

[54] **UNIFORM RIBBON FEED APPARATUS**

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197/151, 159, 162; 101/336

[56]

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2,917,250 12/1959 Bodenstein242/187 X
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[57]

ABSTRACT

A ribbon feeding apparatus having a ratcheted ribbon spool engageable by a reciprocating pawl to incrementally rotate the ribbon spool. A camming lug operatively coupling the pawl and responsive to the diameter of the ribbon on the spool inversely varies the increment of angular engagement of the pawl with the ratchet wheel as the ribbon diameter increases, thus effecting uniform ribbon feed.

6 Claims, 3 Drawing Figures

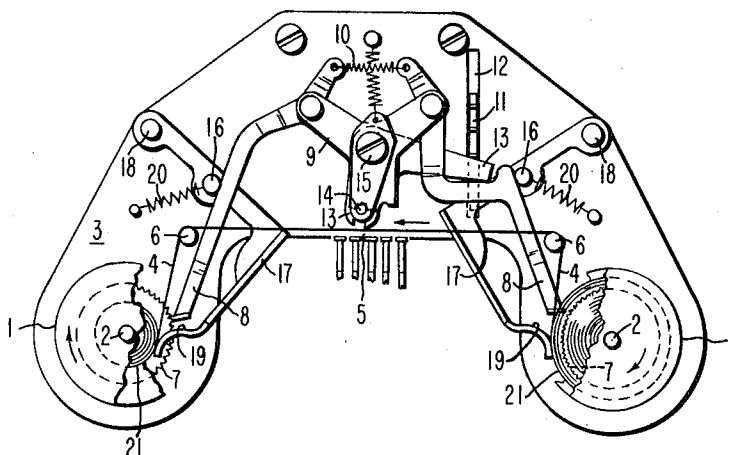


FIG. 1.

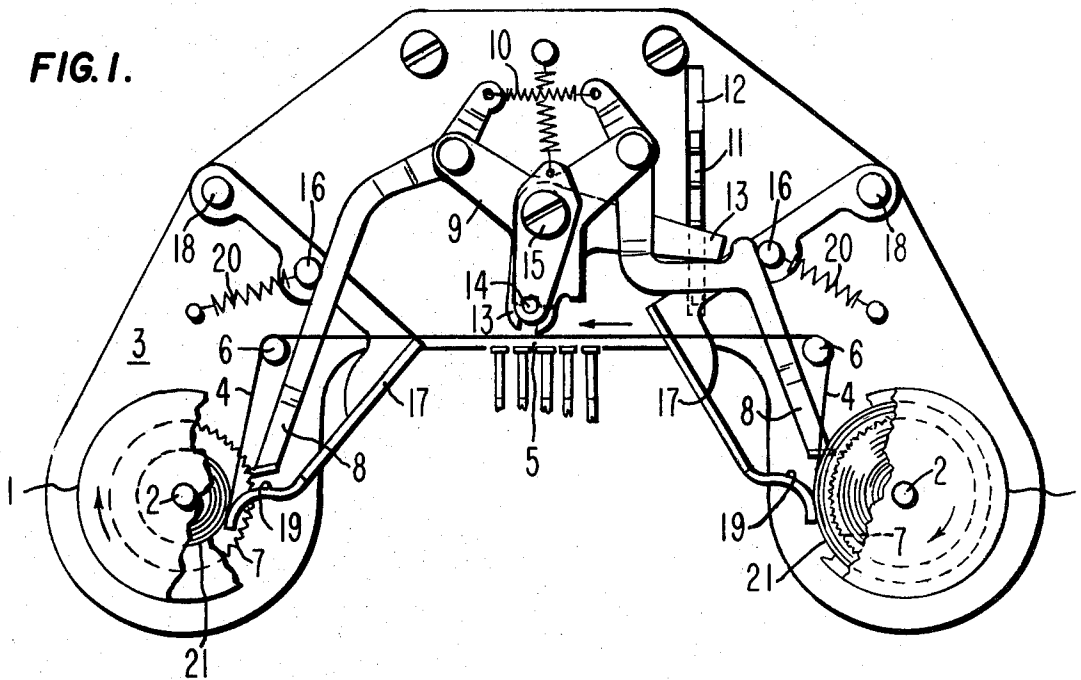


FIG. 2.

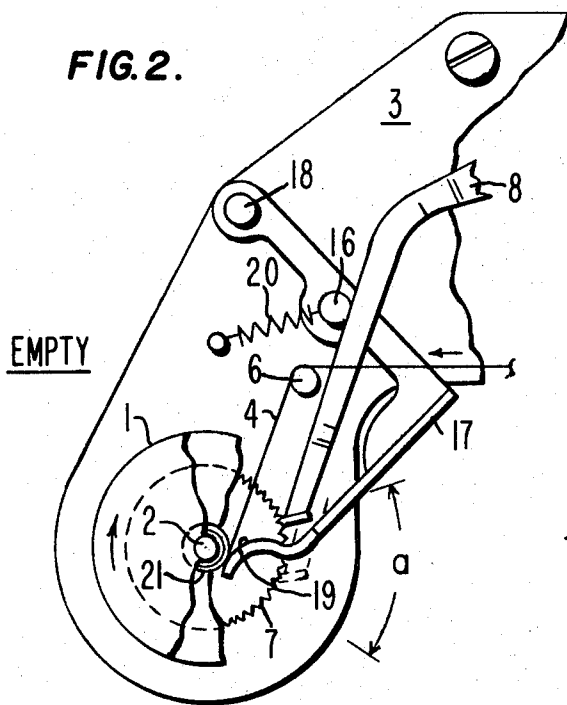
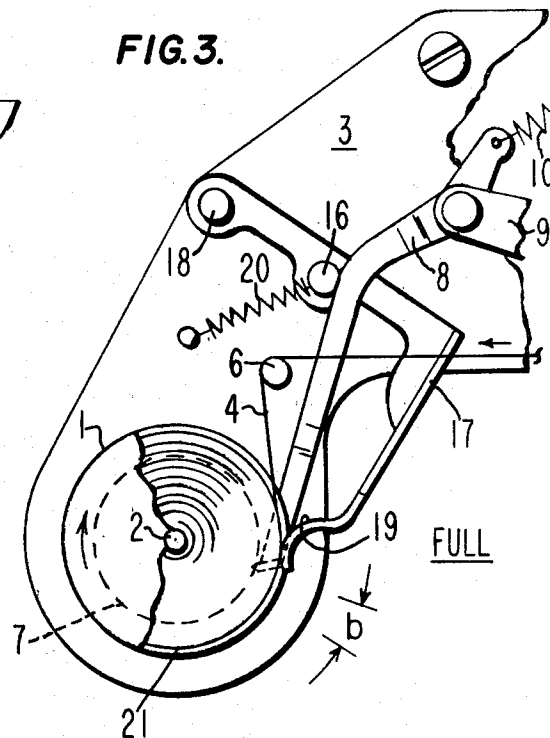


FIG. 3.



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UNIFORM RIBBON FEED APPARATUS

BACKGROUND OF THE INVENTION

The invention relates generally to apparatus for the movement of webbed material and specifically to apparatus for feeding inked ribbon.

The use of ink impregnated ribbon as an ink source in the printing operations of various machines is well known. In a generalized application inked ribbon is interposed between a medium such as paper and a raised font on an impacting surface of a print hammer. After an impact by a hammer the ink supply in the impacted area of the ribbon is depleted and must be replenished by capillary action from adjacent ribbon areas before another print of sufficient quality can be made from the same area. To prevent reprinting on an area of ribbon used by a previous print the ribbon is moved before the next print impact is undertaken. In determining the distance a ribbon should move between impacts consideration must be given to the sufficiency of the reservoir of ink remaining to replenish the depleted area of ribbon. Printing in close succession would delay replenishment of ink in the impacted portion of the ribbon or inhibit it altogether, whereas moving the ribbon for relatively great distances at high speed between prints is wasteful and presents timing and stress difficulties in a high print rate machine.

For the reasons stated above the visual quality of a printed character is partially a function of ribbon movement or feed. Concern with print quality has become increasingly acute as the use of electronic optical character recognition equipment continues to expand. It was with this concern in mind that the subject device was conceived as an improvement to an existing ribbon feed apparatus disclosed by A. A. Horton in U.S. Pat. No. 1,690,487.

Prior art ribbon feeding apparatus including the one patented by Horton, supra., moves the ribbon from a supply source to a retainer, such as a spool. A common method of moving the ribbon from the supply source to the retainer is by driving the retaining spool to effectively pull the ribbon from the supply source. In many prior art ribbon feeders the retaining spool is driven at a constant rotational speed thereby causing the movement of the ribbon from the supply source to substantially vary in speed as the ribbon on the retaining spool increases in diameter. For example, at any constant rotational speed of the retaining spool if the diameter of the retainer spool doubles the speed of ribbon movement doubles. Under such circumstances, optimum ribbon speed and consequently optimum print quality cannot be attained.

SUMMARY OF THE INVENTION

It is an objective of this invention to overcome the aforementioned deficiency of the prior art by providing a substantially constant speed ribbon movement without requiring a complicated and expensive variable speed driving mechanism.

The invention is an improvement of an inked ribbon feeding apparatus in which a reciprocating pawl engages a ratcheted ribbon spool. Ribbon is fed from the supply spool to the ratcheted ribbon spool incrementally each driving stroke of the pawl. To achieve a nearly constant speed of ribbon feed the invention combines a camming lug with the pawl to detect the changing diameter of the ribbon on the spool and to reduce the angular distance that the pawl is engaged with the ratcheted spool as the ribbon diameter increases.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of the ribbon feed apparatus showing ribbon being fed from right to left;

FIGS. 2 and 3 are detailed views of the camming lug in operation with a nearly empty spool and with a nearly full spool, respectively.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the preferred embodiment of the improved ribbon feed apparatus, as shown in FIG. 1, two ribbon spools 1 in spaced apart relationship are axially mounted to rotate on studs 2 projecting from a base plate 3. Inked ribbon 4 is guided through a printing area 5 from one spool to the other by means of guide posts 6 projecting from the base plate.

To move the inked ribbon from one spool to the other during printing a ratchet wheel 7, rigidly coupled to rotate with each spool 1, is engaged by a reciprocating pawl 8. The pawls are each pivotally coupled to separate arms of a "Y" shaped positioning member 9 and joined at their ends by a coil spring 10. A reciprocatably driven lever 11 extends through a slot 12 in the base plate 3. A bell crank 13 coupled by a pin 14 to the "Y" shaped positioning member 9 is engaged by the reciprocating lever to rock the "Y" shaped member 9 reciprocatably in an arc about a pivot 15. With the "Y" shaped member 9 in the position shown, its rocking motion reciprocates the leftmost pawl 8 downward into driving engagement with the ratchet 7 then upward in succession to reposition the pawl for another driving stroke. The rightmost pawl 8 also reciprocates but is positioned by the "Y" shaped member 9 in cooperation with a projection 16 from a camming lug 17 out of contact with the ratchet 7. With the pawls 8 so positioned the ribbon 4 is fed from right to left in increments having a length determined by the diameter of the ribbon on the spool 1 and the distance of angular engagement of the pawl 8 with the ratchet wheel 7.

When all the ribbon from the rightmost spool has been transported to the leftmost spool the leftmost pawl 8 is unable to rotate its associated ratchet 7. The downward force of its driving stroke against the immovable ratchet is utilized by the apparatus to reverse the direction of ribbon feed. A detailed explanation of the ribbon feed reversal mechanism is given in A. A. Horton, supra. After reversal the rightmost pawl is positioned to engage its associated ratchet and the leftmost pawl is positioned out of engagement. Ribbon is then fed from the left to the right in the manner described above.

The camming lug 17 is rotatably mounted to the base plate 3 by a shaft 18. A camming surface 19 of the lug is urged by a spring 20 into contact with the peripheral surfaces 21 of the ribbon on the spool 1. The projection 16 of the lug in cooperation with the "Y" shaped positioning member 9 determines the position of the pawl 8 relative to the ratchet 7.

OPERATION

FIGS. 2 and 3 illustrate the operation of the camming lug 17 as the ribbon spool increases in diameter. FIG. 2 illustrates the beginning of a feed cycle when an empty spool 1 has just begun to refill. While only the operation of the leftmost or driven ribbon spool 1 will be described, it is understood that after reversal of ribbon feed the rightmost spool becomes the driven spool and operates in combination with the camming lug 17 in the same manner as the spool described.

The position of the camming lug projection 16 is determined by the camming surface 19 of the camming lug 17 on the periphery of the ribbon 21. In the position shown, when the diameter of the ribbon on the spool is small, the camming lug projection 16 positions the reciprocating pawl 8 to engage the ratchet wheel 7 for a full downward stroke, or angle α , as shown in the drawing. As the ribbon on the spool increases in diameter the camming lug 17 is rotated counterclockwise forcing the pawl 8 in contact with the projection 16 of the camming lug away from the ratchet wheel 7 for an increasingly greater distance as the ribbon diameter increases.

Near the end of a feed cycle ribbon on the spool nearly attains its maximum diameter, as shown in FIG. 3. The camming surface riding on the periphery 21 of the ribbon on the spool determines the position of the camming lug projection 16 against the pawl 8. As the pawl approaches the ratchet 7 in a downward driving stroke it slides along the projection until near the end of its stroke when it engages the ratchet for a relatively small angular distance b , as shown in the drawing.

The essential effect of the camming lug 17 upon the pawl 8 acting in response to an enlarging ribbon spool is movement of the pawl away from the ratchet. The pawl moves for the same distance downward each stroke, but as it is moved steadily away from the ratchet it engages the ratchet later in each successive downward stroke. In other words, the angular distance of driving engagement of the pawl with the ratchet wheel varies inversely with the diameter of the ribbon on the spool. The inverse relationship of driving speed of the spool with spool diameter counteracts the undesirable direct relationship between ribbon speed and spool diameter of the unimproved apparatus.

What is claimed is:

1. Ribbon feed apparatus including a spool to hold a ribbon or the like, spool supporting means axially and rotatably supporting said spool, a ratchet wheel rigidly fastened to said spool and axially rotatable with said spool, a pawl reciprocally engageable with said ratchet wheel operable with a driving stroke to rotate said spool, wherein the improvement comprises:

a camming lug rotatable on a fixed axis relative to said spool, said camming lug variably coupling said pawl with said ratchet by means of the accumulated ribbon on said spool, said camming lug being rideable upon the periphery of the ribbon on said spool and operable on the driving stroke of said pawl to move said pawl into engagement with said ratchet for an angular distance of said spool inversely variable with the diameter of the ribbon on said spool.

2. An apparatus as defined in claim 1 wherein a projection on said camming lug in contact with said pawl moves said pawl away from said ratchet wheel as the diameter of the ribbon on said spool increases, said movement serving to reduce the an-

gular distance of said engagement of said pawl with said ratchet during the driving stroke of said pawl.

3. An apparatus as defined in claim 1 wherein said camming lug is biased in contact with the periphery of the ribbon on said spool.

4. In a ribbon feed and reverse mechanism operably associated with a printing device, said mechanism having a pair of spaced-apart rotatable ratcheted spools, a pair of pawls operably associated with said pair of spools, and pawl driving means effective for alternately winding a ribbon onto each of said pair of spools, pivotally mounted means coupled with said pawl means for inversely varying the speed of ribbon winding as the diameter of the ribbon wound on either spool increases, said pivotally mounted means being rotatable on fixed axes relative to said spools.

5. The ribbon feed and reverse mechanism defined in claim 4 wherein said pivotally mounted means for inversely varying the speed of ribbon winding comprises a pair of camming lugs associated with said pair of pawls and each rotatably mounted on a fixed axis relative to its associated ratcheted spool, each of said camming lugs having a camming surface responsive to the periphery of the ribbon wound onto its associated spool, and having a projection cooperably associated with its corresponding pawl, each of said camming lugs being effective to reduce the angular distance of engagement of its associated pawl with the ratchet of its associated ratcheted spool as said ribbon is drivenly wound thereon.

6. The ribbon feed and reverse mechanism defined in claim 4 wherein each of said pivotally mounted camming lugs is biased such that its said camming surface is held in contact with the periphery of the ribbon wound onto its associated ratcheted spool.

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