This invention relates, as indicated, to a traversing guide for wire collers, and, more particularly, to a fluid pressure operated drive for reciprocating a traverse guide carriage with respect to a rotating spool on which the wire is being coiled.

In winding bare wire and the like on a spool, it is desirable to have the wire laid on in tight and direct layers in order that it may be dispensed without snarling. Conventional winding apparatus for this purpose generally comprises a wire coiler having provisions for rotating a spool to coil the wire thereon and a traversing carriage for guiding the movement of the wire to the spool. The traversing carriage is reciprocated axially with respect to the spool at a speed related to the speed of rotation of the spool and the diameter of the wire so that the wire is threaded on the spool in layers with the wire coil convolutions in each layer snugly engaged with each other. The traverse movement of the guide carriage in conventional coilers is commonly effected by drives which include either cams or feed screws interconnecting the carriage with the spool drive. Such traverse guide carriage drives require troublesome adjustments for different spool widths and wire gauges. In the case of a cam drive, the drive cam must be changed for different spool widths or wire gauges, and, in the case of a feed screw drive, the speed reduction gearing connected to the feed screw must be changed for different wire gauges.

One of the principal objects of this invention is to provide a traverse carriage drive which eliminates the feed screws or drive cams of conventional coilers and which has universal adaptability to spools of different widths and wires of different gauges. To this end, the traverse carriage drive of this invention comprises a reversible fluid pressure motor controlled by a reversing valve which has provisions for readily adjusting the length of the path of reciprocating movement of the guide carriage to spools of different widths and its speed to wires of different gauges. In a manner to be described, the adjustments required for different sizes of spools and wires are accomplished with a minimum of effort and without the removal or replacement of any part of the drive apparatus.

A further object of the invention is to provide a fluid pressure operated traverse carriage drive of the character referred to with a novel arrangement of control apparatus for making its operation dependent upon the operation of the rotary spool drive in such manner that the carriage drive and spool drive are stopped and started simultaneously.

Other objects and advantages of the invention will become apparent from the following description.

In the drawings, there is shown a preferred embodiment of the invention. In this showing:

Figure 1 is an elevational view of a wire coiler having a guide carriage and fluid pressure drive therefor constructed in accordance with the principles of this invention;
an opening in the bracket plate 21 and is connected with an operating link 25 secured at its outer end to the arm 26 of the T-shaped mounting member 19. In a manner to be described, reversing operation of the motor 6 for effecting reciprocation of the carriage 5 is controlled by a limit micro-switch designated as a whole by the numeral 27 which is mounted on the bracket structure 23 as shown in Figure 5. The switch 27 includes an operating member 28 which is moved alternately between two positions to open and close different ones of a pair of contacts in a manner to be described. Movement of the operating member 28 between its two operative positions is effected by a rod or control member 29 which extends through openings in the bracket plates 21 and 22 and has a sliding support for endwise movement therein. The portion 30 of the rod 29 between the plates 21 and 22 is threaded and extends through an opening 31 in the guide carriage mounting arm 26. The opening 31 is larger than the external diameter of the threaded portion 30 of the rod 29 so that the carriage may move freely without imparting movement to the rod 29. Stop nuts 32 and 33 are threaded on the center portion 30 and are positioned respectively on opposite sides of the carriage mounting arm 26 which constitutes an actuating member for the rod or control member 29. When the carriage 5 moves to the extreme limit of its path of reciprocating movement at the right as viewed in Figure 5, the arm or actuating member 26 will engage the stop nut 33 and move the rod 29 to the right to thereby actuate the limit switch 27 to one of its two positions. When the carriage 5 moves to its other extreme limit of reciprocating movement, the arm or actuating member 26 will engage the stop nut 32 and move the rod 29 to the left and into the other of its two positions to effect a subsequent actuation of the limit switch 27. In this manner, engagement of the arm 26 with the stop nuts 32 and 33 is effective to intermittently operate the limit switch 27 and thus effect reciprocating movement of the carriage 5 back and forth between the nuts 32 and 33 in a manner to be described. The nuts 32 and 33 control the length of the path of reciprocating movement of the carriage 5, and the length of such path may be readily adjusted to spools of different sizes by adjusting the positions of the nuts on the threaded rod portion 30.

The wire W being wound on the spool 1, referring to Figure 4, has its movement to the spool guided through an opening in a guide die 34 mounted in the carriage 5. The guide die 34 is mounted for vertical movement with respect to the carriage 5 by a pair of vertical guides 35 secured to the carriage 5 (see Figure 3). The guides 35 have a centrally extending slot 36 in which trunnions 37 secured to the guide die 34 are received and have a guided and sliding vertical movement. The slide trunnion mounting of the die 34 in the slots 36 enables it to automatically adjust its vertical and angular position to the quantity of wire on the spool 1.

The manner in which operation of the limit switch 27 by the rod 29 is effective to control reversing movement of the carriage 5 will be best understood by referring to the diagrammatic showing of Figure 6. In this figure, the limit switch 27 is illustrated schematically as being comprised of two switch elements 38 and 39 connected together for simultaneous operation by the operating member 28. When the rod 29 is in the position shown in Figure 6, the switch 38 is closed and the switch 39 is open. Upon movement of the rod 29 to the right by the carriage 5 engaging the nut 33, the switch 38 will be opened and the switch 39 will be closed. Closure of the switches 38 and 39 respectively complete energizing circuits for solenoids 40 and 41 which have armatures connected with the ends of a spool valve 42 in a reversing valve 43. When the solenoid 40 is energized by closure of the switch 39, the spool valve 42 will be moved to the left and when the solenoid 41 is subsequently energized by closure of the switch 38, the spool valve will be returned to the position shown in Figure 6.

The fluid pressure motor 6 comprises an air cylinder 44 having a piston 45 positioned therein and secured to the piston rod 24. Opposite ends of the cylinder 44 are connected with air conduits 46 and 47 which are alternately connected with an air supply conduit 48 through the valve 43. When the spool valve 42 is in the position shown in Figure 6, the conduit 47 is connected with the air supply conduit 48 and the conduit 46 is connected to the atmosphere through an end of the valve casing 43. In this position, air is admitted to the end of the cylinder 44 at the left as viewed in Figure 6 and the piston 45 and rod 24 are moving the carriage 5 in the direction indicated by the arrow. When the switch 38 is opened and the switch 39 is closed by the carriage arm 26 striking the nut 33 and moving the rod 29 to the right, the solenoid 40 is energized to move the spool valve 42 to the left and reverse its position in the valve 43. Movement of the spool valve 42 to the left in this manner is effective to disconnect the conduit 47 from the air supply conduit 48 and to connect the air supply conduit 48 to the conduit 46 so that air is admitted to the end of the cylinder 44 at the right as viewed in Figure 6 and thereby reverse the movement of the piston rod 24 and the carriage 5. In this manner, alternate energization of the solenoids 40 and 41 in response to intermittent operations of the limit switch 27 by the rod 29 is effective to reverse the connections of the air supply conduit to the cylinder 44 and to effect reciprocation of the guide carriage 5.

The speed of movement of the carriage 5 by the piston rod 24 is controlled by a hydraulic cylinder 50 having a piston 51 mounted therein and secured to the piston rod 24. The cylinder 50 is filled with hydraulic fluid and opposite ends of the cylinder are connected by a bypass conduit 52. The connection of the bypass 52 with one end of the cylinder 50 is controlled by a needle valve 53 which may be adjusted to regulate the effective size of the bypass connection between the ends of the cylinder 50. As the piston 51 is reciprocated in the cylinder 50, hydraulic fluid is forced from one end of the cylinder to the other at a rate controlled by the needle valve 53 and adjustment of the needle valve 53 is thus effective to regulate the speed of operation of the piston rod 24 and carriage 5 by the piston 51.

Admission of air to the supply conduit 48 is controlled by a valve 55 which also controls the admission of air to the clutch 13 in the drive for the spool 1. The valve 55 has a spool valve 56 therein which controls the connection of a conduit 57 extending from an air supply line 58 to a common supply conduit 59 for the conduit 48 and the passage 17 which admits air to the clutch 13. The spool valve 56 has a spring 60 biasing it to the position shown in which it disconnects the conduits 57 and 59 and a solenoid 61 for operating it to the right as viewed in Figure 6 against the biasing action of the spring 60 to an open position in which the conduits 57 and 59 are connected with the air supply line 58. The solenoid 61 is connected in the energizing circuit for the solenoids 40 and 41, and its energization is effected by closure of a switch 62. Since the valve 55 controls the supply of air to both the carriage drive motor 6 and the clutch 13, it will be apparent that it provides a complete control over the effects of simultaneous starting and stopping of both the carriage 5 and spool 1, and this operation may be effected conveniently by opening or closing the switch 62.

Admission of air to the passage 18 for operating the brake 14 is effected by a conduit 63 having connection to the conduit 18 and a conduit 64 which is connected to the air line 58. Connection of the conduits 64 and 63 with each other is controlled by a valve 65 having a spool valve 66 therein. The valve 65 includes a spring 67 biasing the movement of the spool valve 66 to the right and to the position illustrated in Figure 6 in which it provides a connection between the conduit 63 and 64.
for operating the brake 14. A solenoid 68 is provided for moving the spool valve 66 to the left as viewed in Figure 6 against the action of the spring 67 to a position in which the conduit 63 is disconnected from the conduit 64 to thereby render the brake 14 inoperative. The solenoid 68 is connected in the circuit controlled by the switch 62 and is energized when the switch 62 is closed to operate the valve 55 to admit air to the clutch 13 and to the carriage drive motor 6. When the switch 62 is opened to stop the rotation of the spool 1 and carriage 5, the solenoid 68 is de-energized and the biasing spring 67 becomes effective to move the spool valve 66 to the position shown in which the brake 14 is rendered effective to stop rotation of the drive member 12 and the spool 1 connected therewith.

From the foregoing, it will be apparent that the rotary drive for the spool 1 and the drive for reciprocating the carriage 5 are simultaneously controlled. In this manner, the fluid pressure motor 6 is rendered effective to reciprocate the guide carriage 5 at all times during which the rotary drive for the spool 1 is operative. The speed of movement of the carriage 5 may be adjusted in accordance with the diameter of the wire being handled by changing the position of the needle valve 53. To adjust the length of the path of reciprocating movement of the carriage 5 for spools having different axial lengths, it is only necessary to adjust the relative positions of the stop nuts 32 and 33 on the operating rod 29. Attention is particularly directed to the fact that these adjustments of the speed and length of reciprocating movement of the carriage 5 can be effected without disconnecting or removing any parts of the driving apparatus, and, if need be, can be effected while the apparatus is operating.

While one embodiment of my invention has been shown and described it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. In a wire coiler having a rotary drive for winding wire on a spool and a traversing carriage mounted for reciprocating movement axially of the spool to thread the wire on the spool in layers, a reversible fluid pressure motor including a piston connected with said carriage for effecting reciprocating movement thereof, a reversing valve mechanism controlling the operation of said motor, and means for operating said reversing valve mechanism comprising an actuating member secured to said carriage for reciprocation therewith, a pair of spaced parts respectively positioned on opposite sides of said actuating member for engagement and actuation thereby when the carriage moves to opposite ends of its path of reciprocating movement, means including a limit switch for operating said reversing valve mechanism to reverse the movement of said carriage, and means connected with said parts for operating said limit switch upon actuation thereby by said actuating member.

2. An apparatus as claimed in claim 1 characterized by said parts having means for adjusting their respective positions to thereby vary the length of the path over which the carriage is reciprocated.

3. An apparatus as claimed in claim 1 characterized by said reversing valve mechanism operating means comprising a solenoid controlled by said limit switch.

4. An apparatus as claimed in claim 1 characterized by said reversing valve mechanism comprising a valve movable between two reversing positions and said operating means comprising a pair of solenoids controlled by said limit switch means and respectively operable upon energization thereof to move said valve to one of its said reversing positions.

5. In a wire coiler having a rotary drive for winding wire on a spool and a traversing carriage mounted for reciprocating movement axially of the spool to thread the wire on the spool in layers, a reversible fluid pressure motor including a piston connected with said carriage for effecting reciprocating movement thereof, a reversing valve controlling the operation of said motor, and actuating means for said reversing valve comprising a rod mounted for endwise movement and having a pair of spaced operating parts secured thereto, an actuating member positioned between said parts and secured to said carriage for reciprocation therewith, said parts being respectively arranged for engagement and movement by said actuating member when the carriage moves to opposite ends of its path of reciprocating movement to thereby impart endwise movement to said rod, a pair of solenoids respectively operable upon energization thereof to actuate said reversing valve to reverse the operation of said motor, a pair of switches respectively controlling the energization of said solenoids, and means connected with said rod and said switches for closing one of said switches in response to movement of said rod by one of said parts and for closing the other of said switches in response to movement of said rod by the other of said parts, one of said switches being open at all times.

6. In a wire coiler having a rotary drive for winding wire on a spool and a traversing carriage mounted for reciprocating movement axially of the spool to thread the wire on the spool in layers, a fluid pressure operated clutch for rendering said drive operable, a reversible fluid pressure motor including a piston connected with said carriage for effecting reciprocating movement thereof, a reversing valve for controlling the reversing operation of said motor, a conduit providing a source of fluid pressure, and means including a common valve connecting said conduit with said clutch and said reversing valve and providing a common control for the operation of said drive and carriage.

7. In a wire coiler having a rotary drive for winding wire on a spool and a traversing carriage mounted for reciprocating movement axially of the spool to thread the wire on the spool in layers, a reversible fluid pressure motor including a piston connected with said carriage for effecting reciprocating movement thereof, reversing valve mechanism controlling the operation of said motor, and means for operating said reversing valve mechanism comprising an actuating member secured to said carriage for reciprocation therewith, a pair of spaced parts respectively positioned on opposite sides of said actuating member for engagement and actuation thereby when the carriage moves to opposite ends of its path of reciprocating movement, means including a limit switch for operating said reversing valve mechanism to reverse the movement of said carriage, and means connected with said control member for operating said limit switch upon movement of said control member by said operating parts.

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