

SPECIFICATION

Ink ribbon cartridge for use in a printer

5 This invention relates to an ink ribbon cartridge for use in a printer.

A conventional ink ribbon cartridge for use in a printer has a compartment in which, at any time, a portion of the ink ribbon is
10 stowed, the ink ribbon being an endless member a portion of which is in operation, constantly withdrawn from the said compartment. If, therefore, the ink ribbon is introduced into the said compartment in such a way as to
15 crease or wrinkle it therein, the printing quality will be adversely affected. Moreover, if the portion of the ink ribbon within the compartment develops small creases, then the amount of ink ribbon which can be forced into the
20 compartment is reduced and consequently it is in practice necessary to enlarge the compartment in order to be able to use the required length of ink ribbon. It is therefore necessary to ensure that any fold in the ink
25 ribbon which is stowed in the said compartment is large.

It has been proposed that the ink ribbon should be transported by being passed between a feed roller and a pinch roller which
30 are urged towards each other by a rubber band. However, it is difficult to control the force exerted by the rubber band, and the use of such a rubber band increases assembly costs. Hence both the reliability and the cost
35 of the cartridge are adversely affected by the use of such a rubber band.

The object of the present invention, therefore, is to overcome the creasing problem referred to above, whilst providing an ink
40 ribbon cartridge whose structure may be maintained simple, whose components may be few and inexpensive, and whose operation is highly reliable.

Accordingly therefore to the present invention, there is provided an ink ribbon cartridge
45 for use in a printer, said cartridge having a toothed feed roller and a toothed pinch roller rotatably mounted therein, and an ink ribbon opposite sides of which are engaged by the
50 teeth of said rollers, the said rollers being arranged to transport the ink ribbon therebetween in one predetermined direction only, and the tooth modules of the feed roller and the pinch roller being different from each
55 other.

Preferably one of the said modules is at least 0.3 mm.

Thus the module of the feed roller teeth may be at least 0.3 mm, or alternatively the
60 module of the pinch roller teeth may be at least 0.3 mm.

One of the rollers may have triangular teeth, in which case the other roller may have modified involute teeth. Alternatively, both the
65 rollers may have triangular teeth.

Preferably the cartridge has a compartment within which the rollers are rotatably mounted and through which the ink ribbon, which is an endless ribbon, is in operation transported in
70 such a way that a portion of the ink ribbon is at all times disposed externally of the compartment for engagement by a character-producing part of the printer.

A brake spring may frictionally engage the
75 ink ribbon in a region in which the latter leaves the said compartment.

The invention also comprises a printer provided with an ink ribbon cartridge as set forth above.

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

Figure 1 is a perspective view of an ink ribbon cartridge for use in a printer according
85 to the present invention.

Figure 2 is a sectional view of the cartridge of Fig. 1,

Figure 3 is a plan view showing a portion of a known ink ribbon cartridge, and

90 Figures 4–7 are plan views similar to Fig. 3 but showing portions of various embodiments of ink ribbon cartridges according to the present invention.

In Figs. 1 and 2 there is shown an ink
95 ribbon cartridge for use in a printer according to the present invention, the cartridge having an outer casing 1 and an inner casing 1b which define therebetween a compartment 1a which is provided with an upper cover 7.
100 Rotatably mounted in the compartment 1a are a toothed feed roller 3 and a toothed pinch roller 4 whose teeth respectively engage opposite sides of an endless ink ribbon 2 which is impregnated with ink. The feed roller 3 is,
105 in operation, driven by a part (not shown) of the printer (not shown) so as to be rotated in one direction only, i.e. counter-clockwise as shown in the drawings, the pinch roller 4 being thus rotated clockwise. The pinch roller
110 4 is resiliently forced towards the feed roller 3 by virtue of being rotatably mounted on a resilient hold-down lever 5.

Such rotation of the feed roller 3 and pinch roller 4 transports the ink ribbon 2 through
115 the compartment 1a from an inlet 7 thereof to an outlet 8 thereof. The ink ribbon 2 travels outwardly from the outlet 8 and through a space 9 between the outer and inner casings 1, 1b, the ink ribbon 2 returning to the inlet
120 7 of the compartment 1a through a space 10 between the outer and inner casings 1, 1b. Thus a portion 2a of the ink ribbon 2 is at all times disposed externally of the compartment 1a for engagement by a character-producing
125 part (not shown) of the printer.

The bulk of the ink ribbon 2 is, at any time, stowed in the compartment 1a, the portion of the ink ribbon 2 leaving the compartment 1a at the outlet 8 being frictionally engaged by a
130 brake spring 6 to ensure that the portion 2a

of the ribbon is taut. By reason of the uni-directional drive to the feed roller 3, the ink ribbon 2 is in operation always transported in one direction only.

5 In Fig. 3 there is shown a feed roller 3 and pinch roller 4 of a conventional ink ribbon cartridge. In the construction shown in Fig. 3, the teeth of the feed roller 3 and pinch roller 4 are of the same shape and have the same
10 tooth module, the tooth module being defined as the pitch circle diameter divided by the number of teeth. Thus in the case of the known construction shown in Fig. 3, the teeth of each of the rollers 3, 4 is of triangular
15 shape as produced by a knurling tool, and the module of the teeth of both the rollers 3, 4 is the same as and is from 0.1 to 0.3 mm.

When an ink ribbon cartridge having rollers 3, 4 as shown in Fig. 3 is used, the ink
20 ribbon 2 will be forced into the compartment 1a and will have regular folds therein provided that there is sufficient space in the compartment 1a. However, if the amount of ink ribbon 2 in the compartment 1a almost
25 fills the latter, then a load resistance is liable to be developed in the direction A and this may cause the bends in the ribbon to become irregular with the result that small fine creases are produced in the ink ribbon 2 and wrinkles
30 occur therein. These wrinkles not only have a bad influence on printing quality, but also cause a deterioration in the quality of the ink ribbon 2 itself. Moreover, such wrinkles increase the load on the feed roller 3 thus
35 giving rise to operational problems.

In Figs. 4-7 there are therefore shown various embodiments of the feed roller 3 and pinch roller 4 which overcome the above-mentioned problems.

40 In the construction shown in Fig. 4, the feed roller 3 has teeth 3a which are of triangular shape and which may be produced by a knurling tool. The pinch roller 4, however, has modified involute teeth 4a, the module of the
45 teeth 4a being at least 0.3 mm and being greater than that of the teeth 3a. The thickness of the teeth of the pinch roller 4, moreover, is made somewhat small.

In the Fig. 5 construction the teeth 3a of the feed roller 3 are of triangular shape, being
50 produced by a general knurling tool, while the teeth 4a of the pinch roller 4 are also of triangular shape. However, the module of the teeth of the pinch roller 4 is substantially
55 larger than that of the feed roller 3 and is at least 0.3 mm.

In the construction of Fig. 6, the teeth 3a of the feed roller 3 are of modified involute
60 shape, while the teeth 4a of the pinch roller 4 are of triangular shape, being formed by a general knurling tool. The module of the teeth of the feed roller 3 is substantially larger than that of the pinch roller 4 and is at least
65 0.3mm. The thickness of the teeth 3a of the feed roller 3 is somewhat small.

In Fig. 7 the teeth 4a of the pinch roller 4 are of triangular shape, being produced by a general knurling tool, while the teeth 3a of the feed roller 3 are also of triangular shape.

70 However, the module of the teeth 3a of the feed roller 3 is substantially larger than that of the teeth 4a of the pinch roller 4, being at least 0.3 mm.

The constructions shown in each of Figs. 4
75 to 7 are such that the ink ribbon 2 which is transported between the feed roller 3 and pinch roller 4 so as to be forced into the space in the compartment 1a has large folds with the result that the length of ink ribbon 2
80 which can be stowed in this space is greater than that which is obtainable by using a conventional feed roller and pinch roller both of which are made by the same knurling tool.

By reason of ensuring that the tooth modules of the feed roller 3 and pinch roller 4
85 are different from each other, the stowing of the ink ribbon in the compartment 1a involves the creation of larger folds with the result that the back pressure exerted by the part of the
90 ink ribbon which is stowed in the compartment 1a is reduced, the load imparted to the feed roller is correspondingly reduced, and, operational problems relating to the feed roller are therefore reduced. The structure of the
95 cartridge is simple and enables high printing quality to be reliably maintained.

CLAIMS

1. An ink ribbon cartridge for use in a
100 printer, said cartridge having a toothed feed roller and a toothed pinch roller rotatably mounted therein, and an ink ribbon opposite sides of which are engaged by the teeth of said rollers, the said rollers being arranged to
105 transport the ink ribbon therebetween in one predetermined direction only, and the tooth modules of the feed roller and the pinch roller being different from each other.

2. An ink ribbon cartridge as claimed in
110 claim 1 in which one of the said modules is at least 0.3 mm.

3. An ink ribbon cartridge as claimed in claim 2 in which the module of the feed roller teeth is at least 0.3 mm.

115 4. An ink ribbon cartridge as claimed in claim 2 in which the module of the pinch roller teeth is at least 0.3 mm.

5. An ink ribbon cartridge as claimed in any preceding claim in which one of the
120 rollers has triangular teeth.

6. An ink ribbon as claimed in claim 5 in which the other roller has modified involute teeth.

7. An ink ribbon as claimed in any of
125 claims 1 to 4 in which both the rollers have triangular teeth.

8. An ink ribbon cartridge as claimed in any preceding claim in which the cartridge has a compartment within which the rollers
130 are rotatably mounted and through which the



of the ribbon is taut. By reason of the uni-directional drive to the feed roller 3, the ink ribbon 2 is in operation always transported in one direction only.

- 5 In Fig. 3 there is shown a feed roller 3 and pinch roller 4 of a conventional ink ribbon cartridge. In the construction shown in Fig. 3, the teeth of the feed roller 3 and pinch roller 4 are of the same shape and have the same
10 tooth module, the tooth module being defined as the pitch circle diameter divided by the number of teeth. Thus in the case of the known construction shown in Fig. 3, the teeth of each of the rollers 3, 4 is of triangular
15 shape as produced by a knurling tool, and the module of the teeth of both the rollers 3, 4 is the same as and is from 0.1 to 0.3 mm.

- When an ink ribbon cartridge having rollers 3, 4 as shown in Fig. 3 is used, the ink
20 ribbon 2 will be forced into the compartment 1a and will have regular folds therein provided that there is sufficient space in the compartment 1a. However, if the amount of ink ribbon 2 in the compartment 1a almost
25 fills the latter, then a load resistance is liable to be developed in the direction A and this may cause the bends in the ribbon to become irregular with the result that small fine creases are produced in the ink ribbon 2 and wrinkles
30 occur therein. These wrinkles not only have a bad influence on printing quality, but also cause a deterioration in the quality of the ink ribbon 2 itself. Moreover, such wrinkles increase the load on the feed roller 3 thus
35 giving rise to operational problems.

In Figs. 4-7 there are therefore shown various embodiments of the feed roller 3 and pinch roller 4 which overcome the above-mentioned problems.

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45 teeth 4a being at least 0.3 mm and being greater than that of the teeth 3a. The thickness of the teeth of the pinch roller 4, moreover, is made somewhat small.

- In the Fig. 5 construction the teeth 3a of
50 the feed roller 3 are of triangular shape, being produced by a general knurling tool, while the teeth 4a of the pinch roller 4 are also of triangular shape. However, the module of the teeth of the pinch roller 4 is substantially
55 larger than that of the feed roller 3 and is at least 0.3 mm.

- In the construction of Fig. 6, the teeth 3a of the feed roller 3 are of modified involute shape, while the teeth 4a of the pinch roller 4
60 are of triangular shape, being formed by a general knurling tool. The module of the teeth of the feed roller 3 is substantially larger than that of the pinch roller 4 and is at least 0.3mm. The thickness of the teeth 3a of the
65 feed roller 3 is somewhat small.

In Fig. 7 the teeth 4a of the pinch roller 4 are of triangular shape, being produced by a general knurling tool, while the teeth 3a of the feed roller 3 are also of triangular shape.

- 70 However, the module of the teeth 3a of the feed roller 3 is substantially larger than that of the teeth 4a of the pinch roller 4, being at least 0.3 mm.

The constructions shown in each of Figs. 4
75 to 7 are such that the ink ribbon 2 which is transported between the feed roller 3 and pinch roller 4 so as to be forced into the space in the compartment 1a has large folds with the result that the length of ink ribbon 2
80 which can be stowed in this space is greater than that which is obtainable by using a conventional feed roller and pinch roller both of which are made by the same knurling tool.

By reason of ensuring that the tooth modules of the feed roller 3 and pinch roller 4
85 are different from each other, the stowing of the ink ribbon in the compartment 1a involves the creation of larger folds with the result that the back pressure exerted by the part of the
90 ink ribbon which is stowed in the compartment 1a is reduced, the load imparted to the feed roller is correspondingly reduced, and, operational problems relating to the feed roller are therefore reduced. The structure of the
95 cartridge is simple and enables high printing quality to be reliably maintained.

CLAIMS

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100 printer, said cartridge having a toothed feed roller and a toothed pinch roller rotatably mounted therein, and an ink ribbon opposite sides of which are engaged by the teeth of said rollers, the said rollers being arranged to
105 transport the ink ribbon therebetween in one predetermined direction only, and the tooth modules of the feed roller and the pinch roller being different from each other.

2. An ink ribbon cartridge as claimed in
110 claim 1 in which one of the said modules is at least 0.3 mm.

3. An ink ribbon cartridge as claimed in claim 2 in which the module of the feed roller teeth is at least 0.3 mm.

- 115 4. An ink ribbon cartridge as claimed in claim 2 in which the module of the pinch roller teeth is at least 0.3 mm.

5. An ink ribbon cartridge as claimed in any preceding claim in which one of the
120 rollers has triangular teeth.

6. An ink ribbon as claimed in claim 5 in which the other roller has modified involute teeth.

7. An ink ribbon as claimed in any of
125 claims 1 to 4 in which both the rollers have triangular teeth.

8. An ink ribbon cartridge as claimed in any preceding claim in which the cartridge has a compartment within which the rollers
130 are rotatably mounted and through which the



ink ribbon, which is an endless ribbon, is in operation transported in such a way that a portion of the ink ribbon is at all times disposed externally of the compartment for engagement by a character-producing part of the printer.

9. An ink ribbon cartridge as claimed in claim 8 in which a brake spring frictionally engages the ink ribbon in a region in which the latter leaves the said compartment.
10. An ink ribbon cartridge for use in a printer substantially as hereinbefore described with reference to and as shown in Figs. 1 and 2 and in any of Figs. 4 to 7 of the accompanying drawings.
11. A printer provided with an ink ribbon cartridge as claimed in any preceding claim.

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