The invention relates to a motion reversing mechanism for regulating the reciprocating movements of a traverse device, and particularly to a rapid or snap acting mechanism which is capable of quickly reversing the direction of travel of a traverse moving at a high speed on a textile yarn winding machine.

The principal object of the invention is to provide a generally improved and more satisfactory snap acting motion reversing mechanism.

Another object is the provision of a device which is capable of automatically actuating a traverse drive means as the traverse approaches predetermined limits of travel.

Still another object is the provision of an improved motion regulating mechanism which is moved into a cocked position by the traverse device itself as it passes through its normal path.

A further object is to provide a resiliently operated motion reversing mechanism which is adapted to rapidly and uniformly effect a reversal in the direction of travel of traverse device moving at high speed, is reliable in operation, and is simple in construction and use.

These and other objects and advantages of the invention will be apparent from the following description and accompanying drawing in which:

Fig. 1 is a vertical section of the motion reversing mechanism of the present invention taken along the line I-I of Fig. 2.

Fig. 2 is a vertical section taken along the line II-II of Fig. 1, with certain of the parts being broken away.

The invention relates to a rapid or snap acting motion reversing mechanism for quickly reversing the direction of travel of a traverse, preferably hydraulically operated, moving at high speed. The reversing mechanism is gradually moved into its cocked or spring-loaded position by the traverse itself as it moves through its normal path, and is capable of rapidly, uniformly, and reliably reversing the traverse drive means as the traverse moves into its predetermined limit of travel. While a solenoid operated reversing valve is satisfactory for a relatively slow moving traverse, the mechanism of the present invention is especially adapted for use with a high speed hydraulic traverse. Use of the present invention in regulating the reciprocating movements of the traverse device employed with a textile yarn up-twister device has proved to be particularly satisfactory in forming double-cone type yarn packages wherein the yarn has a steeper helix angle than was heretofore possible. It is of course obvious that the mechanism of the present invention is adapted for numerous and different applications and is not limited for use only with textile machinery.

With particular reference to the drawing, the reversing mechanism includes a base plate 11 secured to a suitable supporting structure, as for example the channel 13, by screws 15 and spacers 17. Projecting from the front face of the base plate 11, and secured thereto as by screw 19, is a pin 21 having a free end of reduced diameter on which is pivotally mounted a Y-shaped actuating lever 23. In operation the lever 23 oscillates through approximately a 50° angle against the resilient bumpers 25, formed for example of rubber. Any suitable means, as for example a washer 27 and screw 29, may be employed for retaining the lever on the free end of the pin 21. The bumpers 25 are bonded or dovetailed to the plates 31 which are in turn secured, by washers 33 and screws 35, to the front ends of the projecting plates 37, welded or otherwise connected to the base plate 11. The plates 31 are provided with vertically elongated slots 39 to permit adjustment and easy replacement of the bumpers 25. The upper face of the actuating lever 23 has an arcuate flange 41 forming a cam surface having relatively flat ends along which the roller 43 is adapted to ride. The roller 43 is rotatably mounted within the lower bifurcated end of the bracket 45 by a screw 47. A piston rod 49 is connected at one end to a suitable traverse mechanism (not shown), while its opposite end is frictionally gripped by the bracket 45 which is split to permit a firm gripping action to be applied by the screws 51. On the upper end of the bracket 45 is rotatably mounted, as by screw 53, a guide roller 55. A pair of spaced supporting plates 57 and 59 are releasably connected at their upper ends by screws 61 to the opposite edges of a guide plate 63 which has a continuous longitudinally extending groove 65 in which the roller 55 rides. The lower end of the plate 57 is connected to the base plate 11, while the lower end of the plate 59 is secured to the channel 13 through a reinforcing angle bar 67 and forms a front cover for the reversing mechanism. A bearing 69 is detachably fixed at its opposite ends to the plates 57 and 59 by the screws 71, and assists in supporting the piston rod 49 against bending.

A valve 73 is provided for transmitting the snap action regulating movement of the reversing mechanism by means of the conduits 74 and 75 to the hydraulic drive means of the traverse mechanism, and includes a flange 76 secured by screws 77 to the front face of the base plate 11, while the remainder of its structure projects rearwardly of the base plate through the opening 79. A ratchet plate 81 is securely fixed to the shaft 83 of the valve 73 by means of bolts 85 and nuts 87 passing through the outer end of the split bushing 89. The valve shaft 83 is located vertically below the actuating lever pivot, as seen in Fig. 1, and is rotated approximately through a 47° angle as the ratchet plate 81 is oscillated between the resilient bumpers 91. The bumpers 91 are similar in construction to the bumpers 25 previously described and are bonded or dovetailed onto the lower portions of the plate 93 which in turn are secured to the base plate 11. As with the plates 31, the plates 93 are provided with vertically elongated slots 97 to permit these plates to be adjusted relative to the screws 99 and washers 101.

Movement is imparted to the ratchet plate 81 through resilient means extending between the ratchet plate and the arm 103 of the actuating lever 23. This resilient means includes a telescoping connection formed by the socket or sleeve 105 and pin 107 pivotally mounted, respectively, to the arm 103 and ratchet plate 81 along their center lines. As best seen in Fig. 2, the pivotal mounting for the socket 105 includes a screw 109 passing through the bearing 111 and spacer 113 and having threaded on its forward end a nut 115, while the corresponding mounting for the pin 107 includes a similar screw 117, bearing 119, spacer 121, and nut 123. A compression spring 125 encircles the telescoped sleeve 105 and pin 107 and bears against the flanged portions 127 and 129 formed integrally with the bearings 111 and 119 respectively.

From the structure thus far described, it is seen that the oscillating movement of the actuating lever 23 is in turn transmitted to the ratchet plate 81 through the resilient connection including the spring 125 and the tele-
scopped socket and pin 105 and 107. Rather than oscillating the ratchet plate 81 simultaneously with the oscillation of the actuating lever, it is preferred to lock the ratchet plate alternately in its extreme positions and release the same with a snap or rapid movement as the actuating lever moves into engagement with its bumpers. The action of the ratchet plate 81 is facilitated by the locking pawls 131 and 133 pivotally mounted on the reduced forward ends of the pins 135 secured to the base plate 11 by the screws 137 and projecting forwardly therefrom. The pawls 131 and 133 are adapted to engage within the V-shaped notches 136 and 139, respectively, formed in the accurate edge 140 of the ratchet plate 81, as shown in Fig. 1, until tripped as hereinafter described. Springs 141 encircle the pins 135 and have one end secured thereto, and constantly urge the pawls 131 and 133 into engagement with the ratchet plate.

The release of the pawls is effected by means of the trip plate 143 secured to the free end of the arm 102 of the actuating lever 23 by means of screws 145 and washers 147. The plate 143 has, on its outer end, a rearwardly projecting pin 149 adapted to engage with the edges of the guide plates 151 and 153, fixed, as by screws 155, to the outer surfaces of the pawls 131 and 133, respectively. Adjustment of the radial direction relative to the actuating lever pivot is facilitated by its elongated slots 157, while adjustment of the pawls 131 and 133 is accomplished by moving the pins 135 along the accurate slots 159 and 161 formed in the base plate 11 and having a center which corresponds to that of the shaft 83.

In use, the moment-reversing mechanism of the present invention is both cocked and actuated by the reciprocating movements of the traverse device with which it is employed. Thus, as seen in Fig. 1 the piston rod 49 is shown as approaching its rightward limit of movement with the roller about to ride upon the flat end of the camming flange 41. The ratchet plate 81 is held against its left bumper 91 by the pawl 131 and the compression spring 125 is in a compressed condition. It will be noted that with the spring 125 in a compressed condition (Fig. 1), the bearings 111 and 119 are located in laterally spaced vertical planes relative to each other and a vertical plane passing through the center of pin 21 and shaft 83. As the traverse device (not shown) urges the piston rod 49 further to the right, as viewed in Fig. 1, the roller 43 seats the actuating lever 23 firmly against the bumper 25, and the actuating lever 23 sufficiently to permit the pin 149 on the trip plate 143 to engage with the guide plate 151 and urge the pawl 131 counterclockwise against the action of its spring 141. This movement of the pawl 131 releases the ratchet plate 81 and enables the cocked spring 125 to snap the ratchet plate 81 counterclockwise against its right bumper 91, in which position it will be held by the pawl 133 seated within the notch 139. As heretofore mentioned, the ratchet plate 181 moves through approximately a 47° angle indicated by the broken lines 163 and 165, and since it is rigidly connected as to the valve shaft 83, this shaft is likewise rotated to effect a reversal of the traverse hydraulic drive means.

Movement of the piston rod 49 to the left by the traverse device, as viewed in Fig. 1, causes the roller 43 to ride upon the camming flange 41 and gradually pivot the actuating lever 23 counterclockwise through approximately a 50° angle to a position as indicated by the broken line 167. As this movement of the actuating lever urges the bearing 111 slightly beyond the center of the pin 21, as viewed in Fig. 1, the sleeve 105 starts to move downwardly and gradually compresses or cocks the spring 125 until the leftward limit of the traverse device is approached, at which time the pin 149 of the trip plate 143 will engage the guide plate 153 to disengage the pawl 133 from the ratchet plate notch 139. In the same manner heretofore described in regard to the pawl 131, the ratchet plate is free to move clockwise under the action of the spring 125 until it is again locked in the position shown in Fig. 1.

It will be noted that the actuating lever 23 oscillates through a slightly greater angle than that of the ratchet plate 81 to insure that the pin 149 is moved a sufficient distance to urge the pawls fully from their respective notches 136 and 139. Degree of oscillation of the actuating lever and ratchet plate have been noted as 50° and 47°, respectively, it will of course be understood that these angles may be varied by merely adjusting the plates 31 and 93 relative to the base plate 11, extending the trip plate 143 along the arm 103, and altering the position of the locking pawl pivots along the slots 159 and 161. Regardless of degree of accurate swing of these members, it is preferred to have the actuating lever 23 move through a greater angle than the ratchet plate for proper operation.

From the structure above described, it is seen that the mechanism of the present invention provides a desirable fast-acting reversal of the hydraulic drive means of the traverse mechanism in a highly satisfactory manner. Further, it will be seen that the various elements can be readily adjusted or replaced to compensate for any wear or damage.

It is seen from the above description that the objects and advantages of the invention are well fulfilled by the described. The description is intended to be illustrative only and it is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined by the appended claims.

1. A snap action motion reversing mechanism for use with a traverse mechanism of a textile yarn twister having a hydraulic valve and reciprocable piston rod, including a rotatable ratchet plate movable between first and second positions, pawls for locking said ratchet plate alternately in said first and second positions, an actuating lever, a cam surface on said actuating lever, a roller carried by said piston rod and engaging with said cam surface, said roller being adapted to urge said actuating lever between third and fourth positions as said piston rod is reciprocated, a motion transmitting arrangement extending between said actuating lever and said ratchet plate including a sleeve pivotally connected to said actuating lever, a pin pivotally connected to said ratchet plate and telescopically engaging said sleeve and a resilient member urging said sleeve and pin away from each other, and a plate carried by said actuating lever and adapted to alternate disengagement and engagement of said locking pawl from said ratchet plate as said actuating lever approaches its third and fourth positions respectively.

2. A snap action motion reversing mechanism for use with a traverse mechanism having a hydraulic valve and reciprocable piston rod, including a rotatable ratchet plate movable between first and second positions, means for locking said ratchet plate alternately in said first and second positions, a rotatable actuating lever, a cam surface on said actuating lever, a roller carried by said piston rod and engaging with said cam surface, said roller being adapted to urge said actuating lever between third and fourth positions as said piston rod is reciprocated, said cam surface having flattened end portions causing said roller to pivot said actuating lever into said third and fourth positions with an abrupt motion, resilient means operatively connected to said actuating lever and ratchet plate, and means carried by said actuating lever for alternately disengaging said ratchet plate locking means as said actuating lever is abruptly moved into its third and fourth positions.

3. A snap action motion reversing mechanism for use with a traverse mechanism having a hydraulic valve and reciprocable piston rod, including a reciprocable ratchet plate movable between first and second positions, a rotatable actuating lever, means separate from said actuating lever for locking said ratchet plate alternately in said first and second positions, means carried by said
piston rod for urging said actuating lever between third and fourth positions as said piston rod is reciprocated, resilient means operatively connected to said ratchet plate and actuating lever for transmitting motion to said ratchet plate as said actuating lever moves into its third and fourth positions, and means carried by said actuating lever for alternately disengaging said ratchet plate locking means as said actuating lever moves into its third and fourth positions.

4. A snap action reversing mechanism including a rotatable plate movable between first and second positions, means for locking said plate alternately in said first and second positions, a movable actuating lever, cam means on said actuating lever, means acting on said cam means for urging said actuating lever between third and fourth positions, resilient means operatively connected to said actuating lever and plate, and means carried by said actuating lever for alternately disengaging said plate locking means as said actuating lever is moved onto its third and fourth positions.

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