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[54] INK-RIBBON FEEDING AND REVERSING ASSEMBLY

11 Claims, 10 Drawing Figs.

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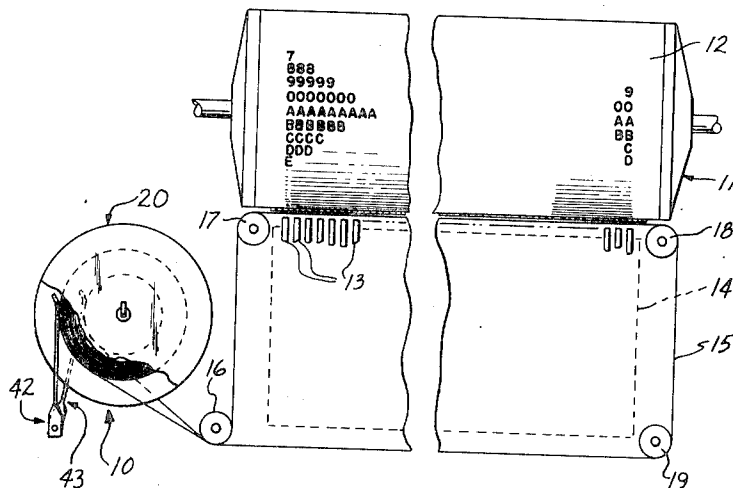
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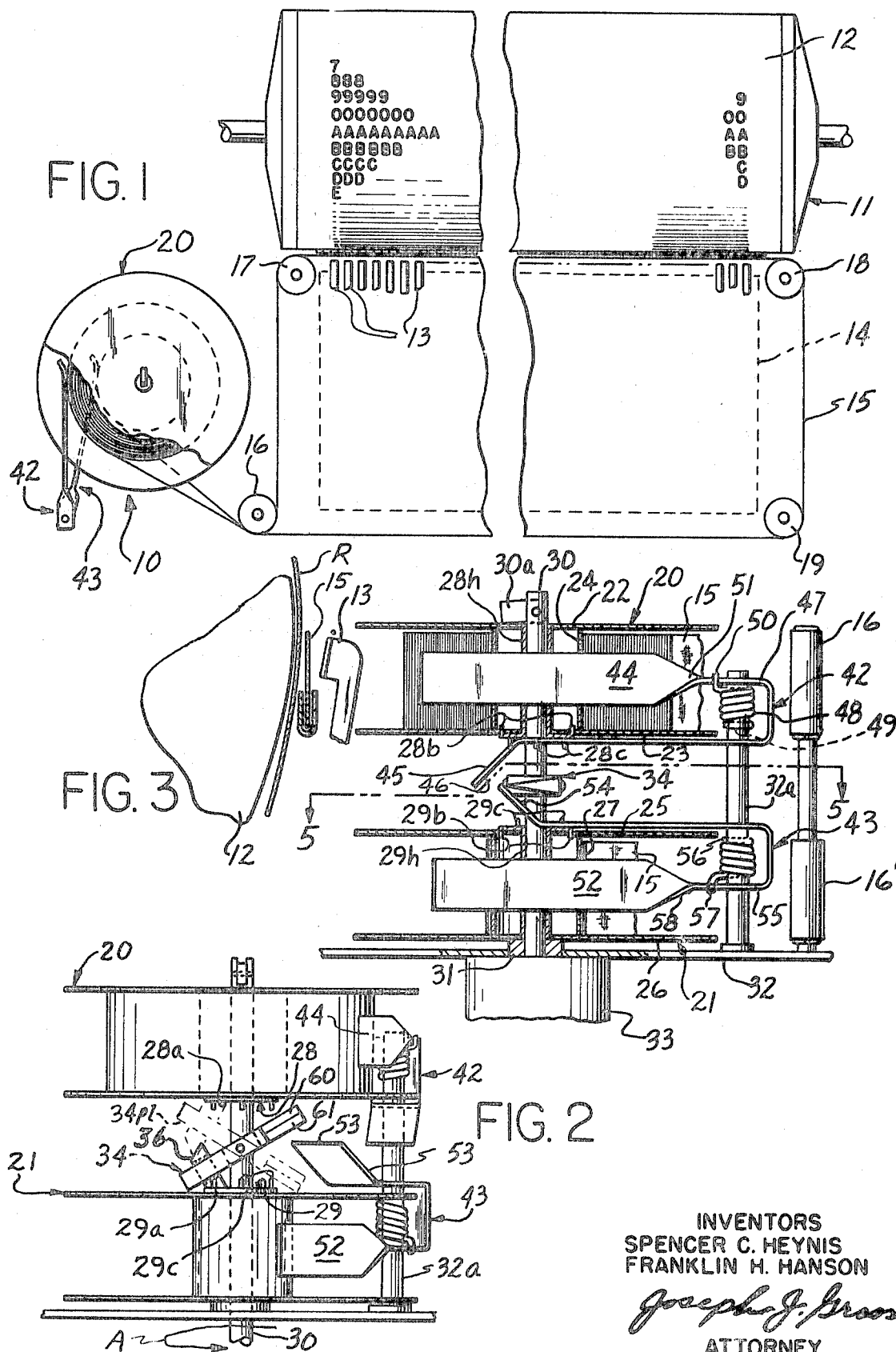
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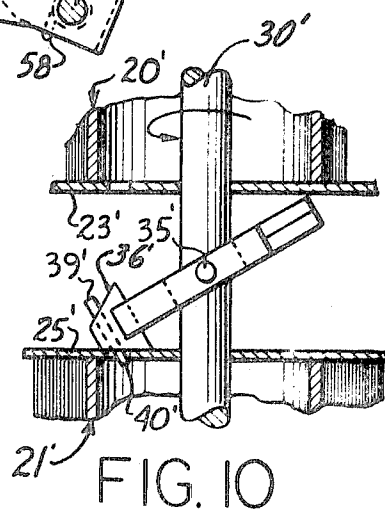
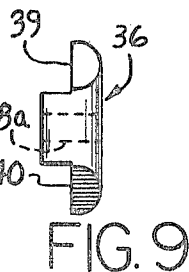
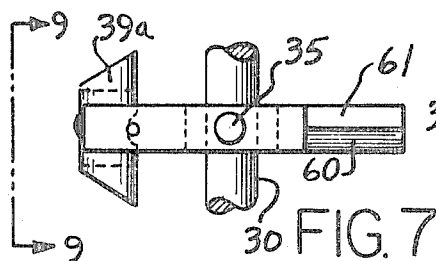
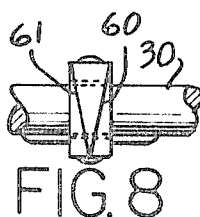
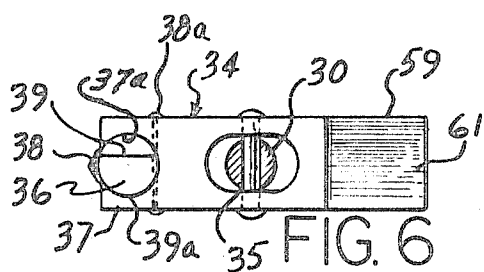
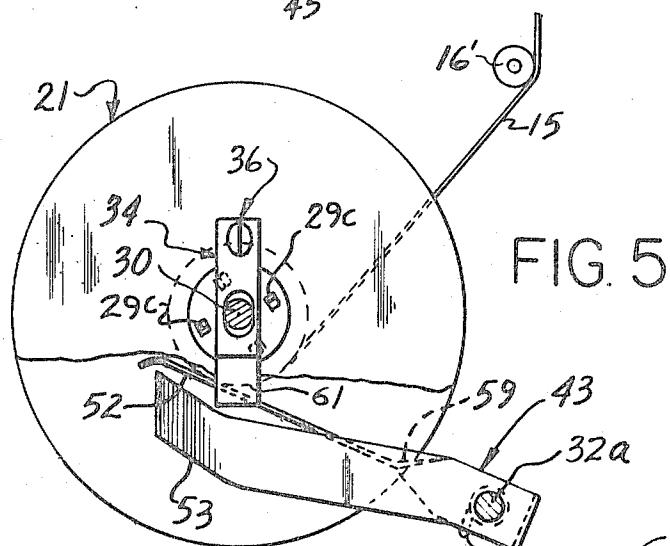
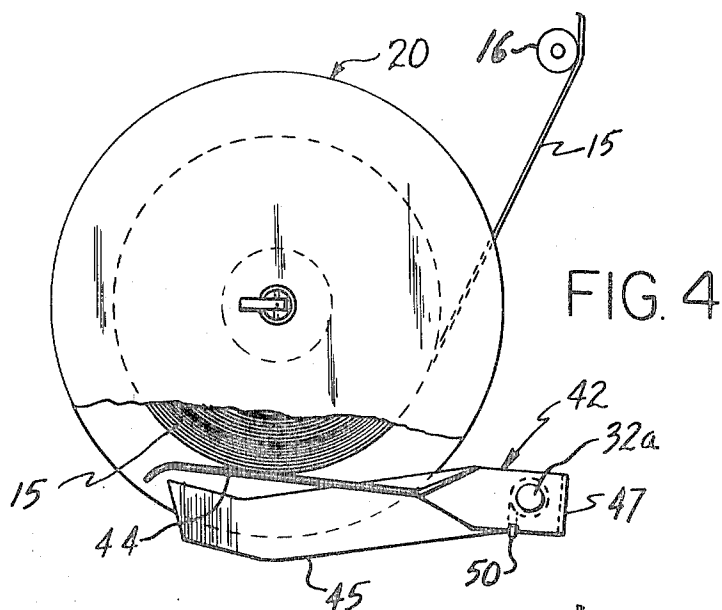
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ABSTRACT: There is disclosed a data recorder in the form of a drum printer, together with an ink-ribbon feeding and reversing assembly for an ink-ribbon which is used in data recording. The assembly includes a first clutch member for driving a first ribbon carrier, a second clutch member for driving a second ribbon carrier, and a third clutch member mounted on a drive shaft for rotation with the drive shaft but pivotal into clutching and driving engagement with either the first clutch member or the second clutch member. The third clutch member includes a permanent magnet driver which cooperates alternately with the first clutch member and with the second clutch member. Sensing and actuating members control switching of the third clutch member.







INK-RIBBON FEEDING AND REVERSING ASSEMBLY

FIELD OF THE INVENTION

This invention relates to the art of ink-ribbon feeding and reversing assemblies.

BACKGROUND

Prior art ink-ribbon feeding and reversing assemblies are typically quite involved as for example in U.S. Pat. Nos. 620,808; 1,073,577; 1,937,145; 2,617,513; 2,627,965 and 2,709,510.

SUMMARY

The invention resides in a novel ink-ribbon feeding and reversing assembly which has a small number of components, and is simple, easy to use, economical to manufacture, compact, lightweight, reliable, and versatile enough to be used in various types of recorders such as tape and page printers, typewriters, and the like.

An assembly in accordance with the invention includes: a power driven drive shaft or drive spindle, a first driven member in the form of a first clutch member in driving engagement with a first ribbon carrier, and a second driven member in the form of a second clutch member in driving engagement with a second ribbon carrier. The ribbon carriers can be of conventional construction. A driver member in the form of a third clutch member is mounted for rotation as a unit with the drive shaft and is pivotal into clutching and driving engagement with either the first clutch member or with the second clutch member. The drive shaft, the first, second and third clutch members and the first and second ribbon carriers are mounted for rotation about a common axis. A first one-piece sensing and actuating member has a sensing portion which rides on the ink-ribbon on the first ribbon carrier and has an actuating portion for camming the third clutch member to initiate its switching movement out of clutching and driving engagement with the second clutch member and into clutching and driving engagement with the first clutch member. Similarly, a second one-piece sensing and actuating member has a sensing portion which rides on the ink-ribbon on the second ink-ribbon carrier and has an actuating portion for camming the third clutch member to initiate its movement out of clutching and driving engagement with the first clutch member and into clutching and driving engagement with the second clutch member. The third clutch member includes a permanent magnet driver which is magnetically cooperable with either the first or the second clutch member, both of which are constructed of magnetizable material. The permanent magnet driver forms part of the drive connection and it serves to assure completion of the switching movement initiated by the camming action and also to assure that the third clutch member is held in clutching cooperation with the clutch member with which it was switched. As the frame and the mounts for the drive shaft and for the sensing and actuating members are disposed solely to one side of the ribbon carriers and of the first, second, and third clutch members, ready access is provided for changing the ink-ribbon.

Other features and advantages will be apparent when reference is made to the following detailed description and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is the top plan view of a fragmentary portion of a data recorder, together with an ink-ribbon feeding and reversing assembly in accordance with the invention;

FIG. 2 is a rear elevational view of the assembly shown in FIG. 1, depicting one position of the pivotal clutch member by phantom lines and depicting the other position by solid lines;

FIG. 3 is a side elevational view, partly in section, of the assembly shown in FIGS. 1 and 2, showing the pivotal clutch member in the process of being switched between the phantom line position and the solid line position depicted in FIG. 2;

FIG. 4 is top plan view of the assembly, showing one ribbon carrier and its associated sensing and actuating member;

FIG. 5 is a sectional view taken along line 5-5 of FIG. 3;

FIG. 6 is an enlarged view of the pivotal clutch member and rotatable drive shaft shown in FIG. 5;

FIG. 7 is a side elevational view of the clutch member and drive shaft shown in FIG. 6;

FIG. 8 is an end view of the clutch member and drive shaft shown in FIG. 6;

FIG. 9 is an end view of a magnetic driver taken along line 9-9 of FIG. 7; and

FIG. 10 is a fragmentary view of an alternative embodiment of the invention in which the conventional ribbon carriers also form part of a clutch arrangement.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, there is shown an ink-ribbon feeding and reversing assembly generally indicated at 10, in conjunction with a recorder generally indicated at 11. Any suitable form of recorder 11 can utilize the assembly 10 of the invention, for example, a high-speed drum printer having a print drum 12 and a bank of cooperating print hammers 13, a typewriter, a matrix printer, a belt or chain printer, or the like.

The illustrated print hammers 13 are mounted in an assembly 14 for movement into and out of printing cooperation with print symbols to the tub 24 while characters on the print drum 12. An ink-ribbon 15 and record medium R are disposed between the print hammers and the drum 12. The ink-ribbon 15 is trained about rollers 16, 17, 18, 19 and 16'. The ribbon 15 is received by spaced apart ribbon carriers which are shown to take the form of conventional ribbon spools 20 and 21. The spool 20 has side plates 22 and 23 joined by a hub 24. The ribbon spool 21 has side plates 25 and 26 joined by a hub 27. One end of the ink-ribbon 15 can be suitably secured to the hub 24 while the other end can be suitably secured to hub 27, as is conventional. One-piece clutch members 28 and 29 have respective integral hub portions 28h and 29h. The ribbon carriers 20 and 21 receive respective hub portions 28h and 29h, and these hub portions are rotatably received on a drive spindle or drive shaft 30. The drive shaft 30 is rotatably mounted by a bearing 31 mounted in a stationary frame 32. One end of the drive shaft 30 is shown to have a conventional pivotal keeper 30a. The drive shaft 30 is shown to be the output shaft of an electric motor 33. The electric motor 33 is suitably secured to the frame 32. The motor 33 can be of a type which drives the shaft 30 continuously at slow speed or it can be a stepping motor for driving the shaft 30 stepwise.

The clutch members 28 and 29 have respective clutch plates 28a and 29a. The clutch plates 28a and 29a have respective drive lugs 28b and 29b which fit into conventional apertures in the respective side walls 23 and 25 of the ribbon spools 20 and 21. The clutch plates 28a and 29a also have respective lugs 28c and 29c. The lugs 28b, 28c, 29b and 29c can be formed by any suitable method. As best shown in FIGS. 6 and 7, another clutch member generally indicated at 34 is pivotally mounted on the shaft 30 by means of a pin or pivot 35. The clutch member 34 rotates as a unit with the shaft 30 but is pivotal relative to the shaft 30 about a pivot or pin 35 disposed midway between the clutch plates 28a and 29a. The clutch member 34 is shown to include a driver 36 secured in a hole 37a in end 37 by a suitable adhesive 38 and by a pin 38a in end 37 which passes through V-shaped groove 38a in the driver 36. The driver 36 in the illustrated embodiment is a permanent magnet and the clutch members 28 and 29 are composed of magnetizable material. The driver 36 has faces 39 and 40 which can be in driving engagement with the respective lugs 28b and 29b. When the clutch member 34 is in the position shown by solid lines in FIG. 2, the driving face 40 of the permanent magnet driver 36 is in driving engagement with one of the lugs 29c, thereby effecting winding of the ink-rib-

bon 15 onto the ribbon spool 21 and unwinding of the ink-ribbon 15 from the ribbon spool 20. When the clutch member 34 is in the position shown by phantom lines 34pl in FIG. 2, the driving face 39 is in driving engagement with one of the lugs 28c, thereby effecting winding of the ink-ribbon 15 onto the ribbon spool 20 and unwinding of the ink-ribbon 15 from the ribbon spool 21. It is preferable to use lugs 28c and 29c with which the driver 36 cooperates rather than magnetic force alone, so that the size of the magnet which forms the driver 36 can be kept small.

With reference to FIG. 3, one-piece sensing and actuating members 42 and 43 are pivotally mounted on a post or pivot 32a secured to the frame 32. The sensing member 42 has a sensing portion 44 which rides on the outer surface or periphery of the portion of the ribbon 15 which is wound onto the spool 20. The member 42 also includes an actuating portion specifically a cam portion 45 having a cam surface 46. The sensing portion 44 and the actuating portion 45 are joined by a U-shaped portion 47 which is pivotally mounted on the pivot 32a at spaced apart locations. A spring 48 is received by the pivot 32a. One end 49 of the spring 48 is anchored to the pivot 32a and its other end 50 is hooked around the U-shaped portion 47 to urge the sensing and actuating member 42 in a clockwise direction (FIG. 4). Thus, the sensing portion 44 is always urged into contact with the ribbon on the spool 20 and it serves additionally as a brake to prevent excess ink-ribbon from coming off the spool 20. The sensing portion 44 is joined to the U-shaped portion 47 by a right angle bend 51. As seen in both FIGS. 3 and 4, the sensing portion 44 is at right angles with respect to the actuating portion 45. The sensing and actuating member 43 has a sensing portion 52 which rides on the outer surface or periphery of the portion of the ink-ribbon 15 which is wound onto the spool 21. The member 43 also includes an actuating portion specifically a cam portion 53 having a cam surface 54. The sensing portion 52 and the actuating portion 53 are joined by a U-shaped portion 55 which is pivotally mounted on the pivot 32a at spaced apart locations. A spring 56 is received by the pivot 32a. One end 57 of the spring 56 is anchored to the pivot 32a and its other end 58 is hooked around the U-shaped portion 55 to urge the member 43 in a clockwise direction (FIG. 5). Thus, the sensing portion 52 is always urged into contact with the ribbon on the spool 21 and it serves additionally as a brake. The sensing portion 52 is joined to the U-shaped portion 55 by a right angle bend 59. As seen in both FIGS. 3 and 5, the sensing portion 52 is at right angles with respect to the actuating portion 53.

FIGS. 1 through 5 show the ink-ribbon 15 almost completely unwound from the spool 21 and wound onto the spool 20. Referring to FIG. 2, let it be assumed first that the clutch member 34 is in the position shown by phantom lines 34pl. The ribbon is progressively unwound from the spool 21 and is progressively wound onto the spool 20 as the shaft 30 rotates in the direction indicated by arrow A. The member 43 pivots about post 32a as the ribbon 15 continues to be unwound from the spool 21. When the member 43 has pivoted far enough so that the cam surface 54 is presented in the path of follower end 59 of the clutch member 34, the cam surface 54 engages with follower face 60 and the clutch member 34 is cammed from the position shown by phantom lines 34pl in FIG. 2, through the center or midway position shown in FIG. 3, and into the position shown by solid lines in FIG. 2. As soon as the clutch member 34 has moved past the center or midway position, its magnet driver 36 is closer to the clutch member 29 than it is to the clutch member 28. Accordingly, the magnet driver 36 will be more strongly attracted to the clutch member 29 than to the clutch member 28. It is apparent that the switching movement is initiated by the cam surface 40 and its completion is assured by the magnet driver 36. The driver 36 not only assures that the initiated switching movement of the clutch member 34 is completed, but also that the clutch member 34 remains in clutching engagement with either the clutch member 28 or the clutch member 29 with which it was switched into clutching engagement. The driver 36, being in

driving engagement with clutch member 29, causes the ink-ribbon to be progressively wound onto the ribbon spool 21 from the ribbon spool 20 as the shaft 30 rotates in the direction of arrow A. When the ink-ribbon 15 has been almost completely unwound from the ribbon spool 20 and wound onto the ribbon spool 21, the actuating portion 46 of the member 42 engages follower face 61 to effect camming of the clutch member from the solid line position shown in FIG. 2, through the center or midway position shown in FIG. 3, and into the phantom line position shown in FIG. 2. As soon as the magnet driver 36 moves past the center or midway position it becomes more strongly attracted to the clutch member 28. Thus, the magnet driver 36 assures that the clutch member 34 is moved into and thereafter maintained in clutching engagement with the clutch member 28 until such time the ink-ribbon is almost completely unwound from the ribbon spool 21, at which time the member 43 again effects clutching of the clutch member 34 with the clutch member 29.

The assembly 10 can be used with a printing punch. In a typical printing punch, a record tape is punched with code holes representative of data and the data is also printed out on the tape. It is conventional to provide an arrangement by which the tape can be stepped either forwards or backwards. When the tape is being stepped backwards it is disadvantageous to drive most ribbon assemblies and it is even more disadvantageous to drive most ribbon assemblies backwards because it can result in the ink-ribbon coming off the spool. The clutch member 34 of the present invention prevents motion from being imparted either to the clutch member 28 or to the clutch member 29 if the shaft 30 is rotated in a direction opposite to the direction indicated by arrow A. This is so because the rounded surface 39a (see especially FIGS. 6 and 7) will only cause clutch member 34 member 34 be cammed over the lugs 28c or 29c if the shaft 30 were to rotate in that opposite direction. Accordingly, the clutch member 34 can serve as a one-way clutch either with the associated clutch member 28 or with the associated clutch member 29.

With reference to the embodiment of FIG. 10, it is noted that clutch members 28 and 29 have been omitted and their functions are performed by ribbon spools 20' and 21' themselves. Clutch member 34' pivotally mounted on shaft 30' by a pin or pivot 35' carries a driver 36' having a pair of lugs or pins 39' and 40'. The clutch member can be pivoted into the indicated position in which the pin 40' is in the aperture in the side plate 25' of ribbon spool 21'. The clutch member can also be pivoted into the position in which the pin 39' is in the aperture in the side plate 23' of the ribbon spool 20'. As in the embodiment of FIGS. 1 through 9, when the driver 36' is a magnet, the side plates 23' and 25' are composed of magnetizable material. In other respects the embodiment of FIG. 10 is the same as the embodiment of FIGS. 1 through 9.

We claim:

1. For an ink-ribbon feeding and reversing assembly, non-reversible driver means, a first rotatably mounted ribbon carrier, first driven means for driving the first ribbon carrier, a second rotatably mounted ribbon carrier, second driven means for driving the second ribbon carrier, means mounting the driver means and the first and second driven means for rotation about a common axis but providing pivotal movement of the driver means into driving engagement either with the first driven means or with the second driven means, and actuating means operable when the ribbon is unwound from the first ribbon carrier for pivoting the driver means out of driving engagement with the second driven means and into driving engagement with the first driven means and operable when the ribbon is unwound from the second ribbon carrier for pivoting the driver means out of driving engagement with the first driven means and into driving engagement with the second driven means.

2. For an ink-ribbon feeding and reversing assembly as defined in claim 1, wherein said actuating means comprises: a one-piece member having a sensing portion riding on the periphery of the ink-ribbon which is wound on the first ribbon

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carrier and a camming portion for camming the driver means into driving engagement with the first driven means when the ink-ribbon is substantially entirely unwound from the first ribbon carrier and a one-piece member having a sensing portion riding on the periphery of the ink-ribbon which is wound on the second ribbon carrier and a camming portion for camming the driver means into driving engagement with the second driven means when the ink-ribbon is substantially entirely unwound from the second ribbon carrier.

3. For an ink-ribbon feeding and reversing assembly as defined in claim 1, wherein the first and second driven means include magnetizable material, the driver means includes a permanent magnet, the driver means being urged into driving engagement with either the first or the second driven means by magnetic attraction.

4. For an ink-ribbon feeding and reversing assembly as defined in claim 1, wherein the first driven means forms part of the first ribbon carrier, and the second driven means forms part of the second ribbon carrier.

5. For an ink-ribbon feeding and reversing assembly as defined in claim 1, including a frame, a drive shaft for the driver means, bearing means mounted by the frame for rotatably mounting the drive shaft, the first and second ribbon carriers being rotatably mounted about the drive shaft, the frame and the bearing means being disposed solely to one side of the ribbon carriers to allow ready access for changing the ink-ribbon.

6. For an ink-ribbon feeding and reversing assembly a pair of ink-ribbon carriers, means including permanent magnet means for driving one or the other of the ribbon carriers, and automatic sensing means operative when the ink-ribbon has been wound onto one ribbon carrier for controlling the drive means to drive the other ribbon carrier to thereby cause the ink-ribbon to be wound onto the other ribbon carrier, said drive means including a rotatably mounted shaft, first clutch means for driving one ink-ribbon carrier, second clutch means for driving the other ink-ribbon carrier, third clutch means carrying the permanent magnet means and rotatable as a unit with the shaft, and means mounting the third clutch means for pivotal movement on the shaft into clutching and driving engagement with either one of the first and second clutch means.

7. For an ink-ribbon feeding and reversing assembly: a rotatable drive shaft, a first ribbon carrier rotatably mounted on the drive shaft, first clutch means for driving the first ribbon carrier, a second ribbon carrier rotatably mounted on the drive shaft, second clutch means for driving the second ribbon carrier, third clutch means, means mounting the third clutch means to the drive shaft and movable relative to the drive shaft into clutching engagement with either the first or the second clutch means, and means responsive to the ink-ribbon being unwound from the first ribbon carrier for initiating movement of the third clutch member from clutching and

driving engagement with the second ribbon carrier toward clutching and driving engagement with the first clutch means and responsive to the ink-ribbon being unwound from the second ribbon carrier for initiating movement of the third clutch means from clutching and driving engagement with the first clutch means toward clutching and driving engagement with the second clutch means, and means formed in part by the third clutch means for completing the initiated movement.

8. For an ink-ribbon feeding and reversing assembly: a rotatable drive shaft, a first ribbon carrier having a first one-piece clutch member rotatably received about the drive shaft, a second ribbon carrier having a second one-piece clutch member rotatably received about the drive shaft, a third clutch member mounted for relative movement on and with respect to the drive shaft, a first one-piece sensing and actuating member engageable with the ink-ribbon wound on the first ribbon carrier and coacting with the third clutch member to drive the third clutch member out of clutching engagement with the second clutch member and into clutching engagement with the first clutch member, and a second one-piece sensing and actuating member engageable with the ink-ribbon wound on the second ribbon carrier and coacting with the third clutch member to drive the third clutch member out of clutching engagement with the first clutch member and into clutching engagement with the second clutch member.

9. For an ink-ribbon feeding and reversing assembly as defined in claim 8, wherein the first one-piece clutch member is constructed of magnetizable material, the second one-piece clutch member is constructed of magnetizable material, and the third clutch member includes a permanent magnet which is more strongly attracted to the closer one of the first and second clutch members.

10. For an ink-ribbon feeding and reversing assembly as defined in claim 8, the first one-piece sensing and actuating member having a sensing portion riding in contact with the ink-ribbon on the first ribbon carrier and an actuating portion having a cam surface for camming the third clutch member into clutching engagement with the first clutch member when the ink-ribbon is substantially entirely unwound from the first ribbon carrier, and the second one-piece sensing and actuating member having a sensing portion riding in contact with the ink-ribbon on the second ribbon carrier and an actuating portion having a cam surface for camming the third clutch member into clutching engagement with the second clutch member when the ink-ribbon is substantially entirely unwound from the second ribbon carrier.

11. For an ink-ribbon feeding and reversing assembly as defined in claim 8, including magnetic means for holding the third clutch member in clutching engagement with the clutch member with which it was caused to be in clutching engagement.

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