

"INK RIBBON CASSETTE"

The present invention relates to an ink ribbon cassette, e.g. for use in a dot printer which prints characters, drawings, or graphs in colour.

According to the present invention there is
5 provided an ink ribbon cassette comprising a cassette case containing an ink ribbon; an ink transfer roller which is rotatably mounted in the cassette case and which is provided with a plurality of ink transfer rings which the
10 said ink ribbon contacts; and a plurality of cartridge positioning means arranged adjacent to the ink transfer roller, the said cartridge positioning means being respectively adapted to position ink cartridges which contain differently coloured inks and which feed the latter
15 to the ink transfer rings, whereby the ink ribbon may be provided with a plurality of differently coloured stripes.

Preferably, the cartridge positioning means are arranged to position the ink cartridges in a radial array around a part of the circumference of the ink transfer
20 roller.

The said cassette is preferably provided in combination with a plurality of said ink cartridges which are positioned by said cartridge positioning means.

Each ink cartridge may have a wick protruding therefrom which contacts the respective ink transfer ring.

5 The centre lines of the ink cartridges are preferably disposed in a common plane, the outer end of at least one of said wicks being spaced from said plane. Thus there may be at least one pair of similarly shaped ink cartridges which are arranged in the cartridge positioning means so as to be upside down with respect to each other, whereby the outer ends of their wicks are disposed on opposite
10 sides of said plane and are equally spaced from the latter.

The invention enables the interior space of the cassette case to be used effectively, thereby enabling the cassette to be made small.

15 The invention enables the ink ribbon to be provided with coloured stripes or bands which do not mix with each other so that clear printing can be achieved.

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

20 Figure 1 is a plan view of a multi-colour ink ribbon cassette in accordance with the present invention in which a cover has been removed,

Figure 2 is a vertical section of the multi-colour ink ribbon cassette shown in Figure 1,

25 Figure 3 is a bottom view of a transfer roller shown in Figures 1 and 2,

Figure 4 is an elevational view of a follower wheel shown in Figures 1 and 2,

Figure 5 is a sectional view taken along the line V-V in Figure 1,

5 Figure 6 is a vertical section of an ink cartridge shown in Figures 1 and 2,

Figure 7 is a front elevational view of the ink cartridge of Figure 6,

10 Figure 8 is a side view of another ink cartridge, and

Figure 9 is a front elevational view of the ink cartridge of Figure 8.

15 Terms such as "upper" and "lower", "leftward", "clockwise" and "counter-clockwise" as used in the description below, are to be understood to refer to directions as seen in the accompanying drawings.

Referring to Figures 1 and 2, a cassette 1 is composed of a lower case 2 and a cover 3, and is provided with a sufficient space to accommodate a print head (not shown in the drawings). An endless ink ribbon 4 is
20 impregnated with four coloured stripes 4y, 4m, 4c, 4b which correspond respectively to the three primary colours of yellow, magenta and cyan, and to black. A portion of the ink ribbon 4 is disposed within a chamber 5 so that it may follow
25 a zigzag path therein. The ink ribbon 4 passes through

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5 passages 6, 7 and passes through openings 8, 9. An ink transfer roller 10 is rotatably mounted in the cassette case 1. The ink transfer roller 10 is provided with four ink transfer rings 10_y, 10_m, 10_c, 10_b, in parallel, these rings respectively corresponding to the colours of the ink ribbon 4.

10 The lower part 11 of the ink transfer roller 10 protrudes through a hole 12 bored in the lower case 2 and is provided with a criss-cross hole 13 in the bottom as shown in Figure 3. When the cassette case 1 is set on a print head, a drive shaft of the print head engages with the criss-cross hole 13, and the ink transfer roller 10 is rotated counter-clockwise as seen when looking in the direction of Figure 1. The upper part 14 of the ink transfer roller 15 10 protrudes upwardly through a hole 15 in the cover 3 and can be rotated manually.

20 The ink ribbon 4 passes through the nip between a follower roller 16 and the ink transfer roller 10. The follower roller 16 is, as shown in Figure 4, provided with four ridges 16_y, 16_m, 16_c and 16_b, which correspond respectively to the ink transfer rings 10_y, 10_m, 10_c and 10_b of the ink transfer roller 10. The follower roller 16 is provided with reduced diameter portions 17 between said ridges, and is rotatably mounted in a support member 18 (Figure 1). The 25 support member 18 is slidably supported by the lower case 2

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and is pushed leftward as seen in Figure 1 by a helical spring 19. The ink ribbon 4 is therefore pushed onto the ink transfer roller 10 by the follower roller 16, and when the ink transfer roller 10 is rotated in the counter-clockwise direction as seen in Figure 1, the ink ribbon 4 is rotated clockwise as seen in Figure 1.

A leaf spring or resilient lever 20 is disposed in the passage 7. The leaf spring 20 abuts against a projection 21 on the lower case 2, and the ink ribbon 4 passes frictionally therebetween so that appropriate tension is applied to the ink ribbon 4. Ink cartridges 22Y, 22M, 22C and 22B, which respectively correspond to the four colours yellow, magenta, cyan and black, have their centre lines disposed in a common plane and are arranged in a radial array around a part of the circumference of the ink transfer roller 10. Wicks 23 made of felt or the like project from the cartridges to contact corresponding ink transfer rings 10_y, 10_m, 10_c and 10_b of the ink transfer roller 10. The ink cartridges 22Y, 22M, 22C and 22B can be easily placed in and removed from housings 24 provided in the lower case 2. The housings 24 have openings downwards as shown in Figure 5. The housings 24 have side walls 25 and rear walls 26. Springs 27, which are disposed in the housings 24 and which act against the rear walls 26, push the ink cartridges 22Y, 22M, 22C, 22B toward the ink transfer roller 10.

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The ink cartridge 22Y corresponding to the uppermost ink transfer ring 10y and the ink cartridge 22B corresponding to the lowermost ink transfer ring 10b are the same except that the colours of the inks contained in the cartridges are different. As shown in Figures 6 and 7, the ink cartridge 22Y includes a rectangular case 28, a cap 29 and ink-containing fibrous or other material 30. The outer end of the wick 23 protrudes through a hole in the cap 29 at a point which is spaced from the centre-line of the case 28 by a distance d_1 . When the ink cartridge 22Y is disposed in its housing 24 in the position shown in Figures 6 and 7, in which the wick 23 extends upwardly with respect to the said centre-line, the wick contacts the uppermost ink transfer ring 10y. On the other hand, the ink cartridge 22B is placed in its housing 24 so as to be upside down with respect to the position of the parts shown in Figures 6 and 7, and its wick 23 extends downwardly to contact the ink transfer ring 10b. Thus the outer ends of the wicks 23 of the pair of similarly shaped ink cartridges 22Y, 22B are disposed on opposite sides of the common plane containing the centre lines of the ink cartridges and are equally spaced from said plane. The ink cartridges 22M, 22C, which correspond respectively to the transfer rings 10m, 10c, are used in common except that the colours of the inks contained in the cartridges are different.

Figures 8 and 9 show the ink cartridge 22M, in which a cap 29' is provided with a hole at a position which is spaced from the centre line of the case 28 by a distance d_2 . The wick 23 protrudes through the hole in the cap 29 to contact the ink transfer ring 10m. The ink cartridge 22C is placed in its housing 24 so as to be upside down with respect to the position of the parts shown in Figures 8 and 9 and the wick 23 extends downwardly to a point which is spaced from the centre line of the case 28 by a distance d_2 to contact the ink transfer ring 10c. As described above the four ink cartridges 22Y, 22M, 22C, 22B need employ only two kinds of caps 29, 29'.

In operation, when the ink ribbon cassette is placed in position on the print head (not shown in the drawings), the ink transfer roller 10 is rotated as the print head moves and the ink ribbon 4 is rotated in the clockwise direction as seen in Figure 1. The various coloured inks are supplied to the ink transfer rings 10y, 10m, 10c, 10b respectively from the ink cartridges 22Y, 22M, 22C, 22B through the wicks 23 and the inks are transferred to form the coloured stripes 4y, 4m, 4c, 4b of the ink ribbon 4 as the ink transfer roller 10 rotates. The four colours of ink are used to unequal extents and the inks in the ink cartridges are consumed at different times. Each ink cartridge is replaced by a new spare ink cartridge when it is used up.

The ink ribbon cassette can be used for a long time by duly replacing the exhausted ink cartridges until it is damaged too much to be used. Then the ink ribbon cassette is replaced by a new one.

5 In the construction described above which employs ink cartridges, very small amounts of ink are supplied to the four coloured stripes 4y, 4m, 4c, 4b and the ink ribbon does not contain ink in excess. Therefore there is no fear of any mixture of colours between the coloured stripes
10 4y, 4m, 4c, 4b.

 The embodiment described above concerns an ink ribbon cassette relating to four colours, but the present invention may also be applied to a three colour ink ribbon cassette, in which case the wick of the ink
15 cartridge corresponding to the middle ink transfer ring is positioned on the centre line of its case 28.

 The shape of the ink cartridges need not necessarily be rectangular. Further, instead of the follower roller 16, a resilient lever may be employed which abuts against the
20 ink transfer roller 10 so that the ink ribbon is fed in a tensioned state.

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CLAIMS

1. An ink ribbon cassette comprising a cassette case containing an ink ribbon; an ink transfer roller which is rotatably mounted in the cassette case and which is provided with a plurality of ink transfer rings which the said ink ribbon contacts; and a plurality of cartridge positioning means arranged adjacent to the ink transfer roller, the said cartridge positioning means being respectively adapted to position ink cartridges which contain differently coloured inks and which feed the latter to the ink transfer rings, whereby the ink ribbon may be provided with a plurality of differently coloured stripes.
2. A cassette as claimed in claim 1 in which the cartridge positioning means are arranged to position the ink cartridges in a radial array around a part of the circumference of the ink transfer roller.
3. A cassette as claimed in claim 1 or 2 in combination with a plurality of said ink cartridges which are positioned by said cartridge positioning means.
4. A cassette as claimed in claim 3 in which each ink cartridge has a wick protruding therefrom which contacts the respective ink transfer ring.



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5. A cassette as claimed in claim 4 in which the centre lines of the ink cartridges are disposed in a common plane, the outer end of at least one of said wicks being spaced from said plane.

5 6. A cassette as claimed in claim 5 in which there is at least one pair of similarly shaped ink cartridges which are arranged in the cartridge positioning means so as to be upside down with respect to each other, whereby the outer ends of their wicks are disposed on opposite
10 sides of said plane and are equally spaced from the latter.

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

8. A multicolour ink ribbon cassette comprising:
15 a cassette case for a multicolour ink ribbon in a plurality of stripes of colours, a transfer roller rotatably supported and provided with transfer rings which said ink ribbon contacts, and a plurality of ink cartridges arranged around said transfer roller, each ink cartridge being provided
20 with a lead protruding to make contact with said transfer ring of said transfer roller.

9. A multicolour ink ribbon cassette according to claim 8, in which said ink cartridges are arranged radially around said transfer roller.

