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Tape printing apparatus.

Tape printing apparatus comprising a tape carrier (33b) for carrying a tape (31); a pair of feed rollers (11,29) through the nip between which may pass a tape (31) from the tape carrier (33b); means (4) for driving the said feed rollers (11,29) so as to cause the tape (31) to be fed therefrom in a longitudinal direction; ink ribbon feeding means (30,33a) for feeding an ink ribbon (32) along a path a part of which is in contact with the tape (31) at a printing station; and printing means (6,11) for causing the ink ribbon (32) at the printing station to print on the tape (31) characterised in that one (11) of the said feed rollers (11,29) forms part of the said printing means (6,11) so that, during printing, it supports both the tape (31) and the ink ribbon (32) at the printing station.

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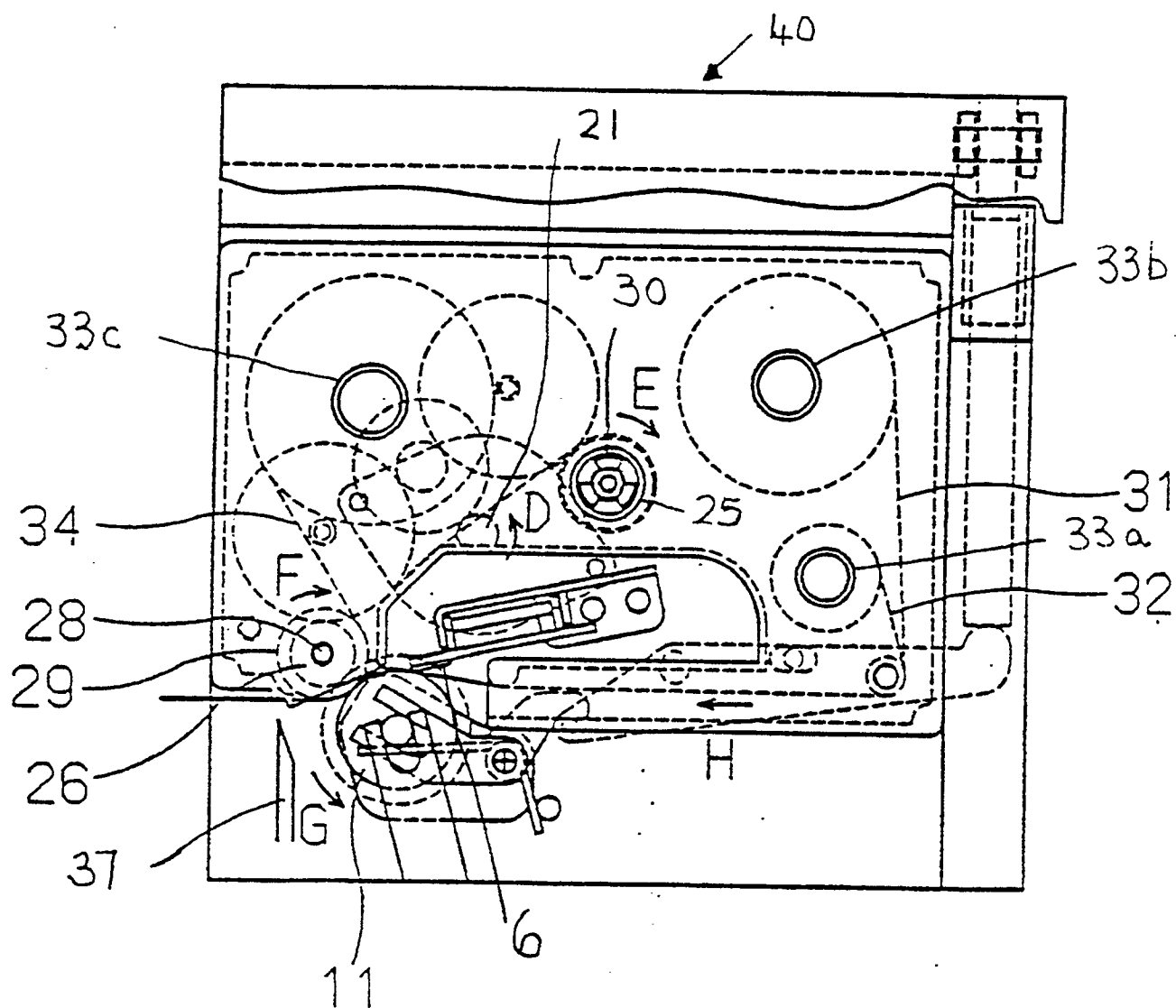


Fig. 4

The present invention relates to tape printing apparatus, e.g. for printing on record-carrying tape used mainly for things such as labels.

A tape printing apparatus is disclosed in JP-A-1-163073 in which, as shown in Figure 7, a pair of tape feed rollers 38 have a nip therebetween through which is pressed both a tape 31 from a tape carrier 33b and also an adhesive tape 34, provided with peelable paper (not shown) and an adhesive layer (not shown), coming from a tape carrier 33c, whereby adhesion occurs between the tapes 31, 34. The tape 31, prior to adhesion to the tape 34, is printed by a thermal printing head 6 in association with an ink ribbon 32, the latter passing from an ink ribbon carrier 33a to an ink ribbon take-up roll 30a. The tape 31 during such printing is supported by a platen roller 11 over which it passes.

However, in the arrangement shown in JP-A-1-163073, the distance between the platen roller 11 and the tape feed rollers 38 has to be longer than the total of the lengths of the radii of the rollers 11, 38 for the purposes of the mechanism. Moreover, in addition to the necessary distance between the platen roller 11 which is used together with the thermal printing head 6 and the feed rollers 38 used to effect the adhesion of the tapes 31, 34, it is also necessary to provide a further distance between the rollers 38 and the position (not shown in Figure 7) where the now united tape 31, 34 is cut into appropriate lengths, with the result that a great deal of tape is wasted unnecessarily.

Also, since two types of roller, namely the platen roller 11 and the tape feed rollers 38, are required, the mechanism becomes complicated leading to increased costs.

Consequently, in the case of the present invention the platen roller 11 and one of the tape feed rollers 38 is combined into a single roller so that the distance from the printing position to the cutting position may be shortened to prevent wasted tape and so as to simplify the apparatus. With such a construction, when a single platen roller is pressed in order to print on a tape constituting a record medium and printing is effected by means such as a thermal head, a further tape comprising pasteboard, an adhesive layer and peelable paper is simultaneously adhered by pressure to the tape constituting the record medium.

Thus according to the present invention, there is provided tape printing apparatus comprising a tape carrier for carrying a tape; a pair of feed rollers through the nip between which may pass a tape from the tape carrier; means for driving the said feed rollers so as to cause the tape to be fed therefrom in a longitudinal direction; ink ribbon feeding means for feeding an ink ribbon along a path a part of which is in contact with the tape at a printing station; and printing means for causing the ink ribbon at the printing station to print on the tape characterised in that one of the said feed rollers forms part of the said printing means so that dur-

ing printing, it supports both the tape and the ink ribbon at the printing station.

Preferably, the apparatus is provided with a second tape carrier for carrying a second tape which may be passed therefrom and through the said nip in alignment with the first-mentioned tape.

Severing means are preferably provided for severing the tape or tapes on the downstream side of the feed rollers.

The apparatus may comprise a cassette within which are disposed the said tape carrier or carriers and the said ink ribbon feeding means.

The printing means preferably comprises a printing head and means for effecting relative movement between the printing head and the said one feed roller into printing and non-printing positions.

The invention also comprises a method of effecting tape printing in which a tape is moved longitudinally through a printing station by being passed through the nip of a pair of driven feed rollers; an ink ribbon is fed along a path a part of which is in contact with the tape at the printing station; and printing is effected on the tape at the printing station characterised in that, during printing, one of the feed rollers supports both the tape and the ink ribbon at the printing station.

A second tape may be passed through the said nip in alignment with the first-mentioned tape.

Preferably, the first mentioned tape is a transparent tape and the second tape is provided with an adhesive layer so that the tapes are stuck to each other as a result of passing through the said nip.

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

Figure 1 shows one embodiment of a tape printing apparatus according to the present invention, with a cassette thereof removed, Figure 1(a) being a left side view and Figure 1(b) being a view from above;

Figure 2 shows a tape cassette which may be used in the tape printing apparatus of Figure 1, Figure 2(a) being a left side view and Figure 2(b) being a view from above;

Figure 3 shows the apparatus of Figures 1 and 2 at non-printing time such as that adopted for removal and attachment of the cassette, Figure 3(a) being a left side view with the upper portion of the cassette case removed, and Figure 3(b) being a view from above;

Figure 4 is a view similar to that of Figure 3(b) but showing the parts at printing time;

Figure 5 is an enlarged view at printing time of the region around the thermal printing head of the apparatus;

Figure 6 is a diagrammatic perspective view of the tape printing apparatus of Figures 1-6; and Figure 7 is a schematic plan view showing a known tape printing apparatus.

In Figures 1(a) and 1(b) there is shown an embodiment of a tape printing apparatus according to the present invention in which a head arm 7 axially supports a head support member 9 by means of a head support shaft 8, the head arm 7 being attached to a mainframe 1. The head support member 9 carries a print or thermal head 6 which forms part of a printing station and is provided with a plurality of heating elements (not shown) formed in a row at right angles to the feed direction of a transparent tape 31 (shown in Figure 3). A platen roller holder 10 has a contact part 10a for contacting a release lever shaft 16.

The platen roller holder 10 is axially rotatably supported on a platen roller holder shaft 13. The platen roller holder 10 carries a platen roller gear 27 and a platen roller 11 which is attached to a shaft part 27a of the platen roller gear 27. A platen roller lever or spring 12 has one end contacting a stopper shaft 18, and applies force in the direction of an arrow A against the shaft part 27a of the platen roller gear 27. A release lever 14 is attached to the release lever shaft 16, and is axially rotatably supported on a release lever support shaft 15 which is attached to the mainframe 1. A release lever 17 which is movably mounted on a subframe 2, is shiftable in the directions of a double-headed arrow B, and is adapted to contact the release lever 14. An upper cover 19, which is shown in Figure 1(b) in an open state, has a projection portion 19a for controlling the amount of shifting of the release lever 17. The upper cover 19 is pivotable with respect to a lever case 3 in the directions of a double-headed arrow C about an upper cover shaft 20 as a fulcrum. The mainframe 1 is attached to the lower case 3. As shown in Figure 6, the lower case 3 is provided with a keyboard 45 and a liquid crystal or other display 46.

A motor 4 has a motor gear 21 attached thereto, the latter driving a ribbon winding gear 25 via a reduction gear 22 and a winding intermediate gear 23. The ribbon winding gear 25 and a ribbon winding shaft 5 form a friction clutch structure, and absorb variations in torque arising from differences in ribbon diameters etc. A tape feed gear 26 is axially attached to a tape feed gear shaft 28, and is rotated by the motor gear 21 via the reduction gear 22 and a tape feed intermediate gear 24. Tape cassette positioning shafts 2a and 2b are both mounted on the subframe 2.

Figures 2(a) and 2(b) illustrate a tape cassette 40 used in the tape printing apparatus of the present invention, Figure 2(a) being a left side view and Figure 2(b) being a plan view. Figures 3(a) and 3(b) are diagrammatic views of the cassette 40 in its non-printing state such as at removal or on attachment, Figure 3(a) being a left side view of the cassette with the upper case removed, and Figure 3(b) being a plan view. Figure 4 is a diagrammatic view of the cassette 40 during printing time.

A thermal ink ribbon 32, the transparent tape 31

and an adhesive tape 34 having pasteboard which are found around cores 33a, 33b, 33c respectively, pass through routes formed by a cassette case upper portion 36 and a cassette case lower portion 35, the latter having positioning holes 35a and 35b in which the tape cassette positioning shafts 2a and 2b are mounted. A tape feed roller 29 is axially supported on the tape feed gear shaft 28 and has a hole 29a. A ribbon winding core 30 has a differently shaped hole 30a in which is mounted the ribbon winding shaft 5 which effects winding of the thermal ink ribbon 32. That is to say, the thermal ink ribbon 32 passes from the core 33a to the ribbon winding core 30; the transparent tape 31 passes from the core 33b to the nip of the rollers 11, 29 and so to a cutter 37; and the adhesive tape 34 passes from the core 33c to the said nip and the cutter 37.

At the time of printing, the thermal head 6 is pressed against the platen roller 11 through the thermal ink ribbon 32 and through the transparent tape 31 which forms a record material, the thermal ink ribbon 32 passing along a path a part of which is in contact with the transparent tape 31 at the printing station. The tape feed roller 29 is axially supported on the tape feed gear shaft 28, and during printing it presses against the platen roller 11 through the adhesive tape 34 at the same time as the thermal head 6 presses against the platen roller 11 through the adhesive tape 34 so that ink is transferred onto the transparent tape 31.

The platen roller 11 during non-printing time can be shifted so as to move away from the transit route of the transparent tape 31. Thus when the upper cover 19 is in the open position best seen in Figure 6, the projection portion 19a forces the release lever 17 in the direction which causes clockwise rotation of the release lever 14 as seen in Figure 1(b) and consequently the platen roller 11 is spaced from the tape feed roller 29 so as to permit insertion and removal of the cassette 40. When, however, the upper cover 19 is closed, the platen roller 11 is pivoted into its printing position in which it is in contact, via the tapes 31, 34, with the tape feed roller 29. This is because, if pressure is not applied to the release lever 17, the platen roller 11 is urged towards the thermal head 6 and the tape feed roller 29 by the spring force of the platen spring 12 shown in Figure 1(b).

By rotating the motor gear 21 in the direction of an arrow D (Figure 4), the ribbon winding gear 25 and the tape feed gear 26 are respectively rotated in the arrow E direction and the arrow F direction. When the tape feed gear 26 rotates in the direction of the arrow F, the platen roller 11 rotates in the direction of an arrow G, so that the transparent tape 31 which has been stuck to the adhesive tape 34 is fed in the direction of an arrow H. On the other hand, inside the tape cassette 40, the thermal ink ribbon 32 is also fed in the direction of the arrow H along with the passage of the

transparent tape 31, and the slack portion occurring there is taken up by the ribbon winding core 30 driven by the ribbon winding shaft 5. At the thermal head 6, printing is carried out on the transparent tape 31 by effecting a printing control corresponding to the passage of the transparent tape 31.

Figure 5 is a view to a larger scale of the region around the thermal head 6 at printing time. In the present embodiment, the radii of the platen roller 11 and of the tape feed roller 29 are respectively 7.6mm and 5.8mm, and the angle θ between a line 41 from the left hand end of the thermal head 6 to the centre of the platen roller 11 and a line 42 joining the centres of the platen roller 11 and the tape feed roller 29 is 56° while the angle ϕ between the line 42 and a vertical line 43 from the centre of the tape feed roller 29 is 45° . In the present embodiment, the diameter of the platen roller 11 cannot be made very small because of its having to contact the thermal head 6 and to support the transparent tape 31 during printing and thus the need for it to have a specific curvature. This is because if the curvature is too small, the difference in curvature arising from the thickness of the peeling paper and pasteboard of the adhesive tape 34 becomes large and peeling tends to occur between the peeling paper and the adhesive tape, and because the travel resistance of the tape becomes large and imparts a load on the motor 4. The distance from the printing part of the thermal head 6 to the cutter 37, for cutting the adhesive tape 34 with the transparent tape 31 adhering thereto, could be shortened by about 3 mm because of the construction described above.

In order to pivot the platen roller 11 into and out of contact with the tape feed roller 29, the locus of movement of the centre of the platen roller 11 is arranged to pass a line 44 defining the centre of the arc subtended by the angle θ . It is preferable to get as small an angle θ and an angle ϕ as possible. Since the platen roller 11 is substantially brought into contact with a tape feed roller 29 and the thermal head 6 in the printing position, sagging of the tapes at this time can be prevented. Moreover, since contact between the tapes can be easily effected at this time if the angle θ is made as small as possible, any differences in their positions can be prevented.

In the embodiment shown in Figures 1-6, the distance from the said printing part to the cutter 37 is reduced by making a single roller of the tape feed roller 29 and the platen roller 11, and as a result, the useless blank part of the tape up to the printing position could be shortened. Further, by effecting tape feeding with the platen roller 11, the mechanism may be simplified compared to the case when using two rollers and cost reduction may therefore be achieved.

Claims

1. Tape printing apparatus comprising a tape carrier (33b) for carrying a tape (31); a pair of feed rollers (11,29) through the nip between which may pass a tape (31) from the tape carrier (33b); means (4) for driving the said feed rollers (11,29) so as to cause the tape (31) to be fed therefrom in a longitudinal direction; ink ribbon feeding means (30,33a) for feeding an ink ribbon (32) along a path a part of which is in contact with the tape (31) at a printing station; and printing means (6,11) for causing the ink ribbon (32) at the printing station to print on the tape (31) characterised in that one (11) of the said feed rollers (11,29) forms part of the said printing means (6,11) so that, during printing, it supports both the tape (31) and the ink ribbon (32) at the printing station.
2. Tape printing apparatus as claimed in claim 1 characterised in that the apparatus is provided with a second tape carrier (33c) for carrying a second tape (34) which may be passed therefrom and through the said nip in alignment with the first-mentioned tape (31).
3. Tape printing apparatus as claimed in claim 1 or 2 characterised by severing means (37) for severing the tape or tapes (31,34) on the downstream side of the feed rollers (11,29).
4. Tape printing apparatus as claimed in any preceding claim characterised by a cassette (40) within which are disposed the said tape carrier or carriers (33b,33c), and the said ink ribbon feeding means (30,33a).
5. Tape printing apparatus as claimed in any preceding claim characterised in that the printing means comprises a printing head (6) and means for effecting relative movement between the printing head (6) and the said one feed roller (11) into printing and non-printing positions.
6. A method of effecting tape printing in which a tape (31) is moved longitudinally through a printing station by being passed through the nip of a pair of driven feed rollers (11,29); an ink ribbon (32) is fed along a path a part of which is in contact with the tape (31) at the printing station; and printing is effected on the tape (31) at the printing station characterised in that, during printing, one (11) of the feed rollers (11,29) supports both the tape (31) and the ink ribbon (32) at the printing station.
7. A method as claimed in claim 6 characterised in that a second tape (34) is passed through the said nip in alignment with the first-mentioned tape

(31).

8. A method as claimed in claim 7 characterised in that the first-mentioned tape is a transparent tape (31) and the second tape (34) is provided with an adhesive layer so that the tapes are stuck to each other as a result of passing through the said nip. 5
9. Recording apparatus, within recording apparatus comprising (a) a printing means that does printing on a tape recording medium having transparency, (b) a tape feed means that feeds adhered tapes in their longitudinal direction, these being the said tape recording medium and tape comprising peeling paper laminated to pasteboard with an adhesive layer, (c) a cut means for cutting the said adhered tapes in desired positions, and (d) a tape cassette that furnishes the said tape recording medium and ink ribbon and tape comprising pasteboard, an adhesive layer and peeling paper, characterized in that in the said printing means it has the roller press the said tape recording medium through the ink ribbon, and in the said tape feed means it uses the same roller as the roller that presses the said adhered tapes. 10 15 20 25

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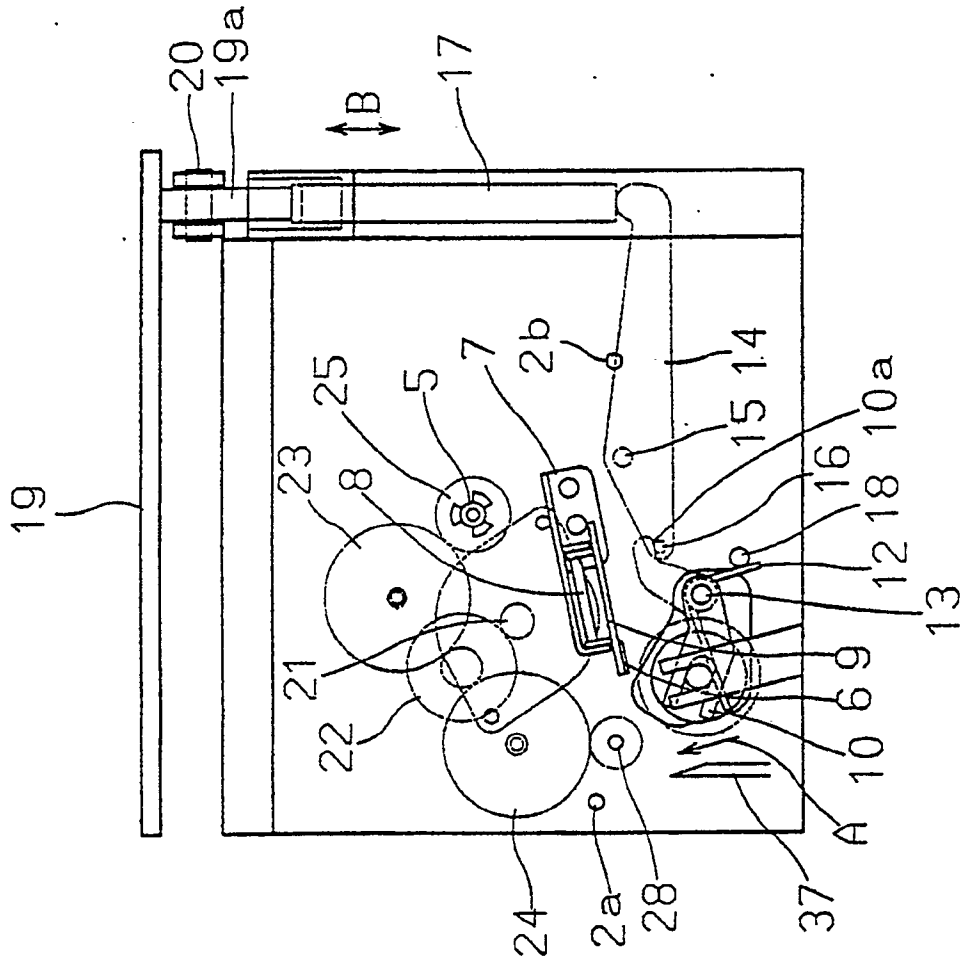
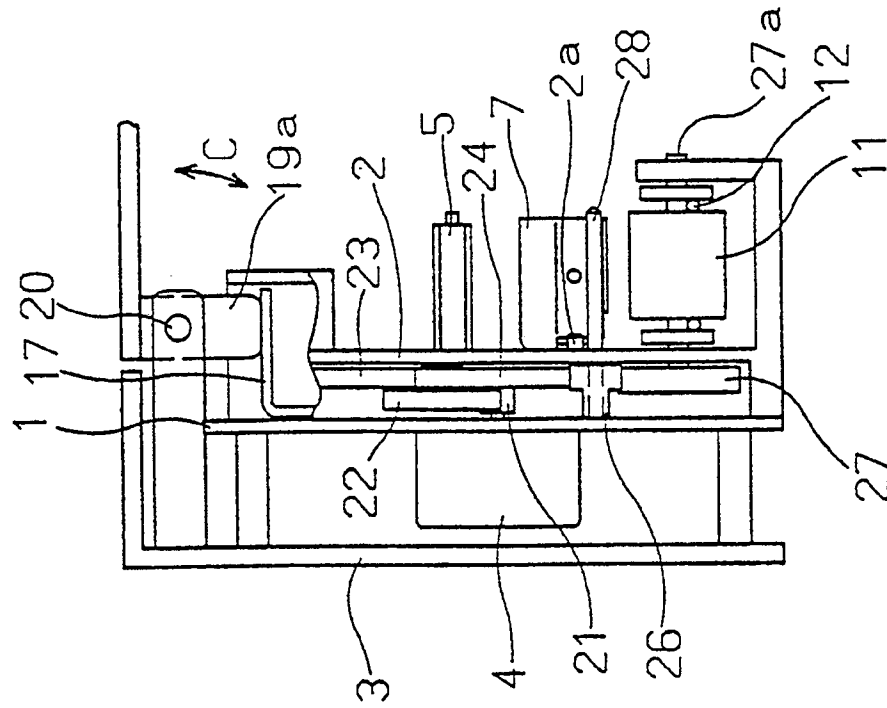
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(a)

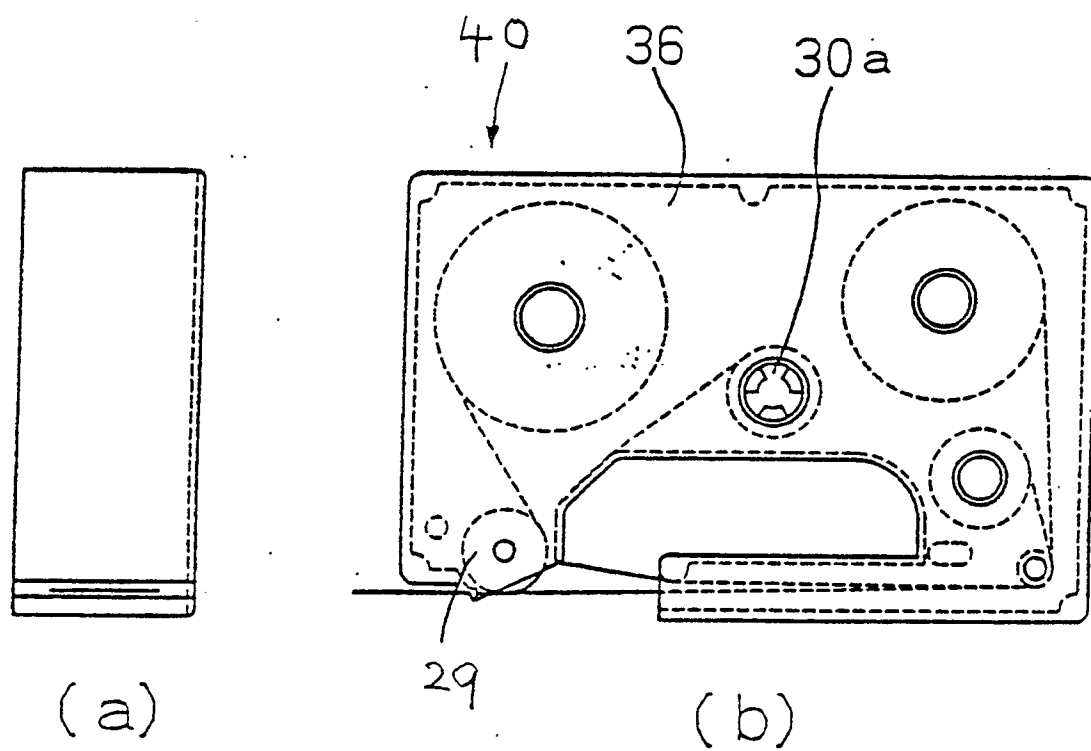


Fig. 2

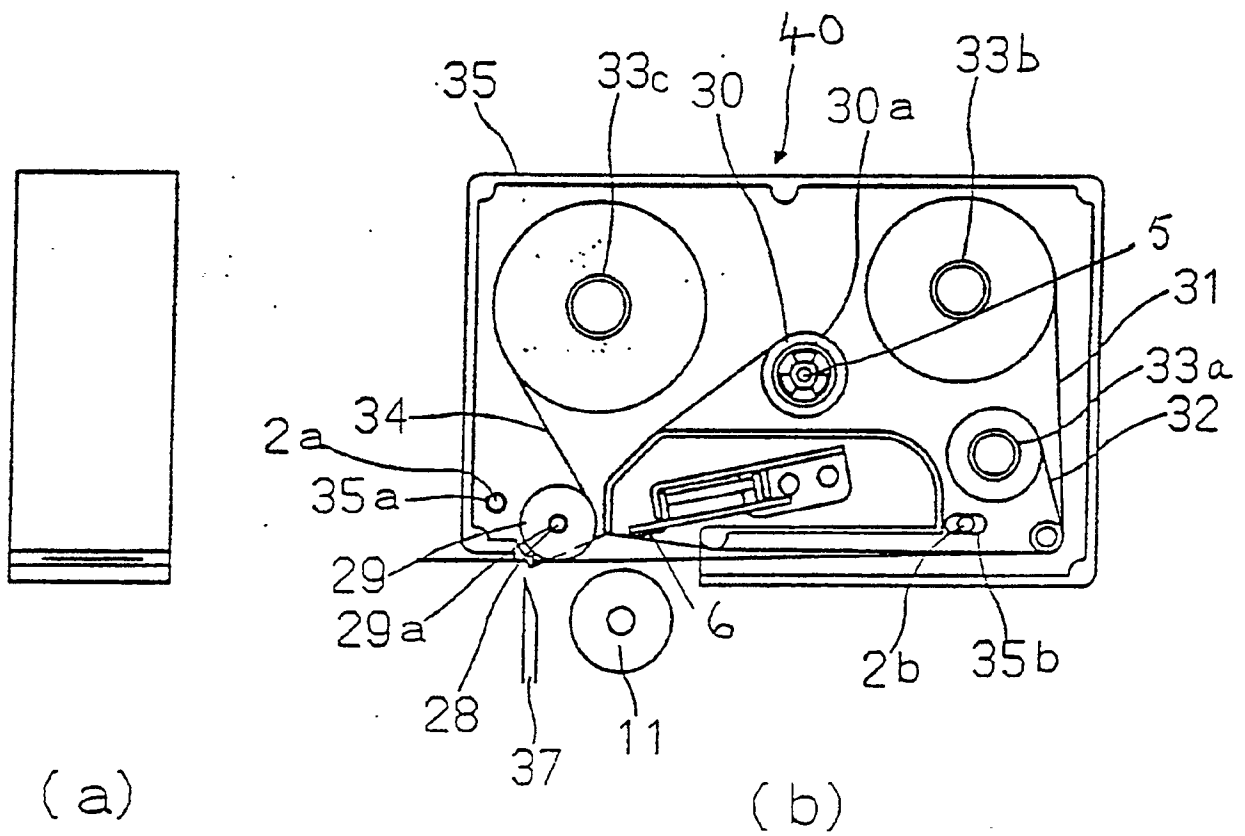


Fig. 3

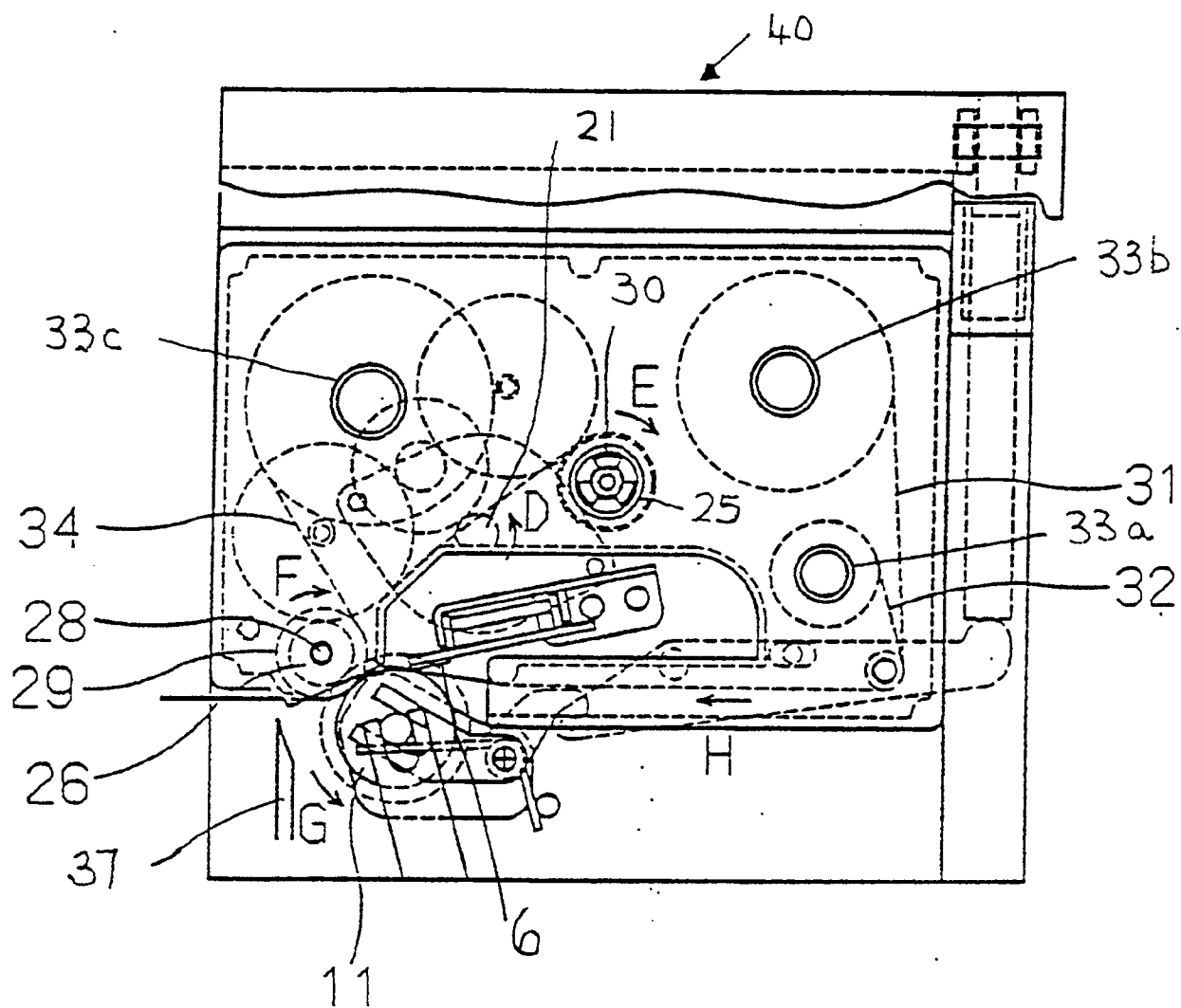
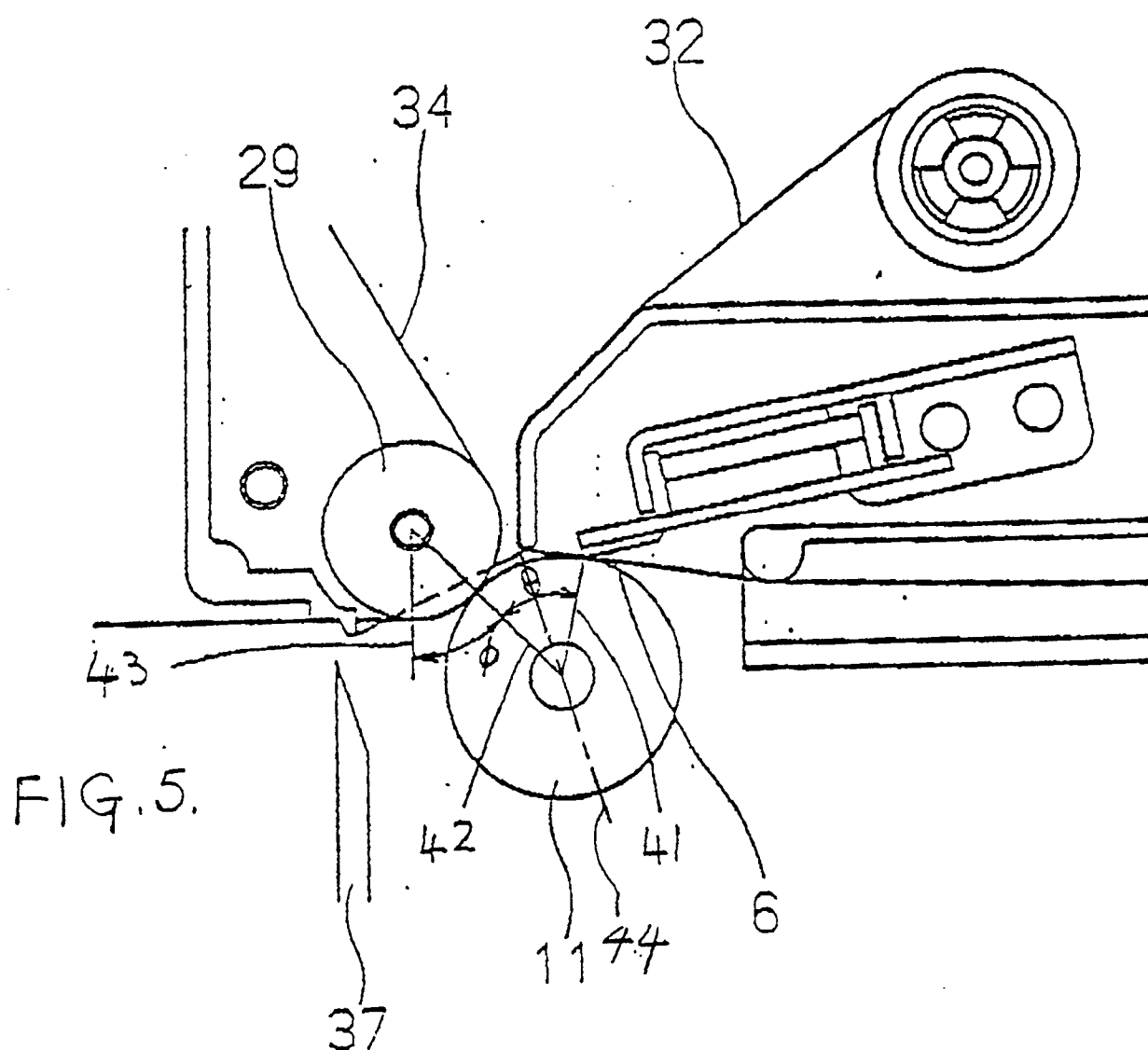


Fig. 4



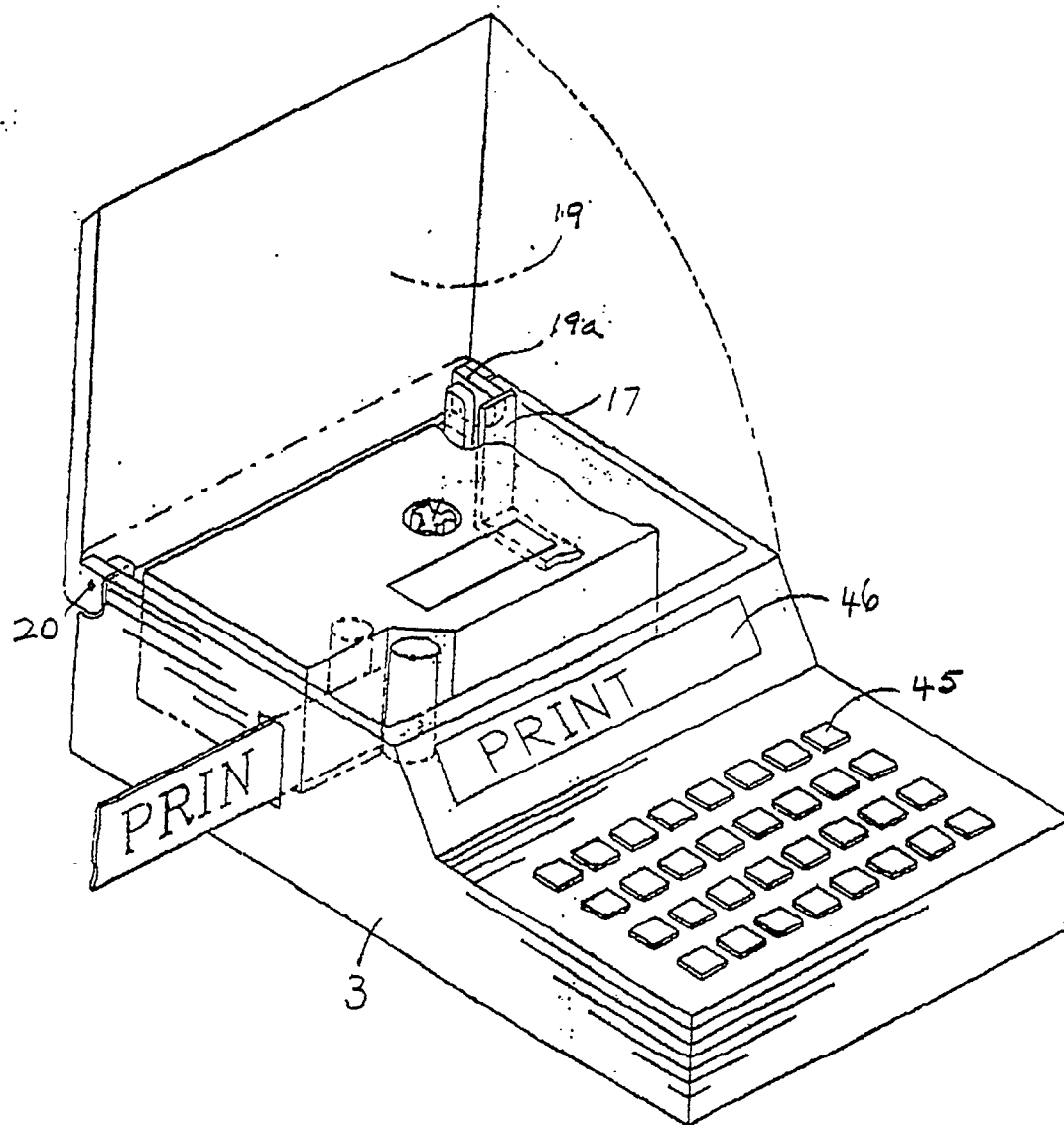


FIG. 6.

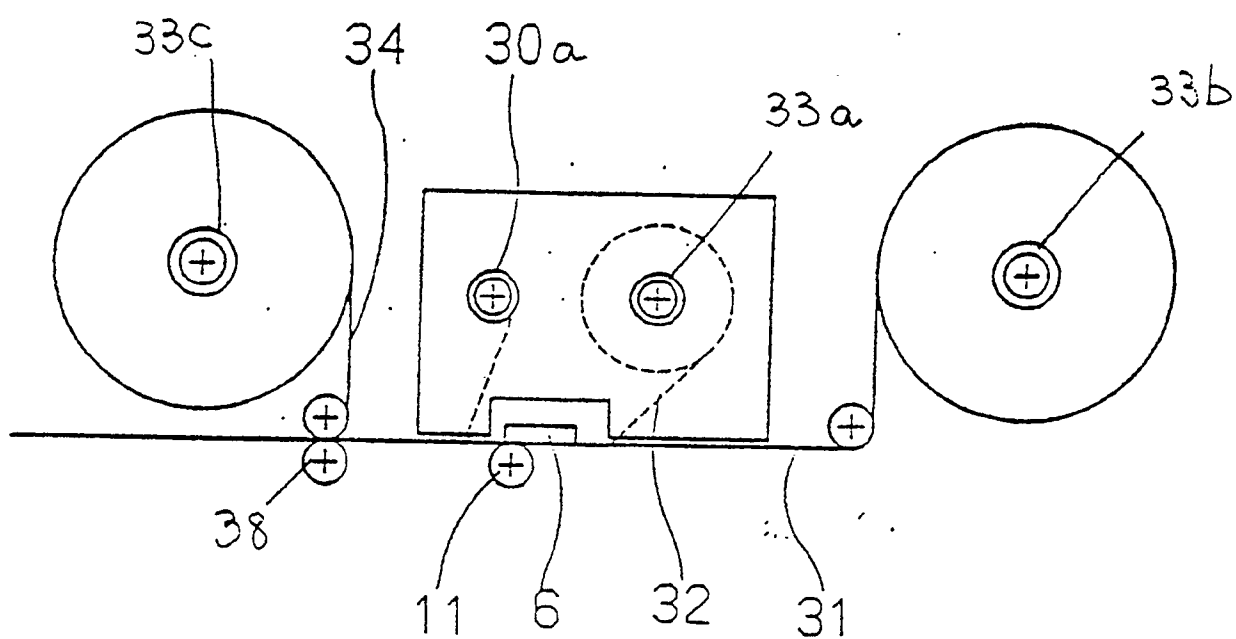


FIG. 7.



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 30 4398

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	EP-A-0 297 486 (SEIKO EPSON CORP.) * figures 1-3,12 * ---	1,6	B 41 J 11/02
A	US-A-4 141 291 (Y. HATA et al.) * figures 1,2,4,6,7 * ---	1,6,9	
A	US-A-4 556 333 (R. STEFANSSON) * figures 1-3 * -----	1,6	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 41 J
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 09-08-1991	Examiner ZOPF K
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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