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⑤④ **Crane hydraulic control system.**

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Description

The present invention relates to a drive assembly for a crane cable, and more particularly but not exclusively to a drive assembly for a tag line for a crane and for use with cranes employed in ocean areas to lift loads from boats.

In ocean regions which are subjected to considerable wave action, such as the North Sea, it is very difficult to operate a crane to raise a load from a boat. This is due to movement of the ship relative to the crane. Motion of the load will subject the crane to shock loading while this problem is exacerbated since the weight of the load indicated to the crane operator may not be consistent with the actual weight of the load. Additionally the weight may not be fully uncoupled from the boat or may be caught on a rail and become jammed. In all these circumstances it is possible for the crane to be damaged and the operator subjected to danger. Thus, given any one of the above adverse conditions and the situation that the load is engaged at the crest of a wave, the crane may be subjected to excessive loading as the boat falls under the influence of wave action thereby subjecting the crane uncontrollably to the full load dynamically magnified.

In the use of tag lines on cranes to date the controls for such tag lines must be continually manipulated if the tag line is to retain and support the load at a predetermined location. That is to say the controls are not generally adapted to maintain a constant tension in the tag line.

It is known from U.S. Patent Specification No. 3,817,033 to provide a hydraulically driven winch arrangement which is mounted on a floating boat which moves up and down on waves, and which is able to compensate for such wave-induced motion of the boat. The winch is driven by the motor of a hydrostatic transmission, and there is a pressure responsive valve which is activated by a predetermined high pressure in the hydrostatic transmission when the boat and the winch together are raised, and relieves the pressure by reducing the volume of fluid displaced by the pump of the transmission. Accordingly, the lifting motion applied to a load by the winch is slowed-down, and the pull exerted on the lifting cable is maintained constant despite the boat with the winch mounted thereon being raised by waves to a higher level.

Although this known system has the general object of compensating for wave motion, the system employs control pressure within a hydraulic control circuit to change the angle of a swash plate of the pump in the hydrostatic transmission. These known systems, although achieving a certain amount of success, lack the rapid response necessary for rapid changes in height relationship between the winch and the load to be lifted which occur in some operating environments. More particularly, in areas such as the North Sea, where these changes in height can be rapid, the type of systems known from the U.S. patent are not acceptable.

The present invention has been developed with a view to providing a drive assembly for a crane cable which is able to respond more rapidly to wave-induced motion than the known system, the drive assembly having a pump which is controlled by a valve arrangement to a maximum possible output, and then has its output varied by venting pressure therefrom to adapt the system rapidly to a wave induced motion.

According to the invention there is provided a drive assembly for a crane cable comprising a hydraulic motor arranged to apply a force to said cable; a variable displacement hydraulic piston pump having a variable angle swash plate to determine the displacement thereof, said pump being operatively coupled with said motor to drive same by pumping hydraulic therethrough; displacement control means for controlling the angle of the swash plate; and a hydraulic control circuit operatively coupled with said control means so as to control the displacement of the pump via the control means:

characterised in that the hydraulic control circuit includes first valve means actuable to deliver control pressure to said displacement control means so as to bias said pump to maximum displacement, and second valve means to determine the pressure delivered by said pump by controlling the displacement thereof to thereby determine the maximum force applied to said cable;

and in that said displacement control means includes a primary control means and a vent line, said first valve means being coupled with said primary control means and said second valve means being coupled with said vent line so that venting pressure from said vent line via said second valve means overrides said primary control means to determine the angle of said swash plate.

A preferred form of the present invention will now be described by way of example with reference to the accompanying drawings wherein:

Figure 1 is a hydraulic control system to control the hoist hydraulic motor and hydraulic pump of a crane;

Figure 2 is a hydraulic circuit including a main hoist hydraulic motor and hydraulic pump to be controlled by the circuit of Figure 1; and

Figure 3 is a hydraulic circuit for a tag line control system to be employed with the circuit of Figure 2.

As will be described in more detail below, in relation to a preferred embodiment of the invention, there is provided a drive assembly for a crane cable which comprises a hydraulic motor (20) arranged to apply a force to the cable, a variable displacement hydraulic piston pump (21) having a variable angle swash plate to determine displacement thereof and being operatively coupled with the motor to drive same by pumping hydraulic fluid therethrough, displacement control means for controlling the angle of the swash plate, and a hydraulic control circuit (10) operatively coupled with the control means so as to

control the displacement of the pump via the control means.

The hydraulic control circuit (10) includes first valve means (18) actuatable to deliver control pressure to the displacement control means so as to bias the pump (21) to maximum displacement, and second valve means (27, 29) to determine the pressure delivered by the pump (21) by controlling the displacement thereof to thereby determine the maximum force applied to the cable.

The displacement control means includes a primary control means (24, 25) and a vent line (26), the first valve means (18) being coupled with the primary control means (24, 25) and the second valve means (27, 29) being coupled with the vent line (26) so that venting pressure from the vent line via the second valve means (27, 29) overrides the primary control means (24, 25) to determine the angle of the swash plate.

In Figure 1 there is depicted a control hydraulic circuit 10 for the hoist motor and pump of a crane to be used in conjunction with the hydraulic circuit of Figure 2 which includes the hoist hydraulic motor 20 and hydraulic pump 21. The circuit 10 is adapted to control the maximum output of the pump 21 so that the force applied to the hoist cable by the motor 20 has a predetermined maximum. The circuit 10 provides for two modes of controlling the output of the pump 21. The first mode of operation is to control the pump 21 when a load is initially being coupled to the hoist cable. In this first mode the cable will merely follow movement of the load as in the case of a pitching boat. This is known as a light line operation. The second mode of control enables the load to be raised. This is known as a normal line operation. However, in both modes of operation the force applied to the hoist cable is limited at a predetermined maximum which, if exceeded, will result in the motor 20 reversing so as to pay out cable to reduce the load.

With reference to Figure 2 in particular, there is schematically illustrated the hydraulic motor 20 which is driven by the hydraulic pump 21. The motor 20 is provided with speed control valves 22 which in the case of a radial piston-type motor, selectively vary the hydraulic fluid displacement of the motor 20 to thereby regulate the speed and torque of the motor 20, assuming a given pressure and fluid delivery to the motor 20. Also provided is a boost extraction valve 23 which enables hydraulic fluid to be drained from the pump circuit.

The circuit 10 is connected to the pump 21 by hydraulic lines 24, 25 and 26 at the points designated H₁, H₂ and V. The line 26 is a vent line. The pump 21 is preferably an axial piston type with a variable angle swash plate to regulate the pump displacement and direction of flow through the pump 21. The pump 21 is equipped with a primary displacement control by way of a control piston 31 and cylinder 32 to which the circuit 10 is connected via lines 24 and 25. The control piston 31 and cylinder 32 alter the swash plate angle of the pump 21. Additionally, as the hydraulic con-

trol pressure within the pump is proportional to the pump output, the swash pump angle is variable by venting pressure therefrom via line 26. However, it should be appreciated that the piston 31 is moved by varying the pressure between the lines 24 and 25. In this known type of pump the vent line allows pressure to be bled from within the pump which in turn allows main pump pressure to be used in controlling the swash plate angle. Thus the response of the pump is rapid. The circuit 10 includes a main control panel 15 having two valves 12 and 13 which are manipulatable via an operator to control the main hoist motor and pump and are coupled to lines 24 and 25. The valves 12 and 13 are coupled via line 16 to a pump which provides hydraulic fluid under pressure to be used in circuit 10. Circuit 10 further includes a wave compensation selection valve 17 and a wave compensation valve 18. The valve 17 is a solenoid actuated valve and merely selects the position of valve 18. There is also provided a hoist up limit valve 19 which limits the maximum raised hoist position. Connected to the line 26 is a load capacity selection valve 27 which adjustably limits the maximum load force, and thus the load lift, applied to the main line by limiting the pump output pressure. Also connected to the line 26 is a light line selection valve 28 and a light line limit valve 29. The valve 29 may also be adjustable. The valve 28 is solenoid actuated and can be simultaneously actuated with valve 17 in the light line wave compensation mode of operation.

In operation the lift force provided by the hoist may be set at a predetermined maximum by the valve 27 or by the valve 29 upon selection of valve 28. If wave compensation is required the valve 17 is actuated. By doing so, main control pressure is connected to the line 25 via actuation of valve 17 which would bias the pump 21 to maximum output. This is commonly known as biasing the pump to an "on-stroke" mode of operation. However, this is modified by venting pressure from vent line 26 when the output of the pump 21 exceeds a predetermined pressure. Initially the predetermined pressure is adjustably set by valve 29 by actuation of the valve 28.

As mentioned above this is a light line operation. Once the load has been securely engaged the solenoid valve 28 is operated to isolate the valve 29, this then places the pump 21 under normal mode of operation. Under normal load lifting conditions the maximum output of the pump 21 is determined by valve 27.

Accordingly via lines 24, 25 and 26 the angle of the swash plate of pump 21 may be automatically varied to determine the pressure and direction of flow produced by the pump 21. Under wave conditions the motor 20 may be actually reversed in rotational direction to maintain a constant tension in the hoist cable, as for example when the boat is falling under the influence of wave action. The pressure output may be varied between a maximum set by valve 27 and 0 for the normal hoisting mode or the predetermined fixed setting

of valve 29 in the case of light line, wave compensation mode and the flow may be reversed in direction. In variable swash plate pumps, the flow is reversed by having the pump operate "over centre". In this "over centre" condition the swash plate is positioned so as to reverse the pump flow and thus reverse the motor 20.

An operator may regain manual control of the lifting operation by again actuating valves 12 and 13 which will cause actuation of sensor 30, which in turn will deactivate solenoid valve 17 and hydraulic control valve 28 and return circuit 10 to a normal mode of operation with a maximum tension setting controlled by valve 27. Under wave compensation mode of operation, the operator does not manipulate the valves 12 and 13 which will remain in a neutral position.

Turning now to Figure 3, there is depicted a tag line control circuit 50 to be coupled to the pump 21 of Figure 2. However, in this example the motor 20 of Figure 2 is adapted to apply a constant tension to a tag line. The lines 24, 25 and 26 of Figure 3 correspond to the lines 24, 25 and 26 of Figure 2 for ease of description.

The circuit 50 includes a control panel 53 which includes spool valves manipulated by an operator and to which is connected control pressure via line 55, a variable setting and pilot operated constant tension control valve 56 connected to vent line 26, and an isolation valve 57 which upon selection of constant tension mode of operation applies full control pressure to the line 25. There is also provided an override valve 58.

The valves of control panel 53 are biased to a neutral position wherein control pressure is permitted to flow through valves 57 and 58 to bias the pump to maximum output. The pump will then maintain a constant output pressure as dictated by the adjustable setting of valve 56. For example, if the pressure drops, the valve 56 will cause the pump 21 to increase in stroke, or if the pressure increases to the setting of the valve 56, the valve 56 will cause a decrease in stroke. If the control panel 53 is operated to increase tension in the tag line, the output pressure is increased by increasing the stroke of the pump 21. The valve 56 is influenced by control pressure, proportional to the tension required, to adjust the pump 21 pressure output.

If tag line tension is to be decreased and the tag line paid out, then the line 25 is dumped to tank via valve 58 and proportional control pressure is delivered to the line 24 via panel 53.

If the tag line tension is to be dropped to zero, then panel 57 is operated.

Claims

1. A drive assembly for a crane cable comprising a hydraulic motor (20) arranged to apply a force to said cable; a variable displacement hydraulic piston pump (21) having a variable angle swash plate to determine the displacement thereof, said pump being operatively coupled with said motor (20) to drive same by pumping hydraulic

therethrough; displacement control means for controlling the angle of the swash plate; and a hydraulic control circuit (10) operatively coupled with said control means so as to control the displacement of the pump via the control means:

characterised in that the hydraulic control circuit (10) includes first valve means (18) actuable to deliver control pressure to said displacement control means so as to bias said pump (21) to maximum displacement, and second valve means (27, 29) to determine the pressure delivered by said pump (21) by controlling the displacement thereof to thereby determine the maximum force applied to said cable;

and in that said displacement control means includes a primary control means (24, 25) and a vent line (26), said first valve means (18) being coupled with said primary control means (24, 25) and said second valve means (27, 29) being coupled with said vent line (26) so that venting pressure from said vent line (26) via said second valve means (27, 29) overrides said primary control means (24, 25) to determine the angle of said swash plate.

2. A drive assembly according to claim 1, characterised in that said second valve means (27, 29) is adjustable so that said maximum force may be varied.

3. A drive assembly according to claim 2, characterised in that said cable is a tag line and said motor (20) is a tag line hydraulic motor of a crane, said second valve means (27, 29) being manipulatable by an operator so that the operator may adjust the maximum force applied to the tag line.

4. A drive assembly according to any one of claims 1 to 3, characterised in that venting pressure from said vent line (26) via said second valve means (27, 29) allows pressure delivered by said pump (21) to be used to govern the angle of said swash plate.

5. A drive assembly according to any one of claims 1 to 4, characterised in that said motor (20) is a hoist hydraulic motor.

6. A drive assembly according to any one of claims 1 to 5, characterised in that said second valve means (27, 29) includes a first valve (27) to regulate said maximum force so as not to be greater than a first predetermined force and a second valve (29) to regulate said maximum force so as not to be greater than a second predetermined force which is less than said first predetermined force, and a third valve (28) to selectively isolate said second valve (29) so that said first valve (27) determines said maximum force.

7. A drive assembly according to claim 6, characterised in that said first valve (27) and/or second valve (29) is/are adjustably to adjustable determine said maximum force.

8. A drive assembly according to claim 6 or 7, characterised in that the angle of said swash plate is variable so that the pump (21) can reverse the flow of hydraulic fluid through the motor (20) to thereby reverse the motor (20) and prevent the force applied to said cable exceeding said pre-

determined force, by having the motor pay-out cable.

9. A drive assembly according to any one of claims 1 to 8, characterised in that said control circuit (10) includes an operator-manipulatable valve (12, 13) to control the pump (21), and an isolating valve (18) which when actuated by the operator, operatively isolates said operator valve (12, 13) from said pump (21).

10. A drive assembly according to any one of claims 1 to 9, characterised in that the cable extends from a cable drum of a crane, and the hydraulic motor (20) is operatively coupled to the cable drum so as to rotate the same to apply a force to said cable.

11. A drive assembly according to claim 2, characterised in that said second valve means (27, 29) includes a first valve (27) operable upon the main pump pressure exceeding a predetermined maximum pressure to vent pressure from said vent line (26), and a second valve (29) selectably couplable to said vent line (26) so that when coupled thereto said second valve (29) will vent pressure from said vent line (26) if said main pump pressure exceeds a predetermined pressure lower than said maximum pressure.

12. A drive assembly according to claim 3, characterised in that the second valve means comprises a first valve (27) and a second valve (28), at least one of said first valve (27) or second valve (29) being adjustable to adjustably determine a lower pressure and/or said maximum pressure.

Revendications

1. Ensemble d'entraînement d'un câble de grue comprenant un moteur hydraulique (20) agencé de manière à appliquer une force sur ledit câble; une pompe hydraulique (21) à piston à cylindrée variable ayant un plateau oscillant à angle variable pour en fixer la cylindrée, ladite pompe étant couplée fonctionnellement audit moteur (20) pour l'entraîner par pompage de fluide hydraulique; un moyen de commande de la cylindrée pour commander l'angle du plateau oscillant; et un circuit hydraulique de commande (10) couplé fonctionnellement audit moyen de commande de manière à commander la cylindrée de la pompe par le moyen de commande:

caractérisé en ce que le circuit (10) de commande hydraulique comporte un premier moyen formant vanne (18) qui peut être actionné pour fournir la pression de commande audit moyen de commande de la cylindrée de manière à mettre ladite pompe (21) à sa cylindrée maximale, et un second moyen formant vanne (27, 29) pour fixer la pression fournie par ladite pompe (21) en commandant la cylindrée pour ainsi fixer la force maximale appliquée audit câble;

et en ce que ledit moyen de commande de la cylindrée comporte un moyen de commande principal (24, 25) et une canalisation de décharge (26), ledit premier moyen formant vanne (18) étant couplé avec ledit moyen principal de com-

mande (24, 25) et ledit second moyen formant vanne (27, 29) étant couplé avec ladite canalisation de décharge (26) de manière que la pression de décharge issue de ladite canalisation de décharge (26) via le second moyen formant vanne (27, 29) l'emporte sur ledit moyen principal de commande (24, 25) pour fixer l'angle dudit plateau oscillant.

2. Ensemble d'entraînement selon la revendication 1, caractérisé en ce que ledit second moyen formant vanne (27, 29) est réglable de manière que ladite force maximale puisse être modifiée.

3. Ensemble d'entraînement selon la revendication 2, caractérisé en ce que ledit câble est une élingue et que ledit moteur (20) est un moteur hydraulique pour l'élingue d'une grue, ledit second moyen formant vanne (27, 29) étant manœuvrable par un opérateur de manière que l'opérateur puisse régler la force maximale appliquée à l'élingue.

4. Ensemble d'entraînement selon l'une des revendications 1 à 3, caractérisé en ce que la pression de décharge issue de ladite canalisation de décharge (26) via le second moyen formant vanne (27, 29) permet à la pression fournie par ladite pompe (21) d'être utilisée pour commander l'angle dudit plateau oscillant.

5. Ensemble d'entraînement selon l'une des revendications 1 à 4, caractérisé en ce que ledit moteur (20) est un moteur hydraulique de levage.

6. Ensemble d'entraînement selon l'une des revendications 1 à 5, caractérisé en ce que ledit second moyen formant vanne (27, 29) comporte une première vanne (27) destinée à régler ladite force maximale de manière qu'elle ne soit pas plus élevée qu'une première force prédéterminée et une seconde vanne (29) destinée à régler ladite force maximale de manière qu'elle ne soit pas supérieure à une seconde force prédéterminée qui est moindre que ladite première force prédéterminée, et une troisième vanne (28) destinée à isoler sélectivement ladite seconde vanne (29) de manière que ladite première vanne (27) fixe ladite force maximale.

7. Ensemble d'entraînement selon la revendication 6, caractérisé en ce que ladite première vanne (27) et/ou la seconde vanne (29) sont ajustables pour fixer de manière réglable ladite force maximale.

8. Ensemble d'entraînement selon les revendications 6 ou 7, caractérisé en ce que l'angle dudit plateau oscillant est variable de manière que la pompe (21) puisse inverser le flux du fluide hydraulique à travers le moteur (20) pour ainsi inverser le sens de rotation du moteur (20) et empêcher la force appliquée audit câble d'excéder ladite force prédéterminée, le moteur laissant filer le câble.

9. Ensemble d'entraînement selon l'une des revendications 1 à 8, caractérisé en ce que le circuit de commande (10) comporte une vanne susceptible d'être manœuvrée par un opérateur (12, 13) pour commander la pompe (21), et une vanne d'isolement (18) qui lorsqu'elle est manœuvrée par l'opérateur, isole fonctionnellement

ladite vanne (12, 13) manoeuvrée par un opérateur, de ladite pompe (21).

10. Ensemble d'entraînement selon l'une des revendications 1 à 9, caractérisé en ce que le câble vient d'un tambour à câble d'une grue, et que le moteur hydraulique (20) est couplé fonctionnellement au tambour de câble de manière à le faire tourner pour appliquer une force sur ledit câble.

11. Ensemble d'entraînement selon la revendication 2, caractérisé en ce que ledit moyen formant vanne (27, 29) comporte une première vanne (27) actionnable sous l'effet de la pompe principale excédant une pression maximale prédéterminée, pour décharger la pression issue de ladite canalisation de décharge (26), et une seconde vanne (29) qui peut être couplée de manière sélective à ladite canalisation de décharge (26), de manière que lorsqu'elle lui est couplée, ladite seconde vanne (29) décharge la pression issue de la canalisation de décharge (26) si ladite pression de la pompe principale excède une pression prédéterminée inférieure à ladite pression maximale.

12. Ensemble d'entraînement selon la revendication 3, caractérisé en ce que le second moyen formant vanne comprend une première vanne (27) et une seconde vanne (28), au moins une desdites première vanne (27) ou seconde vanne (29) étant réglable pour fixer de manière réglable une limite inférieure de pression et/ou ladite pression maximale.

Patentansprüche

1. Antriebsanordnung für ein Kranseil mit einem hydraulischen Motor (20), der eingerichtet ist, eine Kraft auf das Seil auszuüben, mit einer hydraulischen Kolbenpumpe (21) variabler Förderleistung, die eine Taumelscheibe mit variablem Winkel aufweist, um ihre Förderleistung festzulegen, wobei die Pumpe betriebsmäßig mit dem Motor (20) gekoppelt ist, um denselben durch Hindurchpumpen von Hydraulikmittel anzutreiben, mit Förderleistungs-Steuermitteln für die Steuerung des Winkels der Taumelscheibe und mit einer hydraulischen Steuerschaltung (10), die betriebsmäßig mit den Steuermitteln gekoppelt ist, um so die Förderleistung der Pumpe über die Steuermittel zu steuern,

dadurch gekennzeichnet,

— daß die hydraulische Steuerschaltung (10) eine erste Ventileinrichtung (18), die betätigbar ist, um den Förderleistungs-Steuermitteln einen Steuerdruck zu liefern, um so die Pumpe (21) auf maximale Förderleistung einzustellen, und eine zweite Ventileinrichtung (27, 29) enthält, um den von der Pumpe (21) gelieferten Druck durch Steuerung ihrer Förderleistung zu bestimmen, um dadurch die maximale, auf das Seil ausgeübte Kraft festzulegen und

— daß die Förderleistungs-Steuermittel eine primäre Steuereinrichtung (24, 25) und eine Entlastungsleitung (26) enthalten, wobei die erste Ventileinrichtung (18) mit der primären Steuereinrichtung (24, 25) und die zweite Ventileinrichtung

(27, 29) mit der Entlastungsleitung (26) gekoppelt ist, so daß der Entlastungsdruck aus der Entlastungsleitung (26) über die zweite Ventileinrichtung (27, 29) die primäre Steuereinrichtung (24, 25) übersteuert, um den Winkel der Taumelscheibe zu bestimmen.

2. Antriebsanordnung nach Anspruch 1, dadurch gekennzeichnet, daß die zweite Ventileinrichtung (27, 29) einstellbar ist, so daß die Maximalkraft variiert werden kann.

3. Antriebsanordnung nach Anspruch 2, dadurch gekennzeichnet, daß das Seil ein Hakenseil und der Motor (20) ein hydraulischer Kranmotor für ein Hakenseil ist, wobei die zweite Ventileinrichtung (27, 29) von einer Bedienungsperson manipulierbar ist, so daß die Bedienungsperson die dem Hakenseil zugeführte Maximalkraft einstellen kann.

4. Antriebsanordnung nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß der Entlastungsdruck aus der Entlastungsleitung (26) über die zweite Ventileinrichtung (27, 29) es erlaubt, daß der von der Pumpe (21) gelieferte Druck verwendet wird, um den Winkel der Taumelscheibe zu steuern.

5. Antriebsanordnung nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß der Motor (20) ein hydraulischer Hubwindenmotor ist.

6. Antriebsanordnung nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß die zweite Ventileinrichtung (27, 29) ein erstes Ventil (27), um die Maximalkraft so zu regulieren, daß sie nicht größer ist als eine erste vorbestimmte Kraft, und ein zweites Ventil (29) aufweist, um die Maximalkraft so zu regulieren, daß sie nicht größer ist als eine zweite vorbestimmte Kraft, die kleiner ist als die erste vorbestimmte Kraft, sowie ein drittes Ventil (28), um wahlweise das zweite Ventil (29) zu isolieren, so daß das erste Ventil (27) die Maximalkraft bestimmt.

7. Antriebsanordnung nach Anspruch 6, dadurch gekennzeichnet, daß das erste Ventil (27) und/oder das zweite Ventil (29) einstellbar ist, um die Maximalkraft einstellbar zu bestimmen.

8. Antriebsanordnung nach Anspruch 6 oder 7, dadurch gekennzeichnet, daß der Winkel der Taumelscheibe variabel ist, so daß die Pumpe (21) den Durchfluß des hydraulischen Fluids durch den Motor (20) umkehren kann, um dadurch den Motor (20) zu reversieren und zu verhindern, daß die dem Seil zugeführte Kraft die vorbestimmte Kraft übersteigt, indem der Motor das Seil ausgibt.

9. Antriebsanordnung nach einem der Ansprüche 1 bis 8, dadurch gekennzeichnet, daß die Steuerschaltung (10) ein handbetätigtes Ventil (12, 13) um die Pumpe (21) zu steuern, und ein isolierendes Ventil (18) enthält, daß bei Betätigung durch die Bedienungsperson das Bedienungsventil (12, 13) betriebsmäßig von der Pumpe (21) abtrennt.

10. Antriebsanordnung nach einem der Ansprüche 1 bis 9, dadurch gekennzeichnet, daß das Seil sich von einer Seiltrommel eines Krans aus er-

streckt und der hydraulische Motor (20) betriebsmäßig mit der Seiltrommel gekoppelt ist, um so dieselbe, um dem Seil eine Kraft zuzuführen, zu drehen.

11. Antriebsanordnung nach Anspruch 2, dadurch gekennzeichnet, daß die zweite Ventileinrichtung (27, 29) ein erstes Ventil (27), das, wenn der Hauptpumpendruck einen vorbestimmten Maximaldruck übersteigt, betätigbar ist, um den Druck aus der Entlastungsleitung (26) zu entlasten, und ein zweites Ventil (29) enthält, das wahlweise mit der Entlastungsleitung (26) koppel-

bar ist, so daß das zweite Ventil (29), wenn es damit gekoppelt ist, den Druck aus der Entlastungsleitung (26) entlastet, wenn der Hauptpumpendruck einen vorbestimmten Druck übersteigt, der niedriger ist als der Maximaldruck.

12. Antriebsanordnung nach Anspruch 3, dadurch gekennzeichnet, daß die zweite Ventileinrichtung ein erstes Ventil (27) und ein zweites Ventil (29) enthält, wobei mindestens eines, das erste Ventil (27) oder das zweite Ventil (29), einstellbar ist, um einen niedrigeren Druck und/oder den Maximaldruck einstellbar zu bestimmen.

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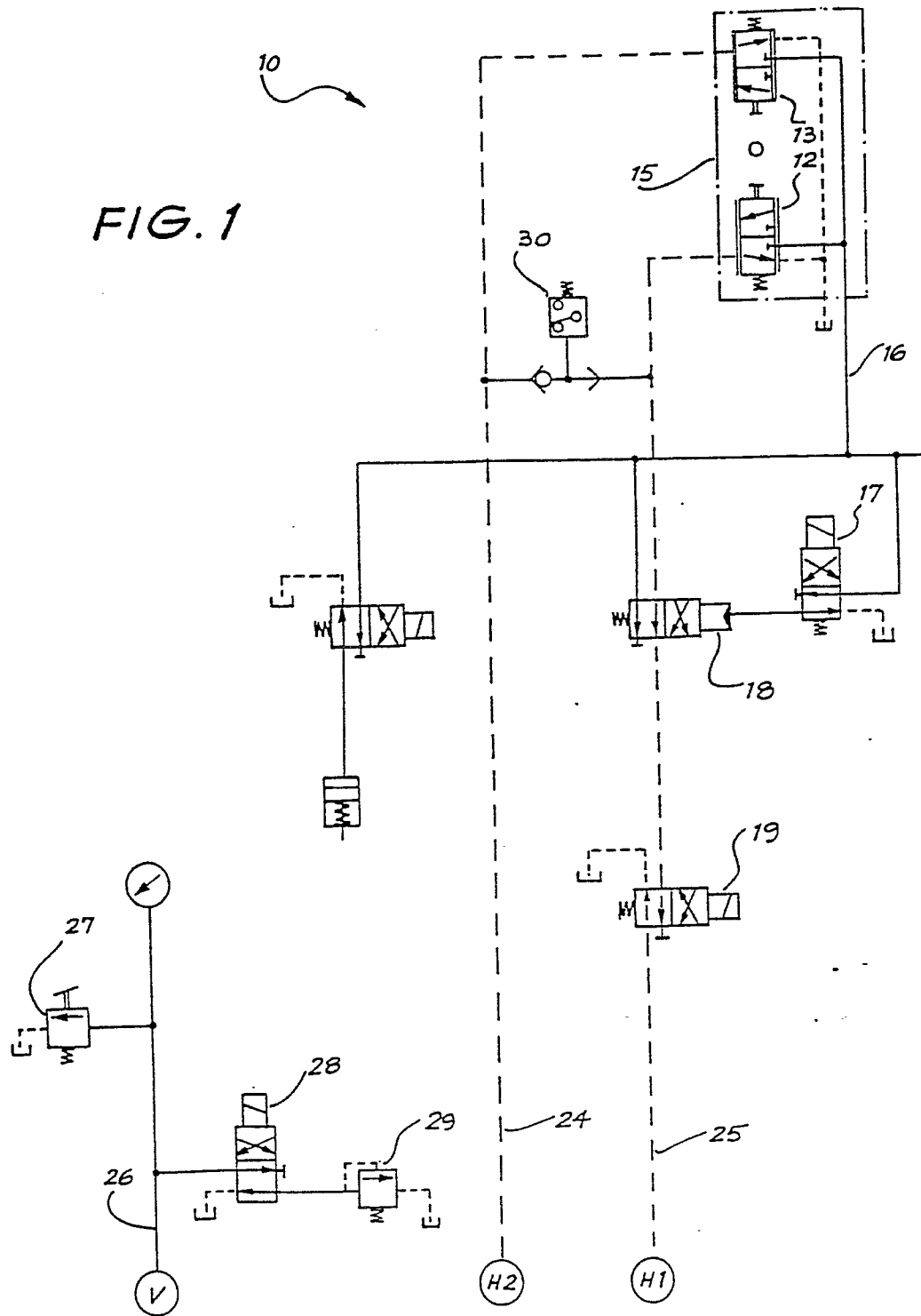
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FIG. 1



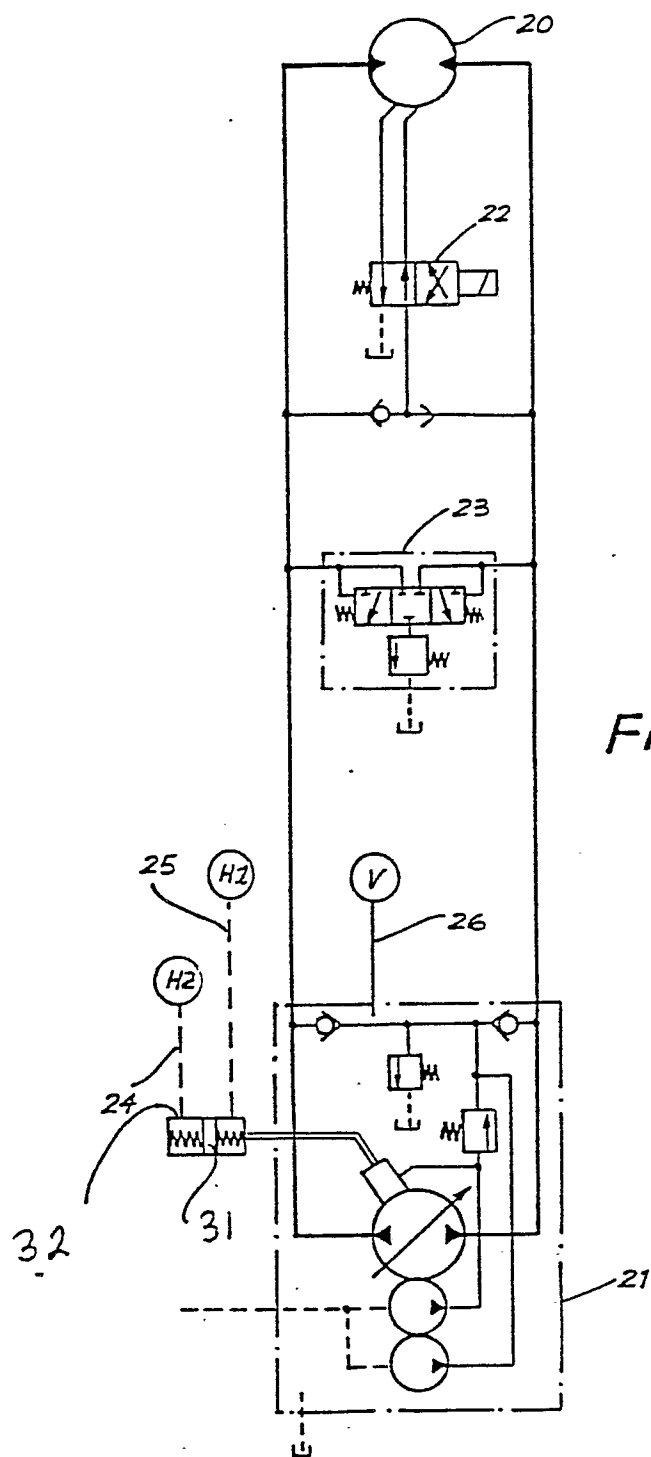


FIG. 2

