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## (54) CONTINUOUS LOOP TAPE APPARATUS


(71) We, HEWLETT-PACKARD COMPANY, of 1501 Page Mill Road, Palo Alto, California 94304, United States of America, a corporation organised and existing under the laws of the State of California, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—


This invention is concerned with a continuous loop tape apparatus.

Replaceable ink cartridges employing a continuous loop of inked tape or Mylar ("MYLAR" is a Registered Trade Mark) ribbon for use with high speed impact printers are known in the art. Typically, a cubically-shaped wire form or a plurality of guides are used to effect a Moebius twist in the continuous loop.

The present invention provides apparatus comprising: a reservoir having a capacity for holding tape; an output port coupled to the reservoir and having an orifice for dispensing tape; an input port coupled to the reservoir and having an orifice for receiving tape; a triangular-shaped device positioned within the output port; and a continuous loop tape having a Moebius half twist therein disposed about the triangular shaped device and the tape having a portion within the reservoir and a portion extending from the output port to the input port.

In an apparatus as set forth in the last preceding paragraph, it is preferred that the triangular-shaped device has a first edge surface, and a second edge surface adjacent the first edge surface, and a third edge surface adjacent the first and second edge surfaces, the edge surfaces forming a triangle, and a portion of the tape is disposed about the first edge surface, the second edge surface and the third edge surface.

An apparatus as set forth in the last preceding paragraph, or the last preceding paragraph but one may further comprise means for varying tension in the tape between the reservoir and the triangular-shaped device.

In an apparatus as set forth in the last preceding paragraph, it is preferred that the means for varying tension comprises a spring.

An apparatus as set forth in any one of the last four immediately preceding paragraphs may further comprise means for moving the tape from the output port to the input port.

In an apparatus as set forth in the last preceding paragraph, it is preferred that the means for moving the tape is disposed within the apparatus and is arranged to create a tensile force within the portion of the continuous loop tape disposed outside the reservoir and extending from the triangular-shaped device to the means for moving the tape.

In an apparatus as set forth in either one of the last two immediately preceding paragraphs, it is preferred that the means for moving the tape comprise a pair of gears disposed about the tape and within the input port.

An apparatus as set forth in the last preceding paragraph may further comprise means operatively coupled to each gear of the pair of gears for directing the tape into the reservoir.

In an apparatus as set forth in any one of the last eight immediately preceding paragraphs, it is preferred that the reservoir comprises a plurality of guides disposed about the tape within the reservoir, the guides being disposed between the input port and the output port in an aligned relationship with tape flow through the reservoir and being separated an increasing distance from the tape in the direction of said tape flow.

The present invention further provides apparatus comprising: a triangular-shaped device having three edge surfaces comprising a first edge surface, a second edge surface and a third edge surface, each of the three edge surfaces being substantially disposed within a plane defined by the other two edge surfaces; and a continuous loop medium having a Moebius half twist therein, a portion of the loop forming the half twist being disposed about the first edge surface, the second edge surface and the third edge surface of the triangular-shaped device.

In an apparatus as set forth in the last preceding paragraph, the medium may be an

inked ribbon, a magnetic tape or photographic film.

The preferred embodiment of the present invention includes an improved Moebius loop device and tensioner in the form of an easily constructed planar triangular-shaped device to effect a Moebius twist and tensioning in a continuous loop. Spring biasing means in combination with the device provides selective tensioning of the continuous loop. A portion of the loop is disposed about a first edge surface of the triangular guide, then about a second edge surface, and then about a third.

The cartridge includes a reservoir coupled to an input port and an output port. A continuous tape is disposed within the reservoir, through the output port, from the output port to the input port and through the input port to the reservoir. The Moebius device is disposed within the output port to provide increased tension within the portion of the loop disposed between the output port and the input port. The reservoir has nonparallel guides which separate in the direction of tape travel through the reservoir to facilitate tape throughput.

There now follows a detailed description which is to be read with reference to the accompanying drawings of an apparatus according to the present invention; it is to be clearly understood that this apparatus has been selected for description to illustrate the invention by way of example and not by way of limitation.

In the accompanying drawings:—

Figure 1 is a cross-sectional diagram of an apparatus, which is a ribbon stuffer cartridge, constructed in accordance with the invention;

Figure 2 is an illustration of an improved Moebius loop device in combination with a portion of a continuous tape loop; and

Figure 3 is an exploded perspective view of the preferred embodiment.

Referring to Figure 1, a sectional view of a preferred ribbon cartridge is shown. The major portion of a continuous loop ribbon 2 is disposed within a ribbon reservoir 4 having a ribbon input port 5 and a ribbon output port 3. Tape 2 is pulled from the output port 3 towards the input port 5 by means, provided by ribbon gears 52 and 54 for moving the tape, and injected into the ribbon reservoir 4. Peeler guides 10 and 12 are disposed about gears 52 and 54 to assist tape 2 in separating from gears 52 and 54, and reservoir guides 11 and 13 direct the injected tape 2 into the interior of reservoir 4. In operation, the combined effect of rotation of drive gears 52, 54 and peeler guides 10 and 12 causes tape 2 to move into reservoir 4 at approximately 50 inches/sec and to form a mass of spring-like-portions of compressed tape 2 in the manner shown in Figure 1. The spring-like portions provide an internal spring biasing force to the mass of tape 2 within reservoir 4 as tape 2 drifts through the reservoir 4 toward output port 3.

The ribbon reservoir 4 preferably includes nonparallel draft guides 6 and 8, and output guide 14. The distance between guides 6 and 8 increases as tape 2 travels from input port 5 towards output port 3. The draft guides 6 and 8 provide draft to assist the major portion of tape 2 disposed within the reservoir 4 to move toward the output port 3. The varying distance between guides 6 and 8 assists the mass of tape 2 within reservoir 4 to expand and to drift toward output port 3. Guide 14 forms a portion of reservoir 4 and acts as a bearing surface for tape 2 as it enters output port 3.

Referring to Figure 1, a novel Moebius loop device 16 is disposed within the output port 3. Tape 2 is biased by output guide 14 as tape 2 passes from the reservoir 4 into output port 3. Tape 2 is then disposed about Moebius loop device 16 as illustrated in Figure 2 to invert tape 2 and form a Moebius half twist in the continuous tape loop formed by tape 2. The tension in tape 2 is greater as it extends from Moebius device 16 in output port 3 to input port 5, for example, than is the tension in tape 2 as it extends from input port 5 to output port 3 within tape reservoir 4. The greater tension in tape 2 as it travels from port 3 to port 5 is created by gears 52 and 54 pulling tape 2 about Moebius device 16.

Referring to Figure 1, means provided by a tension spring 7 is positioned within output port 3 to provide increased tension within tape 2. The spring creates increased tension within that portion of tape 2 which extends from reservoir 4 to Moebius device 16 which results in increased tension in the portion of tape 2 extending from output port 3 to input port 5. Tension is varied by adjusting the bias of tension spring 7.

Referring to Figure 2, the Moebius device 16 in a preferred combination with tape 2 is illustrated. The Moebius device 16 is preferably of a planar shape and has three rounded edge surfaces disposed in a triangular configuration. Tape 2 is disposed about a first edge surface 201, then disposed about a second edge surface 202 adjacent to the first edge surface 201 and then disposed about a third edge surface 203 as illustrated in Figure 2. The tape 2 shown in Figure 2 has a shaded edge to illustrate the Moebius half twist in tape 2 effected by device 16.

Referring to Figures 2 and 3, device 16 can be affixed to output port 3 by cementing tabs 161 and 163 to the body of output port 3, for example, or integrally molding the device 16 into the cartridge body, or by retaining the device 16 within recesses. Sufficient clearance for tape 2 to move about guide surfaces 201,

202, and 203 is provided by tabs 161, 162 and 163.

The device 16 may be fabricated from a single sheet of plastics material to form the preferred device 16 illustrated in Figures 2 and 3. The device 16 can also be formed, for example, from a wire form.

In operation, the preferred embodiment is positioned, for example, in an impact printer such that a portion of tape 2 between output port 3 and input port 5 is disposed between a record medium and impact elements of the printer. As impact elements of the printer strike the portion of tape 2 against the record medium, tape 2 is moved as required by turning gears 52 and 54.

Although the preferred embodiment has been described with reference to use in combination with printing devices, the invention is also applicable to providing a continuous loop magnetic tape to a tape recorder, intelligent terminal and computer and other applications including photographic film or videotape cartridges.

WHAT WE CLAIM IS:—

1. Apparatus comprising:

a reservoir having a capacity for holding tape;

an output port coupled to the reservoir and having an orifice for dispensing tape;

an input port coupled to the reservoir and having an orifice for receiving tape;

a triangular-shaped device positioned within the output port; and

a continuous loop tape having a Moebius half twist therein disposed about the triangular-shaped device and the tape having a portion within the reservoir and a portion extending from the output port to the input port.

2. Apparatus according to claim 1 wherein the triangular-shaped device has a first edge surface, a second edge surface adjacent the first edge surface, and a third edge surface adjacent the first and second edge surfaces, the edge surfaces forming a triangle, and a portion of the tape is disposed about the first edge surface, the second edge surface and the third edge surface.

3. Apparatus according to either one of claims 1 and 2 comprising means for varying tension in the tape between the reservoir and the triangular-shaped device.

4. Apparatus according to claim 3 wherein the means for varying tension comprises a spring.

5. Apparatus according to any one of the preceding claims and further comprising means for moving the tape from the output port to the input port.

6. Apparatus according to claim 5 wherein the means for moving the tape is disposed within the apparatus and is arranged to create a tensile force within the portion of the continuous loop tape disposed outside the reservoir and extending from the triangular-shaped device to the means for moving the tape.

7. Apparatus according to either one of claims 5 and 6 the means for moving the tape comprise a pair of gears disposed about the tape and within the input port.

8. Apparatus according to claim 7 and further comprising means operatively coupled to each gear of the pair of gears for directing the tape into the reservoir.

9. Apparatus according to any one of the preceding claims wherein the reservoir comprises a plurality of guides disposed about the tape within the reservoir, the guides being disposed between the input port and the output port in an aligned relationship with tape flow through the reservoir and being separated an increasing distance from the tape in the direction of said tape flow.

10. Apparatus comprising:

a triangular-shaped device having three edge surfaces comprising a first edge surface, a second edge surface and a third edge surface, each of the three edge surfaces being substantially disposed within a plane defined by the other two edge surfaces; and

a continuous loop medium having a Moebius half twist therein, a portion of the loop forming the half twist being disposed about the first edge surface, the second edge surface and the third edge surface of the triangular-shaped device.

11. Apparatus according to claim 10 wherein the medium is an inked ribbon.

12. Apparatus according to claim 10 wherein the medium is magnetic tape.

13. Apparatus according to claim 10 wherein the medium is photographic film.

14. Apparatus substantially as hereinbefore described with reference to the accompanying drawings.

HEWLETT-PACKARD COMPANY

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1584031 COMPLETE SPECIFICATION

3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

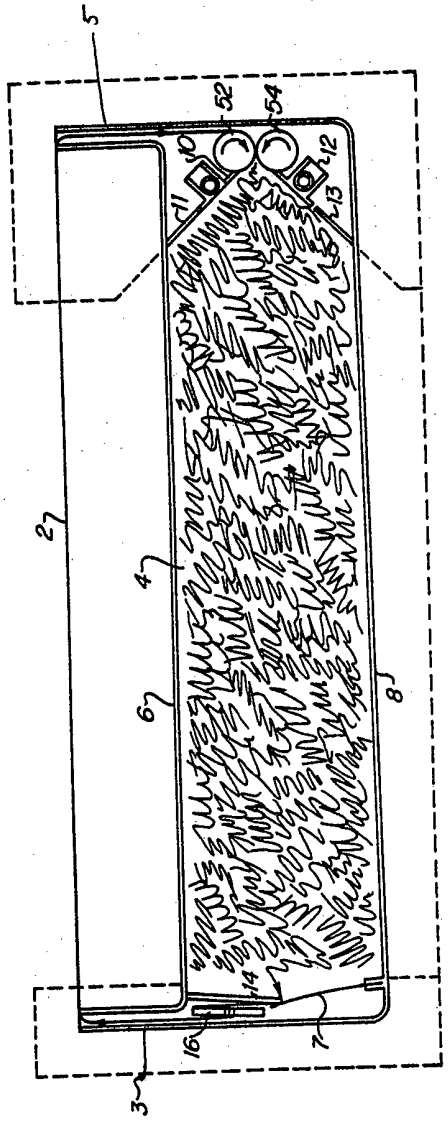


Figure 1

1584031 COMPLETE SPECIFICATION

3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

**Sheet 2**

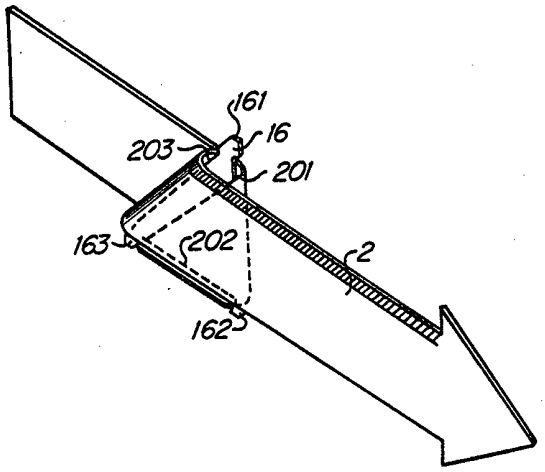


Figure 2

1584031 COMPLETE SPECIFICATION

3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

**Sheet 3**

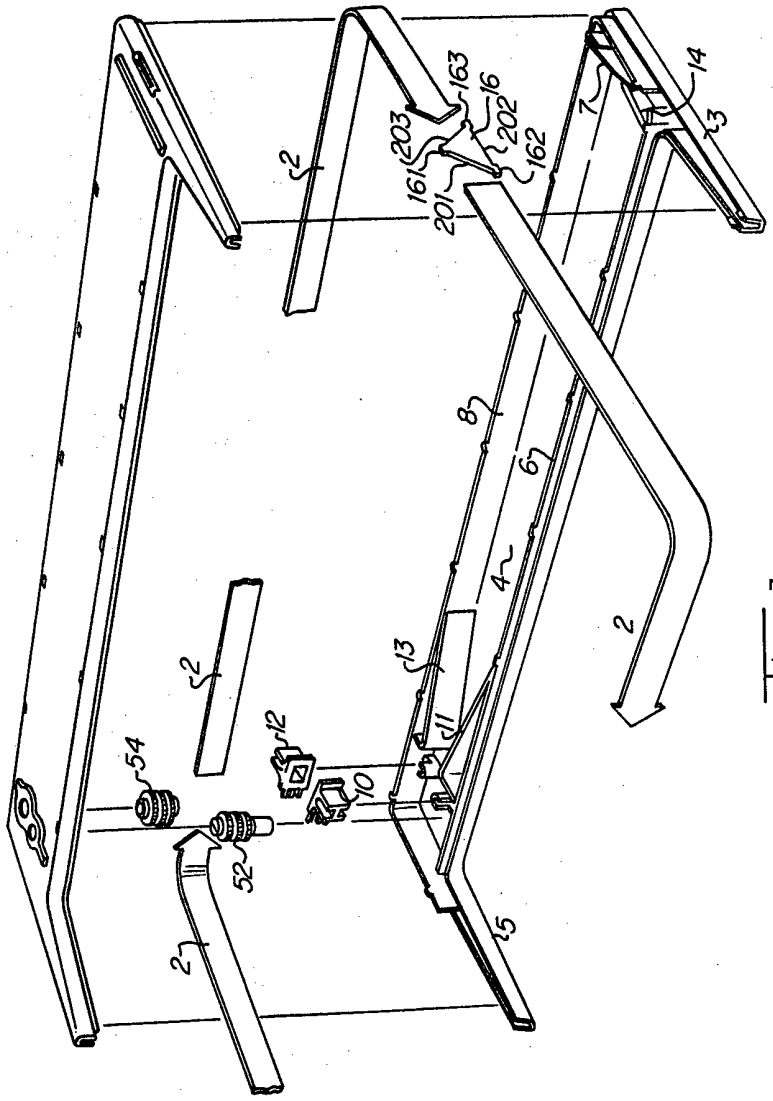


Figure 3