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O. E. ROSEN

2,347,368

CONTROL MEANS FOR HYDRAULIC MOTORS

Filed Jan. 26, 1942

3 Sheets-Sheet 1

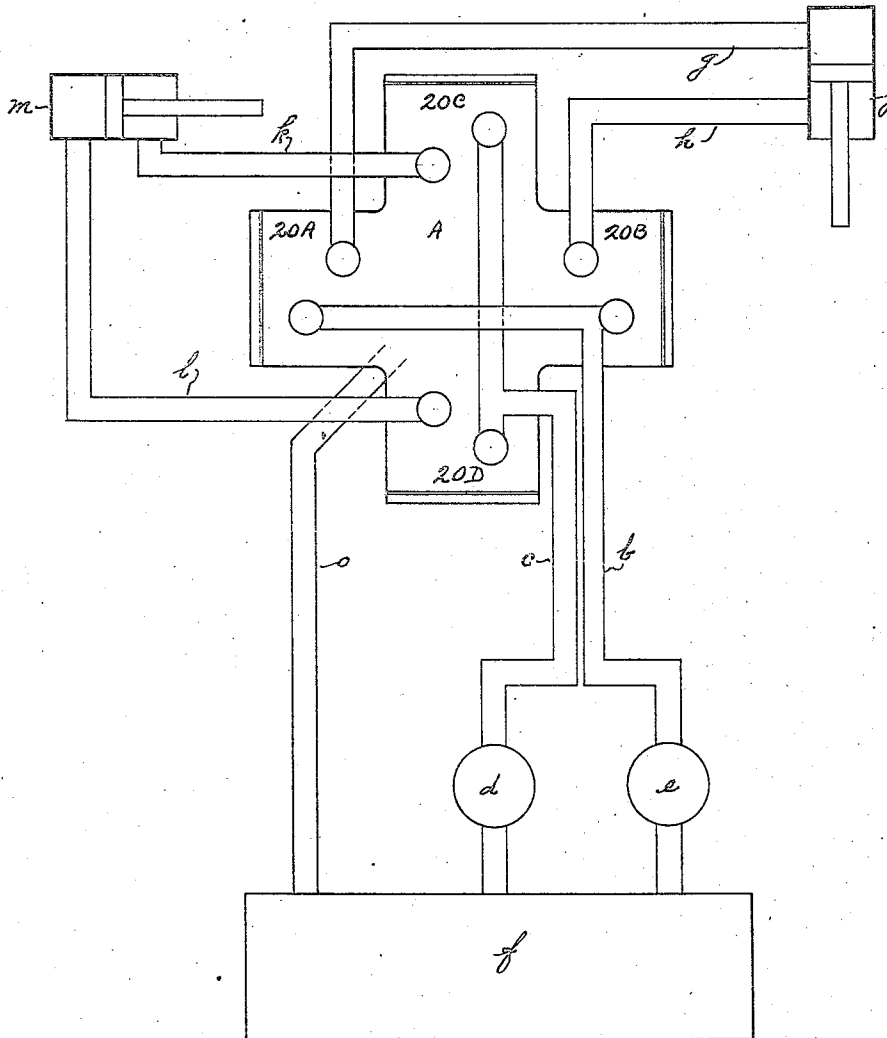


Fig. 1.

INVENTOR.

Oscar E. Rosen

BY

Swan, Fye, & Hardesty

ATTORNEYS

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3 Sheets-Sheet 2

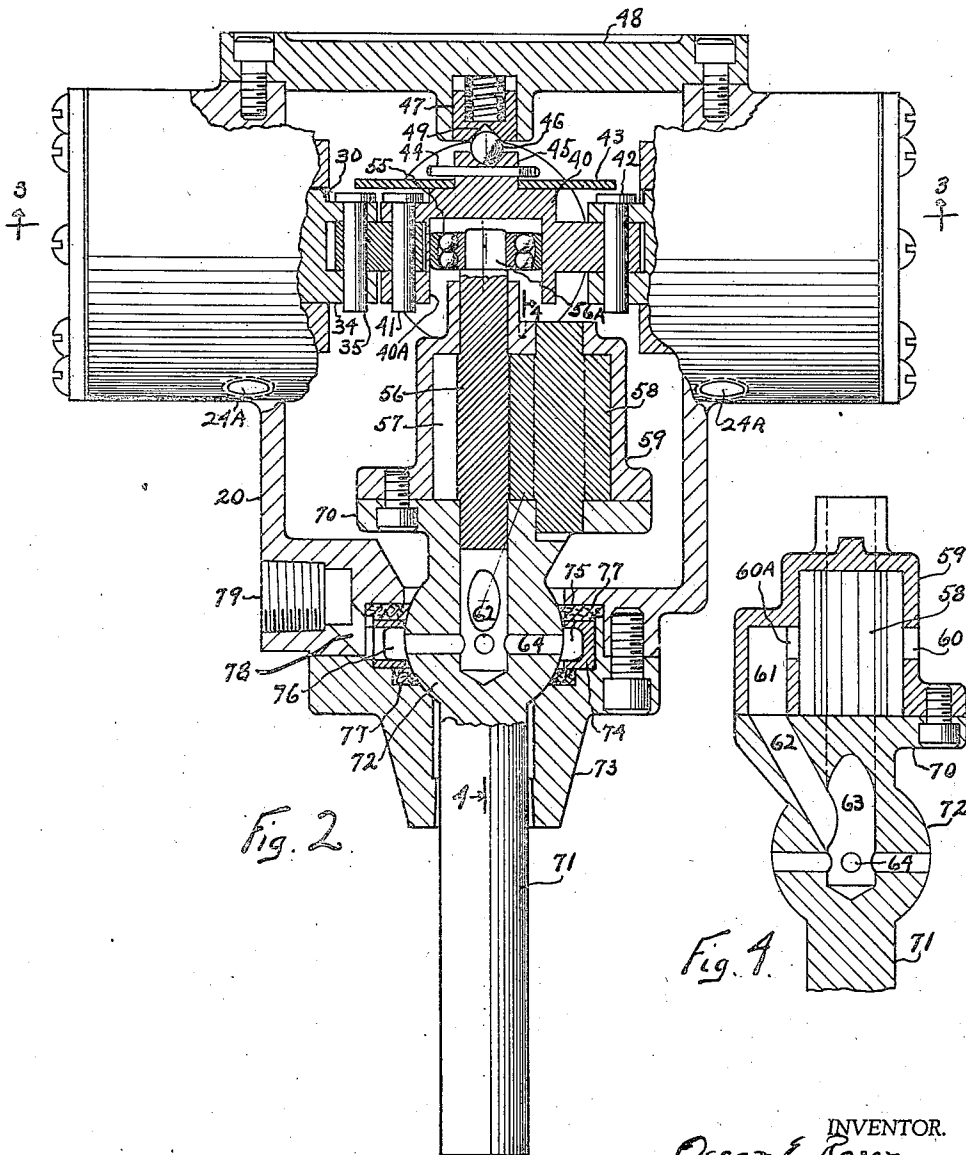


Fig. 2

Fig. 4

INVENTOR.

Oscar E. Rosen

BY

Swan, Frye, & Hardisty
ATTORNEYS

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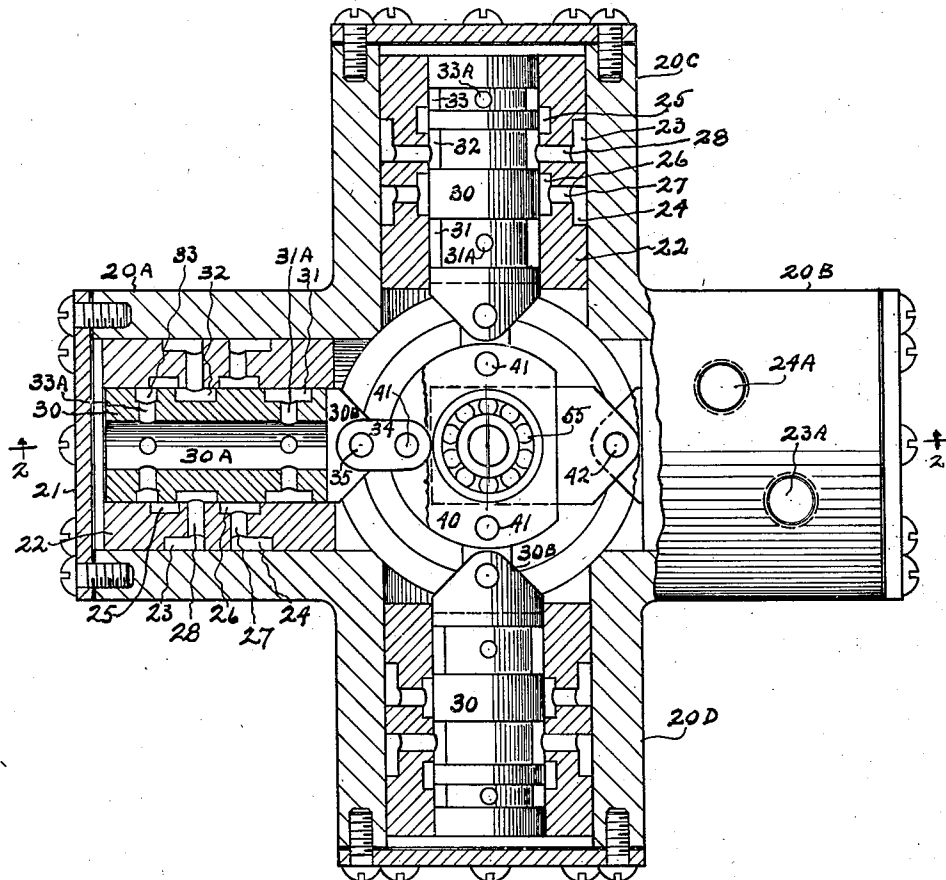
O. E. ROSEN

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INVENTOR.
Oscar E. Rosen
BY Swan, Frye, & Hardesty
ATTORNEYS

UNITED STATES PATENT OFFICE

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CONTROL MEANS FOR HYDRAULIC MOTORS

Oscar E. Rosen, Detroit, Mich.

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5 Claims. (Cl. 303-6)

The present invention relates to control means for hydraulic motors and specifically to a single control means for a plurality of such motors.

Among the objects of the invention is a single control means for a plurality of motors whereby, of two motors, either may be operated by itself or both operated simultaneously, or either may be operated forward while the other operates simultaneously in reverse.

Another object is a control for a pair of motors, adapted to produce motion in directions at right angles to each other, whereby the resulting motion may be in either direction or a composite and therefore diagonal direction.

Still another object is a control of the type indicated which may be operated by means of a single universally mounted lever—the amount and direction of movement being indicated and determined by the movement of said lever.

Other objects and advantages will be apparent to those skilled in the art upon reference to the following description and the accompanying drawings in which

Figure 1 is a diagrammatic view showing the control device and its installation with a pair of motors.

Figure 2 is a partial vertical sectional view through the control device on line 2-2 of Figure 3.

Figure 3 is a partial horizontal sectional view on line 3-3 of Figure 2.

Figure 4 is a section on line 4-4 of Figure 2.

In the drawings, the control device, shown in detail in Figures 2 to 4, is indicated at *a* and is shown as being supplied with suitable fluid through conduits *b* and *c* by pumps *d* and *e* from tank *f*.

Each of the conduits *b* and *c* supplies two opposed cylinders of the control device *a*, the conduit *b* leading to cylinders 20A and 20B, while the conduit *c* supplies cylinders 20C and 20D.

From the cylinders 20A and 20B the conduits *g* and *h* lead to the two ends of a motor *j*, this being shown as of the cylinder and piston type, though any other reversible hydraulic motor could be used. From the cylinders 20C and 20D the conduits *k* and *l* lead to a second motor *m* and from the central housing portion of control *A*, the outlet conduit *o* leads back to tank *f*.

The control valve shown in detail in Figures 2, 3 and 4 comprises a central housing 20 having extending from its upper portion, radially and equally spaced, four cylinders 20A, 20B, 20C, and 20D, which with their liners, valves, etc. are substantially identical.

Each cylinder is closed at its outer end with a suitable plate 21 and provided with a liner 22 which is peripherally grooved on the outside at 23 and 24. The liner is also provided with internal peripheral grooves 25 and 26, the latter (26) communicating through suitable passages 27 with groove 24. Groove 23, through passages 22, also communicates with the interior of the liner at a location between grooves 25 and 26.

The peripheral grooves 23 and 24 connect with suitable ports on the outside of the cylinder, groove 23 being the inlet groove and groove 24 being the outlet groove. On cylinder 20B, the two ports 23A and 24A are respectively inlet and outlet ports.

Coacting with and slidably mounted in each liner 22 is a valve member 30. This consists of an axially bored cylindrical member provided with outer peripheral grooves 31, 32 and 33, grooves 31 and 33 communicating through passages 31A and 33A, with the axial bore 30A of the valve and located near the ends of the latter. Groove 32 is between the other two.

At its inner end, the valve 30 is cross-slotted to provide ears 30B and open the end of the bore 30A. These ears 30B also provide for three of the valves, a connection for a link 34 pivoted therebetween on a suitable pin 35.

Within the housing 20, the several links 34 are pivoted to a centrally located valve actuating element 40, by means of pins 41 while the fourth valve is pivoted directly thereto as at 42 without an intervening link.

The element 40, as shown in Figure 2, is provided on its upper face with a shoulder upon which is seated an annular plate 43 serving to prevent dislocation of the several pins 35, 41, and 42 and itself prevented from dislocation by the pin 44 passing through the central boss 45.

Seated in the upper end of boss 45 is a hardened ball 46 and directly above the latter a spring pressed plunger 47 mounted in the cover plate 48. The plunger 47 is provided with a conical seat 49 for the ball 46.

The lower face of element 40 is provided with a rather deep cut or recess 40A adapted to receive the outer race of an anti-friction bearing 55 at substantially the level of the links 34, and pressed into the inner race thereof is the upper reduced end 56A of a short shaft 56 of a gear 57 which, with a gear 58 and the housing 59, constitutes a gear pump having an inlet 60 from the housing 20 and an outlet 60A leading to a small chamber 61 on the side of housing 59.

The gear pump and housing 59 are mounted

upon the suitably flanged (as at 70) upper end of a lever 71 provided with a spherical enlargement 72, and a passage 62 leads diagonally from chamber 61 to a central chamber 63, within the spherical enlargement 72, having horizontally arranged radial passages 64 leading to the outside.

The lever 71 is held in place by a suitable cap member 73 fixed to the bottom of housing 20 and packed with the packing shown in Figure 2.

This packing consists of metallic ring 74, grooved around its inner periphery as at 75 and with a radial opening 76, sandwiched between two non-metallic packing rings 77.

Registering with the opening 76 in ring 74 is a passage 78 leading through a portion of cap 73 and a wall of housing 20 to an outlet 79.

An important element of this construction is indicated in Figures 2 and 3 by the two lines appearing in the inner race of bearing 55. These two lines indicate the center lines of the shaft 56 and of the reduced extension 56A and show that the latter is arranged slightly eccentric to the former and due to this eccentricity the rotation of the shaft 56 produces a constant small endwise oscillation of all of the valves and thereby insures smooth, quick and accurate response by the motors to movements of the lever 71.

In the operation of the control, the pumps *d* and *e* are first put into operation and liquid is forced into the several cylinders through the openings 23A to the grooves 23 from which it passes through passages 28 to grooves 32 in the valves 30.

With the valves 30 in the position shown (Fig. 3), liquid flow is then into the grooves 25, through to the valve grooves 33, passages 33A and bore 30A to the central housing 20. In use, this central housing 20 is filled with liquid and the flow is continuous through the gear motor 57-58, flowing in through inlet 60 and out through the chamber 61 and passages 62, 63, and 64 to ring 75 from which through passage 78 to outlet 79 and conduit *o* back to tank *f*. This causes continuous operation of motor 57-58.

With the valves in the position shown and the fluid flow as just described, there is no action on either of the motors *j* and *m*, and since fluid can flow neither in nor out, the motors are locked against movement. When, however, a valve 30, for example in cylinder 20A, is moved inward, the groove 32 moves away from groove 25 and opens into groove 26 so the entering liquid flows thereinto and then through passage 27 to groove 25 which opens to its port 24A and is, through conduit *g* connected to one end of motor *j*. At the same time, the valve 30 in cylinder 20B has been moved outward an equal distance and its groove 31 has been moved to open to its groove 27, so that liquid from the other end of motor *j* flows through conduit *h* back through port 24A to its groove 24 and then through passage 27, groove 31 and passage 31A to the bore 30A and to the housing 20.

Movement of the valves 30 in cylinders 20A and 20B in the opposite direction will of course supply and exhaust liquid from motor *j* in the reverse direction. Likewise, movement of the valves 30 in cylinders 20C and 20D will cause the actuation of motor *m* in one or the other direction, while a diagonal movement of the univ.ally mounted lever 71 will of course move all of the valves with corresponding actuation of both motors *j* and *m*.

Now having described the invention and the preferred embodiment thereof, it is to be understood that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and I therefore desire the present embodiment to be considered in all respects as illustrative and not restrictive; reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

I claim:

1. In a unit control for a pair of fluid actuable reversible motors, having a source of fluid supply and separate means for drawing fluid therefrom and forcing it under pressure through each of said motors and returning it to said source, a plurality of valves for controlling the operation and direction of operation of said motors, and means for oscillating said valves during operation of said forcing means.

2. In a unit control for a pair of fluid actuable reversible motors, having a source of fluid supply and means for drawing fluid therefrom and forcing it under pressure through said motors and returning it to said source, a plurality of valves each adapted to direct fluid to one side of a motor or to permit fluid to exhaust back to said source, a common operating means for said valves and a motor connected to said common operating means and adapted to oscillate all of said valves during the operation of said fluid drawing and forcing means.

3. In a control unit for a reversible fluid actuable motor, having a source of fluid and means for forcing fluid under pressure to and through said motor and back to said motor and back to said source, a pair of valve casings, conduit means leading from said forcing means to each of said casings, conduit means leading from each of said casings to one side of said motor, an outlet conduit from said casings leading to said source, valves simultaneously movable from a neutral position to either one of two motor operating positions, in either one of which fluid is directed to one side of said motor while fluid is allowed to exhaust from the other side of said motor, while in neutral position fluid is led directly to said outlet conduit from both valves, means for imparting a vibratory motion to said valves, and means for actuating said valves to or from one of said positions.

4. In a valve unit a plurality of valves for controlling the flow of fluid to and from a hydraulic motor, means for leading fluid to said motor through said unit, means for leading fluid from said motor through said unit and exhausting same, and a fluid motor located within said unit and operable by exhausting fluid, said latter motor being connected in driving relation to said valves whereby to cause oscillation thereof.

5. In a valve unit a plurality of valves for controlling the flow of fluid to and from a hydraulic motor, means for leading fluid to said motor through said unit, means for leading fluid from said motor through said unit and exhausting same, a valve operating lever projecting from said unit, a fluid motor located within said unit and carried by said lever and operable by exhausting fluid, said latter motor being connected in driving relation to said valves whereby to cause oscillation thereof, and fluid outlet means from the latter motor extending through a portion of said lever.