

[54] CONTROL ARRANGEMENT

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74/97, 125.5; 200/47, 67

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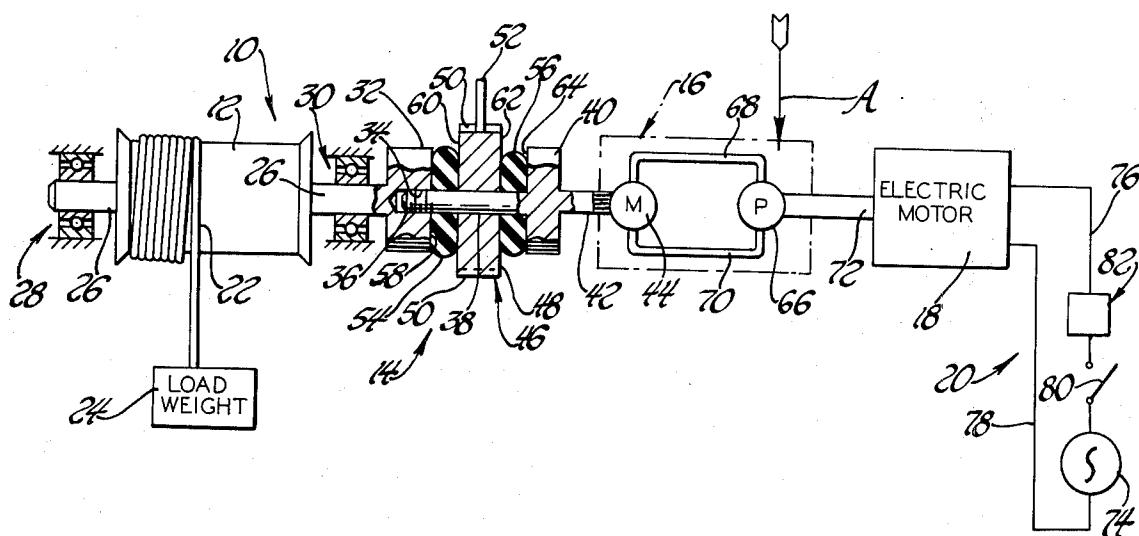
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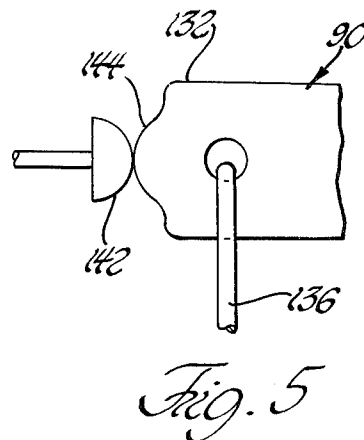
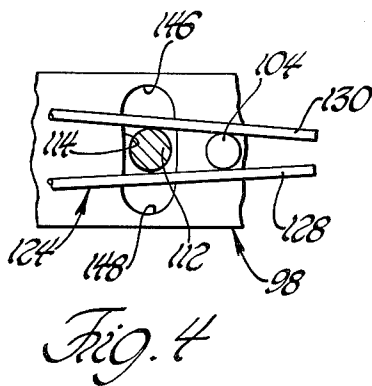
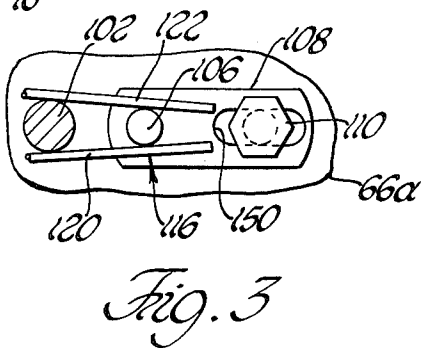
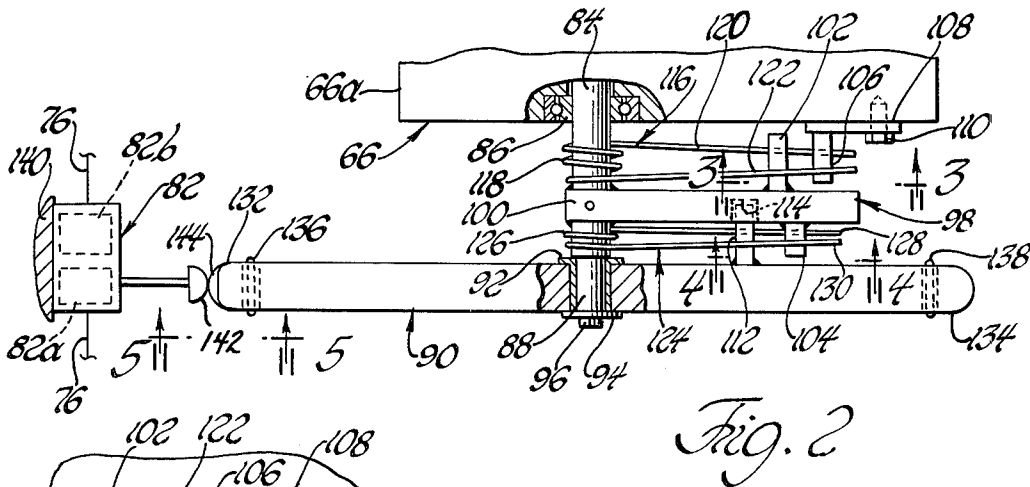
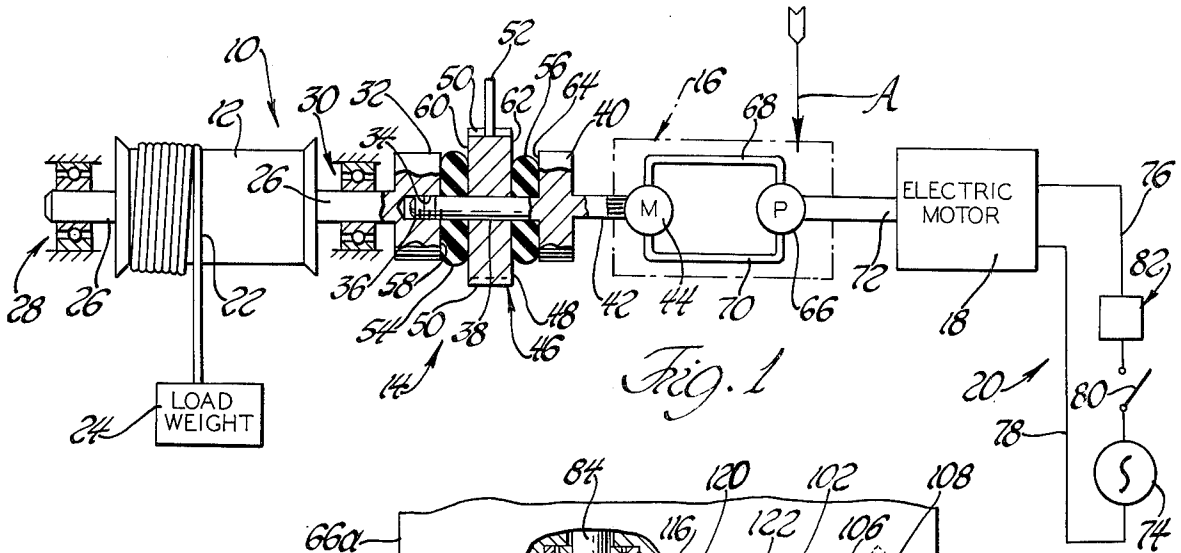
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ABSTRACT

A hoist system employing a hydraulic motor, a variable displacement reversible flow hydraulic pump for supplying hydraulic fluid to the hydraulic motor, and an electric motor employed as a prime mover for the pump has a manually operable control arrangement which can be actuated in either of two directions for thereby determining both the displacement of the pump and the direction of flow of such displacement. Within the overall control arrangement, lost motion connecting means are provided whereby upon initiation of movement of the control assembly by the operator, associated electrical circuit means is closed to thereby energize the electric motor, sequentially prior to the actuation of the pump for determining the direction and displacement of flow therefrom, to pressurize the pump assembly.

12 Claims, 5 Drawing Figures





CONTROL ARRANGEMENT

BACKGROUND OF INVENTION

Heretofore, in arrangements employing an electric motor for driving a variable displacement hydraulic pump which, in turn, was employed for lifting loads it was often the case that the electric motor would be energized to drive the pump while the pump might have been set at some relatively high displacement. Consequently, the operator, especially where the said arrangement was a hoist assembly, would not be able to exercise complete control over the entire range of available lifting speed starting from zero speed to the system's maximum speed.

SUMMARY OF THE INVENTION

According to the invention, a control arrangement for a power supply system employing a variable displacement hydraulic pump and an electric motor energizable for driving said pump, comprises first adjustably positionable means operatively carried by said pump for adjustably varying the said displacement of said pump, second manually positionable means, connecting means operatively interconnecting said second manually positionable means and said first means, third means effective for continually urging said first means and said second means to a neutral position whereat the displacement of said pump is at a desired minimum magnitude, electrical circuit means interconnecting said electric motor and an associated source of electrical potential, and electrical switching means being normally effective to open said electrical circuit means when said first and second means are in said neutral position, said connecting means comprising lost motion means effective to permit initial manual movement of said second means from said neutral position to thereby cause said electrical switching means to close said electrical circuit means and affect energization of said electric motor prior to causing accompanying movement of said first means from said neutral position.

Various general and specific objects and advantages of the invention will become apparent when reference is made to the following detailed description considered in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, wherein for purposes of clarity certain elements and details may be omitted from one or more views:

FIG. 1 is a generally simplified illustration, partly in schematic form, of a hoist assembly employing the teachings of the invention; for purpose of reference, the view of FIG. 1 may be considered as being a generally side elevational view with portions thereof broken-away and in cross-section;

FIG. 2 is an enlarged fragmentary view taken generally in the direction of arrow-A of FIG. 1 illustrating in generally top plan view a portion of the structure diagrammatically depicted in FIG. 1;

FIG. 3 is an enlarged fragmentary view taken generally on the plane of line 3—3 of FIG. 2 and looking in the direction of the arrows;

FIG. 4 is an enlarged fragmentary view taken generally on the plane of line 4—4 of FIG. 2 and looking in the direction of the arrows; and

FIG. 5 is an enlarged fragmentary view taken generally on the plane of line 5—5 of FIG. 2 and looking in the direction of the arrows.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

Referring now in greater detail to the drawings, FIG. 1 illustrates, in somewhat simplified and diagrammatic form, a hoist system 10 comprising a hoist drum 12, a clutch assembly 14, a hydraulic pump and motor assembly 16, a cooperating electric motor 18 and related electrical circuitry 20.

The drum 12, operatively connected as to one end of suitable cable means 22 the other end of which is suitably adapted for connection to a load 24 to be lifted, is operatively keyed for rotation with a rotatable shaft 26 which may be journaled as in bearing assemblies 28 and 30.

One end of shaft 26 may be operatively provided with a first clutch disc 32 which, in turn, is provided with an internally threaded aperture 34 which threadably receives an externally threaded end 36 of a cooperating shaft portion 38 having a second clutch disc 40 formed and carried thereon. A second shaft portion 42 extends from clutch disc 40 and into operative engagement with a hydraulic motor 44 of assembly 16. For clarity and ease of subsequent description, let it be assumed that shaft portion 42 is axially splined (or otherwise made able) to thereby permit axial movement of the shaft 42 relative to hydraulic motor 44 while still enabling the hydraulic motor 44 to rotatably drive the shaft 42.

A pawl and ratchet wheel assembly 46 is situated generally between the clutch discs 32 and 40. The ratchet wheel 48, freely journaled on and carried by shaft portion 38, is provided with angularly spaced axially extending teeth or abutments 50 about the circumferential periphery thereof. A pawl 52, which may be spring-loaded as is well known in the art, is adapted to abuttingly and cooperatively engage such teeth 50 only when rotation of the ratchet wheel 48 is attempted in one direction while the same pawl 52 freely rides over the teeth 50 when the ratchet wheel 48 is rotated in an opposite direction.

Layers or members 54 and 56 of suitable friction material (each of which may be of general disc-like configuration) are situated as to have, for example, friction member 54 juxtaposed to opposed faces 58 and 60 of clutch disc 32 and ratchet wheel 48, respectively, while friction member 56 is juxtaposed to opposed faces 62 and 64 of ratchet wheel 48 and clutch disc 40, respectively.

Assembly 16 is illustrated as comprising a hydraulic motor 44, which is bidirectional, and a variable displacement reversible flow pump assembly 66. In the embodiment illustrated, pump assembly 66 comprises a swash-plate type pump (many embodiments of such being well known in the art). The pump 66 and hydraulic motor 44 may be operatively connected to each other as by conduit means 68 and 70 any of which, depending on the mode of operation of pump 66, may serve as the outlet conduit from pump 66 while at other modes of operation the same such conduit would serve as an inlet conduit for the pump 66.

In any event, hydraulic pump assembly 66 is operatively connected, as through a shaft 72, to an electric

motor 18 which, in the embodiment shown, is A.C. and of a constant speed.

The electrical circuitry 20, very briefly and schematically illustrated, comprises alternating current source of electrical potential 74 having one terminal connected to conductor means 76 and another terminal connected to conductor means 78 with both of such conductor means leading to the electric motor 18. As generally illustrated, conductor means 76 may include master-like switch means 80 and serially situated additional switching means 82 the operation and function of which will be described subsequently.

GENERAL OPERATION OF STRUCTURE OF FIG. 1

In describing the general operation of the structure of FIG. 1, the terms of reference "clockwise" and "counter-clockwise" are employed in describing directions of rotation. For clarity, it is pointed out that such terms of reference are to be interpreted as if the person observing such relative movements was at the right-hand end of FIG. 1, generally in line with the axis of rotation and facing the structure of FIG. 1.

With the presence of a load 24, drum 12 experiences a torque as a consequence thereof tending to cause drum 12 and its keyed shaft 26 to rotate counter-clockwise. Any such counter-clockwise relative movement results in the internally threaded aperture 34 of clutch disc 32 axially drawing threaded end 36 and shaft 38 further into the aperture with the result that clutch disc faces 58 and 64 bear against the friction means 54 and 56 with a greater force.

More specifically, during a load-lifting operation, with the electric motor 18 energized, shaft 72 drives pump 66 causing it to provide a hydraulic driving force to hydraulic motor 44 which, in turn, causes clockwise rotation of shaft 42, disc 40 and shaft 38. The load 24 will cause drum 12 and shaft 26 to exhibit some degree of resistance to clockwise rotation thereof and such resistance, in turn, results in friction discs 54, 56 becoming sufficiently squeezed against ratchet wheel 48 thereby preventing any further relative rotation as among disc 32, disc 40 and ratchet wheel 48. Accordingly, once such a frictional lock is achieved, further clockwise rotation of shaft 42 by motor 44 causes the simultaneous clockwise rotation of ratchet wheel 48 and drum 12 resulting in the lifting of the load 24. As the ratchet wheel 48 is thusly rotated in the clockwise direction during the lifting of the load 24, the pawl 52 in effect freely rides over the ratchet teeth 50; however, any tendency of the ratchet wheel 48 to experience counter-clockwise rotation is immediately prevented by the pawl 52 abutting against and engaging a juxtaposed one of the ratchet teeth 50. Since the ratchet wheel 48 is thusly held stationary, any tendency of the drum 12 to rotate counter-clockwise, due to the torque of the load 24, only causes further tightening of the friction member 54 between the faces of clutch disc 32 and ratchet wheel 48 resulting in, of course, drum 12 being prevented from such counter-clockwise rotation.

Assuming now that the load 12 has already been lifted and that it is now desired to lower it, the following action would take place. Lowering of the load 24 occurs during counter-clockwise rotation of drum 12; however, such rotation is normally prevented as described above, by the ratchet wheel 48 which is stopped from experiencing counter-clockwise rotation.

Accordingly, to lower load 24, the action of pumping means 66 is reversed causing motor 44 to be similarly reversed driving shaft 42, clutch disc 40, shaft 38 which is rotatable with respect to ratchet wheel 48, and threaded shaft portion 36 to all rotate counter-clockwise. At the initiation of such counter-clockwise rotation of shaft 38, clutch disc 32 was frictionally held by friction member 54 and prevented from rotation. Therefore, with drum 12 initially being thusly prevented from counter-clockwise rotation while shaft 38 is driven counter-clockwise, the resulting effect is for shaft 38 and clutch disc 32 to move some distance axially away from each other thereby eliminating the frictional locking effect previously produced by friction member 54 and permitting the drum 12, shaft 26 and clutch disc 32 to start rotating counter-clockwise lowering load 24. The faster that shaft 38 rotates counter-clockwise, the faster the downward movement of the load 24 occurs. However, if the load 24 should present such a torque as to cause drum 12, shaft 26 and clutch disc 32 to start to rotate counter-clockwise faster than shaft 38, the end of such shaft 38 will again be drawn axially inwardly of aperture 34 thereby causing friction member 54 to again exhibit an increased frictional restraining force to retard the counter-clockwise rotation of clutch disc 32 and drum 12.

Although it is believed apparent, nevertheless, it might be brought out that the structure illustrated in FIG. 1 may well be mounted, if desired, on a unitary support structure which, in turn, can be moved from one location to another in accordance with demands for use thereof.

DESCRIPTION OF REMAINING FIGURES

FIG. 2 is an enlarged fragmentary portion of the control means associated with the pump assembly 66. While FIG. 1 is generally shown as a side elevational view (with portions shown in cross-section), FIG. 2 is shown in a generally top plan view, taken generally in the direction of arrow A, and for ease of reference the fragmentarily illustrated structure at 66a may be considered as comprising a portion of the housing or body of the pump assembly 66 of FIG. 1.

In FIG. 2, a control shaft 84 is shown journaled as at 86 and extending into pump structure 66a so as to operatively engage and control the swash plate mechanism of the pump assembly 66 to thereby determine, depending on the direction and degree of rotation of shaft 84, the rate of flow of hydraulic fluid out of the pump assembly 66 as well as the direction of such flow. The other end 88 of shaft 84 is freely journaled to an associated control lever 90 as through a flanged sleeve bushing 92 and cooperating annular washer 94 all of which may be maintained in assembled relationship as through the action of a bolt or screw 96 passing through the washer 94 and threadably engaged with the end 88 of shaft 84.

An arm 98 is fixedly secured as at one end 100 to shaft 84 for unitary rotation therewith. Generally, at or near its other swingable end arm 98 has affixed thereto rod-like cylindrical extensions or members 102 and 104 respectively arranged on opposite sides of arm 98 and laterally extending therefrom. A similar rod-like cylindrical member 106 is fixedly secured, as through a suitable mounting bracket 108 and cooperating fastener means as at 110, to the pump housing structure 66a as to extend laterally therefrom. A fourth rod-like

member 112 is affixed to and carried by control lever 90 in a manner so as to extend laterally therefrom and to have the projecting end thereof received within an elongated slot 114 formed in arm 98.

A first torsion spring 116, having a coiled body 118 situated about shaft 84, has arms 120 and 122 which, as will become apparent, cooperate with members 102 and 106. That is, the relative sizes and placement of members 102 and 106 are such as to enable spring arm 120 to be in engagement with the undersides of both members 102 and 106 while spring arm 122 is in engagement with the upper sides of both members 102 and 106 during such time as when the control system is in a null or neutral condition and not being acted upon by any operator.

A second torsion spring 124, also having a coiled body 126 situated about shaft 84 on the opposite side of arm 98, has spring arms 128 and 130 which, as will become apparent, cooperate with members 112 and 104. That is, the relative sizes and placement of members 112 and 104 are such as to enable spring arm 128 to be in resilient engagement with the undersides of both members 112 and 104 while spring arm 130 is in resilient engagement with the upper sides of both members 112 and 104. In the absence of any external forces applied to the control system, spring arms 128 and 130 are effective for moving members 112 and 104 into what may be referred to as alignment with each other and thereby position lever 90 in a particular predetermined position relative to arm 98. Such null, neutral or reference positions of the related members 102, 106, 112 and 104, and springs 116 and 124 are illustrated in enlarged fragmentary view in FIGS. 3 and 4.

Opposite ends 132 and 134 of lever 90 may be provided with suitable cords or cables 136 and 138, passing therethrough, by which an operator, stationed at an elevation below the overall hoist assembly, may affect the downward movement of either end of lever 90 to the degree desired.

The switch assembly 82 of FIG. 1, is illustrated as being fixed to suitable related support structure fragmentarily illustrated as at 140; such support structure may be part of the overall structure supporting the hoist assembly 10. In any event, support means 140 is effective for keeping the switch assembly 82 in a preselected position as to result in the switch actuating member, such as a plunger 142, being actuated by a selected portion or cam 144, carried by lever 90, only when the lever 90 assumes a predetermined relative position as generally depicted in FIGS. 2 and 5.

OPERATION OF STRUCTURE SHOWN IN FIGS. 2, 3, 4 and 5

Since rotation of the various elements will occur about the axis of shaft 84, it will be easier to describe the various movements if it is first established that the term, counter-clockwise, will now apply to movement in a direction corresponding to rotation of lever 90 and 132 from the plane of the drawing to positions below the plane of the drawing while the term, clockwise, will now apply to movement in a direction corresponding to rotation of lever 90 end 134 from the plane of the drawing to positions below the plane of the drawing.

Aligning spring 116 is of a comparably high rate and high preload with respect to the second aligning spring 124 which is of a relatively low rate and low preload (rate being defined as the force per unit of deflection).

In view of the preceding, it can be seen that as lever 90 is initially rotated in, for example, the counter-clockwise direction, member 112 will cause spring arm 130 of spring 124 to deflect upwardly while member 104 retains spring arm 128 in abutting engagement therewith at the underside thereof. For all practical purposes, arm 98, at this time, may be considered as remaining stationary, primarily because of the effect of the relatively high rate and high preload on spring 116 and its arms 120, 122 maintaining alignment of members 102 and 106.

The arm 98 may be considered as remaining substantially stationary until, during such continued counter-clockwise rotation of lever 90, the upper part of member 112, carried thereby, abuttingly engages the upper end 146 of slot or recess 114 in arm 98 (FIG. 4). When this happens and the counter-clockwise rotation of lever 90 is continued the arm 98 is forcibly also rotated in the counter-clockwise direction, against the resilient resistance of spring means 116, rotating swash plate control shaft 84 in unison therewith. The degree to which shaft 84 is thusly rotated determines the volumetric hydraulic output of pump means 66. If it is assumed that the counter-clockwise rotation of shaft 84 results in the upward movement of load 24 of FIG. 1, then, generally, the further shaft 84 is rotated counter-clockwise the faster will be the rate at which load 24 will be raised.

If, instead, lever 90 is initially rotated in the clockwise direction, member 112 will cause spring arm 128 of spring 124 to deflect downwardly while member 104 retains spring arm 130 in abutting engagement atop thereof. Again, for all practical purposes, arm 98, at this time, may be considered as remaining stationary, primarily because of the effect of the relatively high preload on spring 116 and its arms 120, 122 maintaining alignment of members 102 and 106.

The arm 98 may again be considered as remaining substantially stationary, during such continued clockwise rotation of lever 90, until the lower part of member 112, carried thereby, abuttingly engages the lower end 148 of slot or recess 114 in arm 98 (FIG. 4). When this happens and the clockwise rotation of lever 90 is continued, the arm 98 is forcibly also rotated in the clockwise direction, against the resilient resistance of spring means 116 thereby rotating swash plate control shaft 84 in unison therewith. The degree to which shaft 84 is thusly rotated determines the hydraulic volumetric output of pump means 66. If it is assumed that the clockwise rotation of shaft 84 results in the downward movement of load 24 of FIG. 1, then, generally, the further shaft 84 is rotated clockwise the faster will be the rate at which load 24 will be lowered.

As is generally indicated in both FIGS. 2 and 5, the plunger or switch actuator 142 is held in the "off" position or condition whenever the actuator or control lever 90 is in its neutral or null position. Generally, the neutral or null position or condition may be defined as that position which control lever 90 assumes due to the combined action of spring means 116 and 124 when all manual control thereover is removed. In the embodiment disclosed this would mean that the swash plate control shaft 84 had returned to its null condition resulting in pump means 66 supplying no hydraulic actuating fluid to motor 44 through either conduit means 68 or 70 and that lever 90 along with motion transmitting member or dog 112 have also been returned,

through the action of spring means 124, to a position whereat member 112 is generally between opposed abutment means 146 and 148.

Generally, whenever such control means have been returned to their null or neutral positions, switch actuator 142 is moved (actuated) by the cam portion 144 as to thereby open the circuit through conductor means 76 even though the master switch 80 (if one is employed) may be closed.

Because of the lost motion connecting means, generally described by slot 114 with its abutment portions 146 and 148, and driving member 112, it can be seen that as the operator initially moves control lever 90 either clockwise or counter-clockwise from its neutral position, switch actuator 142 is permitted to move off of cam 144 and outwardly of assembly 82 thereby closing the electrical circuit through conductor means 76. Such closure of the related conductor means 76 causes immediate energization of the electric motor 18 to thereby cause pressurization of the pump means 66. As should be evident, the closing of the circuit through conductor means 76 and the resulting pressurization of pump means 66 occurs almost immediately and decidedly prior to the driving dog or member 112 engaging abutment means 146 or 148, depending upon the direction of rotation of control lever 90. This, of course, means that the entire power system is automatically energized and made operative prior to the actual request signal, for application of such power, subsequently created by the further continued manual rotation of the control lever 90 by the operator.

In the preferred embodiment, switching means 82 provides two functions, the first of which is the switching itself and the second of which is a time delay in switching. The means for accomplishing such functions are well known in the art and respectively diagrammatically illustrated as at 82a and 82b of FIG. 2. That is, means 82a depicts that portion having the function of opening and closing the circuit through conductor means 76 while means 82b depicts that portion having the function of providing a time delay before the said circuit is opened after movement of the control lever 90 to the initial position. Such time delay means are well known in the art and may be set to whatever time duration is desired.

For example, in some situations, as when the operator has rotated control lever 90 clockwise to lift load 24 (in so doing causing means 82a to close the circuit through 76 as previously described) the operator may desire to lower the load 24 as onto a related work station. In order to so lower the load, the operator must rotate control lever 90 counter-clockwise through and beyond its neutral or null position. Therefore, it would be an advantage not to have the electric power to the electric motor 18 be terminated as the end 132 of lever 90 is rotated through its neutral position. Accordingly, the means 82b (which may comprise a suitable R-C circuit with a related field coil holding the contact or switch means of 82a closed for a predetermined length of time) becomes effective, at that instant of cam 144 passing through its neutral position and actuating switch member 142, for maintaining the said circuit through conductor means 76 closed. The duration of such time delay may be in the order of 5.0 seconds; however, as is well known in the art, such electrical timer or delay circuits may be made to provide any span of time delay desired.

It should be apparent that if the operator releases control over the control lever 90, the entire control assembly will, through the resilient action of spring means 116 and 124, return to its neutral or null position at which point switch member 142 will again be actuated. If a time delay means is employed, once the control lever 90 remains at the said null condition for the duration of the time delay, the circuit through conductor means 76 will be opened and the electric motor 18 become de-energized.

In view of the preceding, it should be apparent that the invention provides means whereby: (a) the electric motor 18 and pump assembly 66 need not be operating continuously during all possible conditions; (b) it becomes virtually impossible for an operator to change the particular position of the pump swash plate control for either the direction or volume of flow of hydraulic fluid without first causing energization of the associated electric motor resulting in pump pressurization; and (c) release of the overall control assembly by the operator results in an automatic return of the control assembly to its neutral or null position thereby holding the associated load in position.

As should be apparent, the practice of the invention is not limited to the specific structure herein disclosed. In the main, the invention provides means for creating a signal indicative of the initiation by the operator of a request to associated means for the delivery of power. The specific means herein disclosed for accomplishing this comprises a lost-motion connection which permits a particular controlled degree of movement to occur which is employed at the initiation of the operator's request for power. Torsion springs 116 and 124 are employed to continually seek their own individual null conditions; however, other means may equally well be employed to accomplish the characteristic lost-motion function as well as the related function of causing lever 90 and shaft 84 to continually seek to return to their null or neutral positions. It should also be apparent that various adjustment and calibration means may be provided as, for example, providing a slot 150 in mounting bracket 108 to enable selective positioning of member 106.

Although only one preferred embodiment of the invention has been disclosed and described, it is apparent that other embodiments and modifications of the invention are possible within the scope of the appended claims.

I claim:

1. A control arrangement for a power supply system employing a variable displacement hydraulic pump including a rotatively actuated displacement varying mechanism, an electric motor energizable for driving said pump, electrical circuit means interconnecting said electric motor and an associated source of electrical potential, and electrical switching means for opening and closing said circuit means, said control arrangement comprising:

first means for rotating said displacement varying mechanism, and said first means being adjustably rotationally positionable to a fixed mechanical relationship with said displacement varying mechanism, second means rotatably mounted on said rotating means for manually actuating said electrical switching means to said open and closed positions, third means for urging said rotating means and said actuating means to positions wherein said pump dis-

placement varying mechanism is at a position of minimum displacement and said electrical circuit is open, and

fourth means for effecting operation of said rotating means to vary said pump displacement from said minimum displacement after said actuating means has been rotated to a position causing said switching means to close said electrical circuit.

2. A control arrangement according to claim 1 wherein said first means comprises a rotatable shaft, and wherein said second means comprises a control lever journaled on said shaft for rotation relative thereto.

3. A control arrangement according to claim 1 wherein said first means comprises a rotatable shaft, wherein said second means comprises a control lever journaled on said shaft for rotation relative thereto, and wherein said third means comprises spring means operatively engaging said shaft and said control lever.

4. A control arrangement according to claim 1 wherein said operation effecting means comprises connecting means operatively interconnecting said rotating means and said actuating means and including lost motion means.

5. A control arrangement according to claim 4 wherein said first means comprises a rotatable shaft, wherein said second means comprises rotatable control lever means, wherein said lost motion means comprises first abutment means operatively carried by said rotatable shaft and second abutment means operatively carried by said control lever means, and wherein said third means comprises resilient means, said resilient means being effective to maintain said first and second abutment means spaced from each other when said control lever means and said shaft are in said neutral position.

6. A control arrangement according to claim 5 wherein said control lever means is rotatably journaled on said shaft.

7. A control arrangement according to claim 5 wherein said third means further comprises a first fixed reference member, a second member moveable with respect to said first member and fixedly carried by said shaft for rotation therewith, and wherein said resilient means is effective for operatively engaging said first and second members as to continually urge said first and second members toward a predetermined respective relationship corresponding to said neutral position.

8. A control arrangement according to claim 1 and further comprising time delay means for preventing the

normal opening of said electrical circuit means until after said second means has remained in said neutral position for a predetermined period of time.

9. A control arrangement according to claim 4 wherein said first means comprises a rotatable shaft, wherein said second means comprises a control lever generally freely journaled on said shaft, and further comprising an arm member fixedly carried by said shaft for rotation therewith, a first fixed abutment portion, a second abutment portion carried by said arm member for movement therewith, a third abutment portion carried by said arm member for movement therewith, wherein said lost motion means comprises a fourth abutment portion carried by said control lever for movement therewith and spaced fifth and sixth abutment portions carried by said arm member for movement therewith, and wherein said third means comprises first and second spring means, said first spring means being effective to operatively engage said first and second abutment portions to thereby continually urge said arm member and said shaft toward said neutral position, and said second spring means being effective to operatively engage said third and fourth abutment portions to thereby continually urge said control lever in a direction whereby said fourth abutment means assumes a position generally between and spaced from said spaced fifth and sixth abutment portions.

10. A control arrangement according to claim 9 wherein said fifth and sixth abutment portions comprise a portion of a slot freely receiving said fourth abutment portion therein.

11. A control arrangement according to claim 9 wherein each of said first and second spring means comprises a torsion spring having opposed spring arms, and wherein said first second third and fourth abutment portions are abutably engaged by said opposed spring arms.

12. A control mechanism comprising a shaft mounted for rotational movement, first means for yieldably retaining said shaft in an initial position, a member mounted for rotational movement relative to said shaft, second means yieldably retaining said member in an initial position relative to said shaft, and third means for rotating said shaft from its said initial position in response to rotation of said member beyond a predetermined degree of rotation from the said initial position of said member.

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