This invention relates to a mechanism by means of which the inking ribbon of printing devices is advanced by a step-by-step movement and the direction of feed is reversed before the ribbon is all unwound from a spool.

It is an object of this invention to insure a reliable actuating and reversing of the ribbon by making the engagement of the driving pawl with the ratchet wheel positive.

A further object of this invention is to maintain said reliability in working for a long time without the necessity of overhauls or replacement of parts, by eliminating striking of the driving pawl on the ratchet wheel during the return stroke of the pawl. These features render the mechanism according to this invention more particularly suitable for use in connection with cash registers and other registering machines.

Further objects of the invention will appear from the detailed description of the drawings in which a preferred form of the object of the invention is illustrated. In this preferred form each of the two spools for the inking ribbon is solidly connected with a ratchet wheel and the two pawls for actuating said wheels are articulated to a support which is oscillated reciprocately by the printing mechanism. An abutment which is displaced by the inking ribbon as unwinding is near completion, is struck by one of the two pawls at the end of the idle or return stroke whereby the pawl is brought into engagement. At the end of the forward stroke the pawl strike against a further abutment which brings them out of engagement.

Figure 1 is a front view of the ribbon feed mechanism:

Figure 2 is a section on the line II—II of Fig. 1. Figure 3 is in its left half a section on the line III—III in its right half a section on the line IV—IV of Figure 2.

Figure 4 is a partial section on the line IV—IV of Figure 2.

Figure 5 is a more diagrammatical view showing the mechanism driving means and the path of the ribbon on a smaller scale.

The base plate 1 has fixed at thereto a vertical wall 2 formed with a central opening 2a and side flanges 3, 3 (Figures 2 and 3). A pivot 4, 4' is mounted on each of the flanges 3, 3 and is fixedly connected with one of the spools 5, 5' for the inking ribbon 6. The ribbon 6 travels from the spool 5 over the spool 7 as far as the edge 9, inclined through 45°, of the plate 1, on which it is deflected at right angles. Thence the ribbon travels over an inclined edge on the other side of the plate 1, is bent at right angles again and passing over the roller 7' reaches the spool 5'. In the printing zone which is situated between the inclined edges 9, the plate 1 is formed with a recess 10 (Fig. 3). Two levers 12 and 12' are pivoted by means of the pivots 8 and 8' on the front wall 2 and their ends control the inking ribbon 6 which is fitted with two eyelets, hooks or the like 13, said eyelets being a small distance apart from the respective ribbon ends. Shortly before unwinding of the ribbon from one spool is completed, the eyelet 13 at this end abuts the lever 12 or 12', respectively, and oscillates it against the action of the spring 11 or 11', respectively.

A slidable plate 14 is guided by means of two slits 15, 15' on the pivots 16, 16' screwed in the upper portion of the wall 2. The plate 14 is formed above with a flange 17 and below with two cams 18, 18' entering the opening 2a in the wall 2. The plate 14 is either in the position displaced towards the right, as shown in Figure 1, or in the position displaced towards the left, according to whether the inking ribbon is being wound on the spool 5' in which case the plate 14 is in its right-hand position or on the spool 5 in which case the plate is in its left-hand position. The plate displacement produces in the manner hereinafter described the reversal of the ribbon-feed and is obtained by means of the following mechanism. The plate 14 is provided with a central abutment 19 which is situated in the path of two arms 20, 20' pivoted after the manner of scissors on the bush 21 mounted in the lower portion of the wall 2. The arms are provided with teeth 20a, 20'a and extensions 20b and 20'b between which the actuating spring 43 is stretched. The arms 20, 20' are normally situated in the position shown in Figure 1 for the arm 20', in which the tooth 20'a bears against the action of spring 43 on the step 42 formed on the above mentioned lever 12. As shown also by Figure 1, as the eyelet 13 of the inking ribbon strikes against the lever 12', the latter is rocked clockwise and the step 42 on the lever 12' is released from the tooth 20, so that the lever 20 under the action of spring 43 performs an oscillation towards the right displacing the plate 14 by means of the abutment 19. The displacement towards the left is performed as the other eyelet 13 strikes against the lever 12, thereby releasing the tooth 20' and rocking the arm 20' towards the left. As shall be hereinafter described, after each reversal, the arm 20 or 20' having moved the plate is returned to its normal
position, in which its tooth 20 or 20' bears on the respective step 42, by the member 44 which moves downwardly pushing apart the inner sides of the flanges 20 and 20' on the arms 20, 20'.

In the tension of spring 43, till the step 42 under the action of spring 41 on the end of the pawl 11 is returned underneath its respective tooth 20 or 20'.

The ribbon feed mechanism is driven by the cam 45 (Fig. 5) performing on each printing operation a turn which is transformed into a return oscillation of the lever 46 pivoted at 47 and under the action of the return spring 48. An arm on the lever 46 acts by means of a pin and slot guide on the beam 25 keyed on the pivot 27 extending between the above mentioned pivots 4 and 4' for the spoons 5, 5'. The pivot 27 is arranged in the support 22 having its upper portion U-shaped and secured by means of the screw 24 to the wall 2, and carries two arms 28, 28'.

The beam 26 and two arms 28, 28' therefore perform on each printing operation a forward oscillation indicated in Fig. 2 by the arrow A and a return oscillation indicated by the arrow B. A pawl 29, 29' is articulated to each arm 28, 28' by means of a pivot 32, 32', respectively. A ratchet wheel 31 is actuated by the pawl 29 and a ratchet wheel 31' is actuated by the pawl 29', the former wheel being fixedly connected with the pivot 4 for the spoon 5, while the latter is fixedly connected with the pivot 4' for the spoon 5' for the ink ribbon 6.

According as to whether the pawl 29 or 29' is in engagement with the wheel 31 or 31' during oscillation in the direction A, the spoon 5 or spoon 5' is positively operated and the ink ribbon winds up thereon. This engagement of either pawl 29 or 29' is produced by the flange 17 on the plate 14, whilst at the end of each forward or operative oscillation of the arms 28, 28', both pawls 29, 29' are positively disengaged by their extensions 35, 35' striking against a cross bar 30 mounted on the flanges 3 and 3'. At the end of the return oscillation of the arms (idle stroke in the direction B) the extensions 35, 35' enter slots with inclined bottom 2' opening into the opening 2 in the wall 2, and according to the position of the plate 14 the extension 35 on the pawl 29 or the extension 35' on the pawl 29' strikes the flanges 17 on the plate, whereby the respective pawl engages the ratchet wheel 31, 31', respectively. Supposing the last displacement of the plate 14 has been produced by the eyelet 13 provided on the ribbon 6 near the spoon 5 by striking against the lever 12, the flange 17 has come into the path of the extension 35 on the pawl 29 and at the end of each return oscillation (direction B) the pawl 29 is engaged so that on the next forward oscillation the spoon 5 is driven and the ribbon 6 is unwound from the reel 5'. In the position shown in Fig. 1 the eyelet 13 coming from the spoon 5' strikes against the lever 12'. The flange 17 is removed from the path of the extension 35 and enters the path of the extension 35' on the pawl 29'.

The ratchet wheel 31' and spoon 5' are thereupon positively rotated whilst the pawl 29 is left all the time disengaged from its ratchet wheel 31. A small cylinder 44 is arranged on the rear end of the beam 26 and oscillates on each operation in the space between the two arms 28, 28' returning after displacement of the plate 14 the respective arm 20 or 20' to its normal position.

To keep the pawls 29, 29' in a determined position with respect to the arms 28, 28' till they strike against the cross bar 30 or flange 17, the end of the spring 41 is engaged with a leaf spring 41' acting on a ball 40 arranged in a hole in the pawl (Fig. 4). Depending upon the engaged or disengaged position of the respective pawl, the ball 40 enters one or the other of two recesses 39 in the oscillating arms 28, 28', keeping the pawl in the desired position with respect to the arm 28 or 28', till it is disengaged by striking against the rod 38 or engaged by the striking against the flange 17.

Opposite each ratchet wheel 31, 31' a stop pawl 30 is actuated by means of the pin 33 to the fixed support 22 and is drawn to its engaged position by the spring 37. To release the spoon 5 or 5' from which the ink ribbon 6 unwinds, the stop pawl acting on the ratchet wheel 31, 31' of said spoon should remain disengaged. This is effected in accordance with the displacements of the plate 14 by the cams 18 and 18' and the act upon the extension 34 on the stop pawl 30.

In the position shown in Figures 1 and 2, in which the pawl 29, 35 is inoperative, the extension 34 on the stop pawl 30 is pushed by the cam 18, so that the pawl remains out of engagement of the respective stop wheel 31. As soon as the plate 14 is arranged to actuate the pawl 29, 35, the stop pawl 30 of the respective ratchet wheel 31 is released and is left in engagement with said wheel 31 by virtue of the tension of the spring 37.

While I have shown but one embodiment of my invention, it is obvious that it may be embodied in other forms covered and defined by the appended claims.

What I claim is:

1. A ribbon feed mechanism having two spoons for the ends of the ribbon, comprising for each spoon, in combination, a ratchet wheel coupled for rotation with the spoon, a pawl for driving said ratchet wheel, a support for said driving pawl, means for imparting a reciprocatory movement to said support, a stop for said driving pawl to bring it out of engagement from the respective stop wheel, a second stop for the driving pawl to bring it into engagement with the ratchet wheel at the end of its operative stroke, a second stop for the driving pawl to bring it into engagement with the ratchet wheel at the end of its return stroke, and with the ribbon controlled means for bringing said second stop into engagement for out of operative position.

2. A mechanism according to claim 1, in which the two spoons, ratchet wheels and pawl supports are pivoted side by side about a common axis.

3. A ribbon feed mechanism having two spoons for the ends of the ribbon, comprising for each spoon, in combination, a ratchet wheel coupled for rotation with the spoon, a pawl for driving said ratchet wheel, a support for said driving pawl, means for imparting a reciprocatory movement to said support, a stop for said driving pawl to bring it out of engagement from the respective ratchet wheel at the end of its operative stroke, a second stop for the driving pawl to bring it into engagement with the ratchet wheel at the end of its return stroke, a spring latch between said driving pawl and its support for retaining the driving pawl in its engaged and disengaged position, and ribbon controlled means for bringing said second stop into and out of operative position.

4. A ribbon feed mechanism having two spoons 75
for the ends of the ribbon, a slide and ribbon controlled means for displacing said slide, comprising for each spool, in combination, a ratchet wheel coupled for rotation with the spool, a pawl for driving said ratchet wheel, a support for said driving pawl, means for imparting a reciprocatory movement to said support, a stop for said driving pawl to bring it out of engagement from the ratchet wheel at the end of its operative stroke, a second stop for the driving pawl to bring it into engagement with the ratchet wheel at the end of its return stroke, said second stop being mounted on said slide in such manner as to come into and out of its operative position by the effect of the displacements of the slide, a spring actuated lever for displacing said slide, a ribbon controlled latch for retaining said lever in inoperative position, and a restoring member for said lever coupled with said pawl supports.

7. A ribbon feed mechanism having two spools for the ends of the ribbon and a displaceable slide, comprising for each spool, in combination, a ratchet wheel coupled for rotation with the spool, a pawl for driving said ratchet wheel, a support for said driving pawl, means for imparting a reciprocatory movement to said support, a stop for said driving pawl to bring it out of engagement from the ratchet wheel at the end of its return stroke, said second stop being mounted on said slide in such manner as to come into and out of operative position by the effect of the displacements of the slide, a spring actuated lever for displacing said slide, a ribbon controlled latch for retaining said lever in inoperative position, and a restoring member for said lever coupled with said pawl supports.

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