United States Patent

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[54] DEVICE FOR REVERSING LONG TAPE

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[52] **U.S. Cl.**.....**197/165**

[51] **Int. Cl.**.....**B41j 33/44**

[58] **Field of Search**.....197/165

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Assistant Examiner—R. T. Rader

Attorney—Burgess, Ryan and Wayne

[57] **ABSTRACT**

A device for advancing tape or the like for use in, for example, typewriters in which a movable member is displaced by stoppers fixed to the tape adjacent to its ends so that in response to the movement of this member, the tape is reversed in direction. The tape or the like may be positively reversed and when the positions of the stoppers are slightly changed, the position at which, for example, a type strikes a typewriter ribbon may be changed, so that the service life of the ribbon, tape or the like may be increased.

5 Claims, 5 Drawing Figures

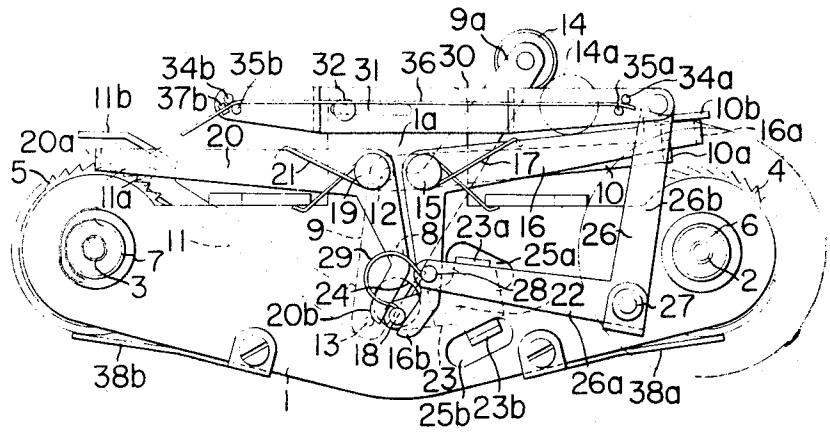
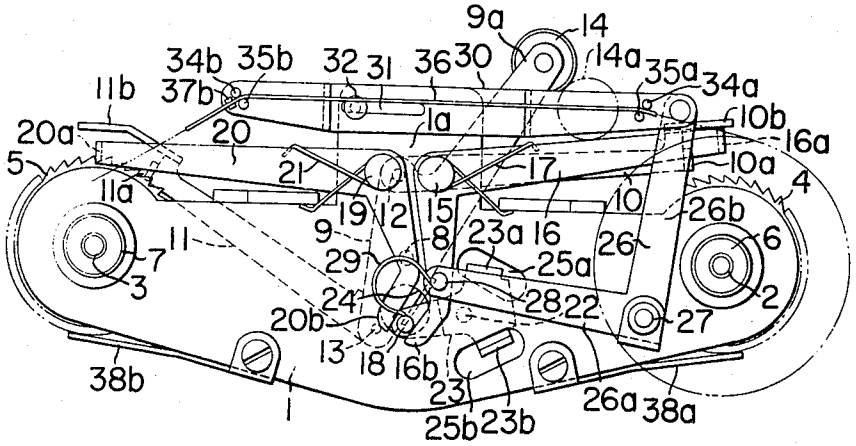


FIG. 1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10a
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26b
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23a
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FIG. 2

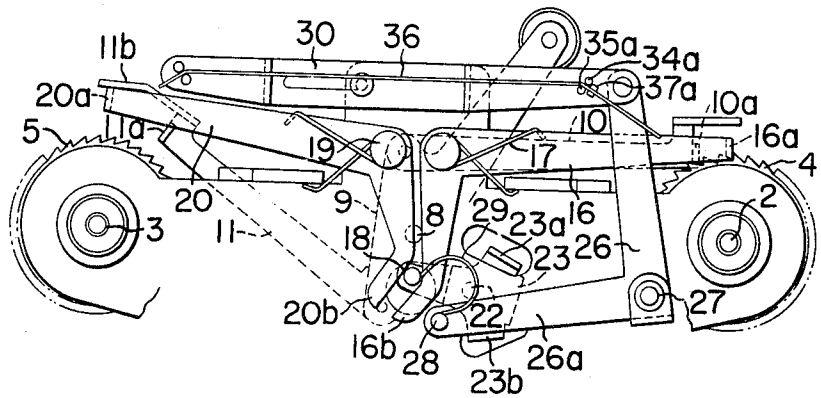
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FIG. 3

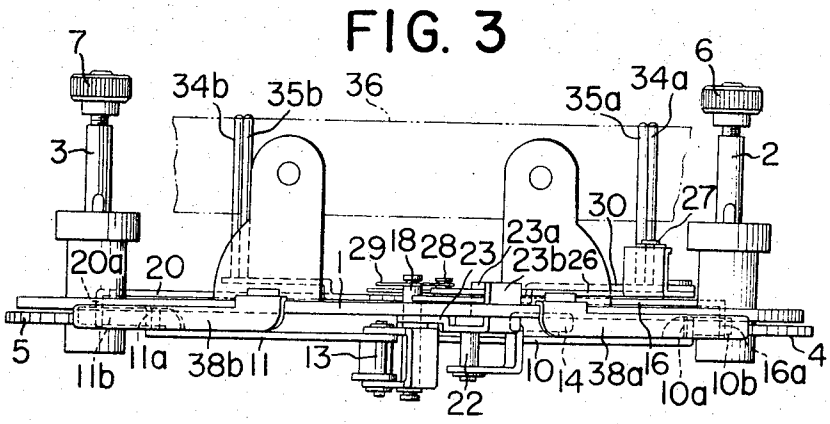


FIG. 4

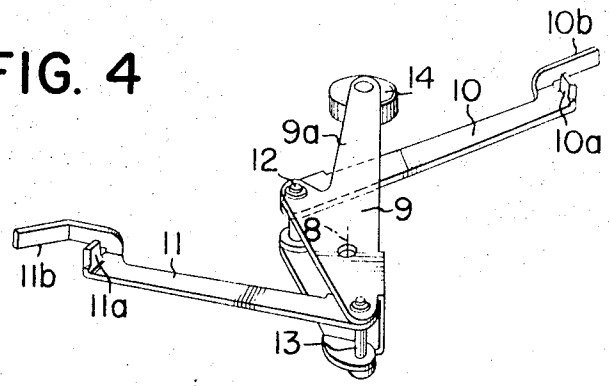
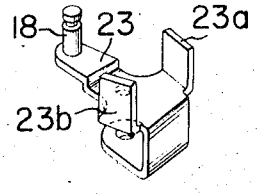


FIG. 5



DEVICE FOR REVERSING LONG TAPE

BACKGROUND OF THE INVENTION

The present invention relates to generally a typewriter and more particularly a device for reversing a long tape or typewriter ribbon.

The carbon tape or ribbon consisting of a base such as plastic or fabric and carbon coated thereupon or impregnated therein is generally used in a typewriter for printing. The carbon tape is advanced from one reel to another intermittently whenever one character is printed and is taken in by the other reel. When the one reel is emptied, the tape is reversed in direction and is advanced from the other reel. Thus, the tape can be reciprocated from one reel to the other and vice versa.

In the conventional device for reversing the tape or typewriter ribbon, both ends of the tape are fixed to the hubs of the supply and take-up reels and when the supply reel is emptied, a lever in contact with the tape is rotated by the tensile force of the tape produced when a key is struck, thereby actuating the tape reversing devices. In the device of the character described above, the tensile force of the tape is not directly acting upon the lever, but a component of the tensile force acts upon the lever, so that the tensile force must be sufficient enough to provide the component thereof. Therefore, the force for striking the key must be increased. Otherwise, the component of the tensile force is not sufficient enough to rotate the lever, so that the tape will not be reversed in direction.

In view of the above, the primary object of the present invention is to provide a device for reversing tape or typewriter ribbon in which the movement of the tape when the supply reel is almost emptied is utilized so as to reverse the tape in a positive and reliable manner.

SUMMARY OF THE INVENTION

One of the novel features of the present invention resides in the fact that a movable member is directly displaced by a stopper which is fixed to the tape adjacent to one end thereof when the supply reel is almost emptied, so that a mechanism for advancing the tape which is operatively coupled to the movable member may be automatically switched, thereby reversing the tape.

In the device of the present invention, the tensile force of the tape can be directly utilized in displacing the movable member, so that the tape can be reversed positively. The position of the stopper relative to the tape or ribbon may be changed after some repetitive uses, so that the type striking position relative to the tape or ribbon may be varied. Therefore, the vague impression of the tape or ribbon upon a paper which rests against a platen, due to the fact that types strike only the same portions of the tape, can be advantageously prevented.

According to one embodiment of the present invention, a device for reversing the tape or ribbon comprises a pair of spaced tape or ribbon winding shafts and a pair of ratchet wheels which rotate these shafts. An actuating member which pivots every time when a printing mechanism is actuated is interposed between the pair of winding shafts. To one end of this actuating member is fixed a shaft actuating member which rotates one of the ratchet wheels and to the other end of the actuating member is fixed another shaft actuating member which rotates the other ratchet wheel. Stoppers are fixed to the tape adjacent to the ends thereof, so that when the supply reel is almost emptied, the movable member is displaced by one of the stoppers. When the movable member is displaced in one direction, one of the shaft actuating members together with its associated catch member for one of the ratchet wheels is deactivated while when the movable member is displaced in the other direction, the other shaft actuating member together with its associated catch member for the other ratchet wheel is deactivated, whereby the tape or ribbon may be reversed in direction.

The above and other objects, features and advantages of the present invention will become more apparent from the description of one illustrative embodiment thereof taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a plan view of one embodiment of a device for reversing the tape or ribbon in accordance with the present invention;

FIG. **2** is a view similar to FIG. **1** illustrating that the tape advancing mechanism is reversed in the opposite direction;

FIG. **3** is a rear view of the embodiment shown in FIG. **1**;

FIG. **4** is a perspective view illustrating only ratchet actuating mechanisms; and

FIG. **5** is a perspective view illustrating only a swinging member which actuates catches for ratchet wheels.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Tape winding shafts **2** and **3** are rotatably fixed at both ends of a symmetrical base plate **1**. A ratchet wheel **4** is fixed to the shaft **2** while another ratchet wheel **5** is fixed to the shaft **3**. Reel retaining screws **6** and **7** are screwed to the tops of the shafts **2** and **3** respectively. These retaining screws **6** and **7** are unscrewed from the shafts **2** and **3** and thereafter reels are fitted over the shafts **2** and **3** and placed in position by screwing the retaining screws **6** and **7** again to the shafts **2** and **3**. In the instant embodiment, the supply reel having the tape wound around the hub thereof is fitted over the shaft **2** while a take-up reel having one end of the tape fixed to the hub thereof is fitted over the shaft **3**.

An actuating member **9** which is pivotably mounted by means of a pivot **8** to the center of the underface of the base plate **1** has a member **10** having a pawl **10a** which engages with the ratchet wheel **4** and a similar member **11** having a pawl **11***a* which engages with the ratchet wheel **5**. The members **10** and **11** are pivotably fixed to the actuating member **9** by means of pivots **12** and **13** respectively, which in turn are disposed at both sides of the pivot **8** of the actuating member **9** at the same spacing therefrom. A roller **14** is rotatably mounted to one end **9***a* of the actuating member **9** and is adapted to swing from the position indicated by the solid line in FIG. **1** to the position indicated by the chain line **14A** in FIG. **1** upon one rotation of a printing mechanism (not shown). It should be noted that the members **10** and **11** are biased by springs (not shown) so that their pawls **10***a* and **11***a* are normally pressed against the ratchet wheels **4** and **5** respectively.

An L-shaped catch member **16** which is pivotably mounted by means of a pivot **15** to a projection **1***a* extending from one side edge of the base member **1** has one arm extended in the same direction as the member **10** and has a catch **16***a* formed at the leading end of the arm for engagement with the ratchet wheel **4**. The catch member **16** is biased so as to normally rotate in the clockwise direction in FIG. **1** by means of a spring **17** and this rotation is limited when the side edge of the end **16***b* of the member **16** engages with a pin **18**. In this position, the catch member **16** has its catch **16***a* disengaged from the ratchet wheel **4** and the outer side edge of the catch **16***a* pushes an arm **10***b* extended from the one end of the member **10**, so that the pawl **10***a* of the member **10** is moved away from the ratchet wheel **4**.

Similarly, a catch member **20** for the ratchet wheel **5** which is pivotably mounted to the projection **1***a* of the base plate **1** by means of a pivot **19** has the similar construction as the L-shaped catch member **16**. The catch member **20** is biased by means of a spring **21** so as to normally rotate in the counterclockwise direction in FIG. **1** and a catch **20***a* at one end of the catch member **20** is pressed against the ratchet wheel **5**. The other end **20***b* of the catch member **20** is extended in the vicinity of the pin **18**.

The pin **18** is fixed to a swinging member **23** which in turn is pivotably mounted by means of a pin **22** to the undersurface of

the base plate 1. The pin 18 is extended toward the upper surface of the base plate 1 through a hole 24 formed through the plate 1. A pair of bent portions 23*a* and 23*b* of the member 23 are extended toward the outside surface of the base plate 1 through openings 25*a* and 25*b* respectively formed therethrough, and between this pair of bent portions 23*a* and 23*b* is interposed one arm 26*a* of a bell crank 26 which is pivotably mounted to the base plate 1 by means of a pivot 27. A pin 28 extending from the leading end of the arm 26*a* is connected to the pin 18 by means of a bowed spring 29 which has a tendency to expand outwardly.

One end of a movable member 30 in an elongated form is articulated to the leading end of another arm 26*b* of the bell crank 26. A rivet 32 having a head and extending from the base plate 1 is loosely fitted into an elongated slot 31 formed through the movable member 30, and at both ends of the movable member 30 are fixed pairs of pins 34*a* and 35*a* and 34*b* and 35*b* respectively. The pairs of pins 34*a* and 35*a* and 34*b* and 35*b* are spaced apart from each other by a relatively small distance.

The tape 36 is extended through the small spacings between the pairs of pins 34*a*, 35*a*, 34*b* and 35*b* and intermediate of the pins 34*a* and 35*a* and the pins 34*b* and 35*b* the tape 36 passes through a printing or type striking section.

Upon actuation of the printing mechanism, the actuating member 9 makes one reciprocal movement, so that the members 10 and 11 are displaced in the opposite directions. Since the pawl 10*a* of the member 10 is moved away from the ratchet wheel 4, the member 10 makes an "idle" run, but since the pawl 11*a* of the member 11 is pressed against the ratchet wheel 5, the ratchet wheel 5 is rotated through an angle corresponding to one tooth thereof upon the displacement of the member 11. In this case, the catch 20*a* prevents the reverse rotation of the ratchet wheel 5. Upon rotation of the ratchet wheel 5, the tape 36 is wound around the reel.

When all of the tape 36 is taken up by the reel carried by the shaft 3 and the reel carried by the shaft 2 is emptied, a stopper 38*a* (See FIG. 2) fixed to the tape 36 engages with the pins 34*a* and 35*a*. When the tape 36 is further advanced after the engagement of the stopper 37*a* with the pins 34*a* and 35*a*, the movable member 30 is displaced toward the left as shown in FIG. 2, so that the bell crank 26 is caused to rotate about the pivot 27 in the counterclockwise direction. Therefore, the pin 28 extending from the leading end of the bell crank 26 and having one end of the spring 29 fixed thereto is displaced across the line connecting the pin 18 of the member 23 and the pivot 22, so that the member 23 immediately rotates about the pivot 22 in the clockwise direction as shown in FIG. 2. The angle of rotation of the member 23 is limited when the bent portion 23*a* or 23*b* thereof engages with either of the side edges of the arm 26*a* of the bell crank 26.

When the member 23 is displaced from the position shown in FIG. 1 to the position shown in FIG. 2, the pin 18 disengages from the leading end 16*b* of the catch member 16, but pushes the side edge of the leading end 20*b* of the catch member 20, so that the latter is caused to rotate about the pivot 19 in the clockwise direction. Consequently, the catch 20*a* is moved away from the ratchet wheel 5 and the side edge of the catch 20*a* also pushes the arm 11*b* of the member 11, so that the pawl 11*a* is also moved away from the ratchet wheel 5, whereby the member 11 is deactivated.

On the other hand, the catch member 16 is caused to rotate about the pivot 15 in the clockwise direction by the spring 17, so that the catch 16*a* is pressed against the ratchet wheel 4 and the catch 10*a* which has been moved away from the wheel 4 is also pressed against the ratchet wheel 4.

When the ratchet actuating mechanism is switched as described hereinabove and the actuating member 9 is driven by the printing mechanism, the ratchet wheel 4 rotates in the clockwise direction so that the tape 36 is wound around the reel carried by the shaft 2. When the reel carried by the shaft 3 is emptied, the movable member 30 is displaced toward the right since another stopper 37*b* fixed to the tape 36 engages with the pair of pins 34*b* and 35*b*. It will be seen that the ratchet actuating or tape advancing mechanism is switched whenever the movable member 30 is displaced in either direction by the stopper 37*a* or 37*b* of the tape 36.

In the instant embodiment, both of the catch members 16 and 20 are actuated by the swinging member 23 having the pin 18, but it will be understood that a pin corresponding to the pin 18 may be fixed to the leading end of the arm 26*a* of the bell crank so as to directly actuate the catch members 16 and 20. When the movable member 30 is so designed that the movement of the movable member 30 may be directly transmitted to both of the catch members 16 and 20, the bell crank 26 can be eliminated.

Plate springs 38*a* and 38*b* whose free ends are pressed against the ratchet wheels 4 and 5 respectively are securely fixed to the base plate 1 and serve to apply the brake to the ratchet wheels when they are rotated by the tape, thereby preventing the slackening of the tape from the reels.

I claim:

1. A device for reversing a long tape comprising
   - a pair of tape winding shafts rotatably disposed in spaced apart relation with each other by a predetermined distance,
   - a pair of ratchet wheels fixed to said shafts respectively for rotating said shafts,
   - an actuating member pivotally mounted in an intermediate area between said shafts for pivotable movement in response to printing operation,
   - a first shaft actuating member fixed to one end of said pivotally mounted actuating member and actuable for rotating one of said ratchet wheels,
   - a second shaft actuating member fixed to the other end of said pivotally mounted actuating member and actuable when said first shaft actuating member is not actuable for rotating the other ratchet wheel,
   - a pair of catch members for releasable engagement with said ratchet wheels respectively in order to prevent reverse rotation thereof when said first and second shaft are respectively actuable,
   - stopper means fixed to each end of said tape,
   - a movable member which is adapted to be displaced longitudinally of a line connecting said shafts when engaged by said stopper means,
   - means mounted in said intermediate area between said shafts for selectively deactivating one of said shaft actuating members and actuating said other shaft actuating member to reverse tape direction when said stopper means effects said displacement, and
   - said mounted means comprises a pivotable element, an L-shaped lever having one end connected to said pivotable element and the other end connected to an end of said movable member and a pair of levers each having one end in contact with said pivotable element and the other end of each respectively including one of said catch members,

2. A device according to claim 1 in which said movable member includes a slot located to slide on a fixed pin to determine the amount of the longitudinal movement.

3. A device according to claim 1 in which said pivotable element includes a pin abutting said one end of each of said pair of levers, said pin movable in an arc as said pivotable element pivots to thereby rotate said ends of said pair of levers.

4. A device according to claim 1 in which spring means connects said one end of said L-shaped lever with said pivotable element, and rotation of said L-shaped lever caused by the longitudinal movement of said movable member effects the pivoting of said pivotable element.

5. A device according to claim 1 in which said other end of each of said pair of levers is respectively positioned adjacent one of said shaft actuating member, and rotation of said pair of levers effects contact with said actuating member to provide said selective deactivation thereof.

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