United States Patent [19]

Otte

[11] **3,915,259**

[45] **Oct. 28, 1975**

[54] **CONTROL SYSTEM FOR REVERSING A TWO-LINE CENTRAL LUBRICATING SYSTEM**

[75] Inventor: **Rudolf Otte**, Hilden, Germany

[73] Assignee: **De Limon Fluhme & Co.**, Dusseldorf, Germany

[22] Filed: **Sept. 17, 1973**

[21] Appl. No.: **397,653**

[30] **Foreign Application Priority Data**

Sept. 15, 1972 Germany 2245240

[52] **U.S. Cl.** ..... **184/7 F**; 184/7 D; 184/7 E

[51] **Int. Cl.²** **F01M 1/06**

[58] **Field of Search** ..... 184/7 R, 7 D, 7 E, 7 F; 137/271

[56] **References Cited**

UNITED STATES PATENTS

2,973,058	2/1961	Bricout	184/7 E
3,024,869	3/1962	Akamatsu et al.	184/7 F
3,223,198	12/1965	Gruber	184/7 D
3,286,793	11/1966	Bricout	184/7 E
3,590,956	7/1971	Obergefell	184/7 E
3,653,466	4/1972	Fujita et al.	184/7 F

FOREIGN PATENTS OR APPLICATIONS

1,126,064	6/1955	France	184/7 E
879,068	10/1961	United Kingdom	184/7 E
1,028,400	4/1958	Germany	184/7 F

Primary Examiner—Charles J. Myhre
Assistant Examiner—Daniel J. O'Connor
Attorney, Agent, or Firm—Walter Becker

[57] **ABSTRACT**

A control system for the reversal of a two-line central lubricating system which includes a first and preferably also a second distributor, a limit switch arranged at the end of the feeding lines, and a control piston which is moved in conformity with the differential pressure between the feeding lines and in conformity with the position of a servo piston interposed between the feeding lines. The control piston is formed by the delivery piston of one of the distributors while the outlets of this one distributor are through the intervention of overflow valves respectively connected to the respective feeding line not under pressure above atmospheric pressure.

3 Claims, 3 Drawing Figures

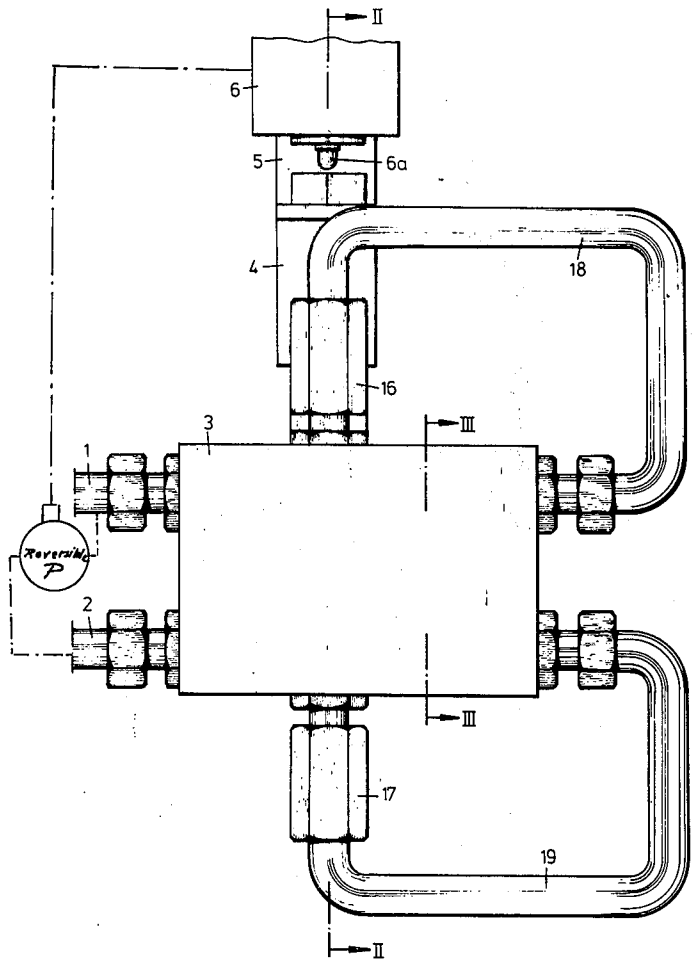


Fig.1

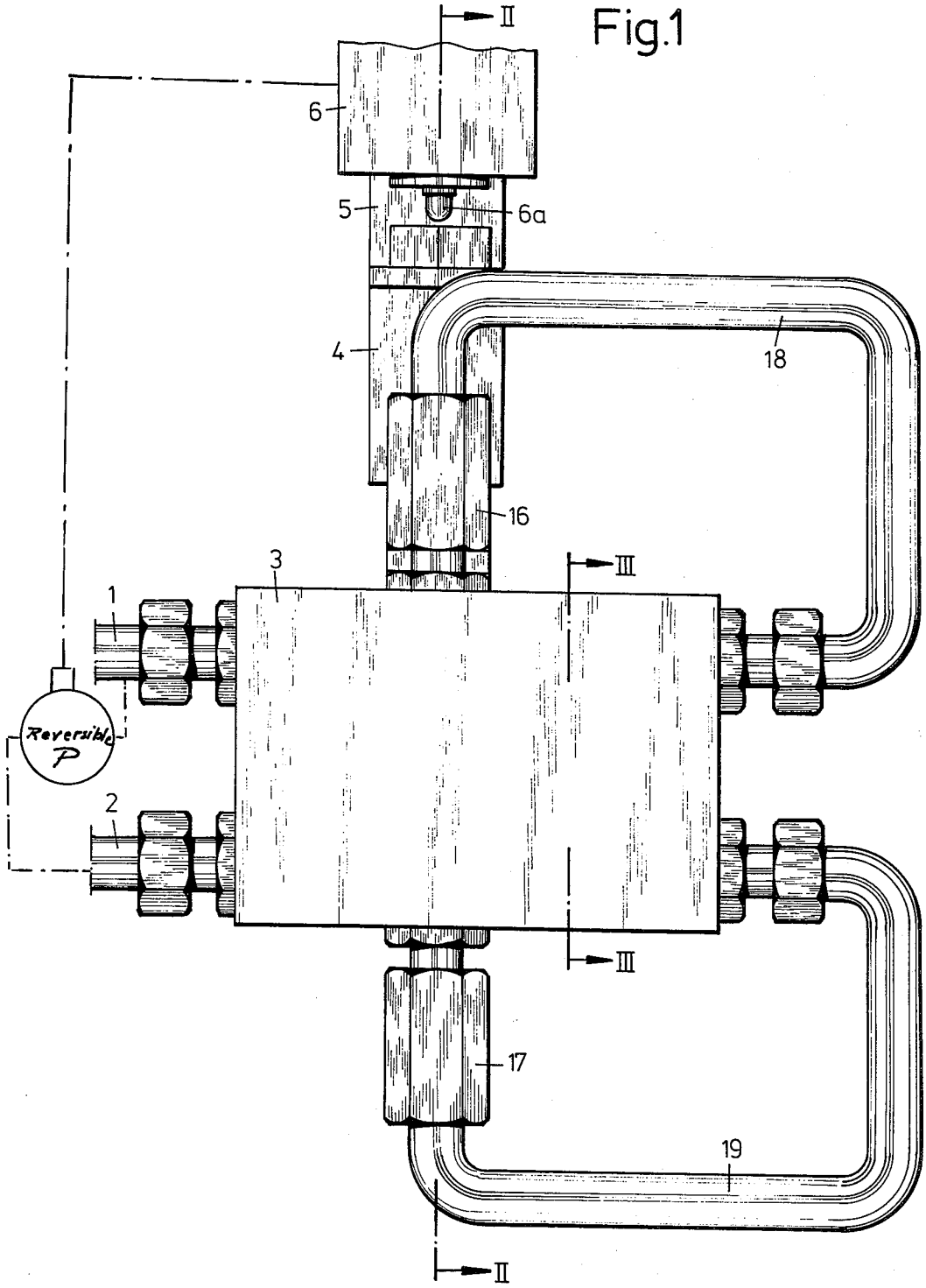


Fig.2

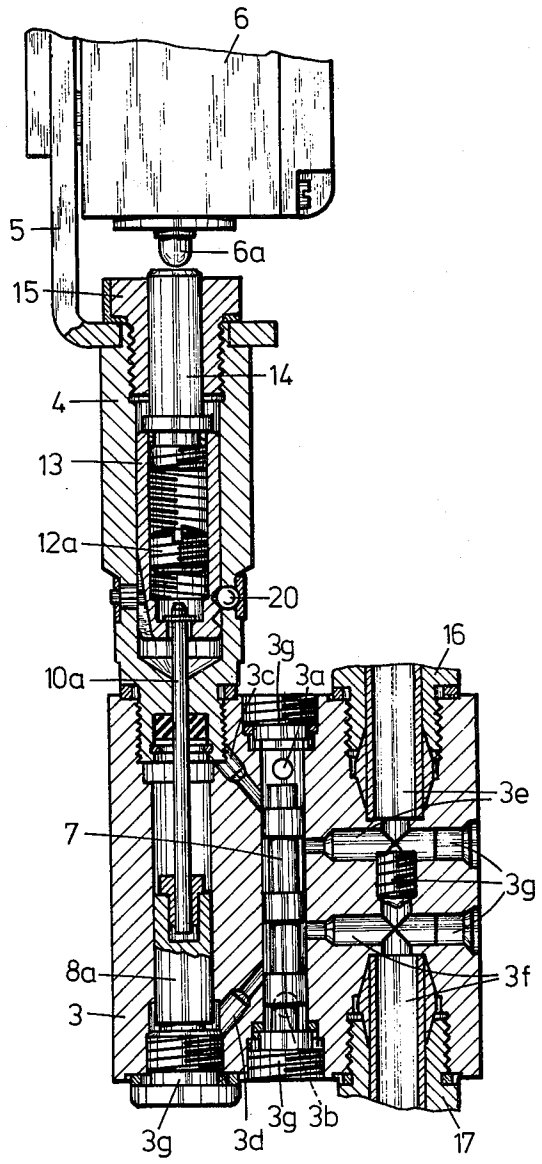
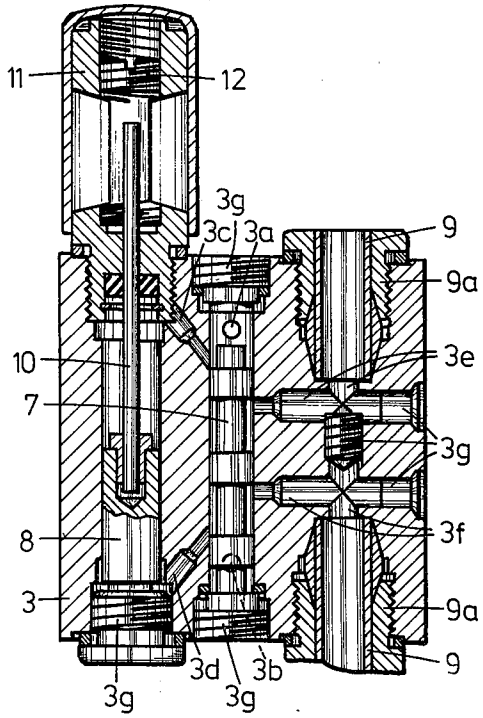


Fig.3



CONTROL SYSTEM FOR REVERSING A TWO-LINE CENTRAL LUBRICATING SYSTEM

The present invention concerns a control device for controlling a two-conduit central lubricating installation which comprises two distributors and is equipped with a limit switch which is arranged at the end of the feeding conduits and brings about the reversal of the control devices. More specifically, the present invention relates to a control device as set forth above which is equipped with a control piston which is operable to actuate the limit switch, and the movement of which is effected in conformity with the differential pressure between the feeding lines, and in conformity with the position of a servo-piston arranged between the feeding lines.

Control devices of this type for reversing a two-conduit central lubricating installation are known, while the reversal or control is effected in the two feeding lines by any desired reversing devices. The lubricant distributors arranged in the installation are hydraulically driven by a change in pressure in the two feeding lines whereby, at the same time, a certain definite quantity of lubricant is conveyed to the area to be lubricated.

With a heretofore known control device, the limit switch is actuated by a control piston which is on both sides spring-loaded. Such an arrangement causes several drawbacks. On one hand, special electrical steps are necessary in order to store the last carried-out contact, because the control piston is on both sides spring-loaded and therefore returns to its intermediate position in which the limit switch is open. Inasmuch as with distributors, between reaching the necessary pressure differential and the completion of the hydraulic lubricating operation, a time delay occurs which is dependent on the pump delivery, it is necessary on the other hand to select the force of the springs acting upon the control piston, relatively high in order to realize the contact necessary for the reversal and to obtain this contact only after the lubrication has been completed. In view of the employment of relatively strong springs there occurs the necessity that the pump arranged in the installation must deliver a higher pressure than is necessary for the lubricating process. Finally, with the heretofore known control devices it is necessary to set the limit switch with extreme precision, while untended adjustments during the operation may bring about disorders in the regular course of operation and cannot be safely avoided.

It is, therefore, an object of the present invention to provide a control device of the above-mentioned general type which will have an energy-saving and function-reliable operation regardless of the pressure behavior inherent to the installation.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which:

FIG. 1 diagrammatically illustrates a side view of the control device according to the invention.

FIG. 2 represents a cross-section taken along the line II—II of FIG. 1.

FIG. 3 illustrates a cross-section taken along the line III—III of FIG. 1, and more specifically illustrates the distributor of the control device.

The control device for controlling or reversing a two-line central lubricating installation which comprises a plurality of distributors and is provided with a limit switch located at the end of the feeding lines and bringing about the reversal of the device, and which is equipped with a control piston operable to actuate the limit switch and movable in conformity with the differential pressure between the feeding lines and also in conformity with the position of a servo-piston arranged between the feeding lines, is characterized primarily in that as control piston there is employed the conveying piston of a distributor, the outlets of which are through the intervention of one overflow valve each connected to the respective other feeding line.

In order to realize a good adaptation of the control device to various conditions, the opening pressure of the overflow valves is adjustable according to a further feature of the invention.

In order to prevent an aging of the lubricant actuating the control piston in the control device, which aging would harmfully affect the operation of the control device, it is suggested, according to the present invention, in the control device additionally to provide at least one conveying piston associated with a point of lubrication so that the lubricant also in the control device be continuously changed. With the heretofore known control device it was necessary either to put up with the aging of the lubricant actuating the control device or a separate distributor had to follow the control device, in which instance an observation of this distributor was possible only at additional cost.

Referring now to the drawings in detail, the control device generally illustrated in FIG. **1** is arranged at the end of the two feeding lines **1** and **2** pertaining to the central lubricating installation. The two feeding lines **1** and **2** respectively leading to a longitudinal bore **3***a*, **3***b*, of a distributor housing **3**. The control device proper is located in the plane II—II and as far as its construction is concerned can best be seen in FIG. **2**, whereas the cross-section along the section line III—III illustrates the construction of an ordinary distributor.

The distributor according to FIG. **3** which in addition to the control device is arranged within the valve housing **3** has a servo-piston **7**, the cylinder bore of which extends between the two longitudinal bores **3***a* and **3***b*. The bore for the servo-piston **7** communicates through overflow passages **3***c* and **3***d* with a further bore in which the conveying piston **8** is located. Moreover, connected to the bore of the servo-piston **7** are outlet bores **3***e* and **3***f*, into which lubricating conduits **9** are screwed by means of screws **9***a*, said lubricating conduits **9** respectively leading to non-illustrated points of lubrication. Connected to the conveying piston **8** is a connecting rod **10**, which extends into a housing **11** and cooperates with an abutment screw **12**, which limits the stroke of the conveying piston **8**. FIG. **3** shows a plurality of stoppers **3***g* which, for purposes of facilitating the manufacture, close the conduits or passages of the distributor housing **3** at the non-required exits.

The distributor described above operates in the following manner: When, as illustrated in FIG. **3**, the feeding line which communicates with the longitudinal bore **3***a* is under pressure, the lubricant present in this feeding line **1** presses the servo-piston **7** back to such an extent that the lubricant can, through the overflow passage **3***c*, pass into the cylinder bore of the conveying piston **8**. The lubricant thus also brings about the dis-

placement of the conveying piston **8** to the end position illustrated in FIG. **3**, while the lubricant between the end face of the conveying piston **8** and the stopper **3***g* passes through the overflow passage **3***d* into the bore of the servo-piston **7**. From this bore, the lubricant passes to the outlet bore **3***f* and thereby into the lower lubricant conduit **9**. The lubricant column in the lubricant conduit **9** is thus displaced in the direction toward the point of lubrication, which later is supplied with a quantity of lubricant that corresponds to the succeeding quantity of lubricant.

If now by reversing the entire two-conduit central lubricating installation the pressure is displaced from the feeding line **1** to the feeding line **2**, a displacement of the servo-piston **7** is effected from its lower to its upper end position. In view of this displacement, the connection between the overflow passage **3***c* and the outlet bore **3***e* is established. The lubricant which through the overflow passage **3***d* acts upon the conveying piston **8** thus moves the lubricant which up to that point surrounds the connecting rod **10** through the overflow passage **3***c* and the outlet bore **3***e* into the upper lubricating conduit **9**. The quantity of lubricant which is discharged per working stroke of the distributor can be varied by adjustment of the abutment screw **12**.

The control device according to FIG. **2** which, as far as its fundamental construction is concerned, corresponds to the above-described distributor houses the conveying piston **8** of the distributor as control piston **8***a*. Also, this control piston **8***a* is provided with a connecting rod **10**a which cooperates with an abutment screw **12***a*. This abutment screw **12***a* is screwed into a sleeve **13**, which is displaceable within an adjusting housing **4**. This adjusting housing **4**, which is placed upon the distributing housing **3**, also carries a limit switch **6** by means of a supporting arm **5**. This limit switch **6**, which establishes the contact for reversing the two-conduit central lubricating installation, is provided with a contact push rod **6**a that is actuated by a control rod **14**. This control rod **14** is connected to the sleeve **13** and is guided within a guiding sleeve **15**, which latter is screwed into the adjusting housing **4** and at the same time connects the supporting arm **5** to the housing **4**.

While with the distributor, according to FIG. **3**, the outlet bores **3***e* and **3***f* advantage with the lubricating conduits **9**, the outlets **3***e* and **3***f* of the control device are respectively provided with an overflow valve **16** and **17**. Each overflow valve **16**, **17**, is respectively, through a short circuit line **18**, **19**, in communication with the other feeding line—i.e., the one which is pressureless.

In this way, the following operation is obtained: When the pressure differential for the operation of the conveying pistons **8** is established between the two feeding lines **1** and **2**, the piston **7** of the control device moves against the residual pressure which prevails in the feeding line without pressure and releases the path for the lubricant to the control piston **8***a*. This piston has its ejection side likewise subjected to the residual pressure and, in addition thereto, to the said opening pressure of the respective overflow valve **16**, **17**. In this way it will be assured that the start of the conveying stroke can be adjusted in conformity with the optimum pressure differential for the respective central lubricating installation.

The control piston **8***a* has now to carry out its complete stroke before the contact push rod **6***a* is actuated. In this way it will be assured that between the obtainment of the pressure differential necessary for the displacement of the control piston **8***a* and the change in contact, a delay will occur which corresponds to the time necessary for the stroke of the conveying piston **8** in the distributors, and more specifically independently of the specific conveying output or delivery of the conveying pump located in the central lubricating installation.

FIG. **2** shows that within the setting housing **4** there is provided an arresting ball **20**, which cooperates with two notches in the sleeve **13**. As a result thereof, the sleeve **13**, which is connected to the connecting rod **14**, is at the end of the respective stroke of the control piston **8***a* arrested in one of the two arresting positions, so that the establishment of contact by the limit switch **6** is effected at the end of the respective piston stroke, and thus obtained control position will be maintained up to the end of the succeeding piston stroke.

As will be evident from the above, the control device, according to the present invention, has the advantage that the control operation is no longer dependent from the obtainment of of a pre-determined spring force, but is dependent merely from the pressure differential which is required for the function of the entire lubricating installation. The said pressure differential is measured at the most critical point, for instance, at the last mentioned lubricating point. In view of the omission of springs against which the control piston of heretofore known control devices had to work, it will be appreciated that with the device according to the invention the increase in the counter pressure as it was effected by the spring will no longer occur or be necessary, so that the energy to be supplied by the pressure pump will be reduced, or when employing identical pumps, the central lubricating installations can be built with longer conduits. Since as control piston for the control device the conveying piston of a distributor is employed, the establishment of contact for the reversal is, with regard to pressure as well as with regard to time, selected in conformity with the working operation of the distributor, so that the control device has the same characteristics as the distributor of the central lubricating installation.

It is, of course, to be understood that the present invention is, by no means, limited to the specific showing in the drawings, but also comprises any modifications within the scope of the appended claims.

What I claim is:

1. In combination with a reversible lubricant feeding pump: two lubricant conveying lines connected with the respective pressure and suction side of said pump; housing means; distributor means arranged in said housing means; said distributor means including a cylinder, a fluid operable piston reciprocable in said cylinder, first and second outlet means provided in said housing means for alternately conveying lubricant displaced by said piston to areas to be lubricated, servo cylinder-piston means communicating with the respective pressure line of said two lubricant conveying lines and controlling fluid communication between said cylinder and alternately one and the other of said outlet means to convey lubricant under pressure alternately to one and the other side of said piston and to discharge lubricant displaced by said piston alternately to one and the other of said outlet means; limit switch means operatively connected to said pump for reversing the

same; and connecting rod means operatively connected to said piston and operable to control said limit switch means and thereby controlling the reversal of said pump.

2. In combination with a reversible central lubricant feeding pump: two lubricant conveying lines connected with the respective pressure and suction side of said pump; housing means; first and second distributor means arranged in said housing means; said first distribtuor means including a first cylinder, a first fluid operable piston reciprocable in said first cylinder, first and second outlet means provided in said housing means for alternately conveying lubricant displaced by said first fluid operable piston to areas to be lubricated, and first servo cylinder-piston means communicating with the respective pressure line of said two lubricant conveying lines and controlling fluid communication between said first cylinder and alternately one and the other of said outlet means to convey lubricant under pressure alternately to one and the other end of said first piston and to discharge lubricant displaced by said first piston to an area to be lubricated; said second distributor means including a second cylinder, a second fluid operable piston reciprocable under differential pressure in said second cylinder, first and second overflow valve means provided in said housing means for alternately conveying lubricant displaced by said second piston to the respective lubricant conveying line for connection with the respective suction side of said pump, second servo cylinder-piston means communicating with the respective pressure line of said two lubricant conveying lines and controlling fluid communication between said first cylinder and alternately one and the other of said overflow valve means to convey lubricant under pressure alternately to one and the other side of said second piston and to discharge lubricant displaced by said second piston alternately to one and the other of said overflow valves; limit switch means operatively connectable to said pump for reversing the same; and means operatively connected to said second piston and operable to control said limit switch means and thereby the reversal of said pump.

3. An arrangement in combination according to claim 2, in which said overflow valve means are adjustable as to the opening pressure thereof.

* * * * *