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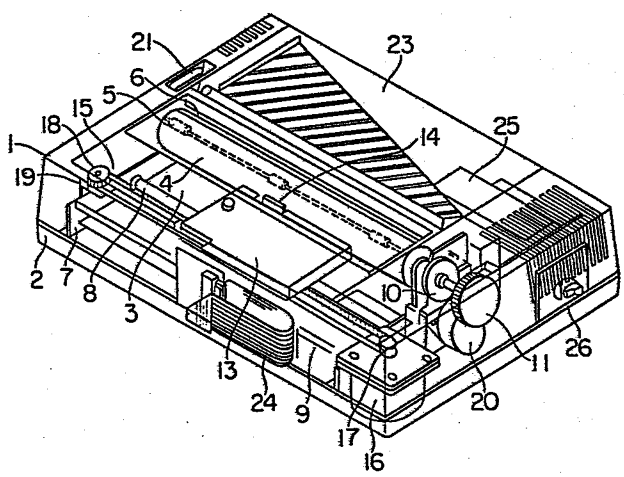
(54) Heat transfer ribbon feeding device for a printer.

(57) A printer has a carriage adapted to be moved reciprocatingly, a thermal head mounted on the carriage, a heat transfer film on the carriage, a driving belt for reciprocatingly driving the carriage, two pulleys between which the driving belt is stretched, a motor for driving said belt, and a film roll-up mechanism for rolling up the film after use. The carriage is fixed to the driving belt at one side of a line interconnecting the pulleys while the film roll-up mechanism has rollers which pinches there-between the portion of the belt at the other side of the line. With this arrangement, it is possible to roll up the used heat transfer film by making an efficient use of the movement of the carriage.



EP 0 126 203 A2

PRINTER

TITLE MODIFIED
see front page

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION:

The present invention relates to an improvement in a printer of the type which makes use of a heat transfer film.

DESCRIPTION OF THE PRIOR ART:

Printers making use of heat transfer films have been known. These known printers, however, involved a problem that the construction of the printer is complicated due to the separate provision of the driving mechanism for reciprocatingly driving a carriage and the driving mechanism for rolling up the heat transfer film on the carriage.

SUMMARY OF THE INVENTION

OBJECT OF THE INVENTION:

Accordingly, it is a primary object of the invention to provide a printer in which the driving mechanism for reciprocatingly driving a carriage and the driving mechanism for rolling up the heat transfer film are united to simplify the construction of the printer as a whole.

BRIEF SUMMARY OF THE INVENTION:

To this end, according to the invention, there is provided a printer having a carriage adapted to be moved reciprocatingly, a thermal head mounted on the carriage, a heat transfer film on the carriage, a driving belt for reciprocatingly driving the carriage, two pulleys between which the driving belt is stretched, and a film roll-up mechanism for rolling up the film after use, wherein the improvement comprises that the carriage is fixed to the driving belt at one side of a line interconnecting the pulleys while the film roll-up mechanism is engaged to the belt at the other side of the line, and driving means is provided for driving one of the pulleys.

This printer has a highly simplified construction because the reciprocatory driving of the carriage and the rolling up of the heat transfer film after use are conducted by a common driving mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a printer in accordance with the invention;

Figs. 2 to 5, 8 and 9 are sectional views and perspective views showing the practical arrangement of various mechanical parts of the printer;

Figs. 6 and 7 are sectional view and a plan view of the cassette portion of the printer;

Figs. 10 and 11 are a perspective view and a sectional view of a paper guiding section; and

Fig. 12 is an illustration showing how the head, the carriage and the heat transfer film are related to one another.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A preferred embodiment of the invention applied to a heat transfer type printer will be described hereunder with reference to the accompanying drawings.

Referring to the drawings, the printer of the invention has a housing constituted by an upper case 1 and a lower case 2. The upper case 1 has a lid 3 covering the mechanical portion 7 of the printer. A paper discharging portion is constituted by a platen 4 and rollers 5 associated with the platen 4.

Namely, the mechanical portion 7 of the printer includes various machine parts such as shafts 8 and 9, gear 10 and the platen 4 provided with a platen knob 11. A carriage 12 shown in Fig. 4 is supported by the shafts 8 and 9 for horizontal sliding movement along these shafts. A thermal head 14 is mounted on the carriage together with a cassette portion accomodating a heat transfer film.

The carriage 12 is fixed to one side of a timing belt, and is adapted to be moved horizontally by means of the timing belt which is stretched between a pulley 17 mounted on the end of the shaft of a pulse motor 16 and an idle pulley 18 of a belt stretching mechanism 19. The other side of the timing belt 15 is utilized for rotating the heat transfer film. The platen 4 is adapted to be rotated by a second pulse motor 20 through a gear 10. The platen 14 is also rotatable by manual through the platen knob 11 independently of the motor 20.

A reference numeral 21 designates a release lever which is adapted to release the pressing force exerted by the pressing rollers on the lower side of the platen 4. A reference numeral 23 designates a separator having functions such as the separation of the sheets continuously fed to and discharged from the printer, holding of the single sheets and so on. The electric power supply to the electric parts such as the thermal head carried by the carriage 12 is conducted through a flat cable 24. Reference numerals 25 and 26 denote, respectively, a transformer and a power switch.

Fig. 2 shows the construction of the frame portion. Numerals 30 and 31 denote side plates having an identical construction. A bottom plate 32 is provided at its both ends with projections 33, 34 and 35. These projections are adapted to be fitted in corresponding apertures formed in the side plates 30 and 31 and caulked to these side plates to thereby form a frame.

The shaft 8 is held at its one end by an E-ring 36 and a fastener 37, and is incorporated in a frame together with a carriage 12. Similarly, the shaft 9 is held on the side plates 30 and 31 by means of an E-ring 36' and a fastener 37'. The pulley 18 is rotatably held by the belt stretching mechanism 19, which in turn is held by means of a belt stretcher mounting screw 38, retaining hole 39 and a biasing spring 40.

The carriage feeding pulse motor 16 is mounted on the motor base 45 through the intermediary of a vibration-proof rubber 41. The paper feeding pulse motor 20 is held by the motor base 45 together with a drive gear 42, intermediate gear 43 and a shaft 44. The motor base is fixed to the side plate 31 by means of screws. The motors and the associated parts in combination constitute a driving unit. A transformer support 46 is secured also to the side plate 31 by means of screws.

Fig. 4 shows the portion around the carriage 12 of the printer in accordance with the invention. The carriage 12 carries a cassette 13 loaded with a heat transfer film 50 to which a thermally-fusible ink has been applied. The thermal head 14 is rotatably held around the shaft 51 through the intermediary of the supporting plate 52. The arrangement is such that the thermal head presses the platen 4 through the medium of the heat transfer film 50 and a print paper 53 so that the resistor mounted on the head 14 produces heat to fuse the ink on the heat transfer film 50 to thereby effect a printing on the print paper 53.

The movement of the timing belt 15 causes a rotation of a pulley 55 which is provided at its one end with a gear 54. At the same time, the timing belt 15 drives at its reverse side a pressing roller 56. On the other hand, a lever 57 provided at its one end with a gear 59 is rotated through frictional engagement with a corrugated washer 58, and a gear 60 is rotated by a gear 54 through the intermediary of a gear 54 to thereby roll up the heat transfer film 50.

A control board unit 61 is held by the lower case 2 and is extractable rearwardly.

The copy paper 53 is fed by the frictional engagement between the pressing rollers 62, 62' and the platen 4. These pressing rollers 62, 62' are held resiliently by a guide portion 64 through shafts 63, 63', and are fixed to a rotary shaft 65. A reference numeral 66 designates a guide for the copy paper 53 and is adapted to prevent involvement of the heat transfer film 50.

Fig. 5 illustrates the operation of the carriage 12. The arrangement is such that, as the pulley 17 rotates, the belt 15 runs to make the carriage 12 run, while rotating the pulleys 55 and 66.

In this state, a solenoid 68 is energized to attract its plunger 69 from the position A' (broken line) to the position A (full line). Consequently, the head pressing lever 70 is rotated to push the head 14 through a retaining member 71, spring 72 and a pressing lever 73.

On the other hand, the rotation of the pressing lever 70 releases the lever 57 so that the latter is rotated through the friction engagement with the corrugated washer 58 to permit the gear 59 to conduct a transmission of rotation between the gears 54 and 60. A reference numeral 74 designates a transmission type photosensor adapted to detect presence or absence of the heat transfer film 50 in the cassette 13.

Figs. 6 and 7 show the cassette 13 in section and in plan, respectively. An idle roller 81 is resiliently pressed by a spring 82 onto a pinch roller 80 fixed to one end of the shaft of the gear 60. The pinch roller 80 cooperate with the idle roller 81 to take-up the heat transfer film 50. A retaining portion 89 on the shaft end of the roller 56 engages with the core 76 to roll up the film thus taken up. An idle core 75 is adapted to be driven by the film which runs along the pinch rollers 78, 78', 79 and 79'.

Referring now to Fig. 8, the core 76 is adapted to be rotated only in the direction for rolling up the film 50, through the rotation of the pulley 55 and the pulley 56. The torque of the roller 56 rotates the shaft 86 through the intermediary of the spring 84 and the friction plate 85. However, the shaft 86 is provided with a ratchet 87 having teeth 87' which engages with an upper lid 88 of the carriage to allow the shaft 86 to rotate only in one direction. Therefore, the shaft 86 rotates only when the core 76 rotates clockwisely as viewed in Fig. 7, so that the film 50 can be rolled up on the core 76.

It may appear possible to roll up the film 50 on the core 76, even if the pinch roller 80, idler 81 and the spring 82 are omitted. According to the invention, however, the arrangement is such that the film 50 can be fed when the head 14 is under the pressure, i.e. when the solenoid 68 is attracting its plunger as shown in Fig. 5A.

Figs. 10 and 11 show how the pressing rollers 62, 62' engage with the guide portion 64. It will be seen that the shafts 63 and 63' are retained at their both ends with fasteners 90.

In operation, the control board unit 61 operates in accordance with the instructions given by the host computer, and the carriage motor 16 and the solenoid 68 are energized. Consequently, the plunger 69 of the solenoid is moved from the position shown by broken line in Fig. 5 to a position shown by full line in the same Figure, so that the head pressing lever 70 is rotated. Consequently, the head 14 is pressed through the retaining piece 71, spring 72 and the pressing lever 73, to thereby press the heat transfer film 50 to the platen 4 through the intermediary of the copy paper 60.

In this state, the electric power is supplied to the head 14 and also to the carriage driving motor 16 so that the carriage 12 is driven through the belt 15. At the same time, the thermal head 14 produces heat to melt the pigment ink on the surface of the heat transfer film 50 to thereby commence the printing on the print paper 53 through the transfer of the ink.

Then, the carriage 12 moves with the head 14 held in the pressing position from the position A to the position B as shown in Fig. 12. The heat transfer film 50 usually has a base made from a polyester film, which is adjacent to the head 14, and a pigment ink is applied to one side of the film, which is adjacent to the copy paper. The head makes the film contact with the copy paper. A wear resistant layer of a material such as a nitrided tantalum is formed on the head surface by spattering to provide a smooth surface. Therefore, the coefficient of friction μ between the copy paper 53 and the heat transfer film 50 is much greater than the coefficient of friction μ' between the heat transfer film 50 and the thermal head 14. As the head 14 moves while pressing the platen 4, the head 14 slides on the surface of the heat transfer film 50 without causing relative movement between the copy paper 53 and the heat transfer film 50. Consequently, the core 75 is rotated so that the heat transfer film 50 is pulled out by a length ℓ' equal to the amount ℓ of movement of the head 14 from the position A to the position B.

Consequently, it is possible to be pulled out the heat transfer film by a movement of the head 14 held in the pressing position, so that the mechanism for pulling the heat transfer film 50 is simplified. Moreover, the transition of heat from the head 14 to the film 50 is facilitated because the head is always held in contact with the heat transfer film unless the core 75 is locked or the heat transfer film 50 is ruptured.

On the other hand, referring to Figs. 5, 8 and 9, the roller 56 is rotated by the running of the belt 15 so that the shaft 86 is rotated through the friction plate 85 and the ratchet 87 to frictionally drive the core 76 only in one direction. Furthermore, the operation of the solenoid 68 causes the lever 57 to rotate the intermediate gear 60, so that the lever 57 and the pressing lever 70 are disengaged from each other to cause a rotation of the roller 80. Consequently, the roller 80 takes up the film 50 by an amount equal to that pulled out from the core 75, and the taken-up film 50 is rolled up by the core 76.

Thus, according to the invention, the transfer film 50 is fed only when the carriage 12 is running and the solenoid 68 is energized so that the new portion of the heat transfer film 50 is used and fed only during the printing which is conducted by the head 14 pressed against the platen 4.

EFFECT OF THE INVENTION

In the printer of the invention, the running belt is stretched between two pulleys. The carriage is fixed to the belt at one side of the line interconnecting two pulleys, while the film roll-up mechanism is engaged to the belt at the other side of the line. As one of the pulleys is driven, both of the carriage and the film roll-up mechanism are driven by a common driving source. Consequently, the construction of the printer as a whole is very much simplified.

CLAIM

A printer having a carriage adapted to be moved reciprocatingly, a thermal head mounted on said carriage, a heat transfer film on said carriage, a driving belt for reciprocatingly driving said carriage, two pulleys between which said driving belt is stretched, and a film roll-up mechanism for rolling up the film after use, wherein the improvement comprises that said carriage is fixed to said driving belt at one side of a line interconnecting said pulleys while said film roll-up mechanism is engaged to said belt at the other side of said line, and driving means is provided for driving one of said pulleys.

FIG. 1

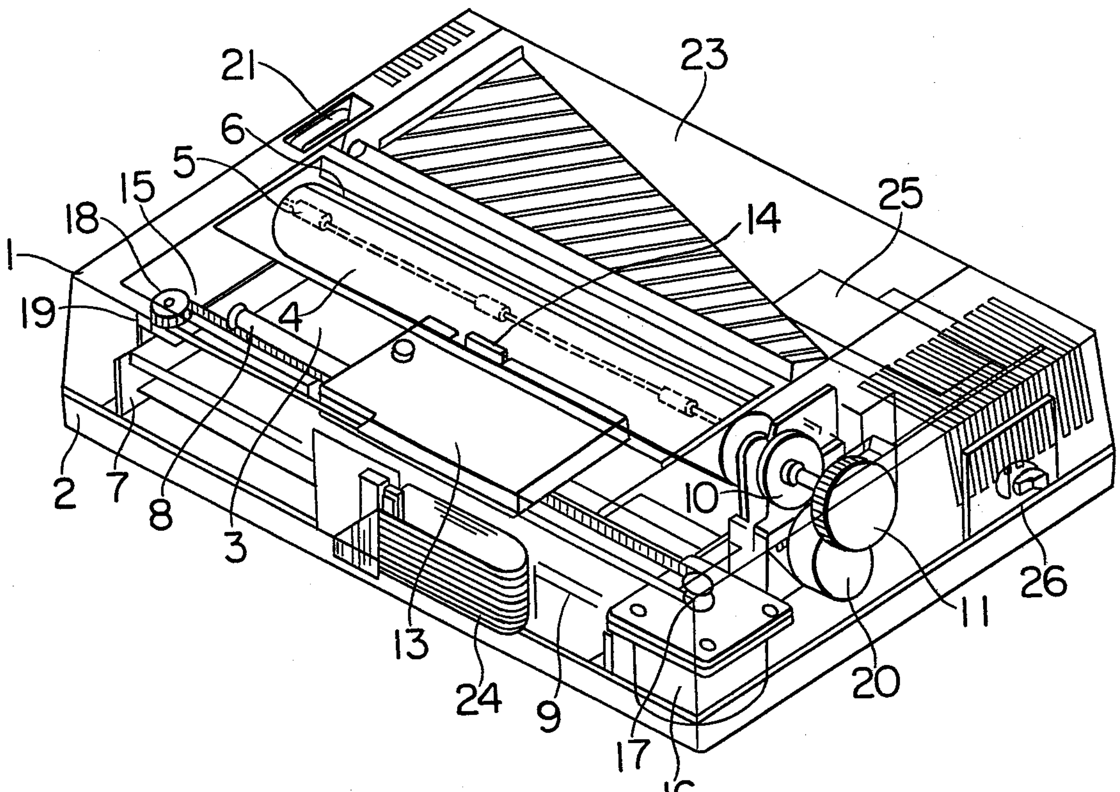


FIG. 2

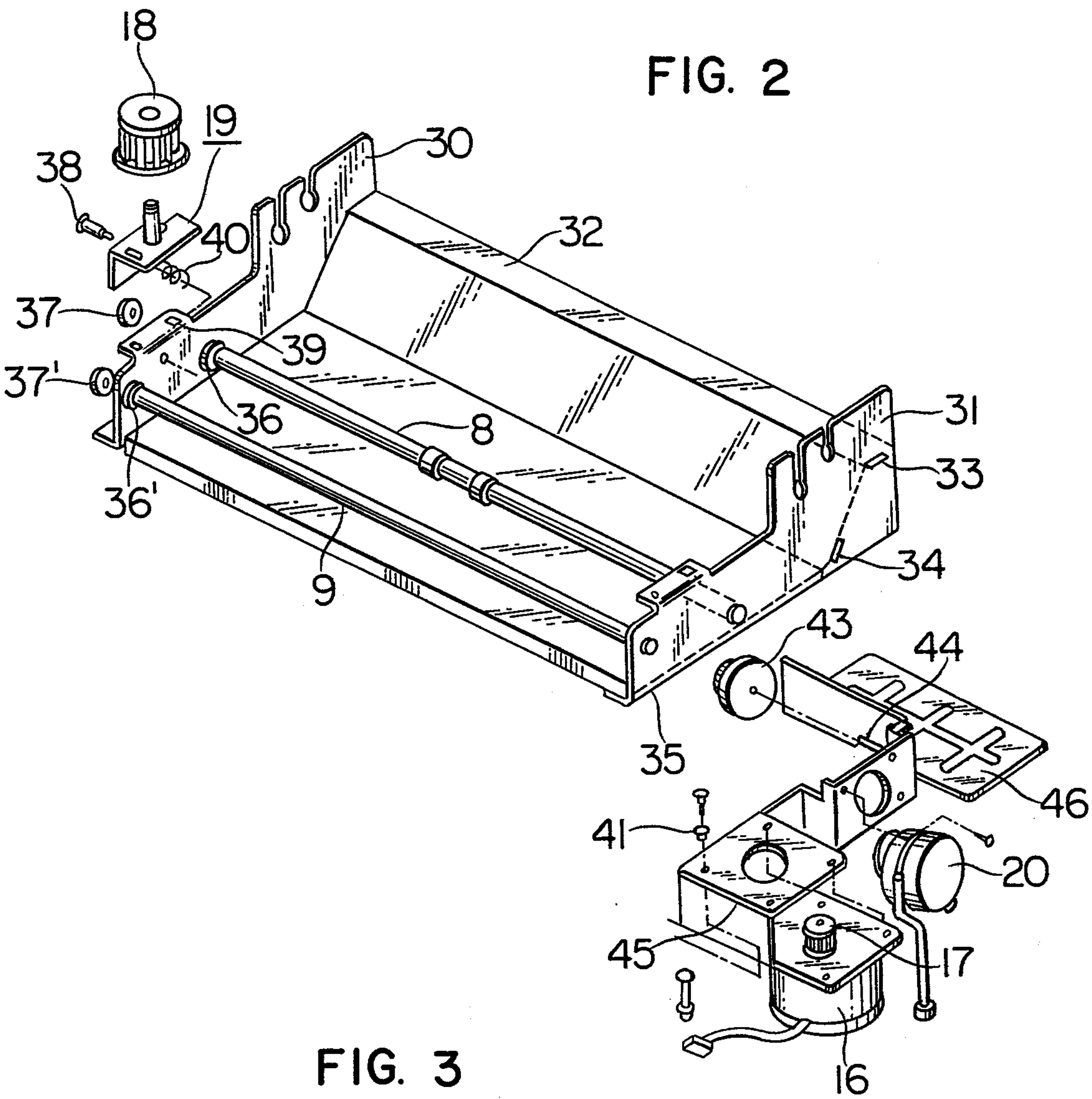

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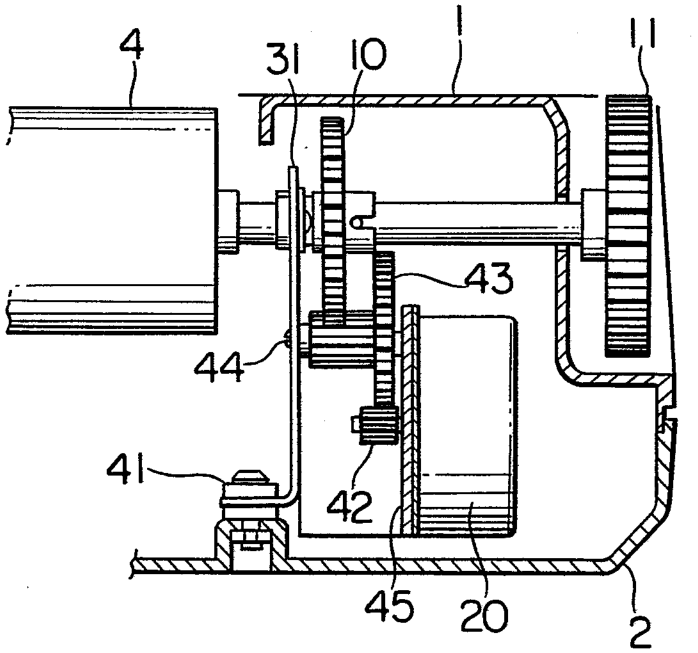
FIG. 3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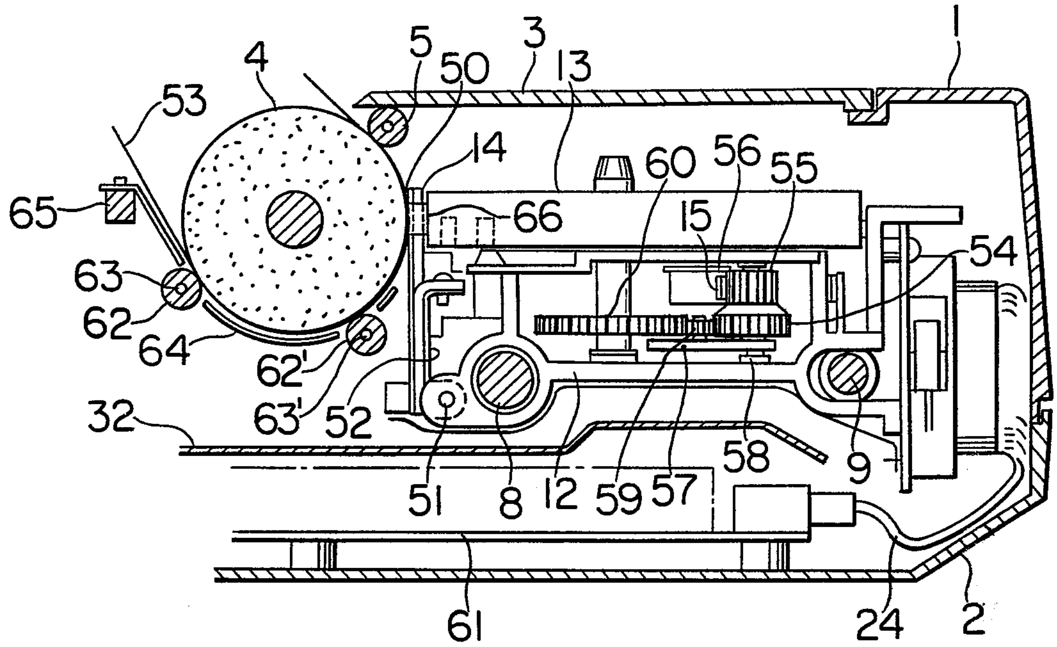
2

FIG. 4


53
4
5
50
3
13
1
14
60
56
55
65
66
15
54
63
62
64
62'
63'
52
32
51
8
12
59
57
58
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61
24
2

FIG. 5

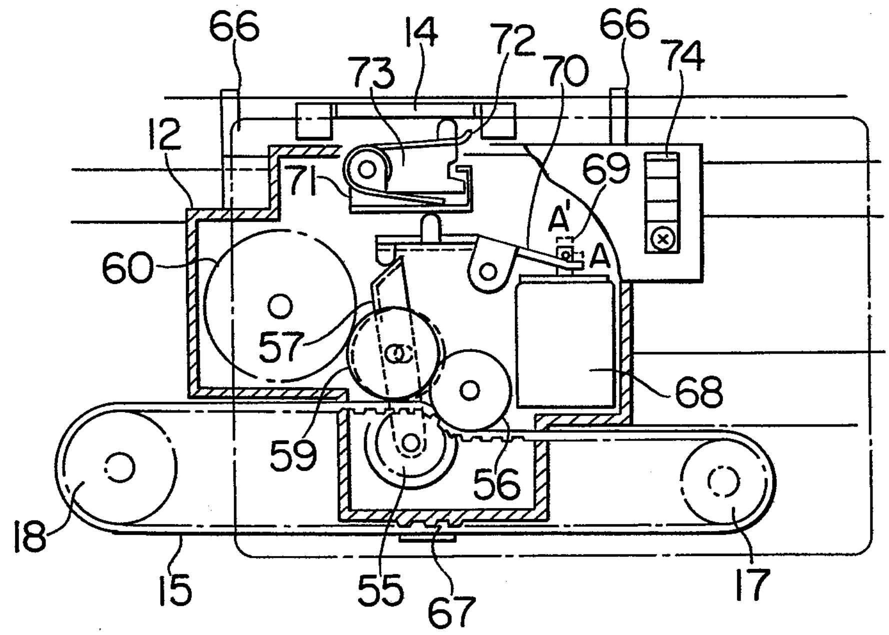
66
14
72
73
70
66
74
12
71
69
A'
A
60
57
68
59
56
18
15
55
67
17

FIG. 6

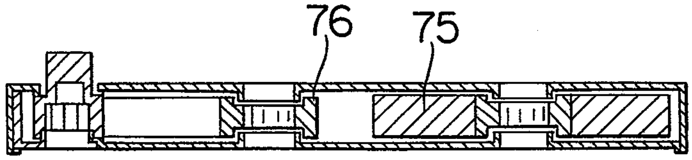

FIG. 7

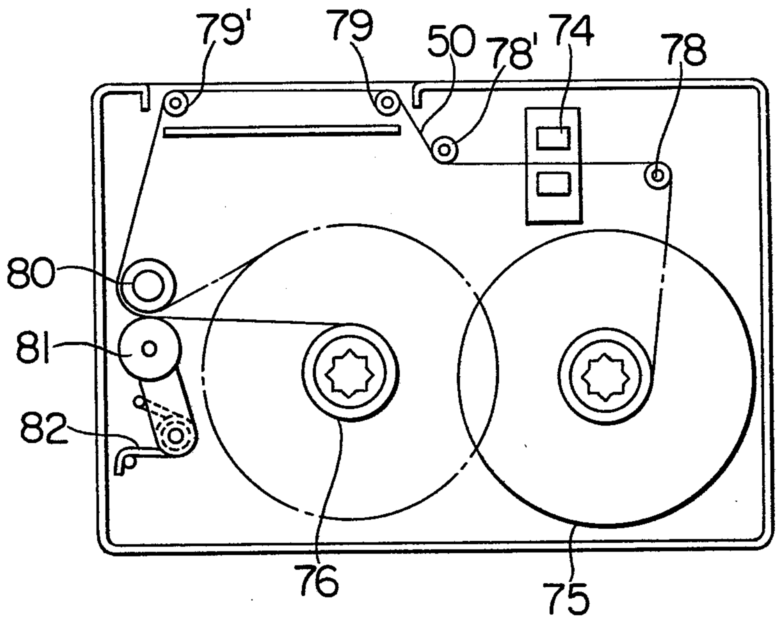

FIG. 8

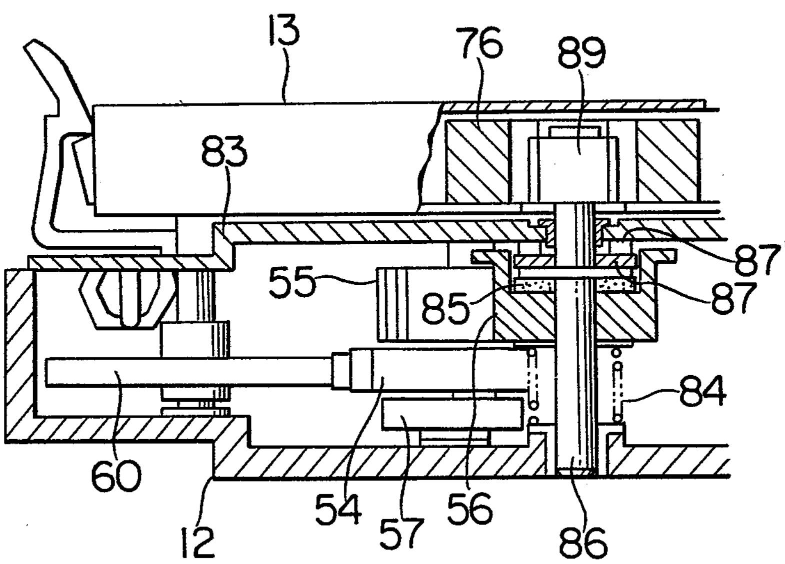

FIG. 9

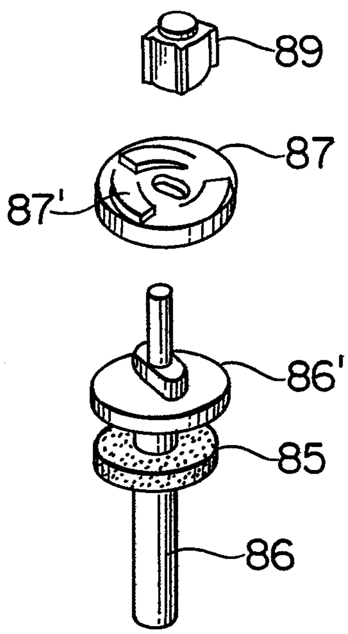

FIG. 10

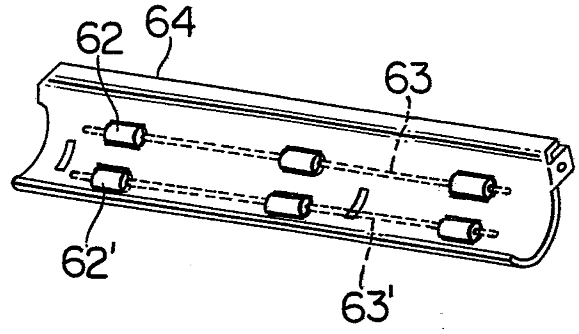

FIG. 11

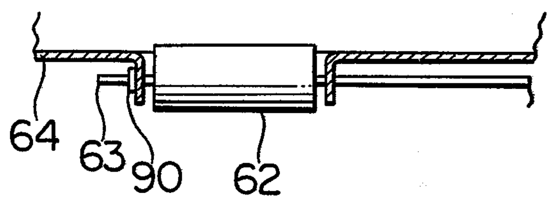

FIG. 12