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[54] **RIBBON REVERSING MECHANISM**
11 Claims, 6 Drawing Figs.

[52] U.S. Cl. **197/162,**
197/165, 64/29

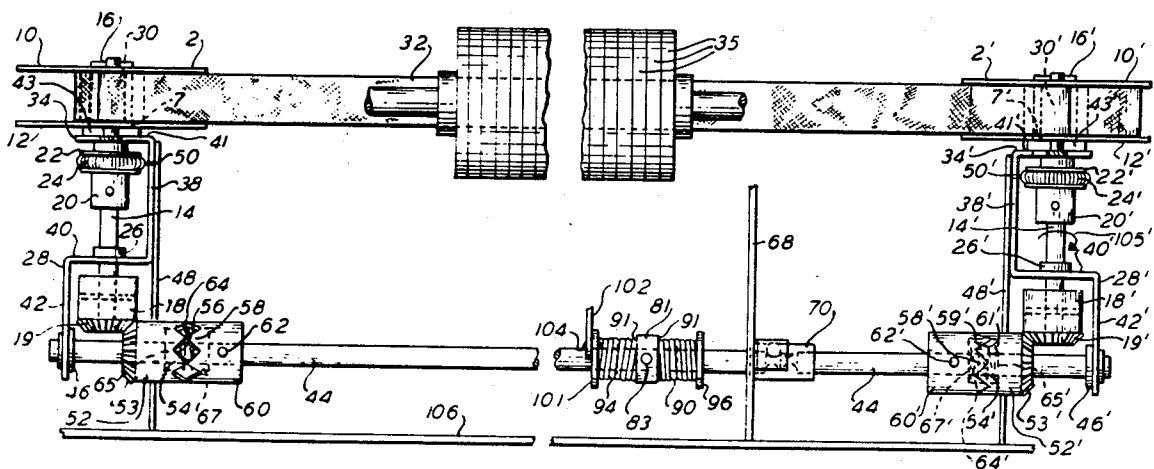
[51] Int. Cl. **B41j 33/46,**
B41j 33/44

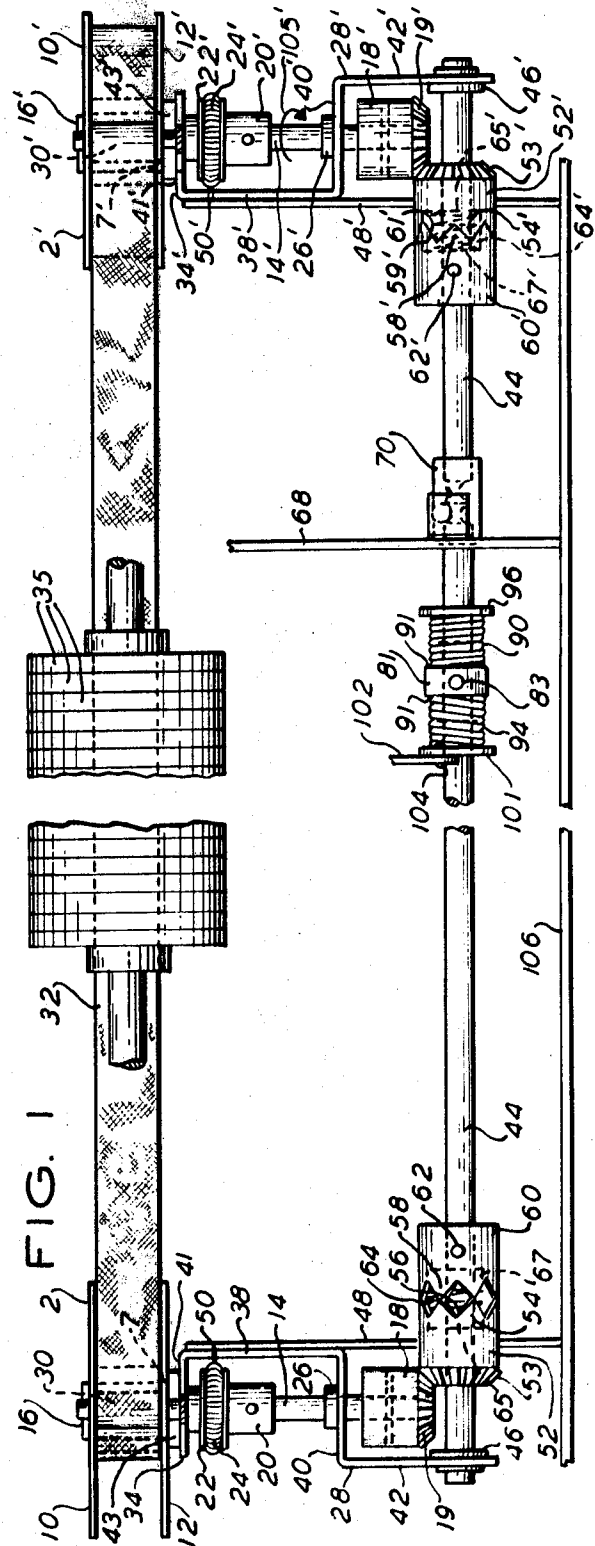
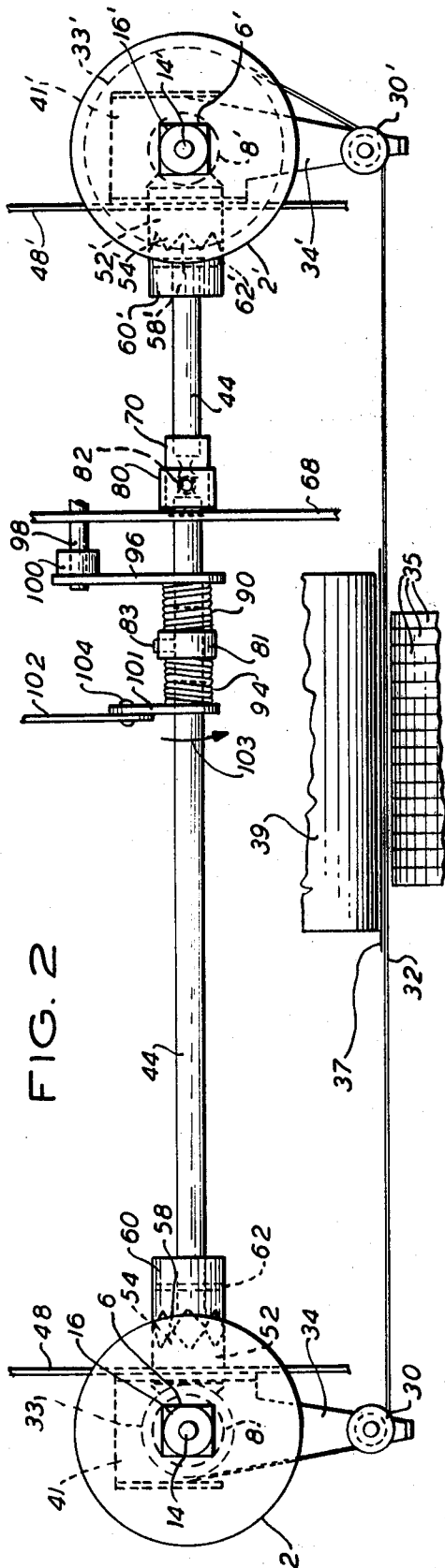
[50] Field of Search. 197/162,
160, 161, 163-165, 151, 84; 101/336; 64/29, 28

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ABSTRACT: A ribbon reversing mechanism operable by ribbon tension for alternatively winding a ribbon around one spool and then the other spool in a typical two spool ribbon winding mechanism such as employed on typewriters, calculators, etc. The reversing means for operating one spool or the other comprises a shiftable drive member which is shifted by two cam operated clutches, each of which also transmits the drive to one of the spools. The clutches are so arranged that as one starts to become disengaged, the other simultaneously starts to become engaged. Thus there is no intermediate position when neither spool is engaged to the drive.





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FIG. 3

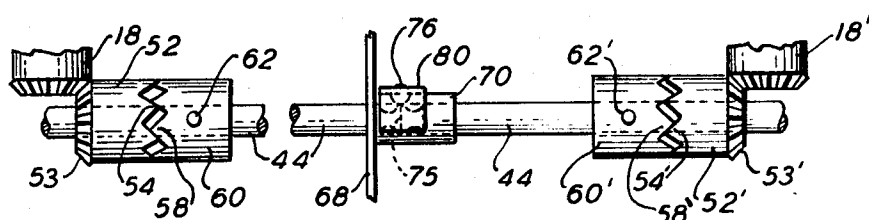


FIG. 4

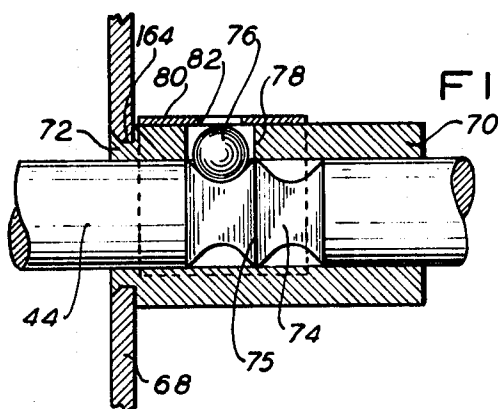


FIG. 5

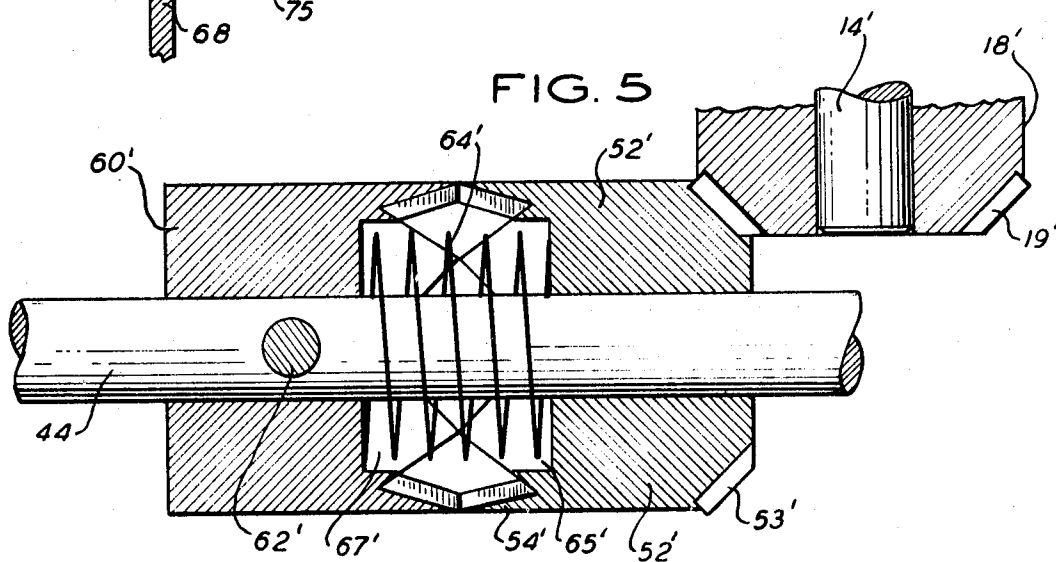
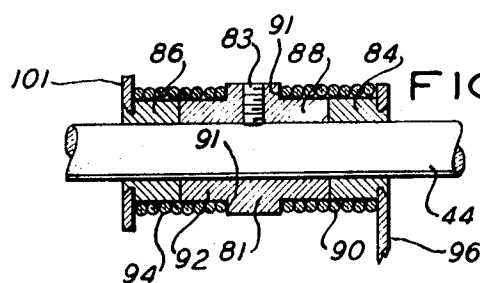


FIG. 6



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RIBBON REVERSING MECHANISM

A

BACKGROUND OF THE INVENTION

In typewriters and calculating machines employing reusable printing ribbons such as cloth ribbons, two winding spools are provided. The ribbon is wound around one of the spools as it is unwound from the other spool. The winding continues until the ribbon is completely unwound from one spool whereupon a switching mechanism is operated to switch the drive to the other spool. The standard switching mechanism consists of a member which has gears on each end, one or the other of which are engageable with either of the winding spools. The member is normally in driving engagement with one spool and when the ribbon is fully wound on that spool, the member is shifted to the other spool to drive that spool. During the interval in which the shift takes place, neither spool is connected to the drive. There is, therefore, a possibility that it might get stuck in this intermediate position and never shift the drive to the other spool. Further, the provision of this transfer position requires additional parts and thus results in more complicated mechanism which makes it more prone to malfunction.

Thus it would be most desirable if the intermediate position in a ribbon reversing mechanism where neither spool is engaged to the drive could be eliminated.

It would also be desirable to further simplify construction if the ribbon reversing means could be incorporated as part of the drive train to the spools.

Applicant has achieved these results by providing a mechanism whereby clutches are provided which transmit the drive to the spools and switch the drive from one spool to the other so that as one spool is being engaged to begin its winding operation the other spool is simultaneously being disengaged. The intermediate position where neither spool is engaged is completely eliminated and a more effective and reliable reversing mechanism is thus provided.

SUMMARY OF THE INVENTION

A ribbon reversing mechanism for switching the drive from one spool to the other in a ribbon feeding mechanism. The drive is first connected to one spool and thus the ribbon is wound thereon until the other spool is almost completely devoid of ribbon. In attempting to unwind more ribbon from the latter spool, the tension in the ribbon since its end is still connected to that spool in the usual manner, will cause a toothed clutch by which the drive is imparted to the full spool, to cam open and begin to shift the drive means so that it engages another toothed clutch connected to the empty spool.

The engagement of the latter clutch will cause the drive to rotate the empty spool and thereby rewind the ribbon. The two tooth clutches are so arranged that as one is being disengaged the other is being engaged. Thus one of the two spools is always engaged to be driven.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view of the ribbon reversing mechanism of my invention.

FIG. 2 is a plan view of the mechanism of FIG. 1.

FIG. 3 is a view of part of the mechanism as it switches from one spool to the other.

FIG. 4 is an enlarged cross sectional view of the detenting mechanism for holding the shifting member in position.

FIG. 5 is an enlarged cross sectional detail of a toothed clutch mechanism.

FIG. 6 is an enlarged cross sectional view of the spring clutch mechanism for the input drive.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The construction of my invention includes a reeling means which includes a pair of printing ribbon winding spools 2 and 2', constructed of metal, plastic, or other suitable material

with upper discs 10, 10', respectively, and parallel lower discs 12 and 12', respectively. In the center of discs 10 and 10', are square openings 6, 6' and in a like manner in the center of discs 12 and 12', are square openings 7 and 7'. Hollow cylindrical posts 8, 8' connect the discs 10, 12, 10', 12' by being positioned therebetween coaxial with openings 6, 6' and 7, 7', respectively.

As will be described herein, the two spools 2, 2' and the means for moving them as shown in FIGS. 1 and 2 are the mirror images of each other in construction and operation and therefore for ease in description, only the left one will be described in detail. The same numbers are used for both the right and left spools and associated mechanisms with primes being added to the right numbers to distinguish them.

Reverting back to the description, spool 2 is positioned on square member 16 which is fixed to shaft 14 and therefore the spool will rotate with shaft 14, as will be described hereinafter. Cylindrical member 18, having bevel tooth edge 19 is secured to the other end of shaft 14 for connecting it to the drive means. Positioned on the shaft 14 below member 16 is a collar 20 which has a channeled extension 22 projecting therefrom for retaining a spring 24. The spring 24 as will be described hereinafter serves to keep the ribbon taut on the spool 2.

Shaft 14 is supported by ribbon guiding member 28, which besides serving as a support for shaft 14 also guides the ribbon into printing position. To accomplish this a small wheel 30 mounted for free rotation is positioned on projection 34 of the guiding member 28.

The printing ribbon 32 passes around wheel 30 and then around outer surface 33 of cylinder 8 of a spool 2. Projection 34, on which wheel 30 is located, is positioned perpendicularly to shaft 14 and slightly below and parallel to disc 12 of the spool 2. The ribbon is therefore positioned so that it passes between platen 39 and type members 35 so that it can be impacted by the type members 35 to cause an impression on a sheet of paper 37 which is positioned against platen 39.

Type members 35 are shown as rotatable discs which are positionable by suitable mechanism (not shown) to the desired position. However, it will be appreciated that a single printing element such as used in typewriters or any other suitable printing device which employs a printing ribbon may be used with my invention. The platen 39 may be a single element for all type members 35 or individual elements for each type member or an element which moves from position to position with respect to the type members. The exact details of the printing elements and platen are not described in detail since they are not considered to be a significant part of the present invention.

Referring again to member 28, as shown in FIG. 1, it consists of four legs, the uppermost as shown in FIG. 1, being leg 41. This leg is positioned so that it helps support shaft 14 by the shaft passing therethrough. Washer 43 is positioned between leg 41 and disc 12 of spool 2 to reduce the friction therebetween. Projection 34, aforementioned, is coplanar with this leg 41 and extends therefrom.

The next leg is leg 38 which extends perpendicularly and downwardly from leg 41 and as will be described is secured to member 48 of the machine frame to support member 28.

The third leg of member 28 is leg 40 which is positioned perpendicularly to leg 38 so that it can support shaft 14 by the shaft 14 passing through an opening therein. Collar 26 connected to this leg 38 is positioned around shaft 14 to assist in holding the shaft 14. The connection between the legs of member 28 is such that shaft 14 can always rotate with respect to them.

The last and lowermost leg of member 28 is leg 42 which extends perpendicularly and downwardly from leg 40 and parallel to shaft 14. The leg 42 is positioned so that shaft 44 which is part of the input drive to the present machine, as will be described hereinafter, can be supported thereby. Shaft 44 fits in an opening in the leg 42 with collar 46 therebetween so that shaft 44 is free to rotate while being supported by member 28.

As aforementioned, member 28 is supported itself by member 48 which is part of the frame of the machine on which it is used. This can constitute any of the main or other stationary support structures of the machine.

Spring 24, as aforementioned, is positioned around extension 22 which surrounds shaft 14. Both the ends 50 of the spring 24 are secured to leg 38 of member 28. As the printing ribbon is being unwound from one spool 2, the spring 24 will be slightly rotated around shaft 14 in the same direction as the shaft 14 and spool 2 are moving. This rotation will retard free movement of the spool 2 to cause the ribbon 32 to be taut and also and most important when the spool 2 stops rotating the spring 24 having been rotated through a small arc around shaft 14 will bias the shaft 14 in the reverse direction back through the same small arc to thereby cause the spool 2 to rotate in this reverse direction through that same angle to take up any slack in the printing ribbon 32 and thereby keep it taut.

Referring now in more detail to the switching mechanism, bevel teeth 19 of cylindrical member 18, which as aforementioned is attached to the bottom end of shaft 14, mesh with bevel teeth 53 of cylindrical member 52. Both sets of these teeth 53 are positioned at a 45° angle with respect to their respective members 18 and 52 so that they mesh evenly with each other.

Referring to member 52 again, it is positioned on shaft 44 but not secured thereto so that it is not affected by rotation of the shaft 44. At the other end of member 52, as shown in FIG. 1, there are a series of large "V" shaped saw teeth 54 which are circumferentially positioned on the end of the member 32. These teeth 54 which are as long as they are wide have openings therebetween which are the same shape as the teeth 54. An identical set of teeth 58 are positioned coaxially on shaft 44 with teeth 54 and positioned so as to intermesh therewith. The latter teeth 58 are formed circumferentially on one edge of cylindrical member 60, which is itself connected to shaft 44 by pin 62 so that it will rotate therewith. Teeth 54 and 58 together with members 52 and 60 from which they project form a clutch, the operation of which will be described hereinafter.

Since both sets of teeth 54 and 58 are positioned in a circumferential manner on the end of members 52 and 60, openings 65 and 67 are formed in members 52 and 60 within the confines of these teeth 54 and 58. These openings 65 and 67 together form an open cylindrical space in which a spring 64 is positioned. The spring 64 which surrounds shaft 44 and is coaxial therewith, is constructed so that when members 52 and 60 are intermeshed it is in its compressed position and tends to bias them apart.

It has been previously mentioned that shaft 44 is supported by member 28. To add to this support, the shaft 44 fits into an opening in member 68, which is also part of the stationary support structure of the machine.

Located adjacent member 68 is a cylindrical hollow collar 70. The collar 70 which is coaxially positioned around shaft 44 is supported by its lip 72 which extends therefrom and is fixed to member 68. The collar 70 fits over two circumferential grooves or channels 74, cut in shaft 44 and located adjacent one another. These grooves 74 serve to bias shaft 44 into position and hold it in position, as will be described in more detail hereinafter.

Located in one of the grooves 74, and shiftable to either of them as shaft 44 is shifted from one side to the other, is a small sphere or ball 76. The ball 76 located partially within the channel 74 and partially within opening 78 in collar 70. A spring plate 80 of a resilient material is secured to collar 70 to cover this opening and prevent the ball 76 from escaping therefrom and also and more important to bias the ball 76 toward shaft 44 for the reasons to be discussed hereinafter. The spring plate 80 also has an opening 82 of a smaller diameter than ball 76 so that the ball 76 can extend partially out of the opening 82 as shown in FIG. 3, without escaping therefrom.

Also, positioned coaxially on shaft 44 is cylindrical collar 81 and two shorter cylindrical collars 84 and 86 which are located adjacent each end of collar 81. Collar 81 is secured to shaft 44 by pin 83, however, collars 84 and 86 are not secured to the shaft 44 and thus the shaft can rotate with respect to them.

Surrounding both collar 84 and the right side 88 of collar 81 is a tightly wound spring 90 which, as will be described subsequently, serves as a spring clutch. In a similar manner and for a similar purpose, spring 94 surrounds collar 86 and the left side 92 of collar 81.

Attached to aforementioned collar 84 is link 96. This link 96 which is positioned perpendicularly to shaft 44 is connected by means of shaft 98 and collar 100 to the aforementioned support 68.

Collar 86 has attached thereto link 101 which in turn is fastened to member 102 by means of a rivet or other suitable securing means 104. Member 102 is in turn connected to a motor or other suitable drive means which drives the mechanism of the present invention. Therefore, link 101 together with members 102, means 104, the spring clutches 90 and shaft 44 are part of the drive mechanism for transmitting the motor drive to the winding spools 2 and 2'.

From the drawing, especially FIG. 6, it is seen that springs 94 and 90 are held in place by links 101 and 96, respectively, and edges 91 of collar 81 so that they will not escape during operation.

The various parts of the mechanism are constructed of steel, plastic or other suitable, strong, durable material.

Supports 48, and 68, as aforementioned, are as shown in FIG. 1 connected to the base 106 or other connecting structure of the machine on which the invention is used.

It is noted, as aforementioned, that the winding mechanism on the left side in FIG. 1, as has been described, and that on the right side in FIG. 1, including the spools, the shaft on which they are positioned, the saw toothed clutch, the ribbon guide, etc., has not been described but since they are mirror image duplicates of one another, only one was described for ease in explaining the device of this invention. Operation which will be discussed hereinafter is also the same except that movement, of course, is in the reverse direction.

The operation of the mechanism is as follows: Member 102 which as aforementioned is operated by a suitable drive means moves forwardly and then backwardly, forwardly would be from top to bottom in FIG. 2. In moving forwardly it causes member 101 which is attached to collar 86 to rotate the collar 96 in a direction as shown by arrow 103 in FIG. 2. The rotation will cause spring 94 to be wound more tightly around collar 86 and around the left side 92 of collar 81. In the conventional manner with spring clutches, this rotation will cause the spring 94 to bind tightly around the two member 81 and 86 and cause them to operate as a unit. Collar 81 will thereby rotate in the same direction as collar 86. Since collar 81 is connected to shaft 44, the rotation of collar 81 will cause shaft 44 to also rotate in the same direction. If the mechanism is in the position as shown in FIGS. 1 and 2, the rotation of shaft 44 will cause the winding of the ribbon 32 around spool 2', since teeth 58' and 54' of members 60' and 52' are engaged, because shaft 44 is in the right shifted position.

It is noted that when link 101 moves backward after a forward stroke, collar 86 must rotate with it. This might tend to rotate collar 81 and shaft 44 in the reverse direction. Since this is not desired, when collar 81 begins to rotate in this direction, spring 90 is wound more tightly around collar 84 and end 88 of collar 81 so that they are bound together as a unit. Therefore, since collar 84 cannot rotate because it is attached to stationary member 68 by links 96 and 98, collar 81 also will not be able to rotate and thereby shaft 44 cannot rotate in the reverse direction.

Reverting back to describing the drive to the spool 2' in more detail, it is as follows: Member 60', since it is attached to shaft 44, will rotate with the shaft 44 and even though member 52' is not attached to the shaft 44, the intermeshing of their

saw teeth 54' and 58' will cause member 52' to rotate with shaft 44. The rotation of member 52' will cause the rotation of member 18' because of the intermeshing of bevel teeth 53' of member 52' with bevel teeth 19' of member 18'.

Since member 18' is secured to shaft 14', the shaft 14' will be rotated in the direction as shown by arrow 105' in FIG. 1. This rotation will cause the rotation of member 16', which is secured on shaft 14' and thereby since spool 2' fits on member 16', the rotation of member 16' will cause the spool 21' to rotate and wind ribbon 32 thereon.

It will be noted that while spool 2' is unwinding ribbon 32 from spool 2, spool 2 will rotate freely since saw teeth 54 and 58 are not in mesh and therefore there is nothing to prevent rotation of the spool 2.

The winding of ribbon 32 around spool 2' will continue until there is no more ribbon 32 wound around spool 2. The ribbon will not be completely removed from spool 2 since it is attached at each of its ends in the conventional manner to central posts 8' and 8, respectively, of the spools 2 and 2'. The ribbon, therefore, will be completely unwound from spool 2, but because it is still attached thereto and spool 2', is still being driven, the ribbon 32 will be stretched taut between the two spools 2 and 2'. Now since the ribbon is taut spool 2' cannot unwind any more ribbon 32 from spool 2 and, therefore, cannot itself rotate. This prevents member 16', shaft 14', and member 18' also from rotating. Since member 18' cannot rotate member 52' will also not be able to rotate since the two are intermeshed by means of bevel teeth 19' and 53'. However, since shaft 44 is still turning, member 60 which is connected thereto will still be trying to turn member 52'. At this point, edges 61' of the saw teeth 54' on member 52' and edges 59' of the saw teeth 58' on member 60, will be pressed against each other to cause members 52' and 60' to cam apart. As more clearly shown in FIG. 3, as they continue to cam apart, shaft 44 will be shifted to the left from the position of FIG. 1 or alternatively, if the shaft 44 was in the left position it would be shifted to the right position.

It is understood that this shifting back and forth will take place throughout operation as soon as one spool or the other is depleted of ribbon 32.

The shaft 44 will continue to shift by the aforementioned camming action of tooth edges 59' and 61' until edge 75 between grooves 74 on shaft 44 causes ball 76 to move to the raised position of FIG. 3. As soon as the ball 76 passes over this edge, it will be biased toward the other groove 74 by the downward bearing action of the spring plate 80.

When the ball 76 is raised to the position of FIG. 3, the spring plate 80 will be flexed outwardly by the ball so that as soon as shaft 44 passes sufficiently toward its new position, the biasing action of the plate 80 will cause the ball to be pressed into the other groove 74 and thereby snap the shaft 44 into the position toward which it is travelling, toward the left as shown in FIGS. 1 and 2. Spring 64' will assist in moving the shaft 44 since it tends to bias members 52' and 60' apart. Saw teeth 58 and 54 thereby will now be fully engaged. Collar 52 will begin to rotate and through bevel teeth 19, shaft 14 and collar 16, spool 2 will now also begin to rotate to wind the printing ribbon 32 thereon.

It will be appreciated that as clearly shown in FIG. 2, as soon as teeth 54' and 58' have begun to separate teeth 59 and 61 have begun to engage. It will be seen that there is no delay between the two positions. The construction is such that as soon as one spool 2 or 2' is depleted of printing ribbon 32 teeth 54 and 58 or 54' and 58' will be cammed apart and shaft 44 will then begin to shift so that the teeth on the opposite end, teeth 58 and 54 or 58' and 54' will simultaneously become enmeshed to thereby avoid any intermediate position where neither spool is engaged, as the drive switches from one spool to the other.

The mechanism of the present invention may be used with intermittent or continuous ribbon drive mechanisms.

It will be apparent from the foregoing that I have developed an apparatus which is simple in construction and well adapted

as a positive ribbon drive. Because of the elimination of an unengaged position, that was heretofore needed, I have provided a more reliable, efficient and positively acting mechanism. Also by the use of clutches which both transmit and shift the drive, the construction is still further simplified.

A specific embodiment of my invention has been illustrated, but the invention is not limited thereto since many modifications may be made by one skilled in the art and the appended claims are intended to cover all such modifications as come within the true spirit and scope of my invention.

I claim:

1. A mechanism for winding a ribbon comprising:

a reeling means having

a first reeling member, and a second reeling member,

drive means mounted to operate said reeling means,

control means including

a shifting member connected to said drive means,

a first clutch means having

a first clutch member connected to said shifting member, and

a second clutch member in axial alignment with said first clutch member coacting with said reeling means and mounted on and in axial alignment with said shifting member so that the shifting member can rotate and shift relative to said second clutch member,

a second clutch means having

a first clutch member connected to said shifting member, and

a second clutch member in axial alignment with said first clutch member coacting with said reeling means, in the same manner and at the same time as said second clutch member of said first clutch means, said second clutch member mounted on and in axial alignment with said shifting member so that the shifting member can rotate and shift relative to said second clutch member,

said control means being responsive to a tension condition of the ribbon to cause said first and second clutch members of said first clutch means which are in a first position wherein they are engaged to disengage and cause said shifting member to move between the first position wherein said drive means is positioned to operate said first reeling member and to second position in which said first and second clutch members of said second clutch means are engaged and said drive means is positioned to operate said second reeling member.

2. The mechanism of claim 1, wherein said first and second reeling members includes gear teeth and wherein said second clutch members include gear teeth which are always enmeshed with the gear teeth of said first and second reeling members.

3. The mechanism of claim 2 wherein said first and second clutch members include saw teeth which are mounted so that when they are enmeshed in the operatively related position the clutch is engaged and when they are out of mesh in an inoperatively related position the clutch is disengaged.

4. The mechanism of claim 3 wherein the saw teeth form cam surfaces which cam apart to disengage one clutch means when the ribbon is in tension, and to cause the shifting member means to move and cause the engagement of the other clutch means.

5. The mechanism claim 4 wherein means is provided to temporarily secure said shifting member in either said first or said second position.

6. The mechanism of claim 5 wherein said second clutch members are cylindrical having said saw teeth at one end thereof and having said gear teeth at the other end thereof.

7. The mechanism of claim 6 wherein biasing means is provided between said first and second clutch members of said first and second clutch means for aiding in the operation of said clutch.

8. The mechanism of claim 7 wherein a link is provided to transmit the drive means to said shifting member to rotate said shifting member and thereby rotate the engaged clutch

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member and the reeling member which is engaged with that clutch member.

9. The mechanism of claim 8 wherein spring clutch means are provided to provide for rotation of the shifting member in only one direction.

10. The mechanism of claim 9 wherein the gear teeth of said second clutch members are beveled gear teeth and wherein

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the gear teeth on said reeling member are also beveled teeth so that the axis of the clutch is perpendicular to the axis of the reeling member.

11. In the mechanism of claim 10 wherein said ribbon is a printing ribbon for use in a printing mechanism.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,602,356 Dated August 31, 1971

Inventor(s) James W. Dodsworth

It is certified that error appears in the above-identified patent
and that said Letters Patent are hereby corrected as shown below:

Column 6, line 14, "9" should be deleted.

Signed and sealed this 17th day of September 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents