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54 **Tape feed mechanism.**

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73 Proprietor : **BROTHER KOGYO KABUSHIKI
KAISHA**
35, 9-chome, Horita-dori Mizuho-ku
Nagoya-shi, Aichi-ken (JP)

72 Inventor : **Nagao, Yoshiaki c/o Brother Kogyo
Kabushiki K.**
35, Horita-dori 9-chome Mizuho-ku
Nagoya-shi Aichi-ken (JP)
Inventor : **Kobayashi, Atsuhiko c/o Brother
Kogyo Kabushiki K.**
35, Horita-dori 9-chome Mizuho-ku
Nagoya-shi Aichi-ken (JP)
Inventor : **Sakuma, Mikio c/o Brother Kogyo
Kabushiki K.**
35, Horita-dori 9-chome Mizuho-ku
Nagoya-shi Aichi-ken (JP)

74 Representative : **Senior, Alan Murray et al**
J.A. KEMP & CO 14 South Square Gray's Inn
London WC1R 5EU (GB)

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Description

The present invention relates to a tape feed mechanism including a tape storage cassette for housing at least two tapes. The two tapes are to be overlapped and cut together.

Apparatus for printing characters on a non-adhesive side of an adhesive tape has been well-known. In this type of apparatus, although characters such as names can be printed on tapes which can be suitably adhered on the desired substrates, the printed characters are erased or become blurred because the printed surface is exposed. To solve such a problem, disclosed is an apparatus for making printed tapes where the printed surface is not exposed in Japanese Patent Application No. SHO62-294471. In this apparatus characters are reversely printed on a transparent film tape and a double-sided adhesive tape in the same width thereof is adhered thereon.

However, in this apparatus because the film tape where characters are printed and the double-sided adhesive tape which is adhered thereon are separately mounted on the apparatus, it is not easy to attach and detach the tapes. To solve this problem, it is possible to attach a cassette which cooperatively houses the tapes to the printing apparatus. However, the tapes cannot be effectively attached to the printing apparatus only by simply housing the tapes in the cassette. Since the tapes are arranged and connected outside the cassette after characters are printed on the film tape, if both the tapes are housed in the cassette and the ends of the tapes are extended to the outside, whenever the cassette is attached to the printing apparatus, it is necessary to arrange the ends of the tapes and guide them to the connection portion, whereby the attaching operation becomes difficult.

Other proposals involve providing a cutter for the tape located downstream of the print position (see eg EP-A-0 272 232), and the object of the present invention is to provide an improved tape printing device making it easier to cut the printed tape.

According to this invention there is provided a tape printing device for producing a printed tape, said printing device including:

a cassette which houses at least two tapes in a wound state; means on the device detachably receiving such cassette; a printing member for printing onto a surface of one of said tapes which is a tape-like recording medium; a tape feeding mechanism to perform tape feed from within the cassette, characterised in that the feeding mechanism feeds the tape towards a cutting position, in that said cutting position is on an outer wall of said cassette, and in that a movably mounted cutter member is provided having a blade portion arranged to be urged towards said cutting position.

The invention will be better understood from the following description which is given by way of example

with reference to the accompanying drawings in which:-

Fig. 1 is a perspective view of a tape storage cassette embodying the present invention.

Fig. 2 is an explanatory view showing the tape storage cassette of Fig. 1 attached to a printer unit.

Description of the Embodiment

The tape holding case incorporating the present invention is now described below with reference to the accompanying drawings.

As shown in the disassembled perspective view of Fig. 1, a tape storage cassette 1 according to this embodiment includes a film tape spool 5 around which a transparent film tape 3 is fitted, a ribbon feed spool 9 having a thermal transfer ribbon 7 wound thereon with its inked surface facing inside, a ribbon takeup spool 11 taking up the thermal transfer ribbon 7 drawn out of the ribbon feed spool 9, a double-sided adhesive tape spool 15 on which a double-sided adhesive tape 13 narrower than the film tape 3 and having one surface covered with an exfoliative sheet is wound with this sheet covered surface facing outside, and an alignment roller 17 for alignment of the double-sided adhesive tape 13 and the film tape 3, all of which are stored in a cassette case 19. They are rotatably carried by support members S1 through S5 mounted on a cover 21 and on the bottom of the cassette case 19 opposed to the cover 21 within the cassette case 19 whose opening is covered with the cover 21.

The tape storage cassette 1 is attachably and detachably mounted on a printer unit capable of reverse-printing desired characters. Thus, the unit accomplishes reverse-printing on the film tape 3 using the thermal transfer ribbon 7. The double-sided adhesive tape 13 is then stuck to the printed surface to provide a print tape with desired characters already printed.

The tape storage cassette case 1 is formed with a recess 25 to receive a thermal head 23 mounted on the printer unit as shown in Fig. 2. Along the inner and outer periphery of the recess 25 provided are upright extending guide plates 27 and 29 to define a space for receiving the thermal head 23. Fig. 2 represents the tape storage cassette 1 fitted in the printer unit, so that the following description will be made with reference mainly to this drawing. The film tape 3 and the thermal transfer ribbon 7 with its inside surface coated with ink face each other and are guided together to the recess 25 by means of a guide pin 31. Guide plates 27 and 29 form a restricting path for the film tape 3 and the thermal transfer ribbon 7 sent to the recess 25 to avoid their blocking the space accommodating the thermal head 23.

The guide plate 29 extending upright from the inner periphery of the recess 25 is provided with a leaf spring 33 loading the film tape 3 and the thermal

transfer ribbon 7 outward to thereby ensure a required space for receiving the thermal head 23.

When the tape storage cassette 1 is attached to the printer unit, the thermal head 23 is thus located behind the thermal transfer ribbon 7. The film tape 3 and the thermal transfer ribbon 7 are then pressed against the thermal head 23 by means of a platen roller 35 provided on the printer unit and movable into and out of engagement with the thermal head 23, whereby desired reverse characters can be printed on the film tape 3.

The thermal transfer ribbon 7 passed through the recess 25 is taken up onto the ribbon takeup spool 11 via an end 29a of the guide plate 29. At the same time, the film tape 3 is drawn out of the cassette 1 by means of the alignment roller 17. When attached to the printer unit, the alignment roller 17 and the ribbon takeup spool 11 are respectively splined to a tape feed element 37 and a ribbon takeup element 39 on the printer unit which are driven for rotation in opposite directions by a drive motor and power transmission mechanism, not shown, and are rotatably driven by these elements in the directions indicated by arrows A and B.

The thermal transfer ribbon 7 and the film tape 3 thus travel along the path consisting of guide pin 31, guide plate 27 and recess 25 by such rotary drive motion. Inertia of such rotary motion however causes an extra amount of thermal transfer ribbon 7 and film tape 3 to be drawn from the respective spools 5 and 7. This results in slack of the ribbon 7 and the tape 3 in the recess 25, making it impossible to accomplish a proper reverse-printing action on the film tape 3. To overcome this problem, the present tape storage cassette 1 is provided with a leaf spring 40 mounted near the guide pin 31, which pressingly biases the thermal transfer ribbon 7 and the film tape 3 from outside. The thermal transfer ribbon 7 and the film tape 3 are thus loaded with back tension to prevent the thermal transfer ribbon 7 and the film tape 3 from being slackened at the recess 25. Furthermore, there is provided a separator film 41 which protects the film tape 3 from ink coating on the thermal transfer ribbon 7 during travelling along the feed path between the position at which the film tape 3 is drawn from the film tape spool 5 and the recess 25. The film tape 3 and the thermal transfer ribbon 7 are given back tension independently of each other by means of the separator film 41 and the leaf spring 40 so that, even if one of the film tape 3 and the thermal transfer ribbon 7 is drawn out for some reason, such pulling action would not affect normal feed motion of the remaining one of the tapes.

The alignment roller 17 not only brings the film tape 3 and the double-sided adhesive tape 13 into alignment but also is operatively associated with a feed roller 42 on the printer unit movable into and out of engagement with the alignment roller 17 to press the adhesive surface of the double-sided adhesive tape 13 against the print surface of the film tape 3 so

as to bond both tapes together. As shown in Fig. 1, the alignment roller 17 is at its ends provided with flanges 17a and 17b mounted at right angles to the roller surface so as to restrict widthwise movement of the tapes 3 and 13. The feed roller 42 is carried by a support member 43 mounted on the printer unit for rotation about an axis 43a. With the tape storage cassette 1 attached to the printer unit, the support member 43 is biased in the direction indicated by an arrow C by means of biasing means not shown, so that the film tape 3 and the double-sided adhesive tape 13 are pressed against the roller surface of the alignment roller 17 for bonding the tapes together.

The support member 43 carrying out the feed roller 42 on the printer unit also carries the platen roller 35 thereon, so that the platen roller 35, like feed roller 42, biases the support member 43 in the direction indicated by the arrow C to press the film tape 3 and the thermal transfer ribbon 13 against the thermal head 23. The platen roller 35 is like the feed roller 42 also in that it is formed by a resilient material such as rubber to avoid scratches at film tape 3 during pressing and to provide a required resistance and friction force.

In the feed path of film tape 3 from the recess 25 to the alignment roller 17 provided is a guide plate 45 for guiding the film tape 3 to a joint position E with the double-sided adhesive tape 13 on the alignment roller 17. The guide plate 45 is at both ends, i.e., at the cover 21 and the cassette case 19 shown in Fig. 1, provided with restricting elements 47a and 47b for restriction of widthwise displacement of the film tape 3. Since a length of the travel path of the film tape 3 is longer than that of the double-sided adhesive tape 13, it is considered that the film tape 3 is aligned in a width direction in advance before it is overlapped with the double-sided adhesive tape 13 by means of the feed roller 42 and the alignment roller 17.

The feed path of the double-sided adhesive tape 13 to the alignment roller 17 includes a guide roller 49 made of silicon resin to prevent the double-sided adhesive tape 13 from sticking to other parts such as thermal transfer ribbon 7 in the cassette 1. The double-sided adhesive tape 13 passed through this path is then guided to the joint position E with the film tape 3 by the roller surface of the alignment roller 17.

The film tape 3 and the double-sided adhesive tape 13 thus joined together by the alignment roller 17 and the feed roller 42 (i.e., print tape) are guided out of the cassette 1 by way of a tape holder 50 provided at the exit. The tape travel path outside the cassette case 19 is provided with a block 55 for receiving a cutting blade 53 in a tape cutter 51 mounted on the printer unit. The print tape thus completed is then cut off by pressing the cutting blade 53 against the block 55 in operation of the tape cutter 51. The tape cutter 51 is rotatably mounted on the printer unit and consists of a cutting blade holder 57 carrying the cutting blade 53 and a rotary arm 59 for rotating the cutting blade hol-

der 57 an the direction indicated by an arrow F. The print tape is cut off by manually moving the rotary arm 59 in the direction indicated by an arrow G.

The tape storage cassette 1 according to the present embodiment is provided with the alignment roller 17 which arranges and connects the film tape 3 and the double-sided adhesive tape 13 and with the block 55 which receives the cutting blade 53 which cuts the printed tape made by the connection therewith. When the printed tape is made by mounting the film tape 3 and the double-sided adhesive tape 13 to the printer, they are connected and cut by the cooperating operations of the alignment roller 17, the block 55, and the feed roller 42 and the tape cutter 51 provided on the printer. In the cassette case 19, the film tape 3 is guided to the connection position E by the operations of the guide pin 31, the guide plate 27, and the guide plate 45, the double-sided adhesive tape 13 being guided to the connection position E by the operations of the guide roller 49 and the roller surface of the guide roller 49, the printed tape which are connected being guided to the position of the block 55 which is the tape cutting position through the tape holder 50.

When the tape storage cassette 1 is detached from the printer and another tape storage cassette housing a different color thermal transfer ribbon is attached so as to make a different color printed tape, by separating the platen roller 35 and the feed roller 42 from the tape storage cassette 1, the tape storage cassette 1 can be directly detached in the condition that the film tape 3 and the double-sided adhesive tape 13 are guided to the connection position E. When the tape storage cassette 1 is attached to the printing apparatus again, it is not necessary to manually guide each tape to the connection position E. In addition, since the tapes are connected from the connection position E to the cutting position, it is not necessary to arrange and connect both the tapes 3 and 13 when attaching the tape storage cassette 1 to the printer, thereby simplifying the attaching operation. Moreover, in the cassette case 19, since the film tape 3 is tensioned by the leaf spring 40 in the position of the guide pin 31, when the tape storage cassette 1 is detached from the printer, the connection portion of the film tape 3 and the double-sided adhesive tape 13 is not outwardly extended, whereby it is possible to keep the tape holding case 1 in the condition that each tape is dismounted from the printer.

Claims

1. A tape printing device for producing a printed tape, said printing device including:
 - a cassette (19) which houses at least two tapes in a wound state; means on the device detachably receiving such cassette; a printing member (23) for printing onto a surface of one of said

tapes which is a tape-like recording medium (3); a tape feeding mechanism (17, 42) to perform tape feed from within the cassette, characterised in that the feeding mechanism feeds the tape towards a cutting position (55), in that said cutting position (55) is on an outer wall of said cassette (19), and in that a movably mounted cutter member (51) is provided having a blade portion (53) arranged to be urged towards said cutting position (55).

2. A tape printing device according to claim 1, wherein the blade portion is mounted on a rotatable cutter member (51).
3. A tape printing device according to claim 1 or 2, including in the feed mechanism a tape aligning member (17a, 17b) for aligning tape.
4. A tape printing device according to claim 1, 2 or 3, wherein the tape feeding mechanism includes feed rollers (17, 42) of which one is in the cassette and which are adapted to be brought in and out of pressure contact.
5. A tape printing device according to claim 3 and claim 4, wherein the tape aligning member is a pair of flange portions spaced apart substantially similarly to the width of the tapes on one of the feed rollers.
6. A tape printing device according to any preceding claim, wherein in use said tape feeding mechanism (17) feeds said tape-like recording medium (3) toward the outside of said cassette case member (19) in such a manner that the printed surface of said tape-like recording medium (3) is arranged parallel to an outer surface of said cassette case member (19).
7. A tape printing device according to any preceding claim, wherein the tapes accommodated in said cassette (19) are said tape-like recording medium (3), a transfer ribbon (7) for printing onto said tape-like recording medium (3) and a double-sided adhesive tape (13) arranged to overlap and be adhered to said tape-like recording medium (3) on which printing operations have been executed.
8. A tape printing device according to claim 7, wherein said tape-like recording medium (3) comprises a transparent film tape.
9. A tape printing device according to claim 7 or 8, wherein in use said double-sided adhesive tape (13) is adhered on the printed surface of said transparent film tape (3), and wherein said printing member (23) executes reverse-printing oper-

ation on said surface of said transparent film tape (3), whereby the printing on said surface appears as normal from the opposite surface thereof.

10. A tape printing device according to claim 7, 8 or 9, wherein a surface of said double-sided adhesive tape (13) opposite to that on which said transparent film tape (3) is adhered is covered with an exfoliative sheet.
11. A tape printing device according to any one of claims 7 to 10, including a pair of guides (27, 29) over which the recording medium is fed before being overlapped with the adhesive tape.
12. A tape printing device according to claim 11, wherein the guides are spaced so that a thermal printing head can be introduced between them.
13. A tape printing device according to any one of claims 7 to 12, including a roller member (49) on the tape holding case of which a circumferential surface is arranged to be brought into and out of contact with an adhesive layer on the adhesive tape (13), and provides a layer having a predetermined adhesive force less than a predetermined value with said adhesive layer when in contact therewith.
14. A tape printing device according to any preceding claim, wherein said feeding mechanism comprises a guide pin (31) for said tape-like material (3).
15. A tape printing device according to any one of claims 7 to 13 including on the cassette a tape holder (50) through which the recording medium (3) and double-sided adhesive tape (13) are guided in overlapped and adhered state to the cutter position (55).

Patentansprüche

I. Banddruckvorrichtung zum Erzeugen eines bedruckten Bandes, mit:
einer Kassette (19), die mindestens zwei Bänder in einem aufgewickelten Zustand aufnimmt; einem Mittel auf der Vorrichtung, das abnehmbar eine solche Kassette aufnimmt; einem Druckteil (23) zum Drucken auf die Oberfläche von einem der Bänder, das ein bandartiges Aufzeichnungsmedium (3) ist; einem Bandvorschubmechanismus (17, 42) zum Durchführen eines Bandvorschubes von innerhalb der Kassette, dadurch gekennzeichnet, daß der Vorschubmechanismus das Band zu einer Schneideposition (55) vorschiebt, daß die Schneideposition (55) auf einer

äußeren Wand der Kassette (19) vorgesehen ist und daß ein bewegbar angebrachtes Schneideteil (51) vorgesehen ist mit einem zum zu der Schneideposition (55) Gedrückt-Werden angeordneten Klingenteil (53).

2. Banddruckvorrichtung nach Anspruch I, bei dem der Klingenteil auf einem drehbaren Schneideteil (51) angebracht ist.

3. Banddruckvorrichtung nach Anspruch I oder 2, mit einem Bandausrichteteil (17a, 17b) in dem Vorschubmechanismus zum Ausrichten des Bandes.

4. Banddruckvorrichtung nach Anspruch I, 2 oder 3, bei dem der Bandvorschubmechanismus Vorschubrollen (17, 42) aufweist, von denen eine in der Kassette vorgesehen ist und die dazu geeignet sind, in Druckkontakt gebracht zu werden und aus dem Druckkontakt gebracht zu werden.

5. Banddruckvorrichtung nach Anspruch 3 und 4, bei dem das Bandausrichteteil durch ein Paar von Flanschabschnitten dargestellt wird, die in einem Abstand voneinander vorgesehen sind, der im wesentlichen der Breite der Bänder auf einer der Vorschubrollen ähnlich ist.

6. Banddruckvorrichtung nach einem der vorhergehenden Ansprüche, bei dem bei der Benutzung der Bandvorschubmechanismus (17) das bandartige Aufzeichnungsmedium (3) zu der Außenseite des Kassettengehäuseteiles (19) auf solche Weise vorschiebt, daß die bedruckte Oberfläche des bandartigen Aufzeichnungsmediums (3) parallel zu einer äußeren Oberfläche des Kassettengehäuseteiles (19) angeordnet ist.

7. Banddruckvorrichtung nach einem der vorhergehenden Ansprüche, bei dem die in der Kassette (19) aufgenommenen Bänder das bandartige Aufzeichnungsmedium (3), ein Übertragungsband (7) zum Drucken auf das bandartige Aufzeichnungsmedium (3) und ein auf beiden Seiten klebendes Band (13), das zum Überlappen und zum Anhaften an dem bandartigen Aufzeichnungsmedium (3), auf das Drucktätigkeiten ausgeführt worden sind, vorgesehen ist, sind.

8. Banddruckvorrichtung nach Anspruch 7, bei dem das bandartige Aufzeichnungsmedium (3) ein durchsichtiges Filmband aufweist.

9. Banddruckvorrichtung nach Anspruch 7 oder 8, bei dem bei der Benutzung das auf beiden Seiten klebende Band (13) auf der bedruckten Oberfläche des durchsichtigen Filmbandes (3) anhaftet und bei der das Druckteil (23) eine umgekehrte Drucktätigkeit auf die Oberfläche des transparenten Filmbandes (3) ausführt, wodurch der Druck auf der Oberfläche normal von der entgegengesetzten Oberfläche erscheint.

10. Banddruckvorrichtung nach Anspruch 7, 8 oder 9, bei der eine Oberfläche des auf beiden Seiten kle-

benden Bandes (13) gegenüber zu der, auf der das durchsichtige Filmband (3) anhaftet, mit einem abgerollten Film bedeckt ist.

II. Banddruckvorrichtung nach einem der Ansprüche 7 bis 10, mit einem Paar von Führungen (27, 29), über die das Aufzeichnungsmedium vorgeschoben wird, bevor es mit dem klebenden Band überlappt wird.

12. Banddruckvorrichtung nach Anspruch II, bei der die Führungen so angeordnet sind, daß ein Thermodruckkopf zwischen ihnen eingeführt werden kann.

13. Banddruckvorrichtung nach einem der Ansprüche 7 bis 12, mit einem Rollenteil (49) auf dem Bandhaltegehäuse, von dem eine Umfangsoberfläche so angeordnet ist, daß sie in Kontakt und aus dem Kontakt mit einer klebenden Schicht des klebenden Bandes (13) zu bringen ist, und eine Schicht vorsieht, die eine vorbestimmte Anhaftkraft, die kleiner als ein vorbestimmter Wert ist, an der klebenden Schicht aufweist, wenn sie damit in Kontakt steht.

14. Banddruckvorrichtung nach einem der vorhergehenden Ansprüche, bei der der Vorschubmechanismus einen Führungsstift (31) für das bandartige Material (3) aufweist.

15. Banddruckvorrichtung nach einem der Ansprüche 7 bis 13, mit einem Bandhalter (50) auf der Kassette, durch den das Aufzeichnungsmedium (3) und das auf beiden Seiten klebende Band (13) in überlapptem und aneinander anhaftendem Zustand zu der Schneideposition (55) geführt werden.

Revendications

1. Dispositif d'impression de bande destiné à produire une bande imprimée, ledit dispositif d'impression comprenant :

une cassette (19) qui loge au moins deux bandes dans un état enroulé; des moyens sur le dispositif recevant de façon détachable une telle cassette; un élément d'impression (23) destiné à imprimer sur une surface de l'une desdites bandes qui est un support d'enregistrement en forme de bande (3); un mécanisme d'avance de bande (17, 42) destiné à réaliser une avance de bande depuis l'intérieur de la cassette, caractérisé en ce que le mécanisme d'avance avance la bande vers une position de coupe (55), en ce que ladite position de coupe (55) est sur une paroi extérieure de ladite cassette (19), et en ce qu'un élément de coupe monté de façon mobile (51) est prévu et possède une partie de lame (53) disposée de façon à être poussée vers ladite position de coupe (55).

2. Dispositif d'impression de bande selon la revendication 1, dans lequel la partie de lame est montée sur un élément de coupe rotatif (51).

5 3. Dispositif d'impression de bande selon la revendication 1 ou 2, comprenant un élément d'alignement de bande (17a, 17b) dans le mécanisme d'avance destiné à aligner la bande.

10 4. Dispositif d'impression de bande selon la revendication 1, 2 ou 3, dans lequel le mécanisme d'avance de bande comprend des galets d'avance (17, 42) dont l'un est dans la cassette et qui sont prévus pour être amenés en et hors de contact de pression.

15 5. Dispositif d'impression de bande selon la revendication 3 et la revendication 4, dans lequel l'élément d'alignement de bande est constitué par une paire de parties de rebord espacées de manière sensiblement similaire à la largeur des bandes de l'un des galets d'avance.

20 6. Dispositif d'impression de bande selon l'une quelconque des revendications précédentes, dans lequel ledit mécanisme d'avance de bande (17) avance lors de l'utilisation ledit support d'enregistrement en forme de bande (3) vers l'extérieur dudit élément de boîtier de cassette (19) de manière à ce que la surface imprimée dudit support d'enregistrement en forme de bande (3) se trouve parallèlement à une surface extérieure dudit élément de boîtier de cassette (19).

35 7. Dispositif d'impression de bande selon l'une quelconque des revendications précédentes, dans lequel les bandes reçues dans ladite cassette (19) sont ledit support d'enregistrement en forme de bande (3), un ruban de transfert (7) destiné à imprimer sur ledit support d'enregistrement en forme de bande (3) et une bande d'adhésif double-face (13) prévue pour recouvrir et être collée audit support d'enregistrement en forme de bande (3) sur lequel des opérations d'impression ont été exécutées.

40 8. Dispositif d'impression de bande selon la revendication 7, dans lequel ledit support d'enregistrement en forme de bande (3) comporte une bande de film transparent.

50 9. Dispositif d'impression de bande selon la revendication 7 ou 8, dans lequel ladite bande d'adhésif double-face (13) est collée lors de l'utilisation sur la surface imprimée de ladite bande de film transparent (3), et dans lequel ledit élément d'impression (23) exécute une opération d'impression inversée sur ladite surface de ladite bande de film

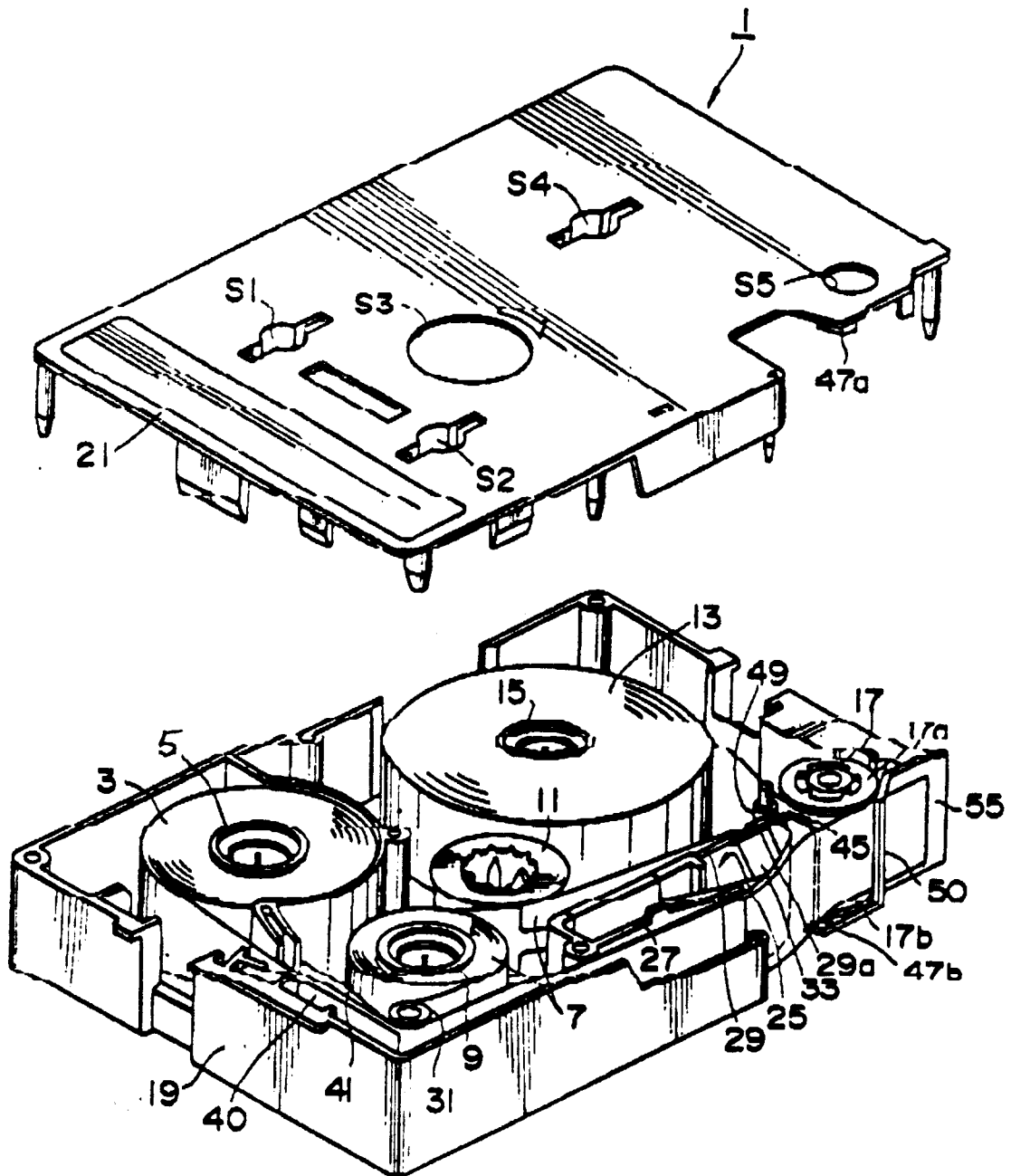
transparent (3), l'impression sur ladite surface apparaissant normale depuis la surface opposée à celle-ci.

10. Dispositif d'impression de bande selon la revendication 7, 8 ou 9, dans lequel une surface de ladite bande d'adhésif double-face (13) opposée à celle sur laquelle ladite bande de film transparent (3) est collée est recouverte avec une feuille détachable. 5
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11. Dispositif d'impression de bande selon l'une quelconque des revendications 7 à 10, comprenant une paire de guides (27, 29) sur lesquels est avancé le support d'enregistrement avant d'être recouvert avec la bande d'adhésif. 15
12. Dispositif d'impression de bande selon la revendication 11, dans lequel les guides sont espacés de telle sorte qu'une tête d'impression thermique peut être introduite entre eux. 20
13. Dispositif d'impression de bande selon l'une quelconque des revendications 7 à 12, comprenant un élément de galet (49) sur le boîtier de maintien de bande dont une surface circonférentielle est prévue pour être amenée en et hors de contact avec une couche d'adhésif sur la bande d'adhésif (13), et procure une couche ayant une force d'adhésion prédéterminée inférieure à une valeur prédéterminée avec ladite couche d'adhésif lorsqu'elle est en contact avec celle-ci. 25
30
14. Dispositif d'impression de bande selon l'une quelconque des revendications précédentes, dans lequel ledit mécanisme d'avance comprend un axe de guidage (31) pour ladite matière en forme de bande (3). 35
15. Dispositif d'impression de bande selon l'une quelconque des revendications 7 à 13, comprenant sur la cassette un support de bande (50) sur la cassette à travers lequel le support d'enregistrement (3) et la bande d'adhésif à double-face (13) sont guidés à l'état recouvert et collé vers la position de coupe (55). 40
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FIG. 1



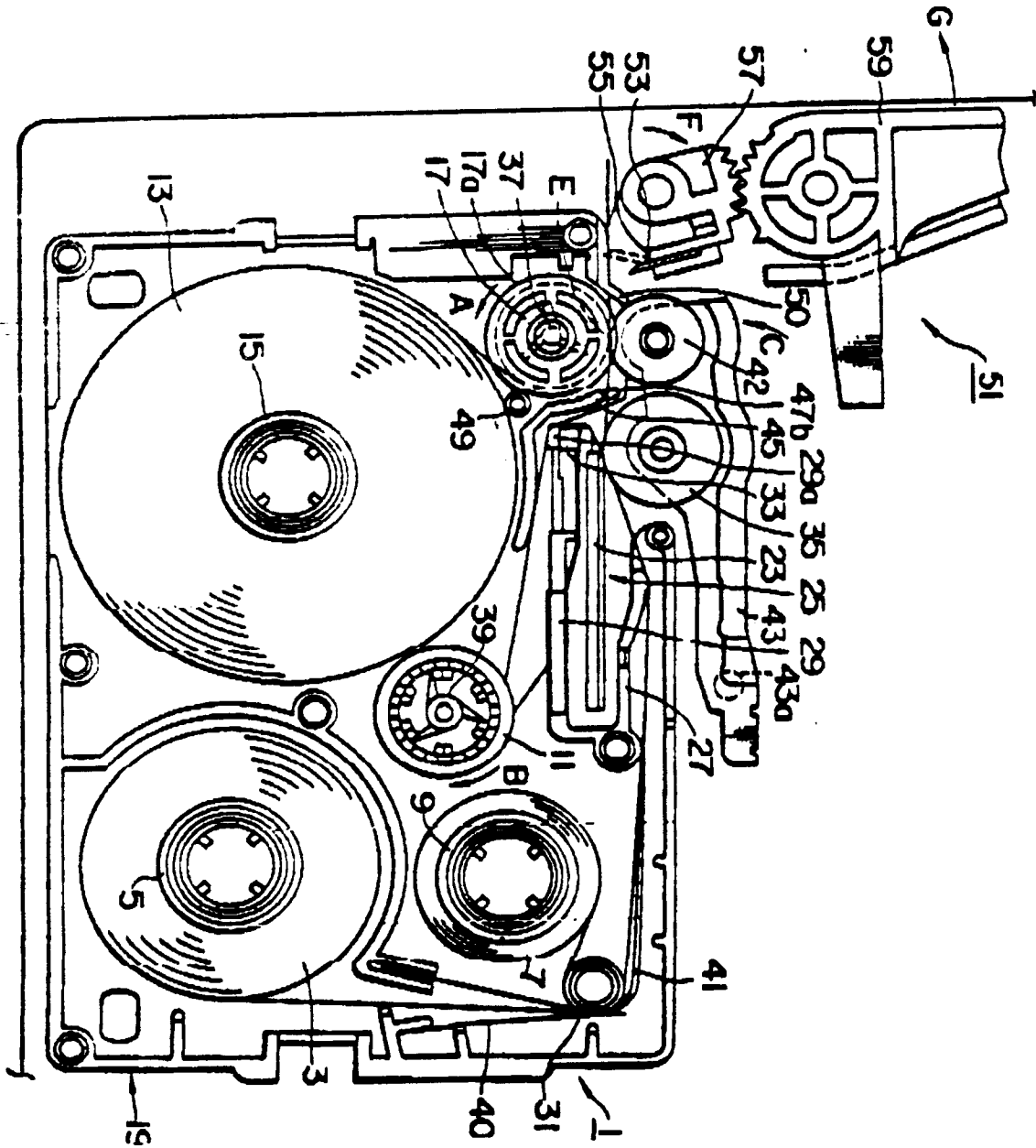


FIG. 2