Dec. 25, 1956 W. R. BATTEN ET AL 2,775,204

DUAL PUMP DRIVE WITH OVERRUNNING CLUTCHES

Filed March 23, 1953 2 Sheets-Sheet 1

Fig. 1

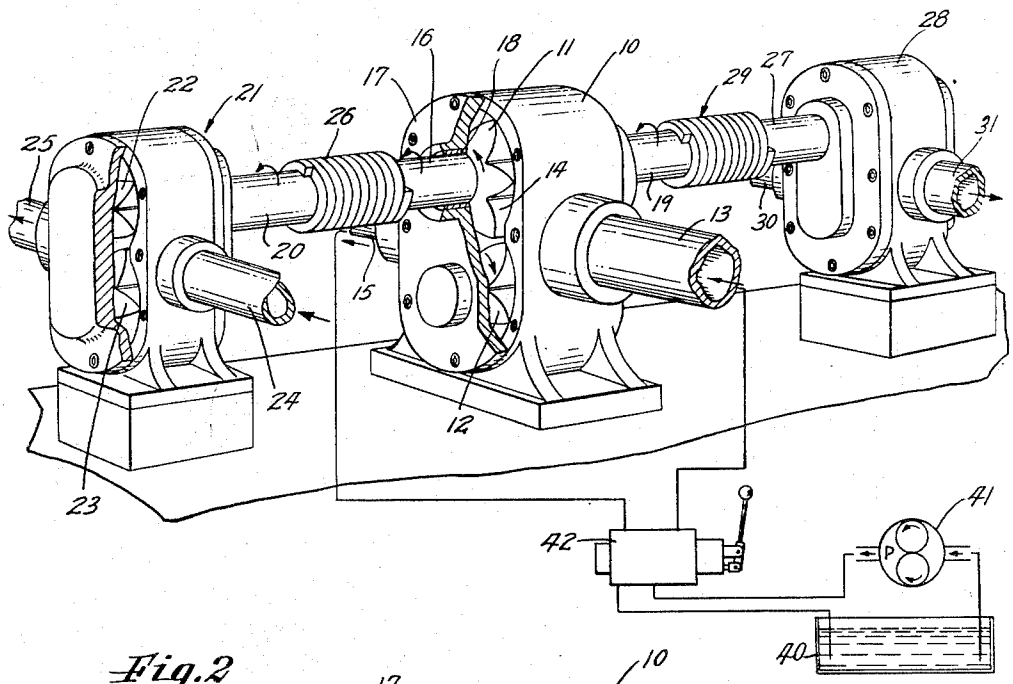
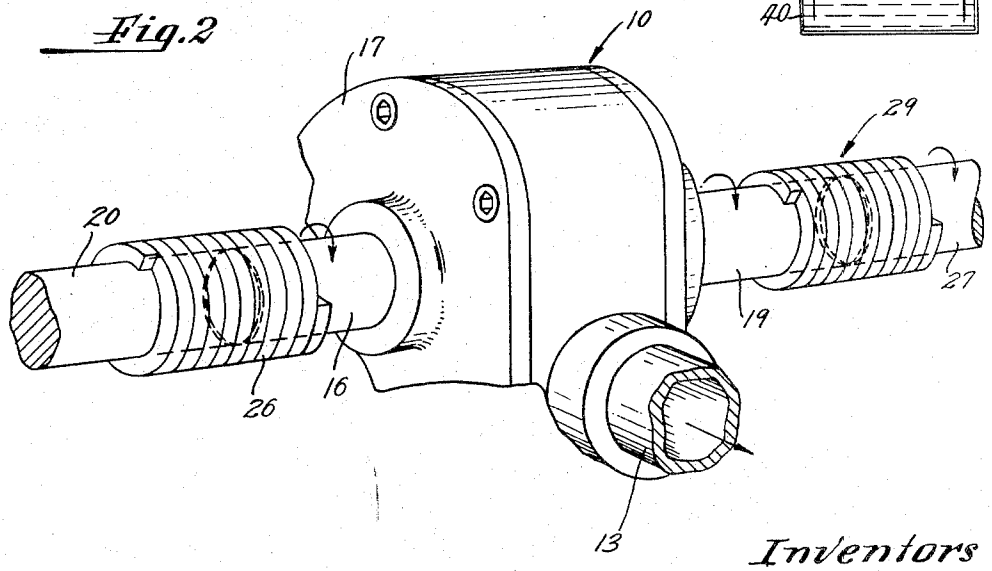


Fig. 2



Inventors
Webster R. Batten
Donald Hadden

By McCanna and Morsbach
Attys.

Dec. 25, 1956 W. R. BATTEN ET AL 2,775,204

DUAL PUMP DRIVE WITH OVERRUNNING CLUTCHES

Filed March 23, 1953 2 Sheets-Sheet 2

Fig. 3

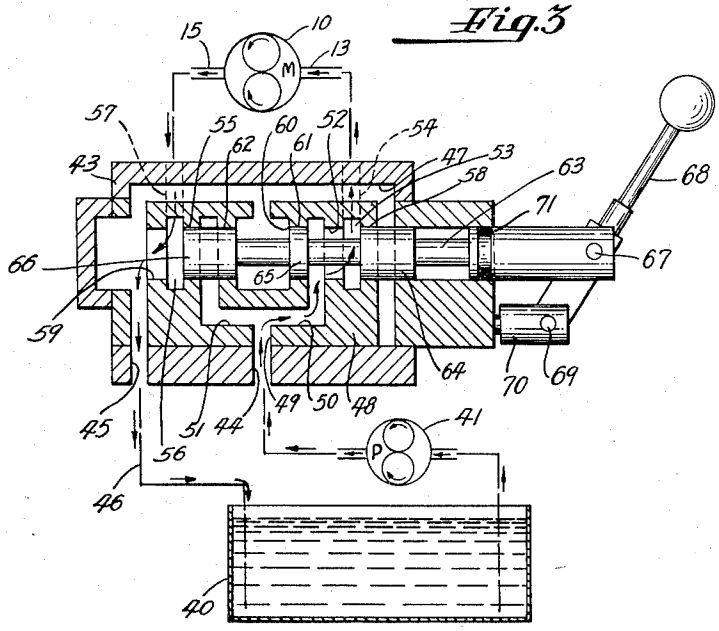
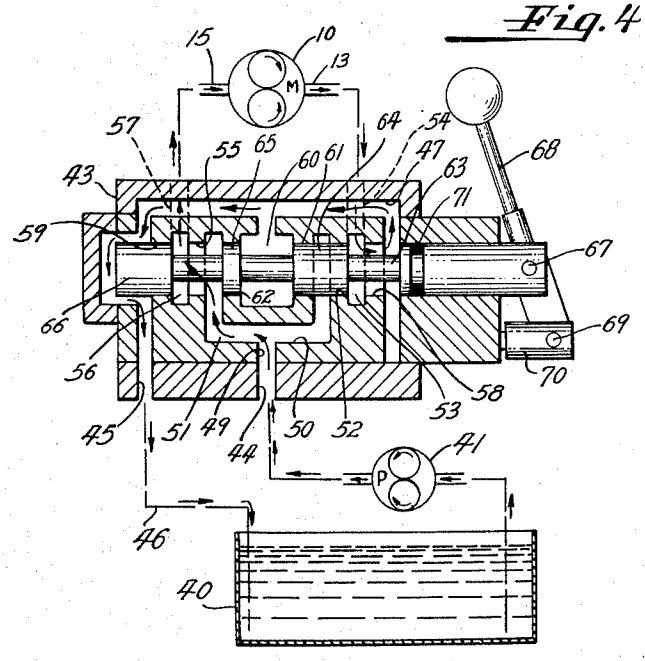


Fig. 4



Inventors
Webster R. Batten
Donald Hadden
By McCanna and Morsbach
Attys.

United States Patent Office 2,775,204 Patented Dec. 25, 1956

2,775,204

DUAL PUMP DRIVE WITH OVERRUNNING CLUTCHES

Webster R. Batten and Donald Hadden, Rockford, Ill., assignors to Geo. D. Roper Corporation, Rockford, Ill., a corporation of Illinois

Application March 23, 1953, Serial No. 344,019

3 Claims. (Cl. 103—11)

This invention relates in general to a pump drive, and more particularly to a drive for driving a pair of pumps alternately from a single hydraulic motor.

In the use of tank trucks for delivering two different fuels it is, of course, necessary to provide two separate pumps for pumping the fuels in separate flows from the tank truck. For various reasons it has not been feasible to couple the two fuel pumps to the power takeoff shaft of the tank truck. Instead, it has been found to be more practical to drive the fuel pumps from an hydraulic motor arrangement operated by high pressure fluid from a control pump. The provision in such arrangements of separate hydraulic motors for each fuel pump has resulted in unnecessary space requirements and cost in such installations. These disadvantages are avoided in the present invention by the provision of a drive for two fuel pumps which requires only a single motor.

It is an object of the present invention to provide a novel and improved drive for driving alternately a pair of pumps.

It is also an object of this invention to provide a novel and simplified arrangement for driving a pair of pumps alternately from a single reversible motor.

The foregoing objects and advantages of the present invention are accomplished in the embodiment illustrated in the accompanying drawing by the provision of a pair of overrunning clutches in the drive from an hydraulic motor to a pair of pumps, these overrunning clutches serving to impart the drive to one of the other of the pumps, depending on the direction of the motor drive.

Other and further objects and advantages of the present invention will be apparent from the following description of one embodiment of the invention, illustrated in the accompanying drawing.

In the drawings:

Figure 1 is a perspective view, with parts broken away, showing the novel drive of the present invention from a single hydraulic motor to a pair of rotary pumps intended to be driven alternately;

Figure 2 is an enlarged perspective view showing the overrunning clutches in the drive from the hydraulic motor, the motor operating in the reverse direction from its operation in Fig. 1;

Figure 3 is a schematic diagram showing the hydraulic circuit for driving the hydraulic motor in the present assembly, with the control valve shown in enlarged longitudinal section in one of its extreme positions for causing the hydraulic motor to be driven in one direction; and

Figure 4 is a view similar to Fig. 3, but with the control valve positioned to reverse the hydraulic motor.

Referring to the drawings in Fig. 1 there is shown a conventional hydraulic motor **10** of the gear type having a pair of meshing gears **11** and **12** adapted to be rotated by the pressure of the incoming fluid, such as oil. In Fig. 1, the arrows indicate that the pressure fluid passes through pipe **13** into the motor chamber **14** at a location therein between the meshing gears, causing the gears to rotate in the direction indicated. The fluid then passes

out of the motor chamber through the pipe **15**. The pressure fluid for the hydraulic motor is supplied from a sump **40** by means of a pump **41** and thence through the control valve, indicated generally at **42** in Fig. 1. From the hydraulic motor **10** the pressure fluid passes back through the control valve **42** to the sump. On tank trucks, the pump **41** would ordinarily be driven from the power take-off shaft on the truck.

The control valve **42** is shown in detail in Figs. 3 and 4 and is constructed to pass fluid under pressure to either side of the hydraulic motor **10**, or to block the flow of fluid to the motor, so that the rotation of the motor may be selectively controlled by means of the valve **42**. This valve **42** is of conventional construction and includes a housing **43** having an inlet passage **44** which receives oil under pressure from the pump **41** and an outlet passage **45** which leads through return conduit **46** back to the sump **40**. The valve housing **43** is formed with an internal chamber **47** communicating with the outlet passage **45** and within which is located a valve body **48**. The latter is formed with an inlet passage **49** leading from the inlet **44** in the valve housing to a pair of branch passages **50** and **51** in the valve body. The branch passage **50** leads to a restricted cylindrical passage **52**, which communicates at its other end with a chamber **53** in the valve body. Chamber **53** communicates with a passage **54** in the valve housing which communicates at its other end with the conduit **13** leading to one side of the hydraulic motor **10**. In like manner, the other branch inlet passage **51** in the valve body leads to a restricted cylindrical passage **55** leading to a chamber **56** in the valve body, this chamber in turn communicating with a passage **57** in the valve housing connected to the conduit **15** at the other side of the hydraulic motor **10**. A restricted cylindrical passage **58**, of the same size as the passage **52**, extends from the opposite end of chamber **53** and in alignment with passage **52** and communicates with the chamber **47** in the valve housing. In like manner, a similar passage **59** extends from the opposite end of the valve body chamber **56** in alignment with the restricted cylindrical passage **55** and communicates with the valve housing chamber **47**. A chamber **60** is formed centrally in the valve body **48** and in communication with the valve housing chamber **47**. A pair of aligned restricted cylindrical passages **61** and **62** extend between the chamber **60** and the branch inlet passages **50** and **51**, respectively.

For controlling the various flows through the valve there is provided a reciprocable stem **63** which carries a first cylindrical plug **64** adapted to be snugly disposed within preselected ones of the valve body passages **58**, **52**, and **61**, depending upon the axial position of the valve stem. The valve stem also carries a middle plug **65** adapted to be disposed snugly in either the passage **61** or the passage **62**, to selectively block either of these passages from communication with the respective branch inlet passage **50** or **51**. At its inner end the valve stem carries a third plug **66** adapted to be snugly disposed within preselected ones of the passages **62**, **55** and **59**. The valve stem at its outer end is pivoted at **67** to a manually controlled operating lever **68**, which is pivotally mounted at **69** at its lower end on a bracket **70** fastened to the valve housing. A suitable O-ring seal **71** is provided on the valve stem to prevent leakage thereat.

In the operation of this control valve, when it is desired to drive the motor in the direction shown in Figs. 1 and 3, with hydraulic liquid being supplied under pressure to the conduit **13**, the operating lever is pulled outwardly, as shown in Fig. 3, to pull the valve stem **63** to one extreme position. In this position, plug **66** is disposed snugly within the valve body passages **55** and **62**, to thereby block communication between the branch inlet **51** and the valve body chambers **56** and **60**. Plug **65**

is snugly disposed within the valve body passage 61, thereby blocking communication between branch inlet 50 and the valve body chamber 60. Plug 64 is disposed in valve body passage 58 and blocks communication between the valve body chamber 53 and the valve housing chamber 47. Oil under pressure flows from pump 41 through inlets 44 and 49, branch inlet 50, passage 52, valve body chamber 53, passage 54 and conduit 13 to one side of the hydraulic motor 10. After passing through the motor the oil is exhausted back to the sump 40 through conduit 15, passage 57, valve body chamber 56, passage 59, valve housing chamber 47, outlet passage 45 and return conduit 46.

To reverse the direction of the motor, the valve lever 68 is moved inwardly to move the valve stem 63 in the same direction to its other extreme position (Fig. 4). In this position, plug 66 is disposed snugly within valve body passage 59 to thereby block communication between the valve body chamber 56 and valve housing chamber 47. Plug 65 is snugly disposed within valve body passage 62, thereby blocking communication between the branch inlet 51 and the valve body chamber 60. Plug 64 is snugly disposed within the valve body passages 61 and 52, and blocks communication between the branch inlet 50 and the valve body chambers 60 and 53. Therefore, oil under pressure from pump 41 flows through inlet passages 44 and 49, branch inlet 51, passage 55, valve body chamber 56 and passage 57 to the conduit 15 leading to one side of the hydraulic motor 10. After passing through the hydraulic motor to drive it in the opposite direction from Fig. 3, the oil passes through conduit 13, passage 54, valve body chamber 53, passage 58, valve housing chamber 47, outlet passage 45 and return conduit 46 to the sump 40.

To stop the hydraulic motor 10, the valve stem may be positioned in a "neutral" position intermediate its extreme positions. In this position, the plug 65 is disposed within the central chamber 60 in the valve body and neither of the valve body passages 61 and 62 is blocked. Therefore, oil under pressure flows through the branch inlets 50 and 51 and thence through the valve body passages 61 and 62 into the valve body chamber 60, and from there to the valve housing chamber 47, from which it returns through outlet passage 45 and return conduit 46 to the sump 40 without actuating the fluid motor 10. In this neutral position, both plugs 64 and 66 block the respective passages 52 and 55, so that no oil flows to the hydraulic motor in either direction.

Returning to the product pump drive system shown in Fig. 1, the upper gear 11 of the motor is attached to a rotary shaft 16, which projects from one face of gear 11 out through the end wall 17 of the motor housing, being supported for rotation thereat by a bearing bushing 18. In like manner, rotary shaft 19 connected to the upper gear 11 of the hydraulic motor projects out through the opposite end wall of the motor housing.

Referring to Fig. 2, the outer end of motor shaft 16 abuts against the outer end of the drive shaft 20 of a conventional first gear pump 21 (Fig. 1). The drive shaft 20 is connected to the drive gear 22 of the pump 21, which meshes with a driven gear 23 to draw in fluid from the inlet pipe 24 and discharge the fluid under pressure to the outlet pipe 25.

To couple the motor shaft 16 to the pump shaft 20 there is provided a conventional overrunning clutch in the form of a tightly wound helical spring 26. This spring is composed of wire of square cross-section and is fitted closely over the adjacent ends of the abutting shafts 16 and 20 to normally grip both shafts tightly. Due to the direction of the helical wrap around of spring 26, when motor shaft 16 is driven counterclockwise in the drawing it causes the spring 26 to wind itself tightly onto the shafts 16 and 20. This locks the pump shaft 20 mechanically to the motor shaft 16, so that the first pump 21 is driven from hydraulic motor 10 in this direction of rotation of motor shaft 16. When hydraulic motor 10 is reversed, by reversing the pressure fluid inlet and outlet connections to the hydraulic motor, the direction of rotation of motor shaft 16 is correspondingly reversed. When rotated in this reverse direction, shaft 16 causes the helical spring 26 to unwind and expand, thereby becoming loosened from the drive shaft 20 for pump 21, so that very little driving force, or none at all, is imparted to the pump drive shaft 20.

In similar fashion, the free end of the other motor shaft 19 abuts against the drive shaft 27 for a conventional second gear pump 28 having the suction inlet conduit 30 and the discharge conduit 31. An overrunning clutch 29 in the form of a tightly wound, square wire, helical spring couples the motor shaft 19 to the pump shaft 27. The spring 29 is fitted closely onto the shafts 19 and 27 to normally grip both tightly.

When motor shaft 19 is driven counterclockwise in the drawing (at which time the other motor shaft 16 is driven in the same direction to drive the first pump 21), the clutch spring 29 is caused to unwind and expand, thereby becoming loosened from the drive shaft 27 for the second pump 28. Thus, no drive is imparted from motor 10 to the second pump 28 when this motor is driving the first pump 21.

Conversely, when motor shaft 19 is driven clockwise in the drawing, as shown in Fig. 2 (at which time no drive is imparted from the motor to the first pump 21), the clutch spring 29 is caused to wind tightly about the shafts 19 and 27, coupling them together mechanically to impart the drive from motor 10 to the second pump 28. Thus, when the motor drives the second pump 28 it is disconnected from driving relation with the first pump 21.

From the foregoing it will be apparent that the present invention provides a novel and simplified arrangement for driving two pumps alternately. Only a single reversible driving motor is required, and the selection of the pump to be driven is controlled simply by choosing the direction in which the driving motor operates, the overrunning clutches operating automatically as described to impart the drive from the motor to only the desired one of the pumps, without driving the other pump at the same time.

For the purpose of illustrating the present invention, there has been described and shown in the accompanying drawing a specific preferred form thereof. However, it is to be understood that the invention is susceptible of other and different embodiments from that shown herein. For example, the hydraulic gear type motor might be replaced by a vane motor or other type of driving motor, the helical spring type overrunning clutches may be replaced by overrunning clutches of other types capable of functioning successfully in the combination of the present invention, and pumps of other types adapted to be driven from rotary drive shafts may be substituted in place of the gear pumps shown and described herein. Therefore, it is to be understood that various modifications, omissions and refinements which depart from the described form of the invention may be adopted without departing from the spirit and scope of the present invention.

We claim:

1. A pumping apparatus comprising a rotary hydraulic motor having first and second fluid passages communicating therewith, first and second rotary shafts driven in unison by said motor, a first rotary pump having a drive shaft, a second rotary pump having a drive shaft, a first overrunning clutch means disposed between said first shaft and the drive shaft for said first pump for establishing a driving connection therebetween when said motor rotates in one direction, a second overrunning clutch means disposed between said second shaft and the drive shaft for said second pump for establishing a driving connection therebetween when said motor rotates in the other direction, and control valve means connected to said first

and second fluid passages of said motor for selectively passing fluid in either direction to said motor to control the direction of rotation of said motor and thereby selectively drive said first or said second pump, said control valve means including valve means operative to block the flow of fluid to and from said first and second passages to thereby lock said motor against rotation in either direction and prevent reverse rotation of said first and said second pumps.

2. A pumping apparatus comprising a rotary hydraulic motor having first and second fluid passages communicating therewith, first and second rotary shafts driven in unison by said motor, a first rotary pump having a drive shaft, a second rotary pump having a drive shaft, a first overrunning clutch means disposed between said first shaft and the drive shaft for said first pump for establishing a driving connection therebetween when said motor rotates in one direction, a second overrunning clutch means disposed between said second shaft and the drive shaft for said second pump for establishing a driving connection therebetween when said motor rotates in the other direction, and a control valve means connected to said first and second fluid passages of said motor, said control valve means being operable in a first position thereof to pass fluid under pressure into said first passage and out of said second passage to rotate said motor in one direction and drive said first pump, said control valve means being operable in a second position thereof to pass fluid under pressure into said second passage and out of said first passage to rotate said motor in the other direction and drive said second pump, said valve means being operable in a third position thereof to block flow of fluid to and from both said first and said second fluid passages to lock said motor against rotation in either direction and prevent reverse rotation of said first and second pumps.

3. A pumping apparatus comprising a rotary hydraulic motor having first and second fluid passages communicating therewith, first and second rotary shafts driven in

unison by said motor, a first rotary pump having a drive shaft, a second rotary pump having a drive shaft, a first overrunning clutch means disposed between said first shaft and the drive shaft for said first pump for establishing a driving connection therebetween when said motor rotates in one direction, a second overrunning clutch means disposed between said second shaft and the drive shaft for said second pump for establishing a driving connection therebetween when said motor rotates in the other direction, a drive pump for said motor, control valve means connected to said drive pump and to said first and second fluid passages of said motor, said valve means being operable in a first position thereof to pass fluid under pressure from said drive pump into said first passage and out of said second passage to rotate said motor in one direction and drive said first pump, said control valve means being operable in a second position thereof to pass fluid under pressure from said drive pump into said second passage and out of said first passage to rotate said motor in the other direction and drive said second pump, said valve means being operable in a third position thereof to by-pass the fluid discharged from said drive pump back to the inlet thereof and to block the flow of fluid to and from said first and second passages to lock said motor against rotation in either direction and prevent reverse rotation of said first and second pumps.

References Cited in the file of this patent

UNITED STATES PATENTS

353,564	Kamm et al.	Nov. 30, 1886
899,513	Champ	Sept. 29, 1908
952,613	Fairweather et al.	Mar. 22, 1910
1,557,222	Warner	Oct. 13, 1925
2,390,204	Curtis	Dec. 4, 1945
2,603,157	Conery	July 15, 1952
2,643,614	Rosenkraus	June 30, 1953