

[54] **DRIVING SYSTEM FOR MOVING RAILS OF TEXTILE MACHINES**

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[56]

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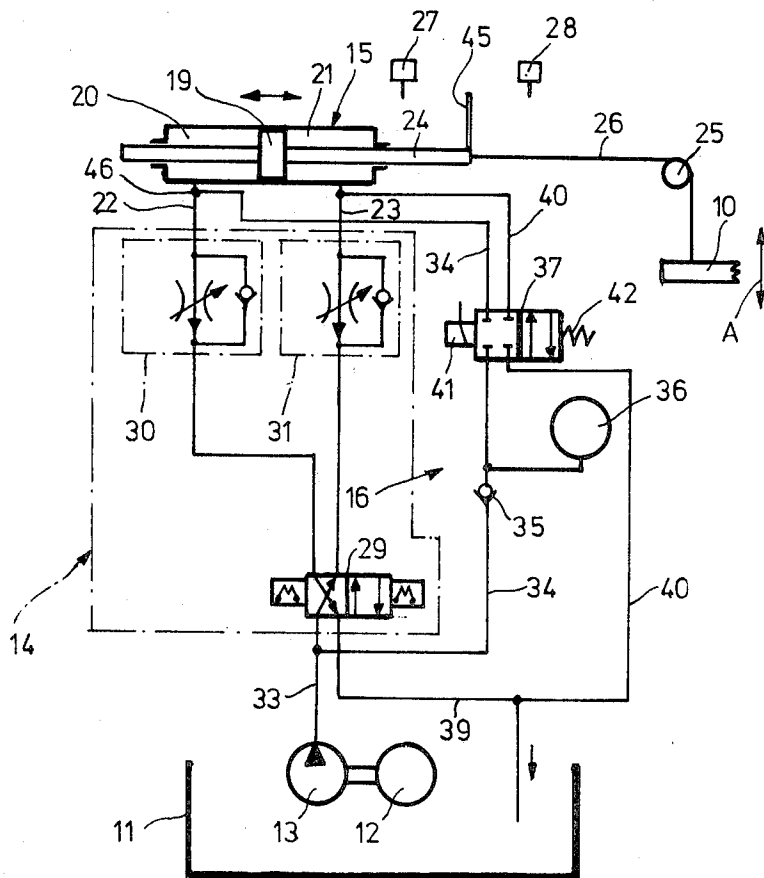
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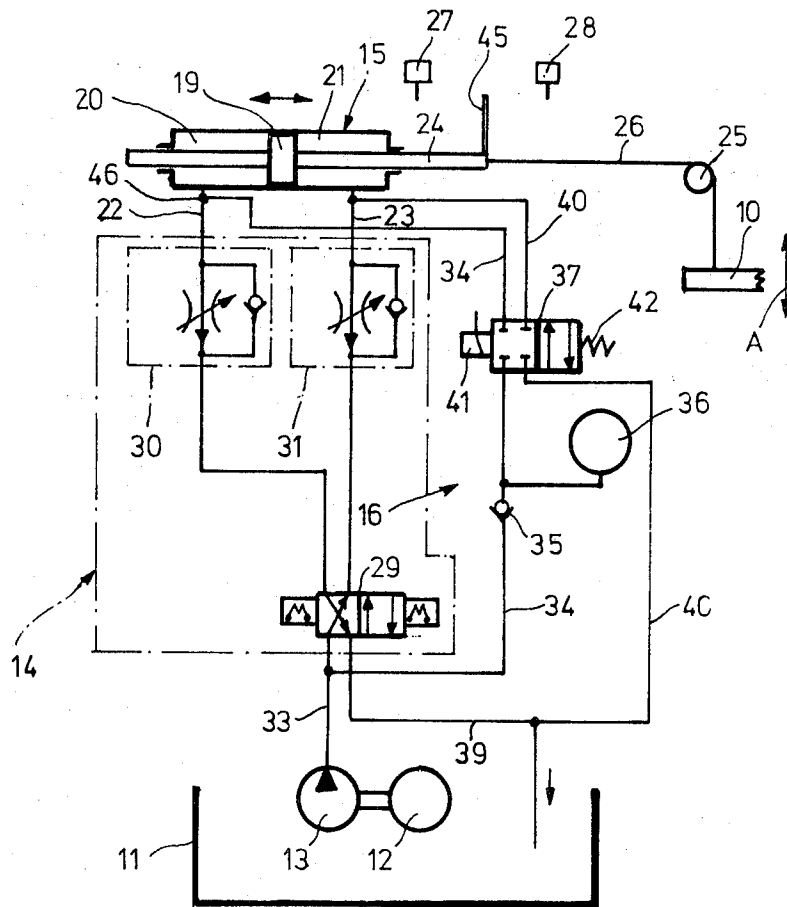
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ABSTRACT

In a yarn winding textile machine, with a main hydraulic control circuit that causes reciprocation of a ring rail, there is associated a hydraulic emergency resetting circuit which includes a solenoid valve also forming part of the main circuit and a hydraulic pressure accumulator. The resetting circuit is connected in such a manner to the hydraulic motor of the main control circuit that upon electric power failure the solenoid valve is automatically switched, causing the hydraulic pressure from the pressure accumulator to rapidly move said hydraulic motor and thus said rail into a position where no normal yarn winding may take place.

7 Claims, 1 Drawing Figure





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DRIVING SYSTEM FOR MOVING RAILS OF TEXTILE MACHINES

BACKGROUND OF THE INVENTION

This invention relates to a hydraulic driving system for vertically reciprocating ring or spindle rails which control the yarn-winding operation in spinning and twisting machines, particularly draw twisting machines.

In textile machines of the aforementioned type, the hydraulic driving system is independent from the electric motors driving the yarn delivery mechanism and spindles. In case of an electric power failure (including a substantial drop in the line voltage), the yarn delivery mechanism and spindles come to a standstill from their operational rotary motion only after a substantial delay due to the relatively large inertia of moving parts. In contradistinction, the hydraulic driving system of the ring or spindle rail comes rapidly to a rest upon power failure which deenergizes the electric drive motor associated with the pressure generating pump of the hydraulic driving system. Thus, immediately after power failure, the yarn continues to be wound on the packages supported by the spools on the spindles for a period while the ring or spindle rails are already stationary. The undesirable result is that upon such occurrence yarn will be wound for the aforementioned period on practically the same location of the yarn package. In many cases this is of particular disadvantage since the desired yarn package formation is disturbed. In case of yarn packages formed of endless synthetic yarns, this disadvantage is even more serious since the yarn package as a whole usually has to be scrapped. In case of draw twisting machines or similar spinning or twisting machines this may mean a loss amounting to hundreds of pounds of yarn upon every power failure.

OBJECT AND SUMMARY OF THE INVENTION

It is an object of the invention to provide an improved rail reciprocating system which, in response to power failure, causes an immediate cessation of winding on the yarn package.

Briefly stated, according to the invention, the rail reciprocating system includes an emergency resetting circuit that has an emergency energy source, a resetting motor connected to the rail and a switch means which is responsive to the condition of the electric energy applied to the textile machine. During normal operation of the textile machine, the emergency resetting circuit is in a deenergized condition. Upon electric power failure, on the other hand, the switch means is automatically actuated, causing the emergency energy source to be operatively connected to the resetting motor which, in turn, effects an immediate shifting of the machine rail into a position in which no regular winding of yarn on the spindle-supported spools may take place.

The invention will be better understood as well as further objects and advantages of the invention will become more apparent from the ensuing detailed specification of a preferred, although exemplary embodiment taken in conjunction with the sole FIGURE which schematically illustrates the invention.

DESCRIPTION OF THE EMBODIMENT

The hydraulic driving system illustrated in the drawing serves to reciprocate vertically a ring rail 10 in the direction of the arrow A. The hydraulic system includes a tank 11 for the hydraulic liquid, a pressure pump 13 driven by an electric motor 12, a main control circuit 14, a hydraulic setting motor 15 designed as a hydraulic cylinder assembly, and an emergency resetting circuit 16 connected parallel with the main control circuit 14 for affecting the hydraulic setting motor 15 and thus the ring rail 10 in case of an electric power failure. The pressure pump 13 serves both the main control circuit 14 and the resetting circuit 16.

With the exception of the resetting circuit 16 which, together with the setting motor 15, constitutes an emergency resetting means for moving the ring rail into an inoperative

position in case of power failure, all other components of the hydraulic driving system may be of known design. The piston 19 of the hydraulic setting motor 15 divides the inner cylinder into two work chambers 20, 21 which are connected to the main control circuit 14 by means of respective hydraulic conduits 22 and 23. The piston rod 24 of the piston 19 is, by means of a cable 26 trained about a pulley 25, connected with the ring rail 10. If the piston is in its extreme right-hand position, the ring rail is in its lowest position in which the spinning or twisting rings (not shown) mounted on the ring rail are, with respect to the spindles (also not shown) at the height of the reserve winding location. In a machine of this type, the yarn winding is controlled by reciprocation of the ring rail 10. It is to be understood that the rail 10 may also be the spindle rail in case the spindles, rather than the rings are reciprocated during the winding operation.

The normal reciprocating motion of the rail 10 is controlled in a known manner by the main control circuit 14. Along and adjacent the travelling path of the piston rod 24 there are disposed limit switches 27 and 28 which may be adjusted along said travelling path in a known and not illustrated manner and which are triggered alternately by an actuating pin 45 affixed to the piston rod 24. The limit switches 27, 28 are connected in a manner not shown with a two-position routing valve 29 forming part of the main control circuit 14 and contained in both hydraulic conduits 22 and 23. The alternate actuation of the limit switches 27, 28 results in an alternating setting of the routing valve 29 into the one and the other position. The result is an alternate actuation or reciprocation of variable amplitude of the hydraulic setting motor 15 and, by virtue of coupling cable 26, of the ring rail 10. In the conduits 22 and 23, between the valve 29 and the two work chambers 20 and 21 of the setting motor 15, there are inserted respective flow rate control valves 30, 31 which regulate the travelling speed of the piston 19 by controlling the flow rate of the hydraulic liquid momentarily discharged from a nonpressurized work chamber 20 or 21. For a liquid flow towards the work chambers, the throttle of each valve 30, 31 is bypassed through a built-in check valve. In this manner only the discharge flow from the work chambers is regulated.

From the pressure conduit 33 leading from the pump 13 to the main control circuit 14, there extends a pressure conduit 34 which leads, through a check valve 35, to a pressure accumulator 36 constituting an emergency energy source and to a shutoff valve 37 formed as a routing valve. The check valve 35 allows passage of the hydraulic liquid only toward the shutoff valve 37 and toward the pressure accumulator 36 which serves as a source for the hydraulic liquid under pressure. Consequently, the pressure in the pressure accumulator 36 corresponds to the pressure prevailing in the pressure conduit 33 and generated by the pressure pump 13. The pressure accumulator 36 contains, in addition to the hydraulic liquid, a gas cushion, tending to force the hydraulic liquid out of the pressure accumulator 36.

Into the nonpressurized return conduit 39 leading from the main control circuit 14 to the tank 11, there merges a discharge conduit 40 extending from the shutoff valve 37. From the latter there also extend continuations of the conduits 34 and 40 to the conduits 22 and 23, respectively.

The shutoff valve 37 may assume a closed and an open position. In the closed position, it blocks each conduit 34, 40, while in the open position, the block is removed.

The shutoff valve 37 is operable by means of an electromagnet 41 and a biased return spring 42. The electromagnet 41 is continuously exposed to the line voltage applied to the textile machine so that as long as the machine is supplied with said voltage, the electromagnet 41 is in a continuously energized condition maintaining the shutoff valve 37 in its closed position against the force of the return spring 42. The latter moves the shutoff valve 37 into its open position as soon as the electromagnet 41 is deenergized due to an interruption of electric energy or upon reduction thereof to such a value that the textile machine becomes inoperative.

OPERATION OF THE PREFERRED EMBODIMENT

During normal operation, the piston 19 of the hydraulic motor 15 is reciprocated by virtue of an alternate switching of the valve 29 effected by an alternating actuation of limit switches 27, 28 by pin 45 secured to piston rod 24. Thus, the rail 10, through cable 26 connected to the piston rod 24, is vertically reciprocated in a desired manner for controlling the yarn winding operation. During this normal operation, the electromagnet 41 of the shutoff valve 37 is in a continuously energized condition, thus maintaining the shutoff valve 37 in a continuously closed position. This, as set forth hereinbefore, results in a continuous complete blocking of conduits 34 and 40. In the closed position of the shutoff valve 37, the pressure accumulator 36 is continuously maintained at the pressure level generated by pump 13. In case of a failure of the pressure pump 13, the liquid under pressure in the pressure accumulator 36 is, by virtue of check valve 35, prevented from escaping through the conduit 34 connecting the pressure accumulator 36 with the pump 13.

If, during normal operation, the supply of line voltage is interrupted or substantially reduced, the electromagnet 41 is immediately deenergized and, as a result, the return spring 42 at once moves the shutoff valve 37 into its open position in which both conduits 34 and 40 are unobstructed. As seen from the FIGURE, this means that chamber 20 of the hydraulic motor 15 is now connected to the pressure accumulator 36 through conduit 34 across shutoff valve 37, and the chamber 21 of the hydraulic motor 15 is connected to the nonpressurized tank 11 through conduit 40, also across shutoff valve 37. As a result, piston 19, irrespective of its position assumed in the last moment of normal operation, is moved to its right-hand extreme position, since now pressure is supplied from the pressure accumulator 36 (the pressure generating pump is inoperative because of the power failure) to the left-hand motor chamber 20 through conduit 34, whereas the right-hand motor chamber 21 is drained through conduit 40. Since neither conduit 34 and 40 are throttled to any extent, the aforementioned motion of piston 19 occurs very rapidly, in fact, several times faster than the normal reciprocating speed which, as mentioned before, is limited by the controlled throttle effect of flow rate regulating valves 30, 31.

It is thus seen that the rail 10, immediately upon power failure, is lowered very rapidly to a position in which no winding on the yarn packages occurs although some parts of the textile machine continue to rotate due to inertia.

It is further noted that, as it may be observed from the FIGURE, in the open position of the shutoff valve 37, the hydraulic liquid forced by the air cushion in pressure accumulator 36 toward the work chamber 20, may also flow into the conduit 22 leading to the flow rate control valve 30 and therefrom, depending upon the position of the routing valve 29, may flow into the conduit 33 or 39. Since, however, the control valve 30 is substantially throttled, such a bypass in general has no disturbing effect. Should, for any reason, a complete elimination of this bypass be desired, then in the conduit 22 between the location 46 and the routing valve 29, there may be inserted an additional, electromagnetic shutoff valve (not shown) which is operable synchronously with but in an opposite sense to the shutoff valve 37. Thus, during normal operation, the additional shutoff valve is open, while in case of power failure it is closed and thus blocks conduit 22.

As seen, the aforediscussed preferred embodiment of the emergency resetting circuit is hydraulic in nature.

It is, however, within the scope of the invention, to provide an emergency resetting circuit which is substantially electric in nature. In such an embodiment, the emergency energy source is constituted by an electric battery, while the setting motor is an electromotor connected to the rail. The electric resetting circuit further includes an electric switch which, upon electric power failure, automatically closes this circuit

and thus energizes the electric setting motor. In such an embodiment it is expedient to so connect the said electric switch with the main hydraulic circuit, that upon energization of the electric resetting circuit, it is ensured that the main hydraulic control circuit does not throttle the displacement of the rail effected by the electric setting motor.

What is claimed is:

1. In a driving system for moving rails of yarn winding textile machines operated with electric energy, said system being of the type that includes a hydraulic rail reciprocating circuit having a hydraulic motor connected to said rail and pump means for supplying hydraulic pressure to said hydraulic motor, the improvement comprising

A. a resetting motor,

B. an emergency energy source, and

C. switch means responsive to said electric energy; said resetting motor, said emergency energy source and said switch means being interconnected to form an emergency resetting circuit; said switch means movable into a first position in which said emergency resetting circuit is maintained in a deenergized condition, said switch means movable into a second position in which said emergency energy source energizes said resetting motor for moving said rail into an inoperative position in which no normal yarn winding takes place; said switch means maintainable in said first position during normal supply of said electric energy to said textile machine; said switch means movable into said second position upon interruption of said normal supply of electric energy.

2. An improvement as defined in claim 1, including means for moving said rail by said setting motor energized by said emergency energy source faster than the speed of its reciprocating motion during normal yarn winding operation.

3. An improvement as defined in claim 1, including

A. a hydraulic pressure accumulator constituting said emergency energy source,

B. hydraulic conduit means connecting said hydraulic pressure accumulator to said hydraulic motor also serving as said resetting motor and

C. valve means forming part of said switch means and inserted in said hydraulic conduit means; said valve means, when in said first position, blocks communication between said hydraulic pressure accumulator and said hydraulic motor; said valve means, when in said second position, establishes communication between said hydraulic pressure accumulator and said hydraulic motor for moving said rail into said inoperative position.

4. An improvement as defined in claim 3, including an electromagnet actuating said valve means and energizable by the electric energy operating said textile machine; said valve means and said electromagnet together constitute said switch means.

5. An improvement as defined in claim 4, including spring means in said valve means urging the latter into said second position and moving said valve means thereinto from said first position upon deenergization of said electromagnet.

6. An improvement as defined in claim 3, wherein said hydraulic motor is formed of a hydraulic cylinder, a piston slidable therein and two chambers separated from one another by said piston and together constituting said cylinder; said hydraulic conduit means connects said hydraulic pressure accumulator with one of said chambers; said improvement further comprises a discharge conduit leading from the other of said chambers and passing through said valve means, said discharge conduit is blocked by said valve means in said first position and opened thereby in said second position.

7. An improvement as defined in claim 3, including an additional hydraulic conduit means connecting said hydraulic pressure accumulator to said pump means to charge said pressure accumulator with hydraulic pressure.

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