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"INK RIBBON CARTRIDGE"

This invention relates to an ink ribbon cartridge and, although the invention is not so restricted, it relates more particularly to an ink ribbon cartridge for use in a small size printer or the like.

5 Ink ribbon cartridges have previously generally comprised a box type case consisting of a top cover and a bottom cover, and a spool contained in the case. Another type of ink ribbon cartridge of the prior art is constituted by that disclosed in U.S. Patent Specification No. 4,188,134. In the ink ribbon
10 cartridge of the latter specification, the spool is inserted through an aperture of a cassette case and is fastened to the latter by a knob bush fitted on the upper portion of the spool.

The above-mentioned ink ribbon cartridges require a
15 considerable number of parts and assembly steps for attachment of the spool with the ink ribbon to the cassette case and hence are costly. The method of connecting the ink ribbon to the spool has been generally such as to involve the use of a resilient arcuate member which is fastened to the
20 spindle of the spool, with the ink ribbon interposed therebetween. This method also needs a separate part and a special operation for attaching it to the spool. Furthermore, in the ink ribbon cartridge of the U.S. Patent Specification No. 4,188,134, the ink ribbon, when loose, can be readily
25 disengaged from a flange portion of the spool, and it is

time-consuming to wind the ink ribbon about the spool again.
Additionally, when the ink ribbon cartridge is mounted on a
printer or the like, the ink ribbon transporting device
located below the ribbon is liable to become entangled in the
5 loose ink ribbon, resulting in faulty operation or damage.

According to the present invention, there is provided
an ink ribbon cartridge comprising a cassette case having
a wall member which is provided with two holes in each of which
is rotatably mounted a cylindrical portion of a respective
10 spool, the cylindrical portion of each spool being located
axially between a knob portion of the spool and a spindle
portion thereof on which an ink ribbon may be wound, the knob
and spindle portions being, at least in part, of larger
diameter than the respective hole and being disposed on
15 opposite sides of the said wall member, each spool having
at least one slit in each knob portion to enable the
latter to be radially contracted so that it can be passed
through the respective hole.

Preferably each slit extends to the end of the
20 respective knob portion which is remote from the
respective cylindrical portion.

Preferably also each slit extends through the cylindrical portion and into the spindle portion of its respective spool.

Each slit preferably does not extend to the end of the
5 respective spindle portion remote from the respective
cylindrical portion.

Each knob portion may be provided with at least one
sloping portion, the end of the latter which is remote
from the respective cylindrical portion having a diameter less than
10 that of the respective hole, the arrangement being such that
said end may be introduced into its hole and the knob portion
may then be pushed through the hole so as to cause the knob portion
to be radially contracted by reason of the engagement between
the rim of the hole and the or each sloping portion.

15 The arrangement may be such that when the knob portion
is strongly pushed further, a protruding portion, which is
located between the sloping portion and the cylindrical portion,
passes through the hole so that the cylindrical portion is
rotatably mounted in the hole.

20 Opposite ends of an ink ribbon may be connected to the
respective spools. Thus the ink ribbon may have an aperture
or slit adjacent each of its opposite ends which does not
extend to the side edges of the ink ribbon, each spool having
a projecting portion which extends through the respective
25 aperture or slit in the ink ribbon.

Each projecting portion preferably extends axially
of the respective spool and is spaced from the respective spindle

portion thereof by a space into which the ribbon extends.

Each spool may be provided, at its end remote from the respective cylindrical portion, with a flange portion, the cassette case being provided adjacent each spool with first and second ink ribbon guide portions, the first ink ribbon guide portions radially inwardly overlapping the respective flange portion, and the second ink ribbon portions being disposed radially outwardly of the respective flange portion so as to surround the latter.

Thus in its preferred form, the ink ribbon cartridge of the present invention is such that the ink ribbon may be easily connected to each spool without using any additional member, each spool may be easily attached to the cassette case without using any additional member, and the ink ribbon is prevented from coming off the spools without using any additional member.

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

Figure 1 is a top perspective view of an ink ribbon cartridge according to the present invention;

Figure 2 is a bottom perspective view of the ink ribbon cartridge shown in Figure 1;

Figure 3 is a sectional view showing the engagement between a cassette case and a spool of the ink ribbon cartridge of Figure 1;

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Figure 4 is a perspective view of a said spool:

Figures 5(a), 5(b), and 5(c) are broken away views of the ribbon of the cartridge to illustrate holes or slits in the ink ribbon;

5 Figure 6 is a broken-away perspective view showing the attachment of the ink ribbon to a spool;

Figure 7 is a broken-away cross-sectional view showing the attachment of a spool to the cassette case; and

10 Figure 8 is a view illustrating how the ink ribbon is guided by the cassette case and the spools.

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

15 An embodiment of the present invention will now be described with reference to Figures 1 to 8.

As shown in Figure 1, a cassette case 1 houses an ink ribbon 4 opposite ends of which are respectively wound around spools 2, 3 of the same configuration. The cassette case 1 has a wall member 1a which has holes 1-1, 1-2 therein through which
20 the spools 2, 3 pass so as to be thereby rotatably supported.

As shown in Figures 2-4, the cassette case 1 has, adjacent each spool, flange periphery guide portions 1-3, 1-4, 1-5, 1-6 which are disposed radially outwardly of and which surround flange portions 2-5, 3-5 of the spools 2, 3 respectively, and
25 flange face guide portions 1-7, 1-8, 1-9, 1-10 of the spools

2, 3 which partially overlap the flange portions 2-5, 3-5 inwardly in the radial direction. The spool 2 comprises a cylindrical portion 2-1 which is rotatably mounted in the hole 1-1 so that the spool 2 is supported in the cassette case 1, protruding portions 2-2, a spindle portion 2-3 on which the ink ribbon 4 may be wound, slit portions 2-4, the flange portion 2-5, a ribbon engagement portion 2-6 which extends axially upwardly from the flange portion 2-5 and towards the upper end of the spindle portion 2-3, foot portions 2-9, and sloping portions 2-10 which form part of a knob portion 2-11.

The cylindrical portion 2-1 is located above the upper end of the spindle portion 2-3 and has a smaller diameter than that of at least the protruding portions 2-2 of the knob portion 2-11 and of the spindle portion 2-3. The protruding portions 2-2 and the spindle portion 2-3 are of larger diameter than the hole 1-1 and are disposed on opposite sides of the wall member 1a. The cylindrical portion 2-1 is rotatably supported in the hole 1-1 of the cassette case 1. The protruding portions 2-2 are arranged in a circle of a greater diameter than that of the hole 1-1. The protruding portions 2-2 are upwardly contiguous with the cylindrical portion 2-1 and are arranged in a circle of a greater diameter than that of the cylindrical portion 2-1, the slit portions 2-4 allowing the protruding portions 2-2 to be radially flexible. The spindle portion 2-3, about which the ink ribbon 4 is wound, also has a greater

diameter than that of the hole 1-1. The slit portions 2-4 are provided in the spindle portion 2-3 and extend therefrom to the knob portion 2-11 through the cylindrical portion 2-1 on both sides of the protruding portions 2-2. The slit portions 2-4 extend to the end of the knob portion 2-11 which is remote from the cylindrical portion 2-1 but do not extend to the end of the spindle portion 2-3 remote from the cylindrical portion 2-1. Thus the slit portions 2-4 enable the knob portion 2-11 to be radially contracted so that it can be passed through the hole 1-1. As will be appreciated, although it is preferred to use a plurality of angularly spaced apart slit portions 2-4 as shown, it is possible if desired to use only one single slit portion 2-4.

The ribbon engagement portion 2-6 extends upwardly in the axial direction from the flange portion 2-5 to a position not above the height of the spindle portion 2-3 with a space 2-8 between the ribbon engagement portion 2-6 and the spindle portion 2-3 for insertion of the ink ribbon 4 therinto, and has a sloping portion 2-7 at the end thereof. The foot portions 2-9 are adapted to be engaged with an ink ribbon driving device (not shown). The sloping portions 2-10 extend to the protruding portions 2-2 which are arranged in a circle of greater diameter than that of the hole 1-1. The end of the knob portion 2-11 remote from the cylindrical portion 2-1 has a diameter less than that of the hole 1-1.

As indicated above, the construction of the spool 3 is identical to that of the spool 2 and will not therefore be

described in detail.

5 In Figure 5(a) the ink ribbon 4 is shown as having
a slit 4-3 which extends in the direction of the length of
the ink ribbon 4. As shown in Figure 5(b), however, the
ink ribbon 4 may alternatively have a slit 4-4 which
extends in the direction of the width of the ink ribbon 4.
A further possibility, as shown in Figure 5(c), is that the
ink ribbon 4 has a circular or elliptical aperture 4-5.
The slits 4-3, 4-4 and the aperture 4-5 respectively do
10 not extend to the side edges of the ink ribbon 4. Although
only one slit or aperture is shown in each of Figures 5(a),
5(b) and 5(c), the ink ribbon 4 is in fact provided adjacent
each of its ends with such a slit or aperture so that it
may be engaged with the ribbon engagement portions of the
15 spools 2, 3 and be wound around the latter.

The attachment of the ink ribbon 4 to the spool 2 will
now be described. If the ink ribbon 4 is put on the ribbon
engagement portion 2-6 by introducing the latter through the
slit 4-3 as shown in Figure 6, the attachment of the ink
20 ribbon 4 to the spool 2 is completed. The sloping portion
2-7 serves to facilitate insertion of the ink ribbon 4 into
the space 2-8 and serves to facilitate the insertion of the
ribbon engagement portion 2-6 into the ink ribbon 4 through
the slit 4-3.

The attachment of the spool to the cassette case is next described. As shown in Figure 7, after the end of the knob portion 2-11 which is remote from the cylindrical portion 2-1 has passed through the hole 1-1 of the cassette case 1, the knob portion 2-11 is prevented from going further upwardly through the hole 1-1 because of the engagement of the sloping portions 2-10 with the cassette case 1. However, when the spool 2 is strongly pushed in the direction of the arrow A, its upper portion, which extends upwardly from the bottom ends of the slit portions 2-4, is bent radially inwardly in the directions of the arrows B and C by reason of the cooperation between the sloping portions 2-10 and the rim of the hole 1-1 in the cassette case 1. As a result, the protruding portions 2-2 pass through the hole 1-1. At the same time, the upper portion of the spool 2 is released from bending in the directions of the arrows B and C, with the result that the cylindrical portion 2-1 of the spool 2 is rotatably mounted in the hole 1-1 and is prevented by the protruding portions 2-2 from coming out of the hole 1-1.

As will be appreciated, when it is desired to remove either of the spools 2, 3 from the cassette case 1, this may be easily achieved merely by pressing the parts of its knob portion radially inwardly towards each other while pressing downwardly on the knob portion.

An arrangement for guiding the feed of the ink ribbon 4 will now be described with reference to Figure 8.

As shown in Figure 8, a detecting lever 5 is mounted on the ribbon transporting device in the printer so as to detect the amounts of the ink ribbon 4 which are on the spools 2, 3. When the detecting lever 5 detects that all the ribbon on one spool has been used up, the direction of ribbon drive is reversed (by means not shown). When the diameter of the ribbon which is wound around a spool is at its minimum, the ink ribbon 4 will pass along a path 4-1, and when it is at its maximum, the ink ribbon 4 will pass along a path 4-2. Accordingly, the ink ribbon 4 is guided by the flange periphery guide portions 1-3, 1-4, 1-5, 1-6 and by the flange face guide portions 1-7, 1-8, 1-9, 1-10 in such a way that these guide portions do not obstruct the ink ribbon feed along the paths 4-1, 4-2 and do not obstruct the operation of the detecting lever 5. This prevents the ink ribbon 4 from coming out of the space defined by the flange portions 2-5, 3-5, the flange face guide portions 1-7, 1-8, 1-9, 1-10 and the flange periphery guide portions 1-3, 1-4, 1-5, 1-6.

By means of the construction described above, it is possible to provide an ink ribbon cartridge wherein an ink ribbon may be easily connected to a spool without using any separate part, and wherein the spool may be easily attached

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to a cassette case, the construction being such that the ink ribbon is prevented from being disengaged from the spool without the need to use any additional member.



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C L A I M S

1. An ink ribbon cartridge comprising a cassette case having a wall member which is provided with two holes in each of which is rotatably mounted a cylindrical portion of a respective spool, the cylindrical portion of each spool being located axially between a knob portion of the spool and a spindle portion thereof on which an ink ribbon may be wound, the knob and spindle portions being at least in part, of larger diameter than the respective hole and being disposed on opposite sides of the said wall member, each spool having at least one slit in each knob portion to enable the latter to be radially contracted so that it can be passed through the respective hole.
2. An ink ribbon cartridge as claimed in claim 1 in which each slit extends to the end of the respective knob portion which is remote from the respective cylindrical portion.
3. An ink ribbon cartridge as claimed in claim 1 or 2 in which each slit extends through the cylindrical portion and into the spindle portion of its respective spool.
4. An ink ribbon cartridge as claimed in claim 3 in which each slit does not extend to the end of the respective spindle portion remote from the respective cylindrical portion.



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5. An ink ribbon cartridge as claimed in any preceding claim in which each knob portion is provided with at least one sloping portion, the end of the latter which is remote from the respective cylindrical portion having a diameter less than that of the respective hole, the arrangement being such that said end may be introduced into its hole and the knob portion may then be pushed through the hole so as to cause the knob portion to be radially contracted by reason of the engagement between the rim of the hole and the or each sloping portion.

6. An ink ribbon cartridge as claimed in any preceding claim in which opposite ends of an ink ribbon are connected to the respective spools.

7. An ink ribbon cartridge as claimed in claim 6 in which the ink ribbon has an aperture or slit adjacent each of its opposite ends which does not extend to the side edges of the ink ribbon, each spool having a projecting portion which extends through the respective aperture or slit in the ink ribbon.

8. An ink ribbon cartridge as claimed in claim 7 in which each projecting portion extends axially of the respective spool and is spaced from the respective spindle portion thereof by a space into which the ribbon extends.



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9. An ink ribbon cartridge as claimed in any preceding claim in which each spool is provided, at its end remote from the respective cylindrical portion, with a flange portion, the cassette case being provided adjacent each spool with first and second ink ribbon guide portions, the first ink ribbon guide portions radially inwardly overlapping the respective flange portion, and the second ink ribbon guide portions being disposed radially outwardly of the respective flange portion so as to surround the latter.

10. An ink ribbon cartridge substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

~~11. An ink ribbon cartridge comprising a cassette case having a wall member which is provided with two holes in each of which is rotatably mounted a cylindrical portion of a respective spool, each spool being provided, at its end remote from the respective cylindrical portion, with a flange portion, the cassette case being provided adjacent each spool with first and second ink ribbon guide portions, the first ink ribbon guide portions radially inwardly overlapping the respective flange portion, and the second ink ribbon guide portions being disposed radially outwardly of the respective flange portion so as to surround the latter.~~



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11. An ink ribbon cartridge comprising:

an ink ribbon having an aperture or a slit adjacent
to each end thereof, each said aperture or slit not communicating
10 with side edges of said ink ribbon;

two spools, each said spool including a spindle, a
flange portion, a cylindrical portion, protruding portions, slits,
and a projection portion, said ink ribbon being wound around
said spindle with a said aperture or slit put on said projection
15 portion, said flange portion guiding said ink ribbon, said
projection portion protruding from said flange portion upwardly
toward an upper end of said spindle, said cylindrical portion being
located above the upper end of said spindle and having a smaller
diameter than that of said spindle, said protruding portions being
20 upwardly contiguous with said cylindrical portion and arranged in
a circle of a greater diameter than that of said cylindrical
portion, said slits allowing said protruding portions to be
flexible in the radial direction of the circle; and

a cassette case having holes each having a smaller
25 diameter than that of the circle of said protruding portions



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of the respective spool, each said hole being engageable
with the respective spool to support the same rotatably
at the respective cylindrical portion, said cassette case further
having first and second portions for guiding said ink ribbon
5 in a range excluding a path of said ink ribbon and a detecting
member for detecting the quantity of said ink ribbon, said first
portions overlapping said flange portion inwardly in the radial
direction thereof, said second portions surrounding said flange
portions, each said spool being detachably attached to said
10 cassette case with its protruding portions bent inwardly in the
radial direction until its cylindrical portion is engaged with
the respective hole of said cassette case.
