

Ribbon Cassette

The present invention relates to a ribbon cassette, e.g. for use on a printer.

5 A ribbon cassette is known in which an endless ink ribbon is stored in a ribbon storage chamber in a meandering or zig-zag state, and printing is effected by means of a print head of a printer by intermittently feeding a portion of the ink ribbon which extends
10 externally of the cassette to a front surface of a platen. Two types of ink ribbons are available, one type being generally called a film ribbon and the other a fabric ribbon. Special ribbon cassettes have previously been employed for each of the respective
15 types for the following reasons.

In the case of the fabric ribbon, a fabric, i.e., a basic material, is impregnated with printing ink. In the case of the film ribbon, however, a synthetic resin film is used as a basic material and ink is applied to
20 one side of the film. The film ribbon is harder than the fabric ribbon since it uses a synthetic resin film as a basic material.

In addition, in the case of the ribbon cassette for the fabric ribbon, when the fabric ribbon is drawn
25 out from the ribbon storage chamber in which the ribbon is stored in the meandering or zig-zag state, the ribbon is bent and then passes through a slit provided in a wall member which partitions the downstream side of the ribbon storage chamber. However, this can cause the
30 ribbon to jam at the slit.

Hence, in order to draw out the ribbon smoothly from the ribbon storage chamber, a rib, projection or the like is provided in the vicinity of an exit of the ribbon storage chamber, so that the ribbon is drawn out

properly by imparting sliding resistance to the ribbon, i.e., by applying a frictional load thereto, e.g. as shown in U.S. Patent No. 4, 645, 364.

5 In the case of the film ribbon, however, since the basic material is harder, if the said rib or the like is formed in the vicinity of the slit of the ribbon storage chamber, the rib hampers the passage of the film ribbon.

10 Two types of ribbon cassette cases have previously been provided, namely a case for the fabric ribbon and a case for the film ribbon. For this reason, separate moulds for these two types have been required and this has increased production costs.

15 According, therefore, to the present invention, there is provided a ribbon cassette having a case provided with a ribbon storage chamber containing either an endless fabric ribbon or an endless film ribbon; the ribbon storage chamber having internal wall means which partitions the ribbon storage chamber into a storage compartment, in which the fabric or film ribbon is
20 arranged in a meandering or zig-zag state, and a further compartment, the internal wall means having a first slit therein for the passage of the fabric ribbon therethrough and a second slit for the passage of the film ribbon therethrough; the case having a ribbon
25 outlet arm over which the ribbon can travel from the interior to the exterior of the ribbon storage chamber and a ribbon inlet arm over which the ribbon can travel from the exterior to the interior of the ribbon storage chamber, the arms extending outwardly of the case; drive
30 means for moving the fabric or film ribbon from the storage compartment and through the respective slit into the further compartment and thereafter over the ribbon outlet arm and over the ribbon inlet arm back to the interior of the storage compartment; and a friction

member arranged adjacent to and upstream of the first slit so that, when the cassette contains a fabric ribbon, the latter passes in contact with the friction member and is subjected to a frictional load thereby, whereas when the cassette contains a film ribbon, the latter passes through the second slit without passing in contact with the friction member.

The internal wall means preferably has first and second wall portions which are respectively provided with the first and second slits, the second wall portion being arranged upstream of the first wall portion with respect to the direction of movement of the ribbon.

The friction member is substantially aligned with or is disposed downstream of the second wall portion. The friction member may be constituted by a rib extending from a wall of the case.

The internal wall means may have a third wall portion which is aligned with the second wall portion and which is engaged by the rib.

Preferably, the second slit is disposed on the side of the transverse centre line of the ribbon storage chamber remote from the side thereof on which the said arms are disposed.

The ribbon storage chamber may contain an additional compartment which is disposed on the downstream side of the further compartment and which is separated from the latter by a partition wall, the partition wall having an aperture therein arranged for the passage therethrough of either the fabric ribbon or the film ribbon.

The additional compartment preferably contains friction imparting means for subjecting either the fabric ribbon or the film ribbon to a frictional load prior to its passage over the ribbon outlet arm.

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

Figure 1 is a cross-sectional view of one embodiment of a ribbon cassette according to the present

5 Figure 2 is a cross-sectional view taken along the line a - b of Figure 1; and

Figure 3 is a cross-sectional view of a film ribbon, which may be employed in the cassette of Figure 1.

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

In Figure 1 there is shown an embodiment of a ribbon cassette 1 according to the present invention which has a case 2 provided with an elongated or oblong ribbon storage chamber 3 which contains either an endless fabric ribbon R or an endless film ribbon Ra. The right hand, or major, portion of the ribbon storage chamber 3 comprises a storage compartment 3a in which the fabric ribbon R or the film ribbon 3a is arranged in a meandering or zig-zag state.

20 The ribbon storage chamber 3 has internal wall means 23 which partitions the ribbon storage chamber 3 into the storage compartment 3a and a further compartment 3b, the ribbon storage chamber 3 also containing an additional compartment 3c which is separated from the further compartment 3b by a partition wall 25.

30 The case 2 is provided with a ribbon outlet arm or pull-out arm 21 and a ribbon inlet arm or pull-in arm 22 which are respectively formed integrally at opposite end portions of the case 2 on side surfaces thereof so as to project in the same direction from the case 2. The pull-out arm 21 is provided with an opening 21a through

which the fabric ribbon R or film ribbon Ra can pass from the interior to the exterior of the ribbon storage chamber 3 prior to travelling over the pull-out arm 21. The pull-in arm 22 is provided with an opening 22a through which the fabric ribbon R or film ribbon Ra can pass from the exterior to the interior of the ribbon storage chamber 3 after having travelled over the pull-in arm 22.

A drive means is provided for feeding either the fabric ribbon R or the film ribbon Ra outwardly from the case 2 and drawing it back into the case 2. The said drive means comprises a shaft 5 of a ribbon feed roller 4 which is rotatably mounted adjacent to the bottom right hand end of the case 2, the shaft 5 passing through this bottom portion. A gear 6 is secured to the roller 4 coaxially therewith, and a pressure roller 7 resiliently abuts against the roller 4. A lower end of a shaft 8 of the pressure roller 7 fits in a guide groove (not shown) formed in the bottom surface of the case 2. A gear 9 is provided on an upper surface of the roller 7 coaxially with the roller 7, an upper end of the shaft 8 being borne by a slider 10. Coupled to the slider 10 is the distal end of a resilient plate 11 having its proximal end secured to the case 2. Consequently, the pressure roller 7 imparts a pressure force to the ribbon feed roller 4, and the gear 6 is positively interlocked with the gear 9 by meshing therewith. In addition, the lower end of the shaft 5 of the ribbon feed roller 4 is held in a position in which it extends through and projects from the bottom of the case 2, as described above, and a drive force from a drive motor (not shown) is imparted thereto. The drive means 4 - 11 in operation moves the fabric ribbon R or film ribbon Ra from the storage compartment 3a and

through a respective first slit 23a or second slit 23b into the further compartment 3b and additional compartment 3c and thereafter over the arms 21, 22 back to the storage compartment 3a.

5 The internal wall means 23 which partitions the ribbon storage chamber 3 has first, second and third wall portions 32, 33, 34. The first and second wall portions 32, 33 are respectively provided with the first and second slits 23a, 23b, the second wall portion 33 being arranged upstream of the first wall portion 32 with respect to the direction of movement of the ribbon R, Ra. The third wall portion 34 is aligned with the second wall portion 33. Thus the upper half of the internal wall means 23 projects leftward of (i.e. to the downstream side of) the lower half thereof.

10 The second slit 23b is disposed on the side of the transverse centre line of the ribbon storage chamber 3 remote from the side thereof on which the arms 21, 22 are disposed. That is to say, the second slit 23b is provided at a position below, as seen in Figure 1, the transverse centre line of the ribbon storage chamber 3. The specific configurations of these slits 23a, 23b are apparent from Figure 2. The upper first slit 23a is for the fabric ribbon R, while the lower second slit 23b is for the film ribbon Ra.

15 The fabric ribbon R is drawn out from the first slit 23a. A rib 24 projects inwardly from an internal surface or wall of the case 2 in the vicinity of the upstream side of the first slit 23a. The rib 24 imparts, sliding, i.e. frictional, resistance to the travel of the fabric ribbon R, and the fabric ribbon R is drawn out smoothly through the first slit 23a by virtue of this load. The rib 24 needs to be spaced apart from the feed path of the film ribbon Ra, so that the latter

passes through the second slit 23b without passing in contact with the rib 24.

5 The rib 24 may be either substantially aligned with or may be disposed downstream of the second wall portion 33. Thus in the embodiment shown in Figure 1, the rib 24 is aligned with and engages the third wall portion 34.

10 The partition wall 25 is disposed midway between the internal wall means 23 of the ribbon storage chamber 3 and a left hand side wall of the case 2. An aperture or slit 25a is formed in the partition wall 25 for the passage therethrough of either the fabric ribbon R or the film ribbon Ra. In the additional compartment 3c on the left-hand side of the partition wall 25, there are
15 disposed guides 26a, 26b for forming a mobius strip, and a guide pin 27 for the fabric ribbon R. A guide pin 28 or the film ribbon Ra is formed below the guide pin 27. The distal end of a resilient plate 12 resiliently abuts against the surface of a projecting corner portion of
20 the pull-out arm 21. The resilient plate 12 is arranged to subject either the fabric ribbon R or the film ribbon Ra to a frictional load prior to its passage over the arm 21.

25 The operation of the embodiment described above will be described hereunder.

First, a description will be given of the case where the ribbon cassette 1 contains a fabric ribbon R.

30 The ribbon feed roller 4 and the pressure roller 7 are interlinkingly rotated by the drive from the drive motor. Consequently, the ribbon R passes through the pull-in arm 22 at the opening 22a, then passes between the ribbon feed roller 4 and the pressure roller 7, and is stored in the storage compartment 3a of the ribbon storage chamber 3. At the same time, the ribbon R is

pulled out from the storage compartment 3a through the first slit 23a while being subjected to load by the rib 24. After having emerged from the first slit 23a, the ribbon R passes through the slit 25a in the wall 25, is inverted by the guides 26a, 26b for forming a mobius strip, and is pulled out through the opening 21a of the pull-out arm 21 while being subjected to a pressure force by the resilient plate 12.

A description will now be given of the case where the ribbon cassette 1 contains a film ribbon Ra shown by the dotted chain line in Figure 1.

The drive means acts in the same way as described above for the fabric ribbon R, but when the film ribbon Ra stored in the storage compartment 3a of the ribbon storage chamber 3 is pulled through the second slit 23b, the film ribbon Ra is not brought into contact with the rib 24, so that the film ribbon Ra is pulled smoothly through this slit 23b.

In addition, as shown in Figure 3, the film ribbon Ra has an ink layer 31 formed on a film 30 by applying ink to one surface thereof. When stored in the storage compartment 3a of the ribbon storage chamber 3, the film ribbon Ra is stored with the film surface 30 facing upwards and with the ink layer 31 located on the lower side. In addition, as described above, the second slit 23b is located at a position beneath the transverse centre line (not shown) of the ribbon storage chamber 3.

Accordingly, if the disposition of the film ribbon Ra in the storage compartment 3a is exactly as shown in Figure 1, the film ribbon Ra is drawn out through the second slit 23b from the position 35 shown in Figure 1, the film ribbon is lowered from its position adjacent to the left hand end of the storage compartment 3a, i.e. from the upper right-hand side of the internal wall

means 23, and is bent in the direction of the second slit 23b. When it passes through the second slit 23b, the film ribbon Ra is pulled out with only the film surface 30 of the film ribbon Ra sliding against an opening edge (i.e. the upper edge in Figure 1) of the slit 23b. Consequently, the surface of the ink layer 31 is not brought into contact with the opening edge of the slit 23b, and the ink layer 31 is therefore protected.

However, if the nearest bend or loop of the film ribbon Ra to the internal wall means 23 is at the position 36 at the bottom of the storage compartment 3, the film ribbon Ra is raised from the position 36, is bent, and enters through the second slit 23b. In this case the film ribbon Ra is pulled out with the ink layer 31 of the film ribbon Ra sliding against the surface of the opening edge (i.e. the lower edge in Figure 1) of the slit 23b. Hence, the ink layer 31 is brought into contact with and slides against the opening edge of the slit 23b. However, since the slit 23b is located below the said transverse centre line, the distance through which the film ribbon Ra will move while the ink layer 31 contacts the said opening edge is very small, and thereafter the film ribbon Ra immediately shifts to a position in which it is lowered from above, and assumes the state in which it is pulled out through the second slit 23b as described in the previous paragraph.

As shown by the chain dotted line, the film ribbon Ra, after having been thus pulled out, passes through the slit 25a, is guided by the guide pin 28, is pressed by the resilient plate 12, is pulled outside through the opening 21a of the pull-out arm 21, and is guided toward a platen (not shown) so as to be used for printing.

Thus in the embodiment described above, when the fabric ribbon R is used, a load is applied to the travel

of the fabric ribbon R by the rib 24, so that the fabric ribbon R is pulled out smoothly through the first slit 23a. On the other hand, when the film ribbon Ra is used, since the ribbon Ra is not brought into contact with the rib 24, the ribbon Ra is pulled out smoothly through the second slit 23b. In addition, since the same ribbon cassette can be used jointly for both types of ribbons, production costs are substantially reduced. Furthermore, since the surface of the ink layer 31 of the film ribbon Ra will be brought into contact with the second slit 23b, for no more than a short distance, the amount of the ink layer 31 of the film ribbon Ra which may be damaged can be reduced.

CLAIMS

1. A ribbon cassette having a case provided with a ribbon storage chamber containing either an endless fabric ribbon or an endless film ribbon; the ribbon storage chamber having internal wall means which partitions the ribbon storage chamber into a storage compartment, in which the fabric or film ribbon is arranged in a meandering or zig-zag state, and a further compartment, the internal wall means having a first slit therein for the passage of the fabric ribbon therethrough and a second slit for the passage of the film ribbon therethrough; the case having a ribbon outlet arm over which the ribbon can travel from the interior to the exterior of the ribbon storage chamber and a ribbon inlet arm over which the ribbon can travel from the exterior to the interior of the ribbon storage chamber, the arms extending outwardly of the case; drive means for moving the fabric or film ribbon from the storage compartment and through the respective slit into the further compartment and thereafter over the ribbon outlet arm and over the ribbon inlet arm back to the interior of the storage compartment; and a friction member arranged adjacent to and upstream of the first slit so that, when the cassette contains a fabric ribbon, the latter passes in contact with the friction member and is subjected to a frictional load thereby, whereas when the cassette contains a film ribbon, the latter passes through the second slit without passing in contact with the friction member.

2. A ribbon cassette as claimed in claim 1 in which the internal wall means has first and second wall portions which are respectively provided with the first and second slits, the second wall portion being arranged



upstream of the first wall portion with respect to the direction of movement of the ribbon.

3. A ribbon cassette as claimed in claim 2 in which the friction member is substantially aligned with or is disposed downstream of the second wall portion.

4. A ribbon cassette as claimed in any preceding claim in which the friction member is constituted by a rib extending from a wall of the case.

5. A ribbon cassette as claimed in claim 4 when dependent upon claim 3 in which the internal wall means has a third wall portion which is aligned with the second wall portion and which is engaged by the rib.

6. A ribbon cassette as claimed in any preceding claim in which the second slit is disposed on the side of the transverse centre line of the ribbon storage chamber remote from the side thereof on which the said arms are disposed.

7. A ribbon cassette as claimed in any preceding claim in which the ribbon storage chamber contains an additional compartment which is disposed on the downstream side of the further compartment and which is separated from the latter by a partition wall, the partition wall having an aperture therein arranged for the passage therethrough of either the fabric ribbon or the film ribbon.

8. A ribbon cassette as claimed in claim 7 in which the additional compartment contains friction imparting means for subjecting either the fabric ribbon or the film ribbon to a frictional load prior to its passage over the ribbon outlet arm.

9. A ribbon cassette substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

~~10. A ribbon cassette including a ribbon storage.~~
