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(54) INKED RIBBON FEEDING DEVICE

(71) We, KABUSHIKI KAISHA SUWA SEIKOSHA and SHINSHU SEIKI KABUSHIKI KAISHA, both Japanese body corporates, of 3-4, 4-chome, Ginza, Chuo-ko, Tokyo, Japan and 3-5, 3-chome, Owa, Suwa-shi, Nagano-ken, Japan, respectively, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to inked ribbon feeding devices and, in particular, although not so restricted, to printers, e.g. printers of relatively small size, typewriters, etc.

The present invention seeks to provide an inked ribbon feeding device of relatively simple construction, of comparatively small size, with fewer parts than conventional inked ribbon feeding devices, and at relatively low cost.

Conventional inked ribbon feeding devices have incorporated reversing mechanisms for reversing the direction of feeding of an inked ribbon between two spools. Such reversing mechanisms may operate by detecting eyelets mounted to the ends of the inked ribbon or by detecting the resistance to feeding when the end of the inked ribbon has been reached, or by detecting a predetermined diameter of the inked ribbon on one of the spools.

These conventional reversing mechanisms require a large number of parts, such as levers, shaft on which the levers are mounted, springs for operating the levers, etc., to be associated with each spool. Therefore, a considerable space is required to house the conventional inked ribbon feeding devices and consequently it is difficult to make a printer of relatively small size and cost.

According to one aspect of the present invention there is provided an inked ribbon feeding device comprising: two axially spaced apart ratchet wheels between which,

in operation, inked ribbon is fed; a single detecting member having two wing portions and two inked ribbon engaging portions; reversing means having two reversing pawls, a wing portion and an engaging portion of the detecting member and a reversing pawl of the reversing means facing each ratchet wheel; and spring means for biasing the reversing means and the detecting member in opposite directions, the arrangement being such that, when all or substantially all the inked ribbon has been fed from one ratchet wheel to the other ratchet wheel, the reversing pawl and wing portion facing the said other ratchet wheel come into engagement to cause the reversing means to move to permit the inked ribbon to be fed from said other ratchet to said one ratchet wheel, the movement of the reversing means causing the spring means to move the detecting member in the opposite direction.

In one embodiment said reversing means is provided with two feeding pawls which are selectively engageable with one or other of the ratchet wheels thereby to rotate the latter in response to reciprocating movement of the reversing means. The reversing means may be a single member carrying the reversing pawls and the feeding pawls.

In another embodiment said reversing means comprises a first member and a second member, the first member carrying the reversing pawls, the spring means biasing the second member and the detecting member in opposite directions, the first and second members being arranged so that movement of the first member in one direction causes movement of the second member in the opposite direction.

The first member may be provided with two feeding pawls which are selectively engageable with one or other of the ratchet wheels thereby to rotate the latter in response to reciprocating movement of the first member.

[Price 33p]

Price 75p

The inked ribbon feeding device preferably includes preventing means for reducing or preventing back-lash of the ratchet wheels when the direction of feeding of the inked ribbon is reversed.

Said preventing means may comprise brake means acting upon at least one of the ratchet wheels. Alternatively said second member may be provided with two further pawls which are selectively engageable with one or other of the ratchet wheels to prevent back-lash thereof.

According to a further aspect of the present invention there is provided a printer or typewriter having an inked ribbon feeding device as recited above.

The invention is illustrated, merely by way of example, in the accompanying drawings, in which:—

Figure 1 is a diagrammatic view of one embodiment of an inked ribbon feeding device according to the present invention;

Figure 2 is a perspective view of a detecting lever of the inked ribbon feeding device of Figure 1;

Figure 3 is a diagrammatic view of another embodiment of an inked ribbon feeding device according to the present invention;

Figure 4 is a diagrammatic view of a third embodiment of an inked ribbon feeding device according to the present invention; and

Figure 5 is a diagrammatic view of yet another embodiment of an inked ribbon feeding device according to the present invention.

Throughout the drawings like parts have been designated by the same reference numerals.

Referring first to Figures 1 and 2 there is shown one embodiment of an inked ribbon feeding device according to the present invention for a printer, typewriter, etc. The inked ribbon feeding device is arranged to feed an inked ribbon 17 from a first spool (not shown) mounted on a shaft 3 for rotation with a ratchet wheel 1 to a second spool (also not shown) mounted on a shaft 4 for rotation with a ratchet wheel 2. When all or substantially all the inked ribbon has been fed from the first spool to the second spool, the inked ribbon feeding device reverses the direction of feeding so that the inked ribbon is fed from the second spool to the first spool.

The inked ribbon feeding device includes a reversing member 5 on opposite sides of which there are reversing pawls 6, 6' facing the ratchet wheels 1, 2 respectively. The reversing member 5 is mounted for pivotal movement on a shaft 8 carried by a driving lever 7 which performs a reciprocating motion in the direction shown by arrows A and B. On the opposite sides of the reversing

member 5 adjacent to the reversing pawls 6, 6' there are feeding pawls 9, 9' for transforming the reciprocating motion of the driving lever 7 into intermittent rotation of the ratchet wheels. A detecting lever 11 is anchor-shaped in plan view and C-shaped in cross-section. Opposite sides of the detecting lever 11 are formed as wing portions 12, 12' which are arranged to engage the reversing pawls 6, 6' respectively. The detecting lever 11 also has opposed inked ribbon engaging or guide surfaces 13, 13' arranged to contact the inked ribbon on the first and second spools respectively. The detecting lever 11 is mounted for pivotal movement about a shaft 14 fixed to a base plate 15. A torsion coil spring 16 biases the detecting lever 11 and the reversing member 5 away from one another. Thus the spring 16 urges one of the guide surfaces 13, 13' of the detecting lever 11 into contact with one spool and at the same time urges the feeding pawl 9', 9 of the reversing member 5 into engagement with the ratchet wheel associated with the other spool.

The operation of the inked ribbon feeding device of Figure 1 will now be described. Figure 1 shows the inked ribbon feeding device at the very moment when the direction of feeding of the inked ribbon is to be reversed, the inked ribbon having been fed from the second spool to the first spool. The ratchet wheel 1 has been rotated intermittently in the direction of the arrow F in response to the reciprocating motion of the driving lever 7 in the direction of the arrow A to cause the inked ribbon to be taken up by the first spool. Consequently, the outer diameter of the inked ribbon on the second spool has been reduced, and so the detecting lever 11 has gradually been moving in the direction of the arrow E under the action of the spring 16. Accordingly, the wing portion 12 has now come into engagement with the reversing pawl 6 as shown. When the driving lever 7 subsequently moves in the direction of the arrow B, the reversing member 5 is forced to pivot in the direction of the arrow C so that the feeding pawl 9' comes into engagement with the ratchet wheel 2. This pivoting of the reversing member 5 causes a tail portion 10 thereof to move in a direction of the arrow D so that the detecting lever 11 is rotated in a direction opposite to that of the arrow E under the action of the spring 16. Thus the positions of the reversing member 5 and the detecting lever 11 are completely reversed from those shown in Figure 1 so that the inked ribbon is now fed from the first spool to the second spool on reciprocation of the driving lever 7.

The inked ribbon feeding device of Figure 1 may have means (not shown) to prevent back-lash of the ratchet wheels due to

movement of the reversing member 5 in the direction of the arrow C. These means may be a frictional brake applied between the ratchet wheel 1 and the shaft 3 and a frictional brake applied between the ratchet wheel 2 and the shaft 4.

In the inked ribbon feeding device of Figure 1, the feeding pawls 9, 9' are formed on the reversing member 5. However, the feeding pawls 9, 9' may be separate from the reversing member 5 as shown in Figure 3 which is a diagrammatic view of a second embodiment of an inked ribbon feeding device according to the present invention.

A feeding pawl lever 20 on which the feeding pawls 9, 9' are provided is mounted for pivotal movement about the shaft 8 fixed to the driving lever 7. A reversing member 21 on which the reversing pawls 6, 6' are provided is mounted for pivotal movement about the shaft 8. A pin 22 connects the feeding pawl lever 20 and the reversing member 21 together so that they move as a unit. A lever 23 is mounted for pivotal movement about a shaft 24 fixed to the base plate 15 for preventing back-lash of the ratchet wheels 1, 2 when the direction of feeding of the inked ribbon is reversed. The lever 23 has two stable positions, one in contact with the ratchet wheel 1 and the other in contact with the ratchet wheel 2, the two stable positions being determined by a coil spring 25. The lever 23 is moved from one position to the other by virtue of engagement with the feeding pawl lever 20 as it pivots. The reversing member 21 and the driving lever 7 are mounted on one side of the base plate 15, while the feeding pawl lever 20 and the lever 23 are mounted on the other. The ratchet wheels 1, 2, the feeding pawl lever 20 and the lever 23 can be disposed in substantially a single plane so that the inked ribbon feeding device is substantially flat.

A third embodiment of an inked ribbon feeding device according to the present invention is shown in Figure 4. The pawls 6, 6' are provided on opposite sides of a first reversing member 35 facing the ratchet wheels 1, 2 respectively. The reversing member 35 is mounted for pivotal movement about the shaft 8 on the driving lever 7. A torsion coil spring 36 has one end secured to the first reversing member 5 and the other end secured to the driving lever 7. A second reversing member 37 has a trapezoidal aperture 38 therein and is mounted for pivotal movement about a shaft 39 fixed to the base plate 15. A pin 40 is fixed to the first reversing member 35 and engages with the walls of the trapezoidal aperture 38 of the second reversing member 37 for the purpose of transmitting the pivotal movement of the first reversing member 35 to the second reversing member 37.

The operation of the inked ribbon feeding device of Figure 4 will now be described. Figure 1 shows the inked ribbon feeding device at the very moment when the direction of the feeding of the inked ribbon is to be reversed, the inked ribbon having been fed from the second spool to the first spool. The ratchet wheel 1 has been rotated intermittently in the direction of the arrow F in response to the reciprocating motion of the driving lever 7 in the direction of the arrow A to cause the inked ribbon to be taken up by the first spool. Consequently, the outer diameter of the inked ribbon on the second spool has been reduced and so the detecting lever 11 has gradually been moving in the direction of the arrow E under the action of the spring 16. Accordingly, the wing portion 12 has now come into engagement with the reversing pawl 6 as shown. When the driving lever 7 subsequently moves in the direction of the arrow B, the reversing member 35 is caused to pivot in the direction of the arrow C so that the feeding pawl 9' comes into engagement with the ratchet wheel 2. The pin 40 on the first reversing member 35 causes the second reversing member 37 to move in the direction of the arrow D so that the detecting lever 11 is rotated in a direction opposite to that of the arrow E under the action of the spring 16. Thus the positions of the first reversing member 35, the second reversing member 37 and the detecting lever 11 are reversed from those shown in Figure 4 so that the inked ribbon is fed from the first spool to the second spool on reciprocation of the driving lever 7.

The inked ribbon feeding device of Figure 4 may have means (not shown) to prevent back-lash of the ratchet wheels due to movement of the first reversing member 35 in the direction of the arrow C. These means may be a frictional brake applied between the ratchet wheel 1 and the shaft 3 and a frictional brake applied between the ratchet wheel 2 and the shaft 4.

A further embodiment of an inked ribbon feeding device according to the present invention will now be described with reference to Figure 5. A first reversing member 50 is mounted for pivotal movement about a shaft 8 on the driving lever 7 and carries the reversing pawl 6, 6' and the feeding pawls 9, 9' and a reversing portion 41. A second reversing member 42 which is mounted for pivotal movement about the shaft 39 on the base plate 15 carries pawls 43, 43' facing the ratchet wheels 1, 2 respectively for preventing back-lash of the ratchet wheels. To this end, the pawl 43 or the pawl 43' is engaged with the ratchet wheel 1 or the ratchet wheel 2 respectively, by the spring 16. When the first reversing member 50 is pivoted in the direction of the arrow C, the reversing

portion 41 is engaged with the pawl 43' to pivot the second reversing member 42 in the direction of the arrow D. When the second reversing member 42 is pivoted, the detecting lever 11 pivots in the direction of the arrow F under the action of the spring 16. The linked ribbon feeding device of Figure 5 is more certain and reliable in operation than the inked ribbon feeding device of Figure 4 because of the provision of the pawls 43, 43' to prevent back-lash of the ratchet wheels.

As mentioned previously, it is difficult to make conventional inked ribbon feeding devices of small size because levers, shafts, springs, etc. have to be associated with each spool.

The inked ribbon feeding devices according to the present invention and described above on the other hand, have only a single detecting lever disposed substantially midway between the two ratchet wheels and only a minimum number of springs are used. Consequently, the linked ribbon feeding devices may be made of comparatively small size and at relatively low cost.

WHAT WE CLAIM IS:—

1. An inked ribbon feeding device comprising: two spaced apart ratchet wheels between which, in operation, inked ribbon is fed; a single detecting member having two wing portions and two inked ribbon engaging portions; reversing means having two reversing pawls, a wing portion and an engaging portion of the detecting member and a reversing pawl of the reversing means facing each ratchet wheel; and spring means for biasing the reversing means and the detecting member in opposite directions, the arrangement being such that, when all or substantially all the inked ribbon has been fed from one ratchet wheel to the other ratchet wheel, the reversing pawl and wing portion facing the said other ratchet wheel come into engagement to cause the reversing means to move to permit the inked ribbon to be fed from said other ratchet to said one ratchet wheel, the movement of the reversing means causing the spring means to move the detecting member in the opposite direction.

2. An inked ribbon feeding device as claimed in claim 1 in which said reversing means is provided with two feeding pawls which are selectively engageable with one or

other of the ratchet wheels thereby to rotate the latter in response to reciprocating movement of the reversing means.

3. An inked ribbon feeding device as claimed in claim 2 in which the reversing means is a single member carrying the reversing pawls and the feeding pawls.

4. An inked ribbon feeding device as claimed in claim 1 in which said reversing means comprises a first member and a second member, the first member carrying the reversing pawls, the spring means biasing the second member and the detecting member in opposite directions, the first and second members being arranged so that movement of the first member in one direction causes movement of the second member in the opposite direction.

5. An inked ribbon feeding device as claimed in claim 4 in which the first member is provided with two feeding pawls which are selectively engageable with one or other of the ratchet wheels thereby to rotate the latter in response to reciprocating movement of the first member.

6. An inked ribbon feeding device as claimed in any preceding claim including preventing means for reducing or preventing back-lash of the ratchet wheels when the direction of feeding of the inked ribbon is reversed.

7. An inked ribbon feeding device as claimed in claim 6 when dependent upon any of claims 1 to 3 in which said preventing means comprises brake means acting upon at least one of the ratchet wheels.

8. An inked ribbon feeding device as claimed in claim 6 when dependent upon claim 4 or 5 in which said second member is provided with two further pawls which are selectively engageable with one or other of the ratchet wheels to prevent back-lash thereof.

9. An inked ribbon feeding device substantially as herein described with reference to and as shown in the accompanying drawings.

10. A printer or typewriter having an inked ribbon feeding device as claimed in any preceding claim.

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portion 41 is engaged with the pawl 43' to pivot the second reversing member 42 in the direction of the arrow D. When the second reversing member 42 is pivoted, the detecting lever 11 pivots in the direction of the arrow F under the action of the spring 16. The linked ribbon feeding device of Figure 5 is more certain and reliable in operation than the inked ribbon feeding device of Figure 4 because of the provision of the pawls 43, 43' to prevent back-lash of the ratchet wheels.

As mentioned previously, it is difficult to make conventional inked ribbon feeding devices of small size because levers, shafts, springs, etc. have to be associated with each spool.

The inked ribbon feeding devices according to the present invention and described above on the other hand, have only a single detecting lever disposed substantially midway between the two ratchet wheels and only a minimum number of springs are used. Consequently, the linked ribbon feeding devices may be made of comparatively small size and at relatively low cost.

WHAT WE CLAIM IS:—

1. An inked ribbon feeding device comprising: two spaced apart ratchet wheels between which, in operation, inked ribbon is fed; a single detecting member having two wing portions and two inked ribbon engaging portions; reversing means having two reversing pawls, a wing portion and an engaging portion of the detecting member and a reversing pawl of the reversing means facing each ratchet wheel; and spring means for biasing the reversing means and the detecting member in opposite directions, the arrangement being such that, when all or substantially all the inked ribbon has been fed from one ratchet wheel to the other ratchet wheel, the reversing pawl and wing portion facing the said other ratchet wheel come into engagement to cause the reversing means to move to permit the inked ribbon to be fed from said other ratchet to said one ratchet wheel, the movement of the reversing means causing the spring means to move the detecting member in the opposite direction.

2. An inked ribbon feeding device as claimed in claim 1 in which said reversing means is provided with two feeding pawls which are selectively engageable with one or

other of the ratchet wheels thereby to rotate the latter in response to reciprocating movement of the reversing means.

3. An inked ribbon feeding device as claimed in claim 2 in which the reversing means is a single member carrying the reversing pawls and the feeding pawls.

4. An inked ribbon feeding device as claimed in claim 1 in which said reversing means comprises a first member and a second member, the first member carrying the reversing pawls, the spring means biasing the second member and the detecting member in opposite directions, the first and second members being arranged so that movement of the first member in one direction causes movement of the second member in the opposite direction.

5. An inked ribbon feeding device as claimed in claim 4 in which the first member is provided with two feeding pawls which are selectively engageable with one or other of the ratchet wheels thereby to rotate the latter in response to reciprocating movement of the first member.

6. An inked ribbon feeding device as claimed in any preceding claim including preventing means for reducing or preventing back-lash of the ratchet wheels when the direction of feeding of the inked ribbon is reversed.

7. An inked ribbon feeding device as claimed in claim 6 when dependent upon any of claims 1 to 3 in which said preventing means comprises brake means acting upon at least one of the ratchet wheels.

8. An inked ribbon feeding device as claimed in claim 6 when dependent upon claim 4 or 5 in which said second member is provided with two further pawls which are selectively engageable with one or other of the ratchet wheels to prevent back-lash thereof.

9. An inked ribbon feeding device substantially as herein described with reference to and as shown in the accompanying drawings.

10. A printer or typewriter having an inked ribbon feeding device as claimed in any preceding claim.

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