the accumulating chamber to the reservoir, valve means for said last named conduit means, and means for opening said valve means only when the compressor is unloaded.

3. An oil separating system for association with a fluid compressor having an oil reservoir in which the oil therein is subject at all times to atmospheric pressure and also having valve means for unloading the compressor, said system comprising an oil separator having an oil accumulating chamber, conduit means for connecting the separator to the discharge outlet of the compressor so that the discharged compressed fluid will pass therethrough, conduit means for conducting the oil from the accumulating chamber to the reservoir, valve means for said last named conduit means, fluid pressure operated means for rendering said unloading valve operative to unload the compressor when the compressor has caused a predetermined fluid pressure to be developed, fluid pressure operated means for opening the oil conduit valve means, and means for operating the two fluid pressure operated means substantially simultaneously when by fluid under pressure which has passed through the separator but only the compressor has developed a predetermined pressure.

4. An oil separating system for association with a fluid compressor having an oil reservoir and means for unloading the compressor, said system comprising an oil separator having an oil accumulating chamber, conduit means for connecting the separator to the discharge outlet of the compressor so that the discharged compressed fluid will pass therethrough, conduit means for conducting the oil from the accumulating chamber to the reservoir independently of the first named conduit means, valve means for said last named conduit means, fluid pressure operated means for causing said unloading means to unload the compressor when the compressor has developed a predetermined fluid pressure, fluid pressure operated means for opening the oil conduit valve means, and means for operating the two fluid pressure operated means substantially simultaneously when the compressor has developed a predetermined pressure.

5. An oil separating system for association with a fluid pressure developing system having a compressor, an oil reservoir subject at all times to atmospheric pressure, an unloading valve, a storage tank and a governor valve for causing fluid pressure developed by the compressor to render the unloading valve operative when the fluid pressure in the storage tank reaches a predetermined value, said oil separating system comprising an oil separator interposed between the compressor and the tank and through which the compressed fluid from the compressor must pass, said separator being capable of removing oil from the discharged compressed fluid and having an oil accumulating chamber, conduit means for conducting the oil from the accumulating chamber to the oil reservoir, a valve for said conduit means, and means operable by the fluid pressure controlled by the governor valve and

employed to render the unloading valve operative for also opening the oil conduit valve.

6. In an air compressing system, an air compressor having an oil reservoir subject at all times to atmospheric pressure, an unloading valve for the compressor, a storage tank, conduit means connecting the outlet of the compressor to the storage tank, an oil separator interposed in the conduit means and having an oil accumulating chamber, check valves for the inlet and outlet of the separator, conduit means independent of the first named conduit means and extending between the oil accumulating chamber and the oil reservoir, a valve for closing the last named conduit means, a fluid motor for operating the unloading valve, a fluid motor for opening the oil conduit valve, conduit means between the fluid motors and the air tank, and valve means controlling said last named conduit means, said last named valve means being caused to be open only when the pressure in the tank is above a predetermined value.

7. In an air compressing system, an air compressor having an oil reservoir, unloading means for the compressor, a storage tank, conduit means connecting the outlet of the compressor to the storage tank, an oil separator interposed in the conduit means and having an oil accumulating chamber, a check valve for preventing return flow of fluid from the tank to the separator conduit means between the oil accumulating chamber and the oil reservoir, a valve for closing the last named conduit means, and means operable by fluid under pressure which has passed the check valve and is of a predetermined value for causing the unloading means to unload the compressor and the oil conduit valve to be opened substantially simultaneously.

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