Aug. 4, 1953

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2,647,698

WINDING MACHINE TRAVERSE MECHANISM

Filed July 25, 1947

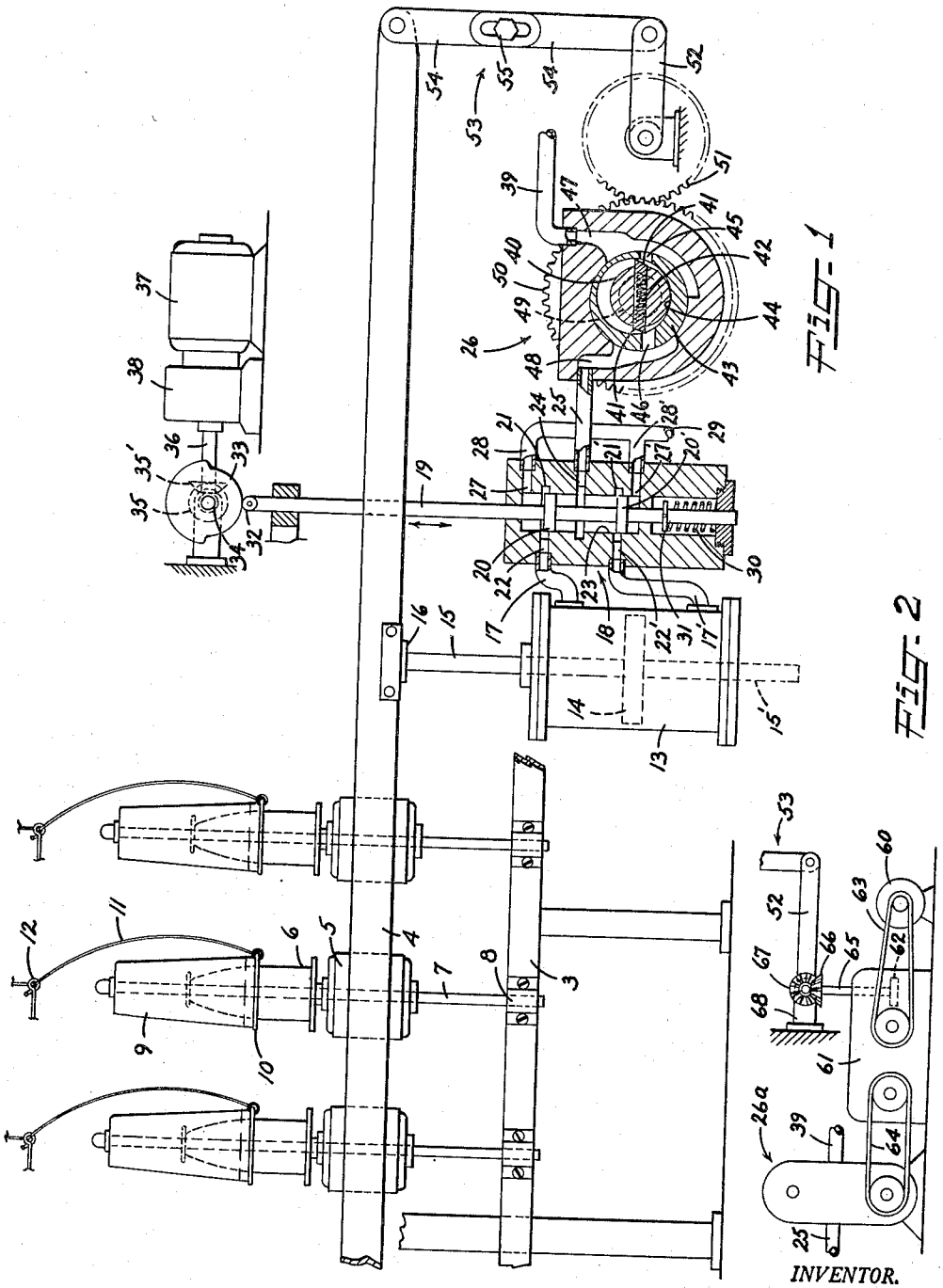


FIG. 1

FIG. 2

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Patented Aug. 4, 1953

2,647,698

UNITED STATES PATENT OFFICE

2,647,698

WINDING MACHINE TRAVERSE MECHANISM

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Application July 25, 1947, Serial No. 763,528

17 Claims. (Cl. 242—43.3)

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This invention relates to traverse mechanism for winding machines which may also serve to twist the yarns or other strands being collected, and is particularly concerned with an improved hydraulic fluid driving mechanism for the traverse.

It has heretofore been suggested to operate the traverse of a winding machine by hydraulic fluid mechanism but when wound packages of special shape are desired, the systems for obtaining the necessary variations in relative speed between the traversing member and the stationary member, regardless of which may serve as the guide or the collecting device, have required a relatively complicated and expensive control mechanism. Such a complicated mechanism not only deters the adoption of hydraulic fluid-driven traverse mechanism for winding machines in many places because of the expensiveness of the initial installation thereof, but also because of the liability for large maintenance costs required to keep the mechanism in proper operating condition.

It is an object of the present invention to provide a hydraulic fluid-driven traverse mechanism which is adapted to build various shapes of packages and yet is of extremely simple construction and comprises relatively few moving control parts. It is a further object of the invention to provide a hydraulic fluid-driven traverse mechanism comprising a fluid-operated piston for reciprocating the traverse rail, a reversing valve, such as that of the ordinary "spool" type for alternately directing the fluid against opposite faces of the driving piston, and a variable displacement or variable speed pump in the fluid supply line to the reversing valve, the discharge rate of the pump being varied in timed relation with the traverse rail and serving to control the rate of flow of the fluid through the reversing valve to the piston so as to control the rate of speed of the traversing rail throughout its stroke. It is a further object of the invention to provide a fluid-operated traverse mechanism of the type just outlined in which the reversing valve is controlled independently of the pump. Further objects and advantages of the invention will be apparent from the drawing and the description thereof hereinafter.

The invention is generally applicable to the driving of the member to be traversed in any winding machine such as the carrier adapted to receive the winding or the carrier for the guide. For example, the traverse mechanism of the present invention may serve to reciprocate a

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thread-guide in a direction parallel to the axis of the package to be wound, whether such package is wound within a centrifugal spinning bucket, such as is more commonly done in the artificial filament spinning industry, or the thread is collected upon a rotating core, such as a spool, or the like. Again, the traverse mechanism may serve to reciprocate the wound package carrier with the package relative to a guide for directing the strands to the package. Thus, the traverse mechanism of the invention may serve to reciprocate either the guide or the package carrier in any form of winding machine including those which serve also to twist the strand, such as flyer twisters, cap twisters, ring twisters, and centrifugal pot twisters. When applied to such winding machines whether with or without twisting, it may serve to drive a single winding unit or a plurality thereof simultaneously as is common in the textile industry. For example, the traverse mechanism may serve to reciprocate a ring rail, a rail supporting a plurality of centrifugal buckets, a rail supporting a plurality of bobbins, or a rail supporting a plurality of guides, including particularly the funnel types of guides. Regardless of whether the traverse mechanism is applied for reciprocating the winding collecting members or the guides, the reciprocation of the rail may be either longitudinally thereof, in which case the axis of the winding is generally parallel to the rail, or at an angle to the rail, such as at a right angle, in which case the axis of the package or packages will be disposed at a corresponding angle to the rail.

A specific application is illustrated in the accompanying drawing, in which—

Figure 1 is a front elevation of a cap twister in which the traverse mechanism, which serves to alternately lift and lower driving motors and bobbins driven thereby, is driven hydraulically by a system comprising a variable displacement pump, and

Figure 2 shows a modification of the system comprising a constant displacement pump driven at varied speed to vary the discharge.

Figure 1 shows a cap twisting machine comprising a stationary rail 3a and traversing rail 4. The traversing rail 4 carries one or more motors 5 which are coupled to bobbins 6 so that the bobbins are rotated at constant speed by the motors. For each of the bobbins 6 carried by rail 4, a post, rod or spindle 7, preferably of cylindrical cross section, is carried by the stationary rail 3 to which it may be secured by a clamp 8. The spindle 7 extends through the

hollow shaft of the motor and bobbin assembly and carries a cap 9 at its upper end. As is known in the art, the rail 4 is traversed up and down so as to alternately move the bobbin 6 into and out of the cap 9 which has a concentric skirt 10 about which the strand of yarn or other material 11 is drawn from a balloon controlling guide 12 on its way to the bobbin.

The traverse driving mechanism comprises a hydraulic motor having a cylinder 13 and a reciprocable piston 14 thereon. The piston is connected by the rod 15 to the rail 4 (at any point along the length thereof but preferably at its midpoint to balance the weight thereof relative to the rod 15 or other connection to the driving piston) by any suitable means such as by means of the bracket 16 or by a bell crank lever such as in copending application Serial No. 585,846, filed March 31, 1945, in the same manner as the piston 35 in that application is connected by the rod 34 to the bell crank lever 29 in that application. It should be understood that any linkage between the piston rod and rail is within the scope of my present invention. A rod 15' may project from the face of the piston 14 opposite that from which rod 15 projects to provide equal pressure areas on opposite faces of the piston. A hydraulic fluid, such as water, oil or any non-corrosive liquid is led to opposite ends of the cylinder 13 by connections 17 and 17'.

The reversing valve 18 may be of a conventional spool type and comprises a rod 19 carrying two enlarged cylindrical portions 20 and 20' spaced apart a distance corresponding to the distance between two annular grooves 21 and 21' which are connected by ports 22 and 22' to the connections 17 and 17' respectively. The bore 23, within which the spool valve operates, communicates through a port 24 and a conduit 25 with the discharge rod of the variable displacement pump 26. This bore 23 also communicates through discharge ports 27 and 27' and connections 28 and 28' and conduit 29 with a receiver or storage vessel in the fluid system adapted to receive the fluid discharged from the cylinder.

The valve rod 19 is normally urged upward by a spring 30 acting against a collar 31 secured to the rod. Its upper end, which may be provided with a roller follower 32, is thus urged resiliently against the surface of a cam 33 rotated by a shaft 34 which is in turn driven through bevel gears 35 and 35' and shaft 36. The shaft 36 is driven by a motor 37 through suitable transmission gearing 38 capable of providing constant or varying speed, as desired. Preferably, the cam 33 has two concentric surfaces of approximately equal length, which surfaces are joined by steep inclines to provide for a quick shift from one surface to the other.

The pump 26 communicates at one side with a suitable supply of fluid by way of a suction conduit 39.

Any type of variable displacement pump may be used, such as the radial piston type or the type which has axial pistons which follow a variably inclined wobble plate. Reference may be had to U. S. Patents 2,266,191, 2,302,411, 2,324,524, and 2,359,558 for illustrative types of variable displacement pumps which may be used. The pump illustrated is that of Patent 2,302,411 and comprises a rotor 40 within which two radial pistons or vanes 41 are outwardly urged by spring 42 into engagement with the internal surface of the eccentric sleeve 43 which fits within the eccentric bore 44. The sleeve has two openings 45 and 46 which communicate with the inlet and exit ports 47 and 48 of the pump body. The sleeve 43 has a concentric axially projecting shaft 49 to which may be secured a gear 50 which is in mesh with a gear 51 secured to the arm 52 for rotation thereby. A link 53, which may be of adjustable length by making it of two pieces 54 having slotted ends to be bolted together at 55, is pivotally connected to the arm 52 and the rail 4.

In operation, the motor 37 preferably drives the cam 33 at constant speed and the cam 33 alternately shifts the valve upwardly and downwardly at substantially equally spaced intervals. This serves to alternately shift the flow of fluid into opposite ends of the cylinder 13. In the position shown, the fluid is being supplied through the port 22' to the lower face of the piston 14, so that the piston is lifting the rail. As the rail rises, it rotates sleeve 43 clockwise to reduce the relative eccentricity between the rotor and sleeve. The gradual reduction of this eccentricity as the rail rises causes the speed of rise to decrease progressively and it will be observed that when the high portion of cam 33 forces the rod 19 down and reverses the direction of flow of the fluid into cylinder 13, the rail 4 will then lower the bobbins with increasing speed. This operation serves to provide a tapered package. The extent of taper and the precise contour of the package may be pre-selected as desired by changing the lengths of lever 53 and arm 52.

In Figure 2 there is shown a modification in which a pump 26*a*, such as a gear pump, which normally discharges at a constant rate when driven at a constant rate, is connected to a liquid supply conduit 39 and the conduit 25 leading to the reversing valve as in Figure 1. However, the driving motor 60 operates the gear pump through an infinitely variable speed transmission 61 which may be of the Reeves belt type provided with an elliptical cam 62 for controlling the space between the pairs of conical pulleys which drive and are driven by the belt. Sprockets and chains may serve to connect the motor 60, transmission 61, and gear pump 26*a* as at 63 and 64. The cam 62 is carried by the control shaft 65 and a bevel gear 66 serves to rotate the shaft and cam. A bevel gear 67 rotatably mounted in a bracket bearing 68 carries an arm 52 and the link 53 is pivotally connected to arm 52*a* and to rail 4. Thus, as the rail 4 rises, the cam 62 is rotated to reduce the speed of pump 26*a* so that it progressively slows down on its upstroke. On the down stroke, the speed of the rail progressively increases.

While the operation as described so far results in the winding of a bottle-shaped bobbin with a continuous taper from a maximum diameter at the bottom to a minimum at the top, other shapes can be produced such as by setting the minimum speed position of the cam 62 for the mid-stroke position of the rail 4. This would produce a package symmetrically tapering from a maximum diameter at the center.

The arrangements of Figures 1 and 2 can be used in the spinning of annular cakes, such as of rayon, in centrifugal buckets. Either or both ends of the cakes may be tapered or the variation in rail speed may be selected to compensate for the tendency to lay down an excess of yarn at the ends of the cake because of the whipping of the yarn at each end of the funnel stroke so that a package of substantially truly annular shape is produced.

It will thus be observed that the present invention provides a fluid-operated traverse

mechanism which is of simple construction and is extremely reliable in operation because of the relatively few moving parts. Because of its simplicity, it is relatively inexpensive in first cost and likewise has a low maintenance cost. These features clearly adapt the system to operation in a wide variety of fields, especially where costs are a primary consideration in producing a competitive product.

It is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as disclosed herein.

I claim:

1. In a winding machine, a supporting member, a strand-collecting device on the member, a member for guiding a strand to the device, a hydraulic motor for imparting relative reciprocatory motion between the members, a valve for reversing the direction of the relative motion between the members, a cam for periodically operating the valve at regular intervals, means for rotating the cam at predetermined speed, a pump for controlling the rate of flow to the motor, and means comprising an element operatively connected to the reciprocated member for varying the discharge rate of the pump in response to the movement of the element imparted thereto by the reciprocated member.

2. In a winding machine, a reciprocable supporting member, a strand-collecting device on the member, a member for guiding a strand to the device, means for rotating the collecting device, means for reciprocating the supporting member to move the collecting member axially back and forth past the guiding member, said reciprocating means comprising a hydraulic motor, a valve for reversing the motor, a cam for periodically operating the valve at regular intervals, means for rotating the cam, a pump for controlling the rate of flow to the motor, and means comprising an element operatively connected to the supporting member for varying the discharge rate of the pump in response to the movement of the element imparted thereto by the supporting member.

3. In a winding machine, a reciprocable supporting member, a strand-collecting device on the member, a member for guiding a strand to the device, means for rotating the collecting member, means for reciprocating the supporting member to move the collecting member axially back and forth past the guiding member, said reciprocating means comprising a hydraulic motor, a valve for reversing the motor, a cam for periodically operating the valve at regular intervals, an independent motor for rotating the cam at constant speed, a pump for controlling the rate of flow to the hydraulic motor, and means comprising an element operatively connected to the supporting member for varying the discharge rate of the pump in response to the movement of the element imparted thereto by the supporting member.

4. In a winding machine, a reciprocable supporting member, a strand-collecting device on the member, a member for guiding a strand to the device, means for rotating the collecting member, means for reciprocating the supporting member to move the collecting member axially back and forth past the guiding member, said reciprocating means comprising a hydraulic motor, a valve for reversing the motor, a cam for periodically operating the valve at regular intervals, an independent motor for rotating the cam at constant speed, a pump for controlling the rate of flow to the hydraulic motor, means for varying the discharge rate of the pump, and control means driven by the supporting member for operating the varying means.

5. In a winding machine, a reciprocable supporting member, a strand-collecting device on the member, a member for guiding a strand to the device, means for rotating the collecting member, means for reciprocating the supporting member to move the collecting member axially back and forth past the guiding member, said reciprocating means comprising a hydraulic motor, a valve for reversing the motor, a cam for periodically operating the valve at regular intervals, an independent motor for rotating the cam at constant speed, a pump for controlling the rate of flow to the hydraulic motor, means for varying the discharge rate of the pump, and means comprising a link connected to the supporting member for controlling the pump varying means.

6. A machine as defined in claim 5 in which the controlling means comprises a rotatable gear and a lever interconnecting the gear with the link, and the varying means is rotatably operated by the gear.

7. In a winding machine, a supporting member, a strand-collecting device on the member, a member for guiding a strand to the device, a fluid motor for imparting reciprocatory motion to one of the members relative to the other, valve means for reversing the direction of said motion, means independent of said reciprocated member for periodically operating the valve means at intervals, means for varying the speed of the motor, and an element operatively connected to the reciprocated member for controlling the speed-varying means in response to the movement of the element imparted thereto by the reciprocated member.

8. In a winding machine, a supporting member, a strand-collecting device on the member, a member for guiding a strand to the device, a fluid motor for imparting reciprocatory motion to one of the members relative to the other, valve means for reversing the direction of said motion, means independent of said reciprocated member for periodically operating the valve means at regular intervals, means for varying the speed of the motor, and an element operatively connected to the reciprocated member for controlling the speed-varying means in response to the movement of the element imparted thereto by the reciprocated member.

9. In a winding machine, a supporting member, a strand-collecting device on the member, a member for guiding a strand to the device, a fluid motor for imparting reciprocatory motion to one of the members relative to the other, a valve connected to the motor for reversing the direction of said motion, means independent of said reciprocated member for periodically operating the valve at regular intervals, a pump for controlling the rate of flow to the motor, driving means for the pump, and control means comprising an element operatively connected to the reciprocated member for varying the rate of discharge of the pump in response to the movement of the element imparted thereto by the reciprocated member.

10. A machine as defined in claim 9 in which the pump is a variable displacement pump.

11. A machine as defined in claim 9 in which the control means varies the speed of the pump.

12. In a winding machine, a supporting mem-

ber, a strand-collecting device on the member, a member for guiding a strand to the device, fluid driving means for imparting reciprocatory motion to one of the members relative to the other, said driving means comprising a fluid motor having a piston therein, valve means for supplying a fluid alternately to opposite sides of the piston to reverse the driving means, means independent of said reciprocated member for reversing the valve means at intervals, and means for controlling the rate of flow to the valve means, said controlling means comprising an element operatively connected to the reciprocated member for varying the rate of flow in response to the movement of the element imparted thereto by the reciprocated member.

13. In a winding machine, a supporting member, a strand-collecting device on the member, a member for guiding a strand to the device, fluid driving means for imparting reciprocatory motion to one of the members relative to the other, valve means for reversing the direction of said motion, means independent of said reciprocated member for periodically operating the valve means at regular intervals, means for supplying a fluid to the driving means through the valve means, and means for controlling the rate of flow to the valve means, said controlling means comprising an element operatively connected to the reciprocated member for varying the rate of flow in response to the movement of the element imparted thereto by the reciprocated member.

14. In a winding machine, a supporting member, a strand-collecting device on the member, a member for guiding a strand to the device, a hydraulic motor for imparting reciprocatory motion to one of the members relative to the other, a valve connected to the motor for reversing the direction of said motion, means independent of said reciprocated member for periodically reversing the valve at regular intervals, a pump for controlling the rate of flow to the motor, driving means for the pump, and control means

comprising an element directly connected to, and movable with, the reciprocated member for varying the rate of discharge of the pump in response to the movement imparted to the element by the reciprocated member.

15. A machine as defined in claim 14 in which the pump is a variable displacement pump comprising a movable member which varies the displacement of the pump in accordance with its movement, and movement of the element imparts movement to said last-mentioned movable member.

16. A machine as defined in claim 14 in which the driving means comprises a variable speed device and the element varies the ratio of said device.

17. In a winding machine, a reciprocable supporting member, a strand-collecting device on the member, a member for guiding a strand to the device, a hydraulic motor for imparting reciprocatory motion to one of the members relative to the other, a valve connected to the motor for reversing the direction of said motion, means independent of said reciprocated member for periodically reversing the valve at regular intervals, a pump for controlling the rate of flow to the motor, driving means for the pump, means for varying the rate of discharge of the pump, and movable means driven by the reciprocated member for controlling the varying means in response to movement derived from the reciprocated member.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,641,300	Spencer	Sept. 6, 1927
2,182,745	Ferris	Dec. 5, 1939
2,276,916	Barrett	Mar. 17, 1942
2,539,267	Nikles	Jan. 23, 1951