May 12, 1959 E. F. EISSFELDT ET AL 2,886,162

TELEPRINTER INK-RIBBON DRIVE CONTROL

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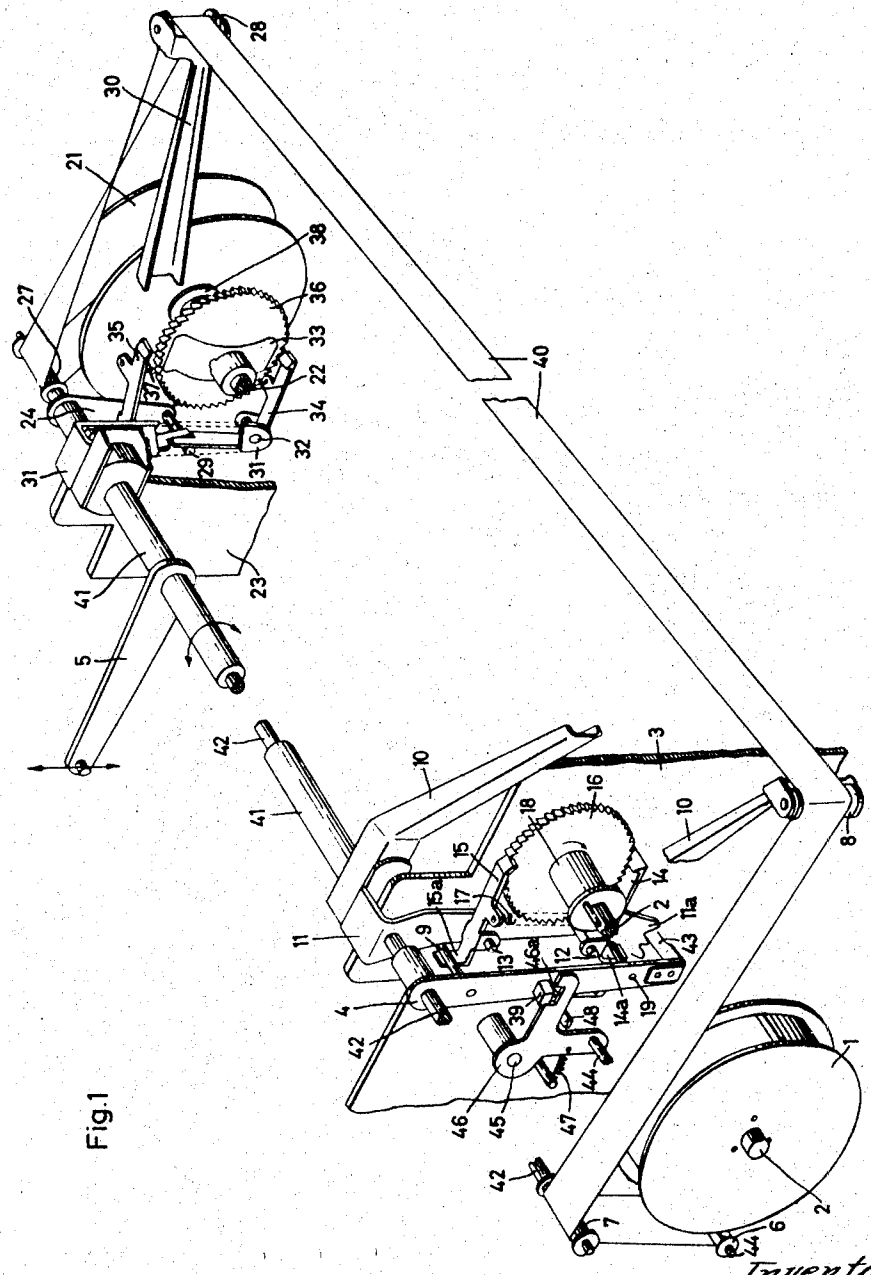


Fig.1

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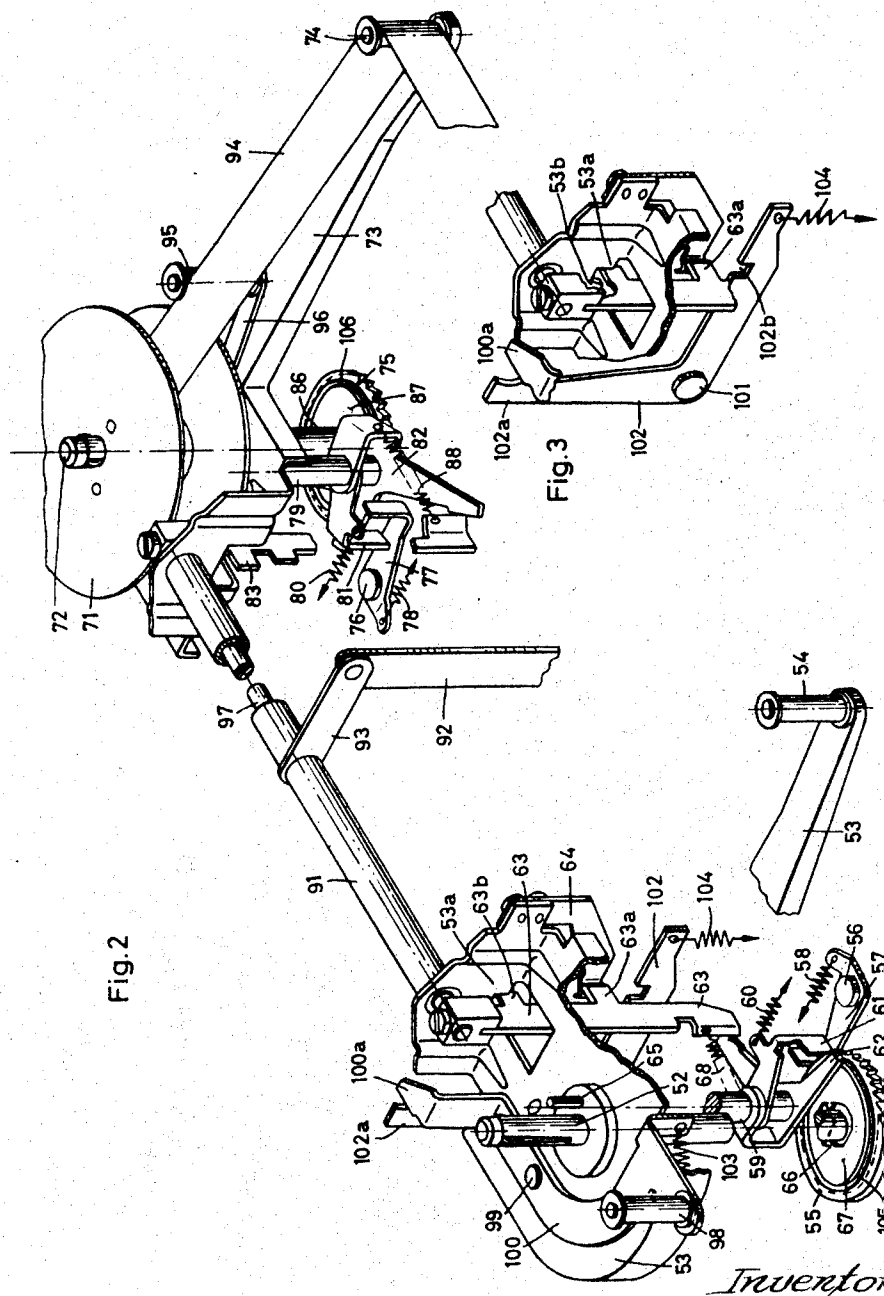


Fig. 2

Fig. 3

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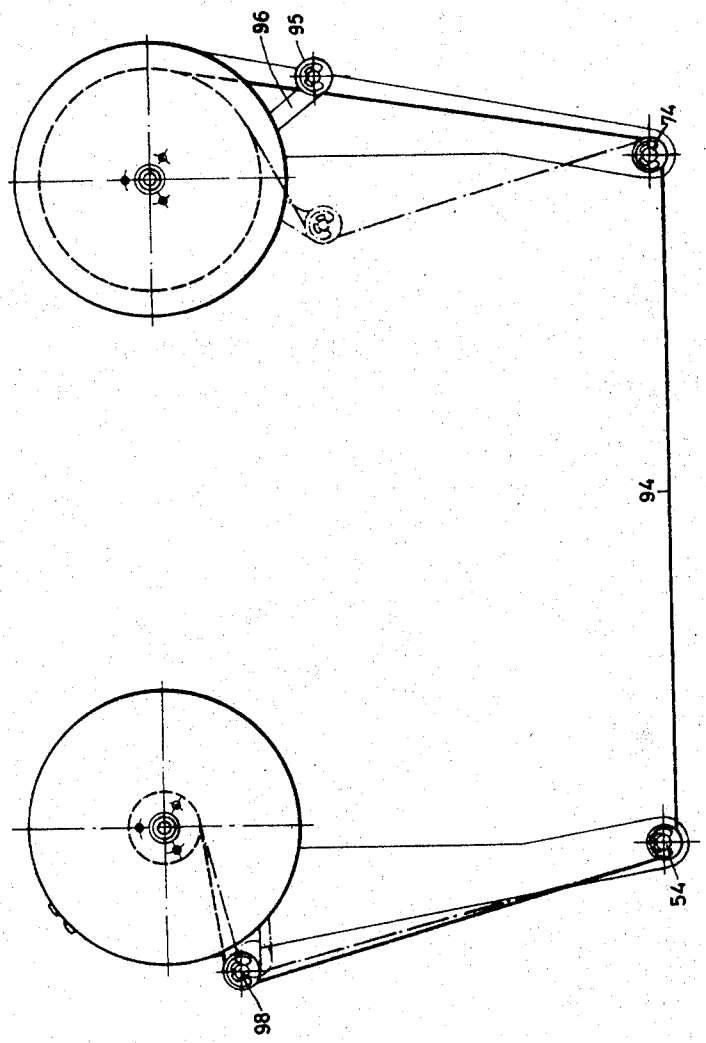


Fig. 4

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TELEPRINTER INK-RIBBON DRIVE CONTROL

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Claims priority, application Germany September 15, 1956

12 Claims. (Cl. 197—162)

This invention is concerned with an automatic ink-ribbon drive and direction reversal or switch-over control, especially for teleprinters.

In the case of teleprinter machines with type carriage movable along the line to be typed, the automatic ribbon drive and switch-over mechanism may be simplified by winding the ink ribbon on substantially fixed journalled reels and moving the ribbon during the typing operation up and down along an axis extending in parallel with the line to be printed. This results in the advantage that the ribbon exposes the line being typed for reading after the typing of each letter or symbol while avoiding the strong lateral distortion of the ribbon that occurs in known ribbon arrangements especially at the start and the end of the line.

However, known devices providing for up and down motion of the ribbon have the drawback of requiring ahead of each ribbon reel or spool a direction reversal mechanism controlled by the ribbon, and of blocking or locking the last actuated reversal mechanism, depending upon the executed drive or transport direction, by means controlled by rivets carried by the ribbon or by an auxiliary bar, cooperating with the last actuated reversal mechanism, extending to the other side of the machine, so as to avoid simultaneous actuation of the reversal mechanism at both ends of the machine.

The invention avoids these drawbacks and permits use of a simple ribbon without any control rivets, by the provision of a reversal mechanism which is independent of the advance direction and controllable by increase ribbon pull only at a predetermined point, the principal parts of such mechanism partaking in the up and down motion of the ribbon except for the instant of reversal, being hindered to carry out the corresponding motion with the ribbon normally tensioned, by a ribbon-controlled transmission lever, and thereby disconnecting the gear for one drive direction while connecting the gear for the other drive connection.

Another embodiment of the invention is concerned with a ribbon advance and reversal of the indicated kind, for a ribbon which is wound from one onto another of two reels, whereby one or the other reel is in driving cooperation with the drive means, depending upon the advance or drive direction of the ribbon. The connection between the reversal mechanism for the reel drive means, allotted to the individual ribbon reels, is effected by means of a shaft or bushing extending concentric to the axis of the up and down motion, such connection assuming one of two angular positions, determined by stops, with respect to actuating levers or arms controlling the operatively effective displacement of the ribbon, and thereby locking in one position one drive pawl against operation while freeing another drive pawl for cooperation with an associated ratchet, and vice versa. The arrangement results in particularly simple conditions for the journalling of the pivotal axis and the control shaft.

There may be provided either relatively fixedly journalled ribbon reels and movable drive parts for ratchets fixedly connected with the ribbon reel carriers, or relatively fixedly journalled drive pawls and displaceable ribbon reel carriers fixedly connected with ratchets.

In a preferred embodiment, a pair of drive pawls cooperates with each ratchet in such a manner, that an advance motion is initiated with one and the same ratchet incident to the up and down rocking motion of the ribbon.

Such operation provides for relatively high advance speed of the ribbon in spite of relatively short pawl stroke and for quick tensioning of the ribbon after the direction reversal or switch-over.

Further details of the invention will appear from the description of embodiments which will be rendered below with reference to the accompanying drawings.

Fig. 1 is a perspective view of a ribbon control device with relatively fixedly journalled ribbon reels;

Fig. 2 is a perspective view of a ribbon control device comprising ribbon reels which execute a rocking motion during operation;

Fig. 3 illustrates details of Fig. 2; and

Fig. 4 shows a simplified plan view of the ribbon and reels employed in Figs. 2 and 3.

The device according to Fig. 1, provided for a page printer, comprises two ribbon reels **1** and **21** which are respectively journalled upon shafts **2**, **22** extending through casing walls **3**, **23** in parallel to the line to be printed. A tubular shaft **41** extending in parallel to the shafts **2**, **22** is rotatably journalled in the casing walls **3**, **23**. This tubular shaft **41** may be angularly rocked by means of a printer lever (not shown) by way of a pull rod (likewise omitted). The ribbon **40** extends from the reel **1** over a deflection roller **6** and over further deflection rollers **7** and **8** to the point of printing, and from there over deflection rollers **28** and **27** to the reel **21**. The rollers **6**, **7**, **27** are on horizontal axes and the rollers **8** and **28** are on vertical axes. The rollers **7** and **27** are disposed upon a shaft **42** which extends through the tubular shaft **41** and is rotatable relative thereto. The rollers **8** and **28** are respectively carried at the free ends of pivotal levers or arms **10**, **30**, which are mounted on the tubular shaft **41** and are rockable therewith. Pawl drive levers **11** and **31**, one on either side of the device, are likewise connected with the tubular shaft **41**. The lever **11** carries pawls **14** and **15**, respectively pivoted on bolts **12** and **13**, and connected for cooperation with each other and with the ratchet **16** by means of a spring **17**. The lever **31** carries in similar manner by means of bolts, of which only the bolt **32** is visible, drive pawls **34** and **35** which are interconnected by means of a spring **37** and cooperate with ratchet **36**.

The ratchets **16** and **36** are respectively operatively interconnected with the reels **1** and **21** by means of clutch bushings **18** and **38**. The reel **1** has been shown outside the device in order to illustrate parts of the drive mechanism. The pawl **11** carries an extension **11***a* in which are formed two notches. The frontal notch is in the illustrated position engaged by a stop spring **43** fastened to a lever **4** which is fixedly connected with the shaft **42**. The lever **4** carries lifting bolts **9** and **19** which are adapted to engage angularly extending rearwardly facing extensions **15***a* and **14***a* of the pawls **15** and **14**. The engagement of the stop spring **43** with one or the other notch in the lever extension **11***a* determines the relative angular position of the shafts **41**, **42**. A lever **24** is fixedly connected with the right hand end of the shaft **42** carrying a bolt or pin **29** for simultaneously lifting the pawls **34** and **35** from the ratchet **36**. Accordingly, in the illustrated position of the parts, the pawls **15** and **14** are cooperatively connected with the reel drive ratchet

16 and the pawls 34, 35 are disengaged from the reel drive ratchet 36.

A leaf spring 33, pressing against the ratchet 36 serves to apply a braking force to the reel 21. A similar leaf spring, not visible in Fig. 1, applies braking force to the ratchet 16 incident to the advance of the ribbon in reverse direction.

The ribbon deflection roller 6 is journalled upon a pin or bolt 44, and the latter is carried upon an arm of an angular lever 46 pivoted on a pin or bolt 45. The lever 46 is held in normal position in engagement with a stop 48 by a spring 47. Other parts cooperating with this lever will be presently explained more in detail.

The operation is as follows:

In the position of the pawls as illustrated in Fig. 1, the ribbon 40 will be wound upon the reel 1 and the unwinding of the reel 21 is controlled by the braking action of leaf spring 33, keeping the ribbon slightly tensioned as it passes the point of printing. The drive ratchet 16 is driven by two teeth incident to each rocking motion of the lever 5 and therewith corresponding rocking motion of tubular shaft 41 and the ribbon-rocking levers or arms 10 and 30, the drive pawl 15 being active in clockwise direction and pawl 14 being thereafter active in counterclockwise direction. The ends of the ribbon are connected to the reels in usual manner.

After the ribbon 40 is unwound from the reel 21, the ribbon tension will increase. The lever 46 carrying the ribbon deflection roller 6 is thereby moved counterclockwise, against the force of spring 47, until its notch 46*a* embraces a member 39 carried by the lever 4.

It shall be assumed that the spring 43 is in the frontal stop position as shown in Fig. 1. The interlocking engagement of the angular lever 46 with the member 39 will occur at the instant when the central portion of the ribbon 40 is in lowermost position. The lever 4 cannot now partake in the rocking motion of the tubular shaft 41 as during the normal ribbon advance. The spring 43 leaves the frontal stop position coincident with the lifting of the central ribbon portion, and falls into the rearward stop notch. The arrested lever 4 lifts by means of the bolts 9 and 19 the drive pawls 15 and 14 to disengage them from the ratchet 16. The lever 24 connected with the shaft 42 frees at the same time at its bolt 29 the rear ends of the drive pawls 34, 35, allowing these pawls to engage the drive ratchet 36. The ribbon 40 is thereby practically freed of tension and the angular lever 46 is rotated into engagement with the stop 48 by the force of the spring 47. The direction reversal for the ribbon drive is thereby completed.

The angular lever 46 leaves its preparatory position again at an instant when the ribbon is completely wound on the reel 21 at the other side of the device, when it will interlock its notch 46*a* with the member 39 at an instant when the central ribbon portion extending between deflection rollers 8 and 28 is in its lifted position. The lever 4 will then be held fast during the lowering of the ribbon-rocking lever arms 10, 30 and the stop spring 43 will accordingly move from the rearward into the frontal stop position.

It is in the above described manner possible to use the same release device for the reversal switching of the ribbon advance in both directions. It is for the setting of the drive merely necessary that the drive lever 5 is connected with the tubular shaft in such a manner that the central portion of the ribbon lies in lifted position in alignment with the line to be printed.

The arrangement of the reversal shaft 42 within the tubular shaft 41 results in simple journalling of the pivotally disposed movable parts. The frictional forces thereby occurring will be very small since the reversal is derived from the angular motion of the tubular shaft by a relative rotation of the two shafts. A special adjustment of the reversal elements with respect to the drive pawls is avoided. The inertia of the pivotal parts can be held very small. The required drive is very simple because the operation of the direction reversal device is released only at one point independently of the advance direction.

In addition, there is no danger of actuating the reversal mechanism for both ribbon reels simultaneously. The control device may be made light-weight and yet resistant to bending stresses by the use of profiled parts as indicated in Fig. 1, for example, in connection with the pivotal ribbon-rocking arms 10 and 30.

The device according to Figs. 2 and 3 comprises again two ribbon reels, one reel being indicated at 71, disposed respectively on shafts 52 and 72, journalled respectively in pivotally disposed ribbon-rocking lever arms 53 and 73, each lever arm forming a platform portion. The shafts 52 and 72 extend approximately vertically. The left hand reel carried by the shaft 52 has been omitted to bring out neighboring parts more clearly. The two ribbon-rocking lever arms 53 and 73 are fixedly interconnected by a suitably journalled tubular shaft 91. Linkage means 92, 93, actuated in suitable manner by a printer control (not shown) are provided for angularly moving the tubular shaft 91 to impart an angular rocking motion to the parts connected therewith.

The ink ribbon 94 extends from the reel 71 over a deflection roller 74 carried by the lever arm 73 at the end thereof to the point of printing and thence over a deflection roller 54 carried by the lever arm 53 and a further deflection roller 98, to the reel (omitted) carried by the shaft 52. Numeral 95 (right hand end of Fig. 2) indicates a roller carried by a spring-biased lever 96. The deflection rollers extend in mutual parallelism and in parallel to the shafts 52 and 72 of the reels.

The shafts 52 and 72 are rotatably journalled in the respective platform portions of the lever arms 53 and 73, extend downwardly thereof, and carry at their lower ends ratchets 55 and 75 respectively. Drive pawls 57 and 77, respectively, rotatable about bolts 56 and 76 cooperate respectively with the drive ratchets 55 and 75. These drive pawls are in driving engagement with their associated ratchets depending upon the direction in which the ribbon 94 moves. Springs 58 and 78 link the corresponding drive pawls with their associated ratchets.

Each lever arm 53 and 73 carries a further shaft, as indicated respectively at 59 and 79, extending in parallel with the reel shafts 52 and 72. Rotatably disposed upon the shaft 59 is a detent pawl 61 and similarly rotatably disposed on the shaft 79 is a holding or stop pawl 81. These pawls are respectively biased in the direction of the corresponding ratchets by spring means 60 and 80. Each bolt 59 and 79 also carries a rotatable pawl release member 62 and 82, respectively.

Inside of the tubular shaft 91 is disposed a rotatable shaft 97 carrying at its opposite ends downwardly extending levers 63 and 83, respectively, such levers being disposed in parallel with the reel shafts 52, 72.

As mentioned before, the lever arms 53 and 73 are formed platformlike at the portions thereof neighboring on the hollow shaft 91 and reel shafts 52 and 72. The lever arm 53 carries a stop spring 64 cooperating with an extension 63*a* of the lever 63. In the position of the parts as shown in Fig. 2, the extension 63*a* engages a frontal ear on the stop spring 64, such spring pressing the lever 63 with an extension 63*b* thereof against an edge 53*a* of a cutout formed in the platform portion of the lever arm 53. Rotatably journalled upon the platform portion of lever arm 53, by means of a bolt 99, is a reversal lever 100 which in turn carries the ribbon deflection roller 98 and cooperates with its upwardly extending end 100*a* with an angular lever 102 fixedly journalled at 101 (see also Fig. 3). These two levers are by springs 103, 104 held in positions in which they cannot affect other parts. The position thereby assumed by the ribbon deflecting roller 98 is shown in Fig. 4 in full lines.

The device according to Figs. 2 to 4 operates as follows:

Assuming the link member **92** to move upwardly, the ratchet **55** will be moved forward against the pawl **57** which is journalled in a structural part of the machine. The ratchet is thereby rotated counterclockwise, for example, by two teeth. The detent pawl **61** journalled on the bolt **59** thereupon engages the ratchet, holding it during the return rocking motion of the hollow shaft **91** and coincident return rocking motion of the reel shaft **52**. The ratchet **55** is thus retracted from the drive pawl **57**, the latter sliding back on the ratchet into preparatory position for the next drive stroke. The ribbon advance rotation of the ratchet is transmitted to the ribbon reel by the resulting rotation of the shaft **52** and follower pin **65** carried by a flangelike portion of the shaft.

The ribbon reel **71** and associated drive shaft are not affected by their drive elements. However, in order to avoid insufficient tension on the ribbon at the point of printing, the shafts **52** and **72** are provided with bushings **66** and **86**, respectively, which are for the sake of clearness shown dotted and in section. The upper ends of these bushings are connected with the corresponding lever arms **53** and **73** and carry at the lower ends brake disks **67**, **87**, respectively, which act upon the corresponding ratchets over oil-soaked felt washers indicated at **105** and **106**. The brake disk is effective during the advance of the ribbon responsive to rotation of the (left hand) ribbon reel as described above.

The ends of the ink ribbon are fastened to the two reels just as explained in the first described embodiment. When the ribbon is unwound from the right hand reel of the device, the ribbon tension will increase, thereby placing pressure on the deflection roller **98** and causing counterclockwise rotation of the lever **100** about the bolt **99** against the force of the spring **103**. The end **100***a* of the lever engages the end **102***a* of the angular lever **102**, rotating the latter counterclockwise about the axis **101**. As soon as the central portion of the ribbon is again in its lowermost position, the notch **102***b* (see also Fig. 3) formed in the lever **102** will embrace the extension **63***a* of the lever **63**.

The lever **63** and the shaft **79** and therewith lever **83** now cannot partake in the rocking motion of the tubular shaft **91** which causes upward motion of the central portion of the ribbon extending between the deflection rollers **54** and **74**. The extension **63***a* will reach the rear position with respect to the stop spring **64**, in which the lever **63** is pressed by the pressure of the stop spring, against an edge **53***b* of the lever arm **53**. The lever **63** rotates at the same time, with its lower end, the release or disconnect member **62**, linked to it by spring **68**, in counterclockwise direction, so as to disengage the pawls **57** and **61** from the ratchet **55**. The ribbon reel on the shaft **52** can now rotate back, after some slackening of the ribbon, far enough to allow the lever **100** to assume the position in which it is shown in Fig. 2.

The lever **83** which rotates together with the lever **63**, as described, frees the pawl-disconnect member **82** which is linked to it by spring **88**, thereby placing the drive pawl **77** and the detent pawl **81** in position for cooperation with the ratchet **75**. The ribbon, during the following operation, will now be wound from the left hand reel upon the right hand reel **71**. As soon as the ribbon is wound on the latter reel, the reversing or switch-over operation is initiated again by way of the lever **100**, in reverse order of steps, at an instant when the lever **102**—at the raised position of the ribbon—has engaged the extension **63***a* of the lever **63**.

The ink ribbon slackens considerably at the instant of switch-over or reversal, and there occurs the danger that ribbon may drop off one of the deflection rollers. In order to avoid this mishap, there is provided the tensioning lever **96** (right hand end of Fig. 2) which is biased by a relatively weak spring and moves into the dot-dash

position shown in Fig. 4, to take up any ribbon slack during the reversal operation.

The ribbon advance and direction reversal according to the invention has been described as applied to teleprinter machines. However, some or all of the features of the invention may be used in connection with other typing machines and the like, and it is therefore understood that the term "teleprinter" is intended to embrace with sensible latitude any machine in which the invention may be used.

Changes may be made within the scope and spirit of the appended claims.

We claim:

1. In a teleprinter having a type carriage which is movable along the line to be printed and having an inking ribbon extending between two reels, said ribbon having a portion which is movably disposed generally in parallel with the line to be printed, and having control means for imparting to said ribbon portion during the printing operation an up and down rocking motion relative to the line to be printed, a device for automatically governing the advance of said ribbon and the reversal of the advance direction thereof, said device comprising ribbon drive means for each reel operatively affected by said control means, a single direction-reversal control-mechanism comprising principal parts which partake in said rocking motion except for the reversal interval, said parts comprising pivotally disposed lever means, means controlled by the tension of said ribbon, indicating reversal of the advance direction thereof, for engaging said lever means to arrest the rocking motion of said parts, and means controlled by said parts for disconnecting the drive means for one of said ribbon reels and coincidentally operatively connecting the drive means for the other ribbon reel.

2. A structure and cooperation of parts according to claim 1, comprising pawl operated ratchet drive means for each reel, positioning means for each pawl to control the operatively effective cooperation thereof with the respectively associated ratchet, rocking lever arms for effecting the rocking motion of said ribbon portion, shaft means extending concentric with the axis of said rocking motion and interconnecting said pawl-positioning means, stop means for holding each pawl-positioning means and therewith said shaft means in either one of two angular positions relative to the position of said rocking lever arms, and means controlled by said pawl-positioning means in each angular position thereof for effecting operative actuation of one pawl and ratchet drive while locking the other pawl and ratchet drive against operation.

3. A structure and cooperation of parts according to claim 2, comprising relatively stationary ribbon reels, drive ratchet means fixedly connected with each ribbon reel, and drive pawl means for each ratchet means interconnected with said rocking lever arms and rockable therewith.

4. A structure and cooperation of parts according to claim 2, comprising ribbon reels respectively connected with each of said rocking lever arms and rockable therewith, drive ratchet means fixedly connected with each ribbon reel and rockable therewith, and pawl means pivotally disposed on a relatively stationary holder for cooperation with each ratchet means.

5. A structure and cooperation of parts according to claim 2, comprising relatively stationary ribbon reels, a drive ratchet fixedly connected with each ribbon reel, two drive pawls for each drive ratchet interconnected with said rocking lever arms and rockable therewith, said pawls being respectively operative to rotate the associated ratchet coincident with each stroke of said rocking motion.

6. A structure and cooperation of parts according to claim 2, comprising means for disposing said ribbon reels along axes extending in parallel with the axis of said rocking motion, deflection rollers for said ribbon extending concentric with the axis of said rocking motion, drive

ratchet means fixedly connected with each ribbon reel, and drive pawl means for each ratchet means interconnected with said rocking lever arms and rockable therewith.

7. A structure and cooperation of parts according to claim 2, comprising spring biased ribbon tensioning means to minimize slackening of said ribbon during the reversal of motion thereof.

8. A structure and cooperation of parts according to claim 2, comprising rocking lever arms each carrying respectively a ribbon reel and a ribbon deflecting lever rockable therewith, drive ratchet means fixedly connected with each ribbon reel and rockable therewith, and pawl means pivotally disposed on a relatively stationary holder for cooperation with each ratchet means.

9. A structure and cooperation of parts according to claim 2, comprising ribbon reels respectively connected with each of said rocking lever arms and rockable therewith, one of said rocking lever arms carrying a ribbon deflecting roller and a reversal controlling lever, drive ratchet means fixedly connected with each ribbon reel and rockable therewith, and pawl means pivotally disposed on a relatively stationary holder for cooperation with each ratchet means.

10. A structure and cooperation of parts according to

claim 2, comprising ribbon reels respectively connected with each of said rocking lever arms and rockable therewith, one of said rocking lever arms carrying a ribbon deflecting roller and a ribbon tensioning lever, drive ratchet means fixedly connected with each ribbon reel and rockable therewith, and pawl means pivotally disposed on a relatively stationary holder for cooperation with each ratchet means.

11. A structure and cooperation of parts according to claim 2, comprising brake means for each ratchet.

12. A structure and cooperation of parts according to claim 2, comprising ribbon reels respectively connected with each of said rocking lever arms and rockable therewith, drive ratchet means fixedly connected with each ribbon reel and rockable therewith, pawl means pivotally disposed on a relatively stationary holder for cooperation with each ratchet means, and brake means for each ratchet.

References Cited in the file of this patent

UNITED STATES PATENTS

912,162	Pentecost	Feb. 9, 1909
1,196,622	White	Aug. 29, 1916
2,564,580	Pentecost et al.	Aug. 14, 1951