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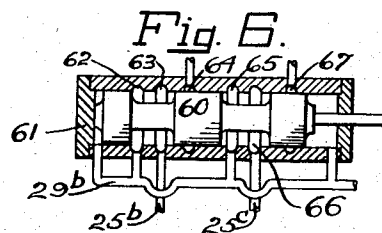
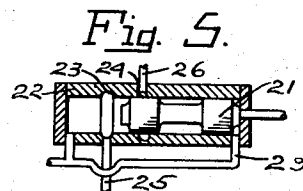
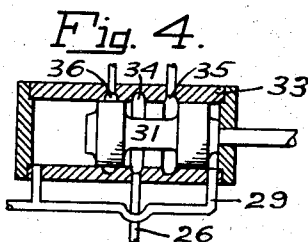
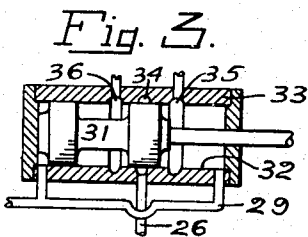
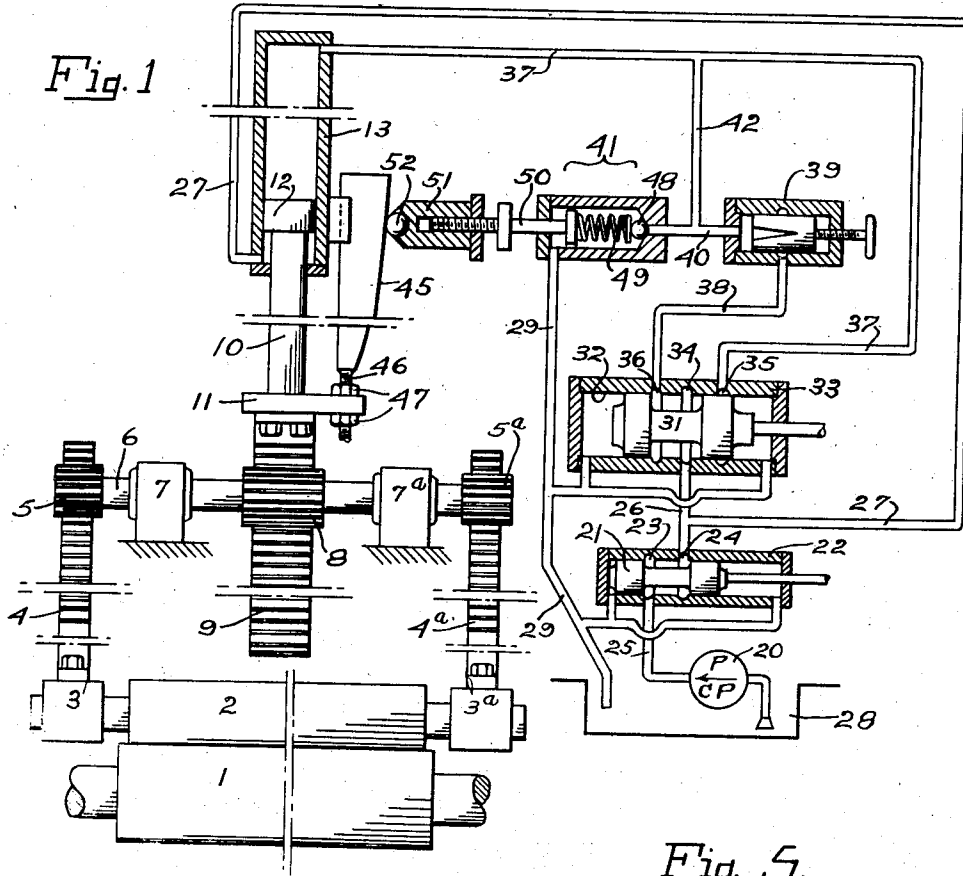
P. SIMONDS

2,194,078

HOLD-DOWN SYSTEM

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2 Sheets-Sheet 1



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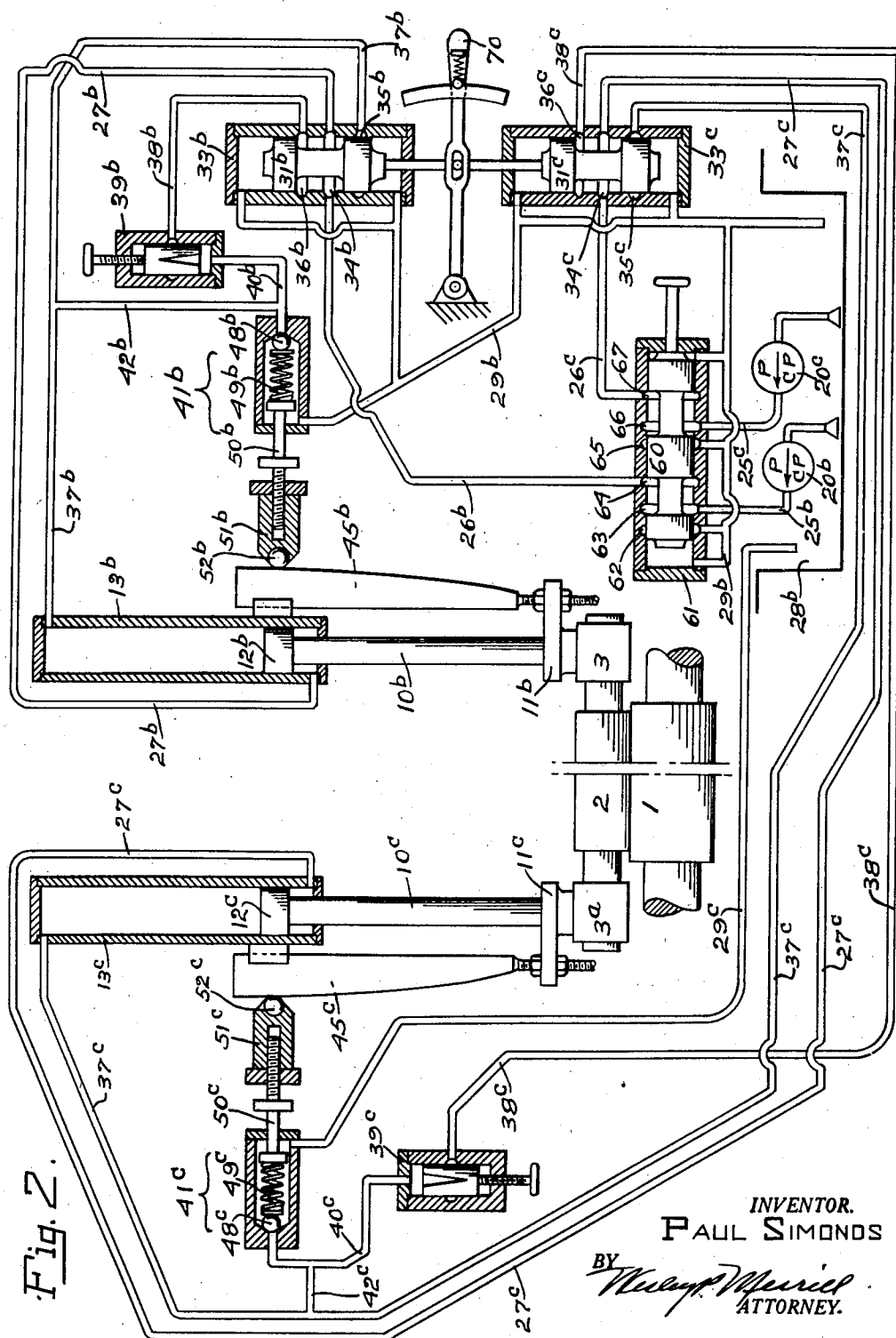
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UNITED STATES PATENT OFFICE

2,194,078

HOLD-DOWN SYSTEM

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Application December 9, 1936, Serial No. 114,929

9 Claims. (Cl. 242—65)

This invention relates to apparatus for holding a movable machine part or other object in contact with another object when the movable object is subjected to a variable force, and it is particularly applicable to apparatus for holding the winding roller of a paper rewinding machine against the winding drum thereof.

Paper is ordinarily wound into rough rolls as it is delivered by the paper making machine and later unwound from those rolls, trimmed to the desired width or cut into strips and then rewound into finished rolls upon cores which are fitted upon the winding roller of a rewinding machine and rotated with the winding roller by contact with a constantly rotating winding drum.

The paper, when being rewound, is led from the rough roll between and over intermediate rollers and between the winding roller and the winding drum. The winding roller presses the paper against the rotating winding drum which causes the winding roller to rotate and wind the paper upon the cores thereon.

The pressure between the winding roller and the winding drum is produced by an external force and by the weight of the winding roller and the paper wound thereon. Since the weight of the paper on the winding roller increases continuously during the winding operation, the pressure between the rewinding roller and the winding drum will increase unless the external force is varied inversely to the variation in the combined weight of the winding roller and the paper wound thereon.

The present invention has as an object to provide an apparatus which will press a movable object against another object and maintain the total pressure therebetween within narrow limits regardless of variations in an external force which also acts upon the movable object.

More specifically, the primary object of the invention is to provide a rewinding machine with a hold-down system which will maintain a substantially constant pressure between the winding roller and the winding drum of that machine regardless of the weight of the roll of finished material upon the winding roller.

An apparatus constructed according to the invention has the advantage of being automatic in operation.

Other objects and advantages will appear from the description hereinafter given of an apparatus in which the invention is embodied.

Hold-down systems constructed according to the invention are shown schematically in the accompanying drawings in which the views are as follows:

Fig. 1 is a diagram of the hydraulic circuit of an apparatus in which a single hydraulic motor is employed to move the winding roller of a rewinding machine toward and from the winding drum thereof, the valves being shown in the positions occupied when the apparatus is functioning to maintain a substantially constant pressure between the winding roller and the winding drum.

Fig. 2 is a diagram of the hydraulic circuit of an apparatus having a hydraulic motor connected to each end of the winding roller of a rewinding machine, the several valves being shown in the positions occupied when the apparatus is functioning to maintain a substantially constant pressure between the winding roller and the winding drum.

Fig. 3 is a sectional view showing the control valve in the position occupied when the winding roller is being raised.

Fig. 4 is a sectional view showing the control valve in the position occupied when the winding roller is being lowered.

Fig. 5 is a sectional view showing a bypass valve shifted from the position shown in Fig. 1 into position to bypass the pump.

Fig. 6 is a sectional view showing a bypass valve shifted from the position shown in Fig. 2 into position to bypass the pump.

The invention has been shown as being embodied in apparatus for maintaining a substantially constant pressure between the winding drum 1 and the winding roller 2 of a rewinding machine. Since the rewinding machine forms no part of the present invention, only the winding drum and the winding roller thereof have been shown. It is deemed sufficient to state that drum 1 is rotated continuously in stationary bearings 40 when the machine is in operation, that roller 2 is journaled at its ends in bearings 3 and 3^a which are movable vertically in stationary guides, and that roller 2 is rotated by contact with drum 1 so that paper may be wound thereon.

FIG. 1

For the purpose of illustration, bearings 3 and 3^a have been shown in this figure as being attached to the lower ends of two racks 4 and 4^a which are guided for vertical movement in suitable guides not shown.

Racks 4 and 4^a mesh with two pinions 5 and 5^a fixed upon opposite ends of a shaft 6 which is journaled in stationary bearings 7 and 7^a

and has a pinion 8 fixed thereon intermediate the ends thereof.

Pinion 8 meshes with a rack 9 which is guided for vertical movement in suitable guides (not shown) and attached at its upper end to a piston rod 10 as by means of an arm or bracket 11.

Piston rod 10 is fixed to a piston 12 which is fitted in a stationary cylinder 13 and forms therewith a hydraulic motor for reciprocating rack 9. When rack 9 is moved upward by motor 12-13, it will rotate pinion 8, shaft 6 and pinions 5 and 5^a which will raise racks 4 and 4^a and thereby move winding roller 2 away from roll 1. When rack 9 is moved downward by motor 12-13, it will rotate pinion 8, shaft 6 and pinions 5 and 5^a which will lower racks 4 and 4^a and thereby move winding roller 2 toward drum 1 and, if it moves far enough, it will press roller 2 against drum 1 with a force proportional to the difference between the forces acting upon the upper and lower ends of piston 12.

Liquid for operating motor 12-13 is supplied by a pump 20 which is adapted to deliver liquid to cylinder 13 at a constant pressure when roller 2 is being urged against drum 1. Pump 20 may be a constant delivery pump which discharges its excess delivery of liquid through a relief valve and thereby maintains pump pressure constant, or it may be a constant pressure pump which operates at a predetermined maximum displacement until pump pressure reaches a predetermined maximum and then automatically reduces its displacement until it is delivering just sufficient liquid to maintain that maximum pressure constant. Since both types of pumps are well known and in extensive use, neither a description nor a detailed illustration thereof is deemed necessary.

The lower end of cylinder 13 is open to pump pressure at all times when the apparatus is in operation and it may be connected direct to pump 20 so that, when it is desired to change rolls or make adjustments, piston 12 will stall at the upper end of its stroke and pump 20 will discharge substantially the entire output through the relief valve if it is a constant delivery pump or reduce its displacement substantially to zero if it is a constant pressure pump.

However, in order to avoid wasting power, the apparatus is shown provided with a valve for bypassing pump 20 when the apparatus is not functioning. As shown, a bypass valve 21 is fitted in a valve casing 22 having two annular grooves or ports 23 and 24 formed in the wall of its bore. Port 23 is connected by a channel 25 to the outlet of pump 20 and port 24 is connected by a channel 26 and a channel 27 to the lower end of cylinder 13.

When the valve 21 is in the position shown in Fig. 1, pump 20 may draw liquid from a reservoir 28 and deliver it through channel 25, valve casing 22 and channels 26 and 27 to the lower end of cylinder 13. When valve 21 is shifted to the position shown in Fig. 5, port 24 is blocked so that piston 12 cannot move downward under the influence of gravity and port 23 is open to a drain channel 29 which is connected to both ends of valve casing 22 and discharges into reservoir 28 so that pump 20 may discharge its entire output through channel 25, valve casing 22 and channel 29 into reservoir 28.

The operation of motor 12-13 is controlled by a control valve 31 which is fitted in the bore 32 of a valve casing 33. Bore 32 has both of its ends connected to drain channel 29 and it is pro-

vided intermediate its ends with three annular grooves or ports 34, 35 and 36 which are controlled by valve 31.

Port 34 has channel 26 connected thereto. Port 35 is connected by a channel 37 to the upper end of cylinder 13. Port 36 is connected by a channel 38 to the inlet of an orifice choke 39 which has its outlet connected by a channel 40 to the inlet of a resistance valve 41. Channel 40 is connected intermediate its ends by a channel 42 to channel 37 intermediate the ends thereof so that liquid may escape from the upper end of cylinder 13 through channels 37, 42 and 40 and resistance valve 41 into drain channel 29 which is connected to the outlet of resistance valve 41.

Resistance valve 41 is so constructed that it may be manually adjusted to have a relatively high resistance to the flow of liquid therethrough when piston 12 is at or near the lower end of its stroke and to have its resistance progressively decreased as piston 12 moves upward. The resistance of valve 41 may be progressively reduced by means of a cam 45 which is slidable vertically in suitable guides and is caused to move vertically with piston 12 as by having a threaded rod 46 arranged upon its lower end and fastened to bracket 11 by two or more nuts 47.

For the purpose of illustration, resistance valve 41 has been shown as having a valve member 48 arranged in its casing and urged against the inlet thereof by a spring 49 which reacts against an adjusting member consisting primarily of a stem 50, which is slidable through the rear end of the valve casing and engages spring 49, and an adjusting nut 51 which is threaded upon the outer end of stem 50 and provided with a roller contact 52 to engage the face of cam 45.

Operation

When the control valve 31 is shifted to the position shown in Fig. 3, port 35 is opened to one end of bore 32 so that liquid from pump 20 may flow through channel 25, bypass valve casing 22 and channels 26 and 27 to the lower end of cylinder 13 and raise piston 12, thereby raising winding roller 2. Piston 12 will eject liquid from the upper part of cylinder 13 through channel 37, bore 32 and channel 29 into reservoir 28.

Roller 2 may be moved downward by shifting control valve 31 to the position shown in Fig. 4. In this position of valve 31, port 36 is blocked and port 35 is open to port 34 so that liquid from pump 20 may flow through channel 37 to the upper end of cylinder 13. Both ends of cylinder 13 are open to pump pressure at this time but the upper face of piston 12 has a greater effective pressure area than the lower face thereof so that the downward force exerted by the liquid upon piston 12 will be greater than the upward force exerted by the liquid upon the lower face of piston 12. Consequently, piston 12 will be forced downward and expel liquid from the lower end of cylinder 13 through channels 27 and 26, valve casing 33 and channel 37 to the upper end of cylinder 13 so that piston 12 and roller 2 are moved downward at high speed. If roller 2 engages drum 1 before valve 31 is shifted, resistance valve 41 will open and pump 20 will discharge therethrough into drain channel 29.

Just before roller 2 engages drum 1, the control valve 31 may be shifted to the position shown in Fig. 1 in which position port 35 is blocked, so that liquid cannot flow direct to the upper end of cylinder 13, and port 36 is open to port 34 so that liquid may flow through choke 39 at a limited

rate to move piston 12 slowly downward if valve 31 is shifted before roller 2 contacts drum 1 and to maintain pressure in the upper end of cylinder 13 after roller 2 contacts drum 1.

5 The resistance of choke 39 to the flow of liquid therethrough is sufficient to permit pump 20 to develop its maximum pressure when it is delivering liquid through choke 39. Consequently, when valve 31 is in the position shown in Fig. 1, the 10 relatively small lower face of piston 12 is subjected to the full pump pressure while the relatively large upper face of piston 12 is subjected to a pressure equal to the pressure required to open resistance valve 41 which is so adjusted that 15 the difference between the downward force exerted by the liquid upon the upper face of piston 12 and the upward force exerted by the liquid upon the lower face of piston 12 is equal to the force required to be exerted upon roller 2 to produce 20 the desired pressure between roller 2 and drum 1.

The apparatus is initially so adjusted that, when roller 2 is in contact with drum 1 and before any paper is wound thereon, contact roller 52 is in engagement with a wide part of cam 45 25 and the resistance of valve 41 is such that the pressure in the upper end of cylinder 13 will be just sufficient to urge piston 12 downward with the correct force to produce the desired pressure between roller 2 and drum 1.

30 Then as paper is wound upon roller 2, it will gradually raise roller 2 and thereby raise piston 12 which will expel liquid from the upper end of cylinder 13 through channels 37 and 42 and resistance valve 41 into drain channel 29.

35 The paper being wound upon roller 2 adds to the weight thereof but cam 45 moves upward with piston 12 and gradually decreases the resistance of valve 41 and thereby decreases the downward force at substantially the same rate that 40 weight is being added to roller 2 so that the pressure between roller 2 and drum 1 remains nearly constant.

Roller 2 will continue to move upward and cam 45 will continue to decrease the resistance 45 of valve 41 during continued winding of paper upon roller 2 until the combined weight of roller 2 and the paper thereon is sufficient to produce the desired pressure between roller 2 and drum 1 at which time the resistance to valve 41 has been 50 so reduced that the pressure acting upon the upper face of piston 12 is just sufficient to counterbalance the high pressure acting upon the lower face of piston 12. Consequently, piston 12 is not transmitting any force to roller 2 at this time.

55 If the roll of paper on roller 2 continues to increase in diameter, it will continue to move roller 2 upward and to add to the weight thereof. However, cam 45 continues to move upward and progressively decrease the resistance of valve 41 60 so that the downward force acting upon piston 12 is gradually reduced and the upward force acting thereon will cause piston 12 to support an increasing part of the combined weight of roller 2 and the paper thereon, thereby maintaining 65 the pressure between drum 1 and the paper on roller 2 nearly constant.

The weight of the roll of paper wound upon roller 2 will increase proportionally to the square of the increasing roll diameter, but the weight of 70 roller 2 and the cores thereon will remain constant. In order to maintain the pressure between drum 1 and the roller 2 within narrow limits, resistance valve 41 may be adjusted by turning nut 51 to counterbalance the weight of 75 roller 2 and the cores thereon, and cam 45 may

be adjusted vertically by means of rod 46 and nuts 47 to regulate the net force exerted upon roller 2 by motor 12-13. Cam 45 is so designed as to reduce the downward force on the roll more rapidly as the diameter of the roll increases in 5 order that the total downward force may be held nearly constant.

FIG. 2

The apparatus shown in this figure is similar 10 to the apparatus shown in Fig. 1 except that a separate hydraulic motor is employed to transmit force to each of bearings 3 and 3^a of winding roller 2 to maintain the desired pressure between 15 roller 2 and winding drum 1. Therefore, parts of the apparatus shown in Fig. 2 which are like the corresponding parts of the apparatus shown in Fig. 1 have been indicated by corresponding reference numerals with the exponent "b" or the 20 exponent "c" added thereto.

As shown, bearings 3 and 3^a are connected, as by means of brackets 11^b and 11^c, to the rods 10^b and 10^c of pistons 12^b and 12^c which are fitted 25 in cylinders 13^b and 13^c, respectively, and form therewith hydraulic motors for moving roller 2 vertically and for pressing it against drum 1.

For the purpose of illustration, the apparatus is shown provided with two constant pressure 30 pumps 20^b and 20^c for supplying liquid to cylinders 13^b and 13^c under the control of a bypass valve 60 but both cylinders may be supplied from the same pump and bypass valve 60 may be 35 omitted and, when the motor pistons stall at the end of a stroke, the pump or pumps caused to discharge through a relief valve or valves if of the constant delivery type or to reduce pump 40 displacement nearly to zero if of the constant pressure type as previously explained. The two pumps are of the same capacity and are driven in unison so that they will deliver liquid at the 45 same rate when operating the motors at rapid traverse speeds.

Bypass valve 60 is fitted in a casing 61 having six 50 annular grooves or ports 62, 63, 64, 65, 66 and 67 formed in the wall of its bore. Ports 62 and 65 and both ends of casing 61 are connected to a drain 45 channel 29^b which discharges into a reservoir 28^b from which the pumps draw their supply of liquid.

Port 63 is connected by a channel 25^b to the 50 outlet of pump 20^b. Port 64 is connected by a channel 26^b to a port 34^b formed in the casing 33^b of a control valve 31^b which controls the operation of motor 12^b-13^b. Port 66 is connected 55 by a channel 25^c to pump 20^c. Port 67 is connected by a channel 26^c to a port 34^c formed in the casing 33^c of the control valve 31^c which controls the operation of motor 12^c-13^c.

When valve 60 is in the position shown in Fig. 2, port 63 is open to port 64 so that pump 20^b 60 may draw liquid from reservoir 28^b and deliver it through valve casing 61 into channel 26^b, port 66 is open to port 67 so that pump 20^c may draw liquid from reservoir 28^b and deliver it through 65 valve casing 61 into channel 26^c, and ports 62 and 65 are blocked.

When valve 60 is shifted to the position shown in Fig. 6, port 63 is open to port 62 and port 66 70 is open to port 65 so that both pumps may discharge through valve casing 61 into drain channel 29^b, and ports 64 and 67 are blocked so that liquid cannot escape from cylinders 13^b and 13^c.

Control valve 31^b and its casing 33^b are exactly the same as the control valve and casing shown in Fig. 1. Control valve 31^c and its casing 33^c are 75

exactly the same as the control valve and casing shown in Fig. 1 except that the valve has its stem extended through the opposite end of the casing so that the stems of both valves may be connected to a single control lever 70 which may be operated to effect simultaneous operation of the motors.

The lower ends of the motor cylinders are open at all times to pump pressure when bypass valve 60 is in the position shown in Fig. 2. In order to reduce to a minimum the number of channel crossings shown in the drawing, channels 27^b and 27^c have been shown as connecting the lower ends of cylinders 13^b and 13^c, respectively, to ports 34^b and 34^c, it being noted that channels 27^b and 27^c are open, respectively, to channels 26^b and 26^c even when annular grooves or ports 34^b and 34^c are covered by the pistons on valves 31^b and 31^c, respectively.

The upper ends of cylinders 13^b and 13^c are connected, respectively, by channels 37^b and 37^c to ports 35^b and 35^c formed in control valve casing 33^b and 33^c respectively. Channels 37^b and 37^c are connected, respectively, by channels 42^b and 42^c to channels 40^b and 40^c intermediate the ends thereof. Channels 40^b and 40^c are connected, respectively, to the inlet of resistance valves 41^b and 41^c which have the outlets thereof connected to drain channels 29^b and 29^c respectively. Channels 40^b and 40^c are also connected, respectively, through orifice chokes 39^b and 39^c and channels 38^b and 38^c to ports 36^b and 36^c formed in control valve casing 33^b and 33^c respectively.

Resistance valves 41^b and 41^c have adjusting nuts 51^b and 51^c threaded, respectively, upon the stems thereof and provided with roller contacts 52^b and 52^c to engage the faces of cams 45^b and 45^c which are moved vertically with roller 2 as by being adjustably attached to brackets 11^b and 11^c respectively.

When lever 70 is moved upward from its central position, control valves 31^b and 31^c will be shifted to the position shown in Fig. 3 so that the upper ends of the motor cylinders are open to the drain. Since the lower ends of the motor cylinders are open to pump pressure, the pump will deliver liquid thereto and cause the motors to raise roller 2.

When lever 70 is moved downward from its central position, valves 31^b and 31^c will be shifted to the position shown in Fig. 4 and both ends of each motor cylinder will be open to pump pressure so that the liquid from the pumps acting upon the differential areas of the motor pistons will force the pistons downward and thereby lower roller 2.

When lever 70 is in the position shown in Fig. 2, ports 35^b and 35^c are blocked and ports 36^b and 36^c are open to pump pressure. Consequently, pressure will extend through chokes 39^b and 39^c to the upper ends of cylinders 13^b and 13^c and liquid may escape therefrom through resistance valves 41^b and 41^c so that the apparatus will function in exactly the same manner that the apparatus shown in Fig. 1 functions.

The invention herein set forth is susceptible of various modifications and adaptations without departing from the scope thereof as hereafter claimed.

The invention is hereby claimed as follows:

1. The combination, with an object restrained from movement in a given direction and a second object movable in said direction toward and from said first object and subjected to a variable force

tending to move it in said direction, of a fluid motor for exerting another force in said direction upon said second object, a source of motive fluid having a pressure above a predetermined value, fluid channels connecting said motor to said source, means for regulating the pressure of the fluid delivered to said motor to regulate the force exerted by said motor upon said second object whereby the resultant of said forces urges said second object against said first object and creates pressure therebetween, and means for adjusting said pressure regulating means to compensate for variations in said variable force and thereby maintain the pressure between said objects nearly constant.

2. The combination, with an object restrained from movement in a given direction and a second object movable in said direction toward and from said first object and subjected to a variable force tending to move it in said direction, of a fluid motor connected to said second object for moving it in said direction, a source of motive fluid having a pressure above a predetermined value, valve means for controlling the delivery of fluid to said motor to cause it to move said second object in said direction toward and from said first object, fluid channels connecting said motor to said source, means for regulating the pressure of the fluid delivered to said motor to regulate the force exerted by said motor upon said second object whereby the resultant of said forces urges said second object against said first object and creates pressure therebetween, and means for adjusting said pressure regulating means to compensate for variations in said variable force and thereby maintain the pressure between said objects nearly constant.

3. In a winding machine having a driving roller rotatable upon a stationary axis and a winding roller supported at least in part by said driving roller to be rotated thereby and adapted to have sheet material wound thereon whereby the weight of said winding roller and the material thereon creates pressure between said rollers and the accumulation of material upon said winding roller causes said winding roller to move away from said driving roller, the combination of a hydraulic motor connected to said winding roller, control means operable to cause said motor to exert a force upon said winding roller, means for initially adjusting said control means to cause said motor to exert a positive force sufficient to create a predetermined pressure between said rollers at the beginning of a winding operation, and means responsive to movement of said winding roller away from said driving roller for adjusting said control means to cause said motor to progressively reduce said positive force to zero and to then exert a progressively increasing negative force upon said winding roller to thereby maintain the pressure between said rollers nearly constant.

4. In a winding machine having a driving roller rotatable upon a stationary axis and a winding roller supported at least in part by said driving roller to be rotated thereby and adapted to have sheet material wound thereon whereby the weight of said winding roller and the material thereon creates pressure between said rollers and the accumulation of material upon said winding roller causes said winding roller to move away from said driving roller, the combination of a hydraulic motor connected to said winding roller, control means operable to cause said motor to exert a force upon said winding roller, means for

initially adjusting said control means to cause said motor to exert a positive force sufficient to create a predetermined pressure between said rollers at the beginning of a winding operation, means responsive to movement of said winding roller away from said driving roller for adjusting said control means to cause said motor to progressively reduce said positive force to zero and to then exert a progressively increasing negative force upon said winding roller to thereby maintain the pressure between said rollers nearly constant, and other control means operable to cause said motor to move said winding roller a substantial distance toward and from said driving roller at high speed.

5. In a winding machine having a driving roller and a winding roller urged by gravity against said driving roller and adapted to have material wound thereon by frictional contact with said driving roller whereby accumulation of material upon said winding roller causes said winding roller to move away from said driving roller, the combination of a reciprocating hydraulic motor for exerting a force upon said winding roller to urge it toward said driving roller whereby said force together with the weight of said winding roller and the weight of the material thereon will create pressure between said rollers, means for supplying motive liquid to one end of said motor to cause said motor to press said winding roller against said driving roller, means for limiting the fluid pressure in said end of said motor to thereby limit the pressure between said rollers, and means responsive to movement of said winding roller away from said driving roller for adjusting said pressure limiting means to progressively reduce the fluid pressure in said end of said motor as the roll of material upon said winding roller increases in weight to thereby maintain the pressure between said rollers nearly constant.

6. In a winding machine having a driving roller and a winding roller urged by gravity against said driving roller and adapted to have material wound thereon by frictional contact with said driving roller whereby accumulation of material upon said winding roller causes said winding roller to move away from said driving roller, the combination of a reciprocating hydraulic motor for exerting a force upon said winding roller to urge it toward said driving roller whereby said force together with the weight of said winding roller and the weight of the material thereon will create pressure between said rollers, means for supplying motive liquid to one end of said motor to cause said motor to press said winding roller against said driving roller, means for limiting the fluid pressure in said end of said motor to thereby limit the pressure between said rollers, means responsive to movement of said winding roller away from said driving roller for adjusting said pressure limiting means to progressively reduce the fluid pressure in said end of said motor as the roll of material upon said winding roller increases in weight to thereby maintain the pressure between said rollers nearly constant, and means including a valve for directing motive liquid to and from said motor independently of said fluid pressure limiting means to cause said motor to raise and lower said winding roller at relatively high speeds.

7. In a winding machine having a driving roller and a winding roller urged by gravity against said driving roller and adapted to have material wound thereon by frictional contact with said

driving roller whereby accumulation of material upon said winding roller causes said winding roller to move away from said driving roller, the combination of a differential hydraulic motor for exerting a force upon said winding roller to urge it toward said driving roller whereby said force together with the weight of said winding roller and the weight of the material thereon will create pressure between said rollers, a pump for supplying liquid at a pressure above a predetermined value, means for directing liquid from said pump to the small capacity end of said motor at pump pressure, means for directing liquid from said pump to the large capacity end of said motor including means for limiting the fluid pressure in the large capacity end of said motor, and means responsive to movement of said winding roller away from said driving roller for adjusting said pressure limiting means to progressively reduce the fluid pressure in the large capacity end of said motor as the roll of material upon said winding roller increases in diameter and weight to thereby maintain the pressure between said rollers nearly constant.

8. In a winding machine having a driving roller and a winding roller urged by gravity against said driving roller and adapted to have material wound thereon by frictional contact with said driving roller whereby accumulation of material upon said winding roller causes said winding roller to move away from said driving roller, the combination of a differential hydraulic motor for exerting a force upon said winding roller to urge it toward said driving roller whereby said force together with the weight of said winding roller and the weight of the material thereon will create pressure between said rollers, a pump for supplying liquid to said motor at a pressure above a predetermined value and connected direct to the small capacity end of said motor, an orifice choke connected in series between said pump and the large capacity end of said motor, an adjustable resistance valve connected in series between the large capacity end of said motor and a drain, a cam movable by said motor in unison with said winding roller for varying the resistance of said resistance valve as said winding roller moves away from said driving roller, and a valve connected between said pump and the large capacity end of said motor and operable to connect the large capacity end of said motor to a drain to enable the liquid delivered to the small capacity end of said motor to cause said motor to raise said winding roller, or to connect said pump direct to the large capacity end of said motor to cause said motor to lower said winding roller, or to connect said pump to the large capacity end of said motor through said choke whereby the pressure in the large capacity end of said motor will be equal to the resistance of said resistance valve.

9. In a winding machine having a driving roller and a winding roller urged by gravity against said driving roller and adapted to have material wound thereon by frictional contact with said driving roller whereby accumulation of material upon said winding roller causes said winding roller to move away from said driving roller, the combination of a differential hydraulic motor for exerting a force upon said winding roller to urge it toward said driving roller whereby said force together with the weight of said winding roller and the weight of the material thereon will create pressure between said rollers, a pump for supplying liquid to said motor at a pressure above

a predetermined value and connected direct to the small capacity end of said motor, an orifice choke connected in series between said pump and the large capacity end of said motor, an adjustable resistance valve connected in series between the large capacity end of said motor and a drain,

and a cam movable by said motor in unison with said winding roller for varying the resistance of said resistance valve as said winding roller moves away from said driving roller.

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