

SPECIFICATION

Cassette type ink ribbon device

The present invention relates to a cassette type ink ribbon device which is adapted to be employed with a printing apparatus such, for example, as an impact type serial printer, a typewriter or the like.

Cassette type ink ribbon devices heretofore in use or for sale may be divided broadly into two types. One of them has a construction substantially the same as that of a cassette recording tape for a cassette tape recorder. Namely, two reels are rotatably mounted within a single cassette case and an ink ribbon is adapted to be wound from one of the reels onto the other.

The other type, which is provided with an endless ink ribbon, generally has a construction as described below. Namely, the endless ink ribbon is folded over like a bellows and packed in an internal space of a single box-shaped case. The folded or packed ribbon is adapted to be pulled out from the case when it is attached to a printing apparatus. Then, the ink ribbon is adapted to be guided by guide rollers which are disposed within the case. The ink ribbon device of the type, however, has some disadvantages. Namely, the ink of the ribbon easily soils the user's hands when the device is attached to the printing apparatus. In addition, the size as well as the space required for the device is large since the case is required to have a sufficiently large internal space for the ink ribbon to be packed therein. Further, this internal space is useless after the case has been attached to the printing apparatus.

According, therefore, to the present invention, there is provided a cassette type ink ribbon device comprising two cassette cases; a transfer roller and an ink roller which are rotatably mounted within one of said cassette cases and which are in contact with each other; a guide body slidably supported within the other of said cassette cases and biased by means of a spring, said guide body being provided with a cavity; and an endless ink ribbon which extends around said transfer roller and said guide body and which passes through apertures in side walls of the cassette cases, a slack part of said ink ribbon being arranged to be packed into said cavity when said cassette cases are positioned close to each other.

The said guide body may be biased by means of the said spring so as to press a part of said ink ribbon against a wall of the corresponding cassette case so that said slack part cannot be freely withdrawn from the cavity.

The cassette cases may be respectively provided with coupling portions by means of which the cassette cases may be releasably coupled together.

The cassette cases may be provided with members for attachment to a printing apparatus.

The cassette cases may be of similar shape.

The invention also comprises a printing apparatus having a cassette type ink ribbon device as referred to above, the transfer roller having a width corresponding to the height of the

characters printed by a printing head of said printing apparatus.

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

Figure 1 is a sectional view of a first embodiment of a cassette type ink ribbon device in accordance with the present invention showing the internal construction thereof, the view being taken on line II—II of Figure 2,

Figure 2 is a vertical sectional view of the structure shown in Figure 1,

Figure 3 is a sectional view corresponding to that of Figure 1 but showing the right and left cassette cases separated from each other instead of being coupled as shown in Figure 1,

Figure 4 is a vertical sectional view taken along line IV—IV of Figure 3,

Figure 5 is a vertical sectional view of a second embodiment of a cassette type ink ribbon device in accordance with the invention wherein the right and left cases are separated from each other in the same way as shown in Figure 3, and

Figure 6 is a fragmentary view of an ink ribbon, and showing characters printed by a printing head and by a transfer roller of the second embodiment.

Terms such as "left", "right", "upper" and "lower", as used in the description below, are to be understood to refer to directions as seen in the accompanying drawings.

A first embodiment of the cassette type ink ribbon device according to the present invention will now be described.

As shown in Figures 1 and 2, a pair of left and right cassette cases 1, 1 have substantially the same configuration or shape and each of them is constituted by a lower case 2 and an upper case 3 made of a plastics material such as that known as ABS or the like. The lower case 2 is provided at corner portions thereof with four holes 4 and the upper case 3 has projection members (not shown) at positions corresponding to the holes 4. The lower and upper cases 2, 3 are connected together by forcing the projection members into the holes 4.

Within an internal space of the left case 1, an ink roller 5 and a transfer roller 6 are rotatably mounted and are in contact with each other. The ink roller 5 is made of an acrylonitrile butadiene rubber (NBR) and contains black ink therein.

Alternatively, the ink roller 5 may be made of felt, porous rubber, or sponge or the like, if desired.

Within an internal space of the right case 1, a guide body 7 is slidably mounted. The guide body 7 has a cavity 8 provided with an inlet at the right hand end thereof, and a half cylindrical portion 9 formed behind the cavity 8 and tongue-shaped portions 10, 10 formed integrally from opposite side walls of the half-cylindrical portion 9. In addition, the guide body 7 is biased rightwards by means of a coil spring 12 which is arranged between the half-cylindrical portion 9 and a side wall 11 of the lower case 2. Further, the lower case 2 is provided on its bottom with a guide groove 13 for slidably supporting the guide body 7

for movement leftward and rightward. The guide groove 13 has a broad portion by means of which the tongue-shaped portions 10, 10 are supported. A bearing hole 15, for rotatably supporting a shaft 14 of the ink roller 5, is bored through the centre of the broad portion of the guide groove 13. In addition, a bearing hole 17, for rotatably supporting a shaft 16 of the transfer roller 6, is bored through the centre of a narrow portion of the guide groove 13. The bearing hole 17 has an elongated shape so as to slidably support the shaft 16 transversely also.

The inner surface of the upper case 3 has the same shape as that of the bottom surface of the lower case 2. The inner surfaces of the lower and upper cases 2, 3 are manufactured and designed, so as to enable them to support either the guide body 7 or the rollers 5, 6. In consequence, the left and right cassette cases 1, 1 can be employed interchangeably although they are required to support different internal parts respectively.

Furthermore, each of the walls 11, 11 facing each other is provided at each of its ends with an aperture 18 and is provided at its middle portion with a coupling pawl or portion 19. The two cassette cases 1, 1 are releasably coupled to each other by engaging the coupling portions 19, 19 as shown in Figures 1 and 2 and a cassette type ink ribbon device of the present invention will be sold to users in such a coupled state. However, the cases 1, 1 can be separated by a user as shown in Figures 3 and 4, in order to attach them to a printing apparatus.

An endless ink ribbon 20 extends around the transfer roller 6 of the left case 1 and the guide body 7 of the right case 1. The endless ink ribbon 20 passes through the apertures 18 and, in addition, has a slack part which is folded over like a bellows and packed in the cavity 8 of the guide body 7 when the cases 1, 1 have been coupled to each other as shown in Figures 1 and 2. In the coupled state as shown in Figures 1 and 2, since the guide body 7 is biased rightward by means of the spring 12, the ink ribbon 20 is clamped between the right hand end of the guide body 7 and the inner side surface of the lower case 2 by virtue of the force of the spring 12. Consequently, the ribbon 20 cannot be freely removed from the cavity 8. This prevents the ink ribbon 20 from becoming entangled in the internal spaces of the cases 1, 1.

In addition, as shown in Figure 4, each of the cassette cases 1, 1 is provided with fulcra 21, 21 and with resilient plate members 22, 22. The fulcra 21 are formed integrally with opposite side walls of the respective lower case 2, while the resilient plate members 22 are formed integrally with the fulcra 21 and are parallel to the side walls. Each of the plate members 21 is provided at the lower end thereof with a projection or snapping pawl 23 which is positioned under the bottom of the lower case 2.

The cassette type ink ribbon device of the present invention can be attached to a printing apparatus such as a serial print or the like as

follows. The left and right cassette cases 1, 1 are shifted by hand so that the coupling portions 19, 19 are disengaged and thus the cases 1, 1 can be separated. When the cases 1, 1 are separated as shown in Figure 3, the slack part of the ink ribbon 20, which had been folded over like a bellows as shown in Figure 1, is withdrawn from the cavity 8 against the frictional force between the right hand end of the guide body 7 and the inner surface of the lower case 2, and the cavity 8 finally becomes empty. Then the guide body 7 is moved leftward against the force of the spring 12 along the guide groove 13 as shown in Figure 3. As a result, the ink ribbon 20 extends around and in contact with the transfer roller 6 and the guide body 7. Thereafter, the cases 1, 1 are pushed downward against a plate 24 of the printing apparatus as shown in Figure 4 and thus the projections 23, 23 are engaged with the plate 24, so that the cases 1, 1 are attached to the plate 24.

The ink ribbon 20 is now pulled out from the apertures 18 of the cases 1, 1 in the form of two loops; and a suitable tension force is applied via the guide body 7 which is biased by means of the spring 12. The transfer roller 6 is thus brought into contact with the ink roller 5 by virtue of this tension force. One of the two loops of the ink ribbon 20 will be arranged to pass between a printing head and a platen (neither of which is shown). When the printing head is operated, the ink ribbon 20 is driven by a feed mechanism therefor in relation to scanning, particularly of the carriage return, and thus the transfer roller 6 and the ink roller 5 are rotated together. Since ink which has been contained in the ink roller 5 is transferred onto the peripheral surface of the transfer roller 6 in the form of a thin film, the transfer roller transfers this film or ink onto the ink ribbon 20. In other words, the ink of the ribbon 20 is used up by the printing of characters and is replenished at the same time through the transfer roller 6 from the ink roller 5. In consequence, the ribbon 20 continues to contain ink therein as long as one likes despite the consumption of ink for printing.

As will be appreciated from Figure 4, if the upper portions of the resilient plate members 22 are manually squeezed together, the lower portions thereof will be forced outwardly and the projections 23, 23 will be released from the plate 24. Thus the cases 1, 1 will be able to be removed upwardly from the plate 24 by lifting them up.

A second embodiment of the invention will now be described with reference to Figure 5.

A left cassette case 101 is constituted by a lower case 102 and an upper case 103. The lower case 102 is provided with integral projections 104 and 105 which rotatably support an ink roller 106 and a transfer roller 107 respectively. A right cassette case 108 is constituted by a lower case 109 and an upper case 110 which are provided on respective inner surfaces thereof with guide grooves 111 and 112 for slidably supporting a guide body 113. Thus in this second embodiment the left cassette case 101 has only the function of

rotatably supporting the ink roller 106 and the transfer roller 107, while the right cassette case 108 has only the function of slidably supporting the guide body 113. The guide body 113 is provided with a cavity 114 and with a half-cylindrical portion 115, and is biased rightwards by means of a coil spring 116. An endless ink ribbon 117 is passed through apertures (not seen in Figure 5) of the cassette cases 101 and 108 and extending around the transfer roller 107 and the guide body 113. In addition, the cassette cases 101 and 108 have coupling portions 118 and resilient plate members 119, the latter being provided at their lower ends with snapping pawls or projections 120.

Although the ink ribbon 117 has a width of h_1 , only a central area thereof is in practice utilized for the printing of characters whose height is h_2 . Therefore, the transfer roller 107 is manufactured and designed so as to provide a height of h_0 which is substantially equal to or a little smaller than h_2 . Thus, the ink ribbon 117 is replenished with ink only at the central area thereof which is in practice utilized for printing. In order to suitably adjust or control the quantity of ink for replenishing the ribbon 117, the external surface of the transfer roller 107 may have a shape other than flat.

A cassette type ink ribbon device as described above can be produced in a compact or small size and at a low cost. The space required for attaching it in position can be decreased since the cassette cases are divided into two bodies.

In addition, the slack part of the ink ribbon is adapted to be packed into the cavity of the guide body, and the latter is slidably supported in one of the cassette cases. The guide body acts as a tensioner for the ink ribbon by virtue of the spring. When the device is attached to a printing apparatus, the ink ribbon is prevented from being easily withdrawn from the cavity by the biased guide body. Consequently, the slack in the ink ribbon never becomes entangled. Further, as the ink ribbon is given a tension through the guide body which is biased by means of the spring, there is no requirement for a special tension application means on the printing apparatus, and consequently, the space for the attachment of the device and the component parts can be decreased. Moreover, it can have an excellent life and, in the case where the transfer roller is designed to have a width corresponding to the height of characters printed by a printing head, the quantity of ink required for replenishment is suitably controlled and thus the ribbon too can have a long life. In addition, handling, attachment and removal of the device are easy and smooth.

CLAIMS

1. A cassette type ink ribbon device comprising two cassette cases; a transfer roller and an ink roller which are rotatably mounted within one of said cassette cases and which are in contact with each other; a guide body slidably supported within the other of said cassette cases and biased by means of a spring, said guide body being provided with a cavity; and an endless ink ribbon which extends around said transfer roller and said guide body and which passes through apertures in side walls of the cassette cases, a slack part of said ink ribbon being arranged to be packed into said cavity when said cassette cases are positioned close to each other.

2. A cassette type ink ribbon device as claimed in claim 1 in which said guide body is biased by means of the said spring so as to press a part of said ink ribbon against a wall of the corresponding cassette case so that said slack part cannot be freely withdrawn from the cavity.

3. A cassette type ink ribbon device as claimed in claim 1 or 2 in which the cassette cases are respectively provided with coupling portions by means of which the cassette cases may be releasably coupled together.

4. A cassette type ink ribbon device as claimed in any preceding claim, in which the cassette cases are provided with members for attachment to a printing apparatus.

5. A cassette type ink ribbon device as claimed in any preceding claim in which the cassette cases are of similar shape.

6. A cassette type ink ribbon device substantially as hereinbefore described with reference to and as shown in Figures 1—4 or in Figure 5 of the accompanying drawings.

7. A printing apparatus having a cassette type ink ribbon device as claimed in any preceding claim, the transfer roller having a width corresponding to the height of the characters printed by a printing head of said printing apparatus.

8. A printing apparatus having a cassette type ink ribbon device comprising two cassette cases through which an endless ink ribbon extends, a transfer roller and an ink roller which are rotatably mounted within one of said cassette cases so as to be arranged to supply ink to said ink ribbon and which are in contact with each other; a tensioner slidably disposed within the other of said cassette cases so as to engage the inside surface of said ink ribbon and a biasing spring which is located between said tensioner and a wall of the other cassette case and which biases said tensioner so as to apply a tensioning force to said ink ribbon during use of the device.



18

rotatably supporting the ink roller 106 and the transfer roller 107, while the right cassette case 108 has only the function of slidably supporting the guide body 113. The guide body 113 is provided with a cavity 114 and with a half-cylindrical portion 115, and is biased rightwards by means of a coil spring 116. An endless ink ribbon 117 is passed through apertures (not seen in Figure 5) of the cassette cases 101 and 108 and extending around the transfer roller 107 and the guide body 113. In addition, the cassette cases 101 and 108 have coupling portions 118 and resilient plate members 119, the latter being provided at their lower ends with snapping pawls or projections 120.

Although the ink ribbon 117 has a width of h_1 , only a central area thereof is in practice utilized for the printing of characters whose height is h_2 . Therefore, the transfer roller 107 is manufactured and designed so as to provide a height of h_0 which is substantially equal to or a little smaller than h_2 . Thus, the ink ribbon 117 is replenished with ink only at the central area thereof which is in practice utilized for printing. In order to suitably adjust or control the quantity of ink for replenishing the ribbon 117, the external surface of the transfer roller 107 may have a shape other than flat.

A cassette type ink ribbon device as described above can be produced in a compact or small size and at a low cost. The space required for attaching it in position can be decreased since the cassette cases are divided into two bodies.

In addition, the slack part of the ink ribbon is adapted to be packed into the cavity of the guide body, and the latter is slidably supported in one of the cassette cases. The guide body acts as a tensioner for the ink ribbon by virtue of the spring. When the device is attached to a printing apparatus, the ink ribbon is prevented from being easily withdrawn from the cavity by the biased guide body. Consequently, the slack in the ink ribbon never becomes entangled. Further, as the ink ribbon is given a tension through the guide body which is biased by means of the spring, there is no requirement for a special tension application means on the printing apparatus, and consequently, the space for the attachment of the device and the component parts can be decreased. Moreover, it can have an excellent life and, in the case where the transfer roller is designed to have a width corresponding to the height of characters printed by a printing head, the quantity of ink required for replenishment is suitably controlled and thus the ribbon too can have a long life. In addition, handling, attachment and removal of the device are easy and smooth.

CLAIMS

1. A cassette type ink ribbon device comprising two cassette cases; a transfer roller and an ink roller which are rotatably mounted within one of said cassette cases and which are in contact with each other; a guide body slidably supported within the other of said cassette cases and biased by means of a spring, said guide body being provided with a cavity; and an endless ink ribbon which extends around said transfer roller and said guide body and which passes through apertures in side walls of the cassette cases, a slack part of said ink ribbon being arranged to be packed into said cavity when said cassette cases are positioned close to each other.

2. A cassette type ink ribbon device as claimed in claim 1 in which said guide body is biased by means of the said spring so as to press a part of said ink ribbon against a wall of the corresponding cassette case so that said slack part cannot be freely withdrawn from the cavity.

3. A cassette type ink ribbon device as claimed in claim 1 or 2 in which the cassette cases are respectively provided with coupling portions by means of which the cassette cases may be releasably coupled together.

4. A cassette type ink ribbon device as claimed in any preceding claim, in which the cassette cases are provided with members for attachment to a printing apparatus.

5. A cassette type ink ribbon device as claimed in any preceding claim in which the cassette cases are of similar shape.

6. A cassette type ink ribbon device substantially as hereinbefore described with reference to and as shown in Figures 1—4 or in Figure 5 of the accompanying drawings.

7. A printing apparatus having a cassette type ink ribbon device as claimed in any preceding claim, the transfer roller having a width corresponding to the height of the characters printed by a printing head of said printing apparatus.

8. A printing apparatus having a cassette type ink ribbon device comprising two cassette cases through which an endless ink ribbon extends, a transfer roller and an ink roller which are rotatably mounted within one of said cassette cases so as to be arranged to supply ink to said ink ribbon and which are in contact with each other; a tensioner slidably disposed within the other of said cassette cases so as to engage the inside surface of said ink ribbon and a biasing spring which is located between said tensioner and a wall of the other cassette case and which biases said tensioner so as to apply a tensioning force to said ink ribbon during use of the device.