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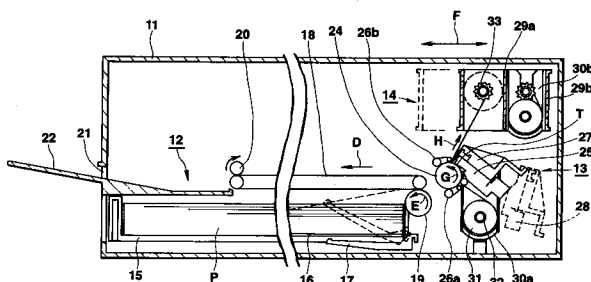
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(54) **Ribbon cassette from which a supply reel or a take-up reel can be pulled out, and a thermal transfer printing apparatus using the ribbon cassette.**

(57) A thermal transfer printer has a thermal head (25), a lift mechanism and first and second racks (29a, 29b) for holding first and second ribbon cassettes (30a, 30b), respectively. Each ribbon cassette holds a supply reel (32) and a take-up reel (33). The used part of an ink ribbon (31) is wound around the supply reel (32), and the unused part of the ribbon around the take-up reel (33). Both racks can slide to the left and the right. When the first ribbon cassette (30a) is selected, the thermal head (25) is positioned away from the printing section, and the lift mecha-

nism pulls out the first ribbon cassette (30a) and the ink ribbon (31) held in the first cassette (30a) downwards from the first rack (29a). As a result, the take-up reel (33) is pulled out from the first cassette (30a) and remains in the first rack (29a). The ink ribbon (31) is thereby stretched vertically near a printing position in the printing section. The thermal head (25) is moved into the printing section to contact the ink ribbon (31). The head (25) transfers ink from the ribbon (31) onto a paper sheet, thus printing image data on the paper sheet.

FIG.2**EP 0 666 181 A1**

The present invention relates to a thermal transfer printing apparatus in which a supply reel or a take-up reel can be pulled out from a ribbon cassette, thereby to set the ink ribbon into contact with the thermal print head.

The conventional thermal transfer printer comprises a printing section (a thermal transfer section) having a thermal print head and a platen, a drive device for driving the print head and the platen, and a data-processing device. A cassette case containing a roll of ink ribbon is removably set in the thermal printer, and the print head transfers ink from the ink ribbon onto a paper sheet, thus printing data.

FIG. 1 is a partly sectional view of an ink ribbon cassette 1 which contains a length of ink ribbon, a part of which is set in contact with the printing section of the conventional thermal printer. As shown in FIG. 1, the cassette 1 comprises a ribbon supply section 3 and a ribbon take-up section 3'. The ribbon supply section 3 has a reel-holding hole 2 and a supply reel 4 rotatably held in the hole 2. Similarly, the ribbon take-up section 3' has a reel-holding hole 2' and a take-up reel 4' rotatably held in the hole 2'. When the take-up reel 4' is rotated clockwise, or in the direction of arrow A, the ink ribbon 5 is fed in the direction of arrow B, passing through the gap between the platen 6 and thermal print head 7 of the printing section.

The printing section, which comprises the platen 6 and the thermal print head 7, is located in an opening 8 of the ink ribbon cassette 1 set in the thermal printer. The platen 6 is rotated counter-clockwise by the drive device (not shown) incorporated in the printer. The print head 7 is located above the platen 6, opposing the platen 6, and can be moved up and down. The print head 7 is spaced away from the platen 6 while printing no data. It is moved downwards to press the ink ribbon 5 and a paper sheet P onto the platen 6 in order to print data on the paper sheet P.

The paper sheet P is fed by a paper-feeding roller (not shown) in the direction of arrow C -- from a lower-right position to the platen 6, and hence to an upper-left position. And after data has been printed, the sheet P is fed to a lower-left position. The ink ribbon 5 is fed from the supply reel 4 as the take-up reel 4' is rotated in the direction of arrow A. Heat is applied to the ink ribbon 5 by the thermal print head 7 at the platen 6, whereby ink is transferred from the ribbon 5 to the upper side of the paper sheet P. The used part of the ribbon 5 is taken up around the take-up reel 4'. After all ribbon 5 has been fed from the supply reel 4, the ribbon cassette 1 is replaced by a new one.

The print head 5 has a length substantially equal to the width of the paper sheet P. It has printing elements (i.e., heat-generating elements) in

the same number as the maximum number of dots that can be arranged in a main scanning direction (i.e., the widthwise direction of the paper sheet P). When driven, each printing element generates heat, melting the ink on the ribbon 5 and transferring the ink onto the paper sheet P to print a dot thereon. The ink ribbon 5 has a width substantially equal to the length of the thermal print head 7 and to the width of the paper sheet P and is contained in the ink ribbon cassette 1. As long as the cassette 1 is set in the thermal printer, the printing section comprising the platen 6 and the thermal head 7 must be placed between the supply reel 3 and the take-up reel 3'. In other words, it is necessary to insert the printing section into the ink ribbon cassette 1. The cassette 1 has an opening 8 which is large enough to allow the passage of the printing section. Due to the large opening 8, the ink ribbon cassette 1 cannot be made smaller.

The ink ribbon cassette 1 is a disposable item. It is discarded after the ink ribbon 5 contained in it has been used up. The discarding of the large cassette 1 means wasting of much material and is undesirable from an economical point of view. Further, since the cassette 1 is relatively large, it is somewhat hard to handle and require a comparative large storage space.

Furthermore, it is very difficult to provide a thermal printer which can contain a plurality of such large ribbon cassettes and which can yet be relatively small. To print, for example, a multi-color image with black characters, it is necessary to remove a cassette containing yellow, magenta and cyan ink ribbons from the printer after the multi-color image has been printed, and to insert another cassette containing only a black ribbon to print black characters. The replacement of ribbon cassettes is time-consuming and greatly reduces the printing efficiency.

An object of the present invention is to provide an ink ribbon cassette that remains a small unit while located outside a printing apparatus or while located in the printing apparatus but not used, and also a thermal printing apparatus designed to print data by using the ink ribbon cassette.

Another object of this invention is to provide a thermal transfer printing apparatus which can contain a plurality of small ink ribbon cassettes which can use the cassettes interchangeably, one at a time.

To attain these objects, there are provided the following ink ribbon cassette and the following thermal transfer printing apparatuses.

A ribbon cassette comprising:

a supply reel on which an unused part of an ink ribbon is wound;

a take-up reel for taking up a used part of the ink ribbon; and

a cassette case holding the supply reel and the take-up reel such that one of the supply and take-up reels is able to be pulled out.

A thermal transfer printing apparatus comprising:

a thermal print head;

a main body for holding a ribbon cassette which comprises a supply reel on which an unused part of an ink ribbon is wound, a take-up reel for taking up a used part of the ink ribbon, and a cassette case holding the supply reel and the take-up reel such that one of the supply and take-up reels is able to be pulled out; and

pulling-out means provided in the main body, for pulling out one of the supply and take-up reels from the cassette case to a position where the ink ribbon contacts the thermal print head.

A thermal transfer printing apparatus comprising:

a plurality of ribbon cassettes each comprising a supply reel on which an unused part of an ink ribbon is wound, a take-up reel for taking up a used part of the ink ribbon, and for holding the supply reel and the take-up reel such that one of the supply and take-up reels is able to be pulled out;

a cassette mounting means for mounting the plurality of ribbon cassettes; and

cassette-moving means for moving a specified one of the plurality of ribbon cassettes to a predetermined position.

This invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a sectional view showing a conventional ribbon cassette;

FIG. 2 is a schematic sectional view of a thermal transfer printer according to an embodiment of this present invention;

FIG. 3 is a perspective view illustrating in detail the ribbon cassette used in the printer shown in FIG. 2;

FIG. 4 is a partly sectional view showing in detail the reel support of the ribbon cassette illustrated in FIG. 3;

FIG. 5 is a partly sectional view depicting the positional relation which the lift mechanism and the reel drivers assume while the ribbon cassette is mounted in the printer;

FIG. 6 is a view explaining how the reel drivers and the lift mechanism interact;

FIG. 7 is another view explaining how the reel drivers and the lift mechanism interact;

FIG. 8 is an exploded view illustrating the cassette-switching mechanism incorporated in the printer; and

FIG. 9 is a front view of the cassette-switching mechanism.

An embodiment of the present invention will now be described in detail, with reference to the accompanying drawings.

FIG. 2 shows a thermal transfer printer according to an embodiment of the invention. As shown in FIG. 2, the printer comprises a housing 11, a paper supplying/ discharging section 12, a printing section 13, and a cassette supplying section 14. The sections 12, 13 and 14 are provided in the housing 11. The paper supplying/discharging section 12 extends from the lower middle part to the left side of the housing 11. The printing section 13 is located at a lower-right part of the housing 11. The cassette supplying section 14 is arranged above the printing section 13.

A paper cassette 15 containing a stack of paper sheets P is removably attached to the paper supplying/discharging section 12. The paper cassette 15 has a pusher plate 16 on its bottom. Placed on the pusher plate 16 is the stack of paper sheets P. A pushing lever 17 is hinged to the lower side of the cassette 15 and can be rotated to lift the plate 16 from below.

A paper feeding/discharging endless belt 18 horizontally extends above the paper cassette 15 and can be driven counterclockwise, in the direction of arrow D. The lower half of the endless belt 18 abuts on the topmost of the stacked sheet P pushed upwards by the pusher plate 16. Thus, when driven in the direction of arrow D, the belt 18 supplies paper sheets P, one by one, from the cassette 15 to the printing section 13. The upper half of the belt 18 serves to transfer the printed paper sheets P from the printing section 13 toward the left side of the housing 11.

A roller 19 is provided, contacting the forward end of the lower half of the belt 18. The roller 19 can be rotated counterclockwise, or in the direction of arrow D, to prevent any paper sheet P from being supplied, jointly with the preceding sheet P, to the printing section 13. In other words, the roller 19 pushes the sheet P back into the paper cassette 15. Further, a paper discharging roller 20 is provided, contacting the rear end of the upper half of the belt 18. A paper tray 22 is provided at the downstream of the paper discharging roller 20 and extending outside through a paper discharging port 21 made in the left side of the housing 11. When driven in the direction of the arrow shown in FIG. 2, the roller 20 transfers onto the tray 22 each printed paper sheet P the belt 18 has transported from the printing section 13.

The printing section 13 comprises a platen 24 and a thermal head 25. An image transfer section T is defined by the platen 24 and the thermal head 25. A lower belt 26a is located beneath the platen

24, in contact therewith, to feed paper sheets P to the image transfer section T. An upper belt 26b is arranged above the platen 24, in contact therewith, for supplying printed paper sheets P from the image transfer section T. The thermal head 25 is held by a bracket 27. When the printer is set into printing mode, the head 25 takes the position indicated by solid lines, pressing an ink ribbon and a paper sheet P onto the platen 24 as will be described later. When the printer is set into non-printing mode, the head 25 is rotated counterclockwise by a head release mechanism (not shown), assuming the position 28 indicated by broken lines.

The cassette supplying section 14 has, for example, two racks 29a and 29b. Both racks 29a and 29b can slide back and forth, in the direction of arrow F. The rack 29a holds a ribbon cassette 30a containing a multi-color ink ribbon 31, whereas the rack 29b holds a ribbon cassette 30b containing a black ink ribbon. When one of the two racks is selected to be used, the other rack stays at a waiting position.

In the case shown in FIG. 2, the rack 29a is used, and the rack 29b remains at the waiting position, because the cassette 30a containing the multi-color ink ribbon has been selected for use in the printing section 13. When the multi-color ribbon 31 is used, the thermal head 25 is positioned at the retracted position 28, and the cassette 30a along with the supply reel 32 holding the ink ribbon 31 is pulled from the rack 29a, down into the printing section 13. Thus, the take-up reel 33 is pulled out of the ribbon cassette 30a and remains in the rack 29a. The ink ribbon 31 is thereby stretched vertically between the supply reel 32 and the take-up reel 33, extending through the image transfer section T.

When printing is initiated, the thermal head 25 is rotated into the printing position indicated by the solid lines. The head 25 presses the ink ribbon 31 and the paper sheet P onto the platen 24. The platen 24 is rotated counterclockwise, in the direction of arrow G, and cooperates with the lower belt 26a to feed the sheet P to the image transfer section T in cooperation with the lower belt 26a. At the same time, the platen 24 cooperates with the upper belt 26b to transport a printed sheet P to the paper supplying/discharging section 12. Meanwhile, the take-up reel 33 is driven by a reel drive mechanism (not shown), taking up the ink ribbon 31 in the direction of arrow H at the same speed the paper sheet P is fed along the circumferential surface of the platen 24. Hence, the thermal head 25 transfers ink from the ribbon 31 to the sheet P, thereby printing a multi-color image on the sheet P.

FIG. 3 is a perspective view illustrating in detail one of the ribbon cassettes 30a or 30b, hereinafter referred to as "ribbon cassette 30," and FIG. 4

shows in detail the reel supports of the ribbon cassette 30.

As shown in FIGS. 3 and 4, the ribbon cassette 30 comprises a bottom member 30-1 and a pair of reel supports 30-2. The bottom member 30-1 has an inner surface which is curved along the circumference of the roll of the ink ribbon 31 wound around the supply reel 32. The reel supports 30-2 are made integral with the bottom member 30-1, extending upwards from the ends of the member 30-1, respectively. The shaft of the supply reel 32 has its ends held in the holes made in the lower end portions of the reel supports 30-2. The shaft of the take-up reel 33 has its ends held in U-grooves formed in the upper end portions of the reel supports 30-2. The take-up reel 33, thus supported by the reel supports 30-2, can be removed from the ribbon cassette 30 when moved upwards to a position indicated by broken lines in FIG. 3.

Two engagement discs 33-1 are coupled to the ends of the shaft of the take-up reel 33. The discs 33-1 are coaxial with the take-up reel 33. Each disc 33-1 has an annular recess and is designed to engage with a take-up reel driver (later described). Each disc 33-1 has an axial hole, in which a pin 33-2 is loosely fitted to slide and forth. The rim of each disc 33-1 has four grooves 33-3 which are equidistantly spaced in the circumferential direction of the disc 33-1. When the disc 33-1 remains engaged with the take-up reel driver, the projections of the take-up reel driver fit in the grooves 33-3. Hence, the engagement disc 33-1 can transmit a force from the take-up reel driver to the take-up reel 33.

The pin 33-2 is set in contact with a spline cam 33-4. The spline cam 33-4 is biased outwards, or toward the reel support 302, by a coil spring 33-5 which is mounted on the shaft of the take-up reel. Thus, unless the ribbon cassette 30 is set in the housing 11, the spline cam 33-4 remains fitted in the cam holder 30-3 of the reel support 30-2 -- by virtue of the bias of the coil spring 33-5. The cam 33-4 therefore inhibits free rotation of the take-up reel 33.

Two engagement discs 32-1 are coupled to the ends of the shaft of the supply reel 32, respectively. These discs 32-1 are of the same design as the engagement discs 33-1 which are coupled to the ends of the shaft of the take-up reel 33. Each of these discs 32-1 has an axial hole, in which a pin is loosely fitted to slide and forth. When each 32-1 disc remains engaged with a supply reel driver (later described), the projections of the supply reel driver fit in the grooves made in the rim of the disc 32-1. The engagement disc 32-1 can therefore transmit a force from the supply reel driver to the supply reel 32. The pin is set in contact with a spline cam, which is biased out-

wards, or toward the reel support 30-2, by a coil spring (not shown) mounted on the shaft of the supply reel. Unless the ribbon cassette 30 is set in the housing 11, the spline cam remains fitted in the cam holder of the reel support 30-2 -- by virtue of the bias of the coil spring. The cam therefore inhibits free rotation of the supply reel 32.

Hence, unless the ribbon cassette 30 is set in the housing 11, the ink ribbon 31 does not slacken even if the cassette 30 is, for example, vibrated with an external force. The ink ribbon 31 is neither damaged nor pulled out unnecessarily.

A projection 30-4 horizontally protrudes from one end of the bottom member 30-1. The projection 30-4 become engaged with the claw of the cassette holder incorporated in a lift mechanism (later described), whereby the ribbon cassette 30 is held in the lift mechanism.

FIG. 5 shows the positional relation which the lift mechanism and the reel driver assume while the ribbon cassette 30 is set in the housing 11. Shown in FIG. 5 are the ribbon cassette 30, the lift mechanism 34 holding the ribbon cassette 30, the take-up reel driver 35, and the supply reel driver 36.

As can be understood from FIG. 5, the lift mechanism 34 comprises a cassette holder 43-1, a claw 34-2, an cam hole 34-3, a lift rod 34-4. Bent in the form of letter U, the claw 34-2 can engage with the projection 30-4 of the ribbon cassette 30. The cam hole 34-3 is an elongated one formed in the lower beam of the cassette holder 34-1 and extending in horizontal direction. The lift rod 34-4 has a cam at its upper end. The cam is slidably fitted in the cam hole 34-3. The cassette holder 34-1 steadily holds the ribbon cassette 30 when the claw 34-2 comes into engagement with the projection 30-4 of the ribbon cassette 30.

As shown in FIG. 5, the take-up reel driver 35 has an end portion 35-1 which opposes the engagement disc 33-1 which is fastened to one end of the take-up reel 33.

With reference to FIGS. 5, 6 and 7, it will be explained how the lift mechanism 34, the take-up reel driver 35, and the supply reel driver 36 operate to place the ink ribbon 31 in the printing section 31 and to drive the ink ribbon 31.

First, as shown in FIGS. 5 and 6, the take-up reel driver 35 is moved in the direction of arrow J (FIG. 6), toward the ribbon cassette 30, whereby its end portion 35-1 fits into the engagement disc 33-1 of the take-up reel 33. The pin 33-2 is thereby pushed into the axial hole of the disc 33-1. The spline cam 33-4 mounted on the pin 33-2 moves to the right, coming out of the engagement with the cam holder 30-3. The take-up reel 33 is released from the U-grooves (FIG. 3) of the ribbon cassette 30 and held by the take-up reel driver 35. The end portion 35-1 of the take-up reel driver 35 has on its

circumferential surface one to four projections (not shown in FIGS. 5, 6 or 7) which can fit into the four grooves 33-3 (FIG. 3) made in the rim of disk 33-1. The driver 35 can therefore transmit a force to the take-up reel 33 to rotate the reel 33. The take-up reel driver 35 is coupled to a drive system (not shown) comprising an electric motor, gears, toothed belts and the like, and can be rotated both forwardly and reversely. A leading end portion of the ink ribbon 31 is wrapped around the take-up reel 33. The leading end portion of the ribbon 31 is much longer than the distance the ribbon cassette 30 is moved downwards from the rack 29a or 29b.

Next, as shown in FIG. 7, the lift rod 34-4 of the lift mechanism 34 is rotated downwards in the direction of arrow K (FIG. 6), around a fulcrum (not shown) and is stopped upon assuming a horizontal position. The cassette holder 34-1 and the ribbon cassette 30 held by the holder 34-1 are lowered in the direction of arrow L until they reach a prescribed lower position, or the image transfer section T. The supply reel driver 36, which is located near this lower position opposes the engagement disc 32-1 of the supply reel 32. The take-up reel 33 remains at the upper position as shown in FIG. 2, since it is held by the take-up reel driver 35. The take-up reel driver 35 rotates counterclockwise, feeding the leading end portion of the ribbon 31.

Then, as shown in FIG. 7, the supply reel driver 36 is moved to the right or toward the ribbon cassette 30, in the direction of arrow M. Its end portion 36-1 goes into engagement with the engagement disc 32-1 of the supply reel 32. As stated earlier in the case of the take-up reel 33 and take-up reel driver 35, the supply reel 32 is thereby released from the U-grooves (FIG. 3) of the cassette 30 and is coupled to the supply reel driver 36. The supply reel 32 can now be rotated, either clockwise or counterclockwise.

Now that the cassette holder 34-1 and the ribbon cassette 30 are located in the image transfer section T, the thermal head 25 can transfer ink from the ribbon 31 fed from the supply reel 32 onto a paper sheet P.

Thus, a multi-color image can be printed as can be understood from FIG. 2. When it becomes necessary to print black characters in the multi-color image already printed, the thermal head 25 is rotated to the retracted position 28 shown in FIG. 2. Then, the take-up reel 33 shown in FIG. 7 is rotated counterclockwise, taking up that portion (FIG. 2) of the ink ribbon 31 which is not used and which stretches from the supply reel 32 to the image transfer section T (i.e., the printing section). Next, the supply reel driver 36 is moved back to the left, setting the supply reel 32 into engagement with the cam holder 30-3 of the ribbon cassette 30. Further, the drive system of the lift mechanism 34

is driven counterclockwise, thus rotating the lift rod 34-4 upwards. The cassette holder 34-1 holding the ribbon cassette 30 is moved back to the initial position shown in FIG. 5. The take-up reel driver 35 is rotated clockwise, and the take-up reel 33 takes up the used portion of the ribbon 31, which stretches between the reel 33 and the image transfer position (i.e., the printing section).

Thereafter, the take-up reel driver 35 is released from the engagement disc 33-1 of the take-up reel 33, and the take-up reel 32 is set into engagement with the ribbon cassette 30. Next, the racks 29a and 29b (FIG. 2) are moved to the left such that the ribbon cassette 30b is placed at the very position the cassette 30a assumed. Then, the cassette 30b is moved and set into the image transfer section T in the same way as the cassette 30a was before, stretching the black ink ribbon vertically. The thermal head 25 can, therefore, print black characters in the multi-color image.

FIG. 8 is an exploded view of the cassette-switching mechanism incorporated in the thermal transfer printer, and FIG. 9 is a front view of this mechanism. In FIG. 9, part of the construction of FIG. 8 is omitted. With reference to FIGS. 8 and 9, the cassette-switching mechanism will be described.

The ribbon cassettes 30a and 30b are loaded into the racks 29a and 29b, being guided by projections 29a-2 and 29b-2 formed on the opposing sides of the racks 29a and 29b. As stated earlier, setting for two different types of ribbon cassette, for example, a block ribbon cassette and a ribbon cassette for multi-color printing including yellow, magenta, and cyan, can be made in this embodiment.

In FIG. 8, the rack 29a and the frame 101a are provided apart from each other, so as to show the construction more clearly. However, in actual construction, those two parts are mounted in contact with each other, as shown in FIG. 9. The same is true of the rack 29b and the frame 101b.

Two seats 101a-1 and 101b-1 protrude from the opposing side of the frames 101a and 101b, and are constructed such that they support the bottom of the ribbon cassette 30. The seat 101a-1 has a notch 101a-2 (not shown), and the seat 101b-1 has a notch 101b-2. The lift mechanism 34 is arranged below these notches 101a-2 and 101b-2.

A gear 103 is mounted on the shaft 105 of an electric motor 102. The gear 103 is in mesh with a gear 104a. The gear 104a is mounted on one end of a shaft 105 and set in mesh with the teeth 29a-3 of the rack 29a. A gear 104b is mounted on the other end of the shaft 105 of the gear 104a and set in mesh with the teeth 29b-3 of the rack 29b. Hence, when the motor 102 is driven, both racks 29a and 29b are simultaneously moved back and

forth.

The rack 29a has a slit 29a-1, and the rack 29b a slit 29b-1. The racks 29a and 29b are slidably connected to the frames 101a and 101b, respectively, by means of fastening members (not shown), such as screws, which extend through the slits 29a-1 and 29b-1 and secured at one end to the frames 101a and 101b.

When the racks 29a and 29b are moved by means of the electric motor 102, the ribbon cassette 30 (containing a multi-color ink ribbon 31 consisting of yellow, magenta and cyan parts) is located at the notches 101a-2 and 101b-2. Then, guided by these notches 101a-1 and 101b-2, the ribbon cassette 30 is lowered to the image transfer section T by means of the lift mechanism 34.

In this manner, two or more ribbon cassettes can be automatically selected and used, one at a time, to print a multi-color image or a monochromatic image in the embodiment described above.

In the above embodiment, the cassette supplying section 14 is provided above the printing section 13, and the ribbon cassette 30 and the supply reel 32 are lowered from the section 14 to the printing section 13, thus pulling out the take-up reel 33 from the cassette 30. The present invention is not limited to this embodiment only. Rather, the cassette supplying section 14 may be located below the printing section 14 and the ribbon cassette 30 only may be positioned upside down, so that the supply reel 32 may be pulled out from the cassette 30 when the cassette 30 and the take-up reel 33 are moved upwards. Furthermore, either reel need not be moved in the vertical direction only. Instead, the racks 29a and 29b may be positioned horizontally, so that the supply reel 32 or the take-up reel 33 may be moved in the horizontal direction.

As has been described, the present invention can provide a small ink ribbon cassette for use in a thermal transfer printing apparatus, characterized in that a supply reel and ribbon take-up reel remain within the cassette, almost in contact with each other, while the cassette is located outside the printing apparatus or while the cassette mounted in the printing apparatus and the apparatus remains in non-printing mode. The cassette is therefore easy to handle. Being small, it helps to make render the printing apparatus smaller. The invention can also provide a thermal transfer printing apparatus which is designed to use this ink ribbon cassette.

Claims

1. A ribbon cassette (30) comprising:
 - a supply reel (32) on which an unused part of an ink ribbon (31) is wound;
 - a take-up reel (33) for taking up a used

part of the ink ribbon (31); and

a cassette case holding said supply reel (32) and said take-up reel (33) such that one of said supply and take-up reels is able to be pulled out.

2. The ribbon cassette (30) according to claim 1, characterized in that said supply reel (32) and said take-up reel (33) are secured to said cassette case by means of two engagement members, respectively, and prevented from rotating and moving from said cassette case.

3. The ribbon cassette (30) according to claim 2, characterized in that said engagement members (33-1) are coupled to and coaxial with said supply reel (32) and said take-up reel (33), respectively, and are biased by springs in a first direction and thereby fastened to said cassette case.

4. The ribbon cassette (30) according to claim 3, characterized in that said engagement members (33-1) are set in engagement with a pin (33-2) coaxial with said supply reel (32) or said take-up reel (33) and movable back and forth, and are released from said cassette case when pushed by said pin (33-2) in a second direction opposite to said first direction.

5. The ribbon cassette (30) according to claim 1, characterized in that said supply reel (32) and said take-up reel (33) each have an engagement member (33-1) at at least one of ends, said engagement member (33-1) set in engagement with a reel driving means incorporated in a printing apparatus.

6. The ribbon cassette (30) according to claim 1, characterized in that said cassette case holds said take-up reel (33) such that said take-up reel (33) is removed from said cassette case when released from engagement with said cassette case achieved by an engagement member (33-1).

7. The ribbon cassette (30) according to claim 1, characterized in that said cassette case holds said supply reel (32) such that said supply reel (32) is removed from said cassette case when released from engagement with said cassette case achieved by an engagement member (33-1).

8. The ribbon cassette (30) according to claim 1, characterized in that said cassette case has a projection (30-4) which is to be coupled to a device for moving said cassette case.

9. A thermal transfer printing apparatus comprising:

a thermal print head (25);

a main body for holding a ribbon cassette (30) which comprises a supply reel (32) on which an unused part of an ink ribbon (31) is wound, a take-up reel (33) for taking up a used part of the ink ribbon (31), and a cassette case holding the supply reel (32) and the take-up reel (33) such that one of the supply and take-up reels is able to be pulled out; and

pulling-out means provided in said main body, for pulling out one of said supply and take-up reels from said cassette case to a position where the ink ribbon (31) contacts said thermal print head (25).

10. The thermal transfer printing apparatus according to claim 9, characterized in that said cassette case has a projection and each of the supply and take-up reels has an engagement member; said pulling-out means comprises reel driving means (35, 36) designed to engage with the two engagement members of said supply reel (32) and said take-up reel (33), respectively, a case-moving device to engage with said projection to move said cassette case, and means for driving the case-moving device; said pulling-out means engages with the engagement member of said take-up reel (33), holds said take-up reel (33) and moves said case-moving device, moving said cassette case and said supply reel (32) contained in said cassette case and pulling out said take-up reel (33) from said cassette case; and that part of said ink ribbon (31) which stretches between said supply reel (32) and said take-up reel (33) is thereby placed to contact said thermal head (25).

11. The thermal transfer printing apparatus according to claim 9, characterized in that said cassette case has a projection and each of the supply and take-up reels has an engagement member; said pulling-out means comprises reel driving means (35, 36) designed to engage with the two engagement members of said supply reel (32) and said take-up reel (33), respectively, a case-moving device to engage with said projection to move said cassette case, and means for driving the case-moving device; said pulling-out means engages with the engagement member of said supply reel (32), holds said supply reel and moves said case-moving device, moving said cassette case and said take-up reel (33) contained in said cassette case and pulling out said supply reel (32) from said cassette case;

and that part of said ink ribbon (31) which stretches between said supply reel (32) and said take-up reel (33) is thereby placed to contact said thermal head (25).

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- 12.** A thermal transfer printing apparatus comprising:

a plurality of ribbon cassettes (30) each comprising a supply reel (32) on which an unused part of an ink ribbon (31) is wound, a take-up reel (33) for taking up a used part of the ink ribbon (31), and for holding said supply reel (32) and said take-up reel (33) such that one of said supply and take-up reels is able to be pulled out;

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a cassette mounting means for mounting said plurality of ribbon cassettes (30); and

cassette-moving means for moving a specified one of said plurality of ribbon cassettes (30) to a predetermined position.

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- 13.** The thermal transfer printing apparatus according to claim 12, characterized in that said cassette-moving means comprises drive means and force-transmitting means for transmitting a force from said drive means to said cassette mounting means.

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- 14.** The thermal transfer printing apparatus according to claim 12, characterized by further comprising a thermal head (25) and pulling-out means provided in said main body, for pulling out one of said supply and take-up reels (32, 33) from said cassette case to a position where the ink ribbon (31) contacts said thermal print head (25).

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- 15.** A ribbon cassette comprising:

a supply reel (32) on which an unused part of an ink ribbon (31) is wound;

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a take-up reel (33) for taking up a used part of the ink ribbon (31); and

a cassette case holding said supply reel (32) and said take-up reel (33) such that one of the supply and take-up reels is able to be pulled out,

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wherein said supply reel (32) and said take-up reel (33) are spaced apart by a predetermined distance in printing mode such that a thermal head (25) is positioned between said supply reel (32) and said take-up reel (33) and contacts said ink ribbon (31), and are located close to each other in non-printing mode.

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FIG.1
PRIOR ART

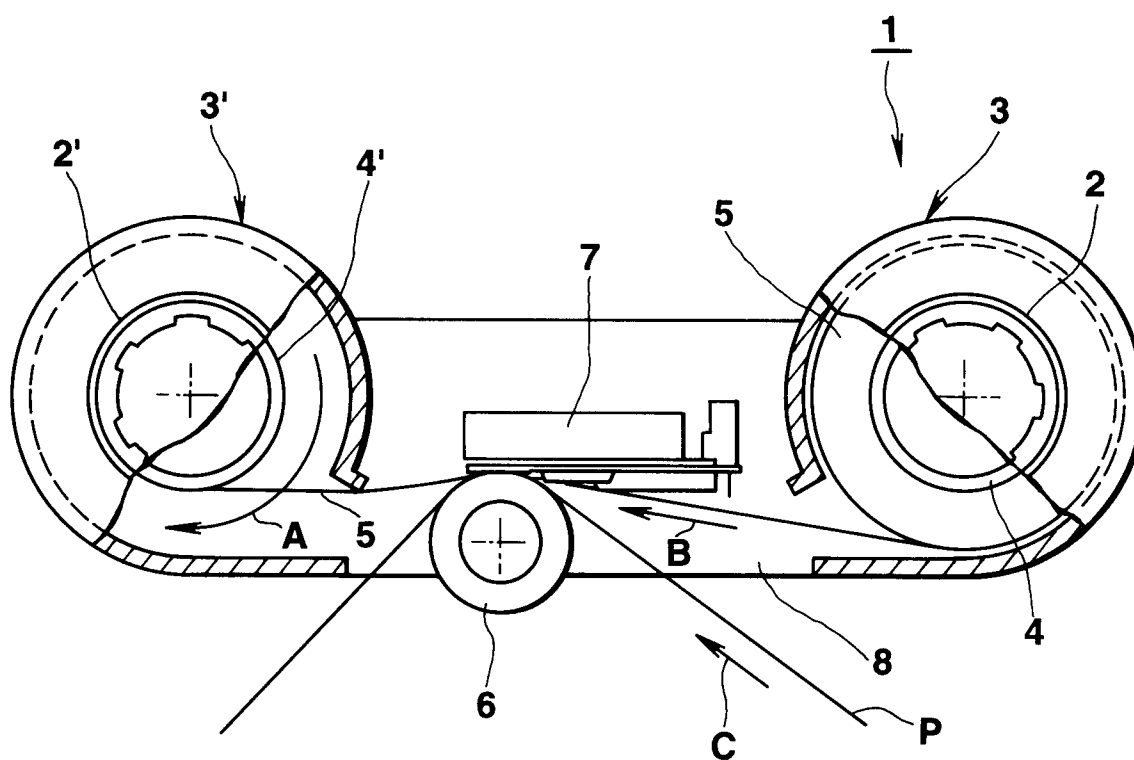


FIG.2

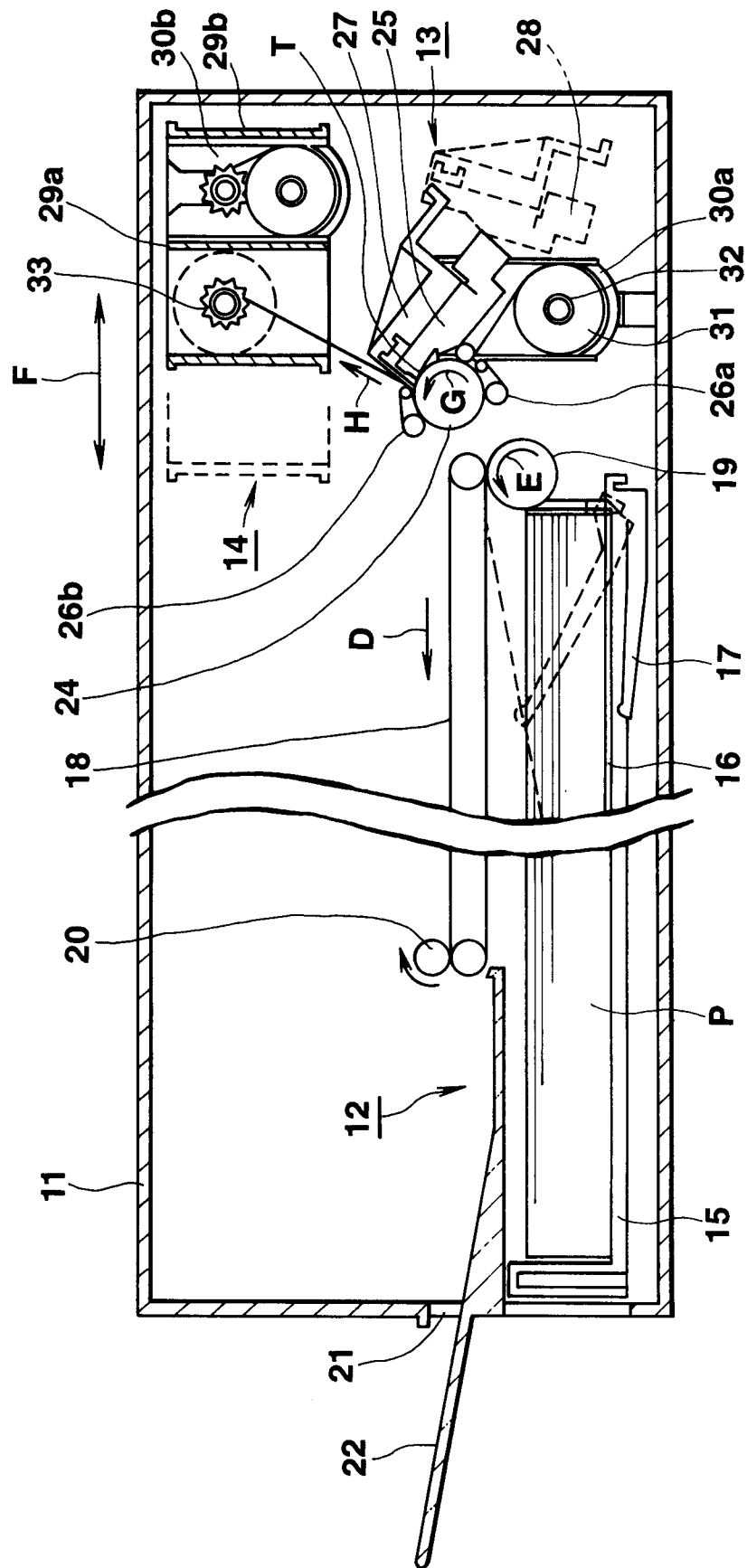


FIG.3

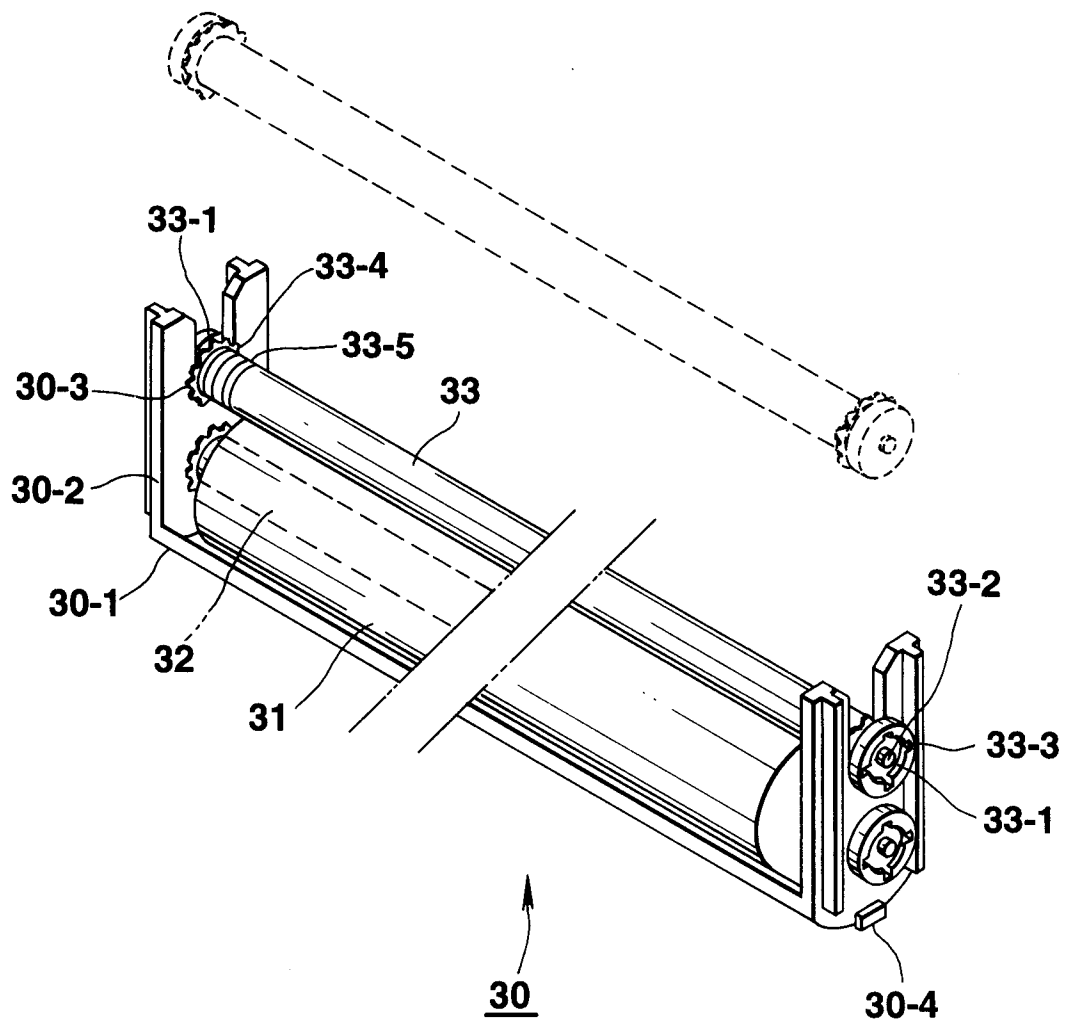


FIG.4

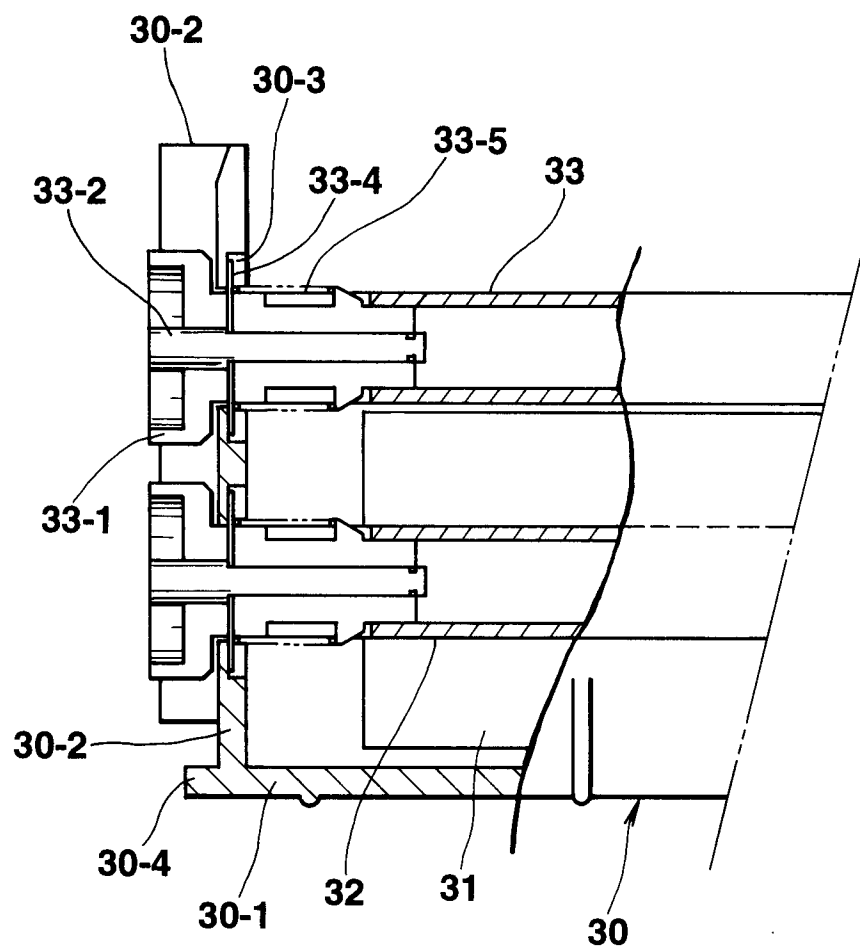


FIG.5

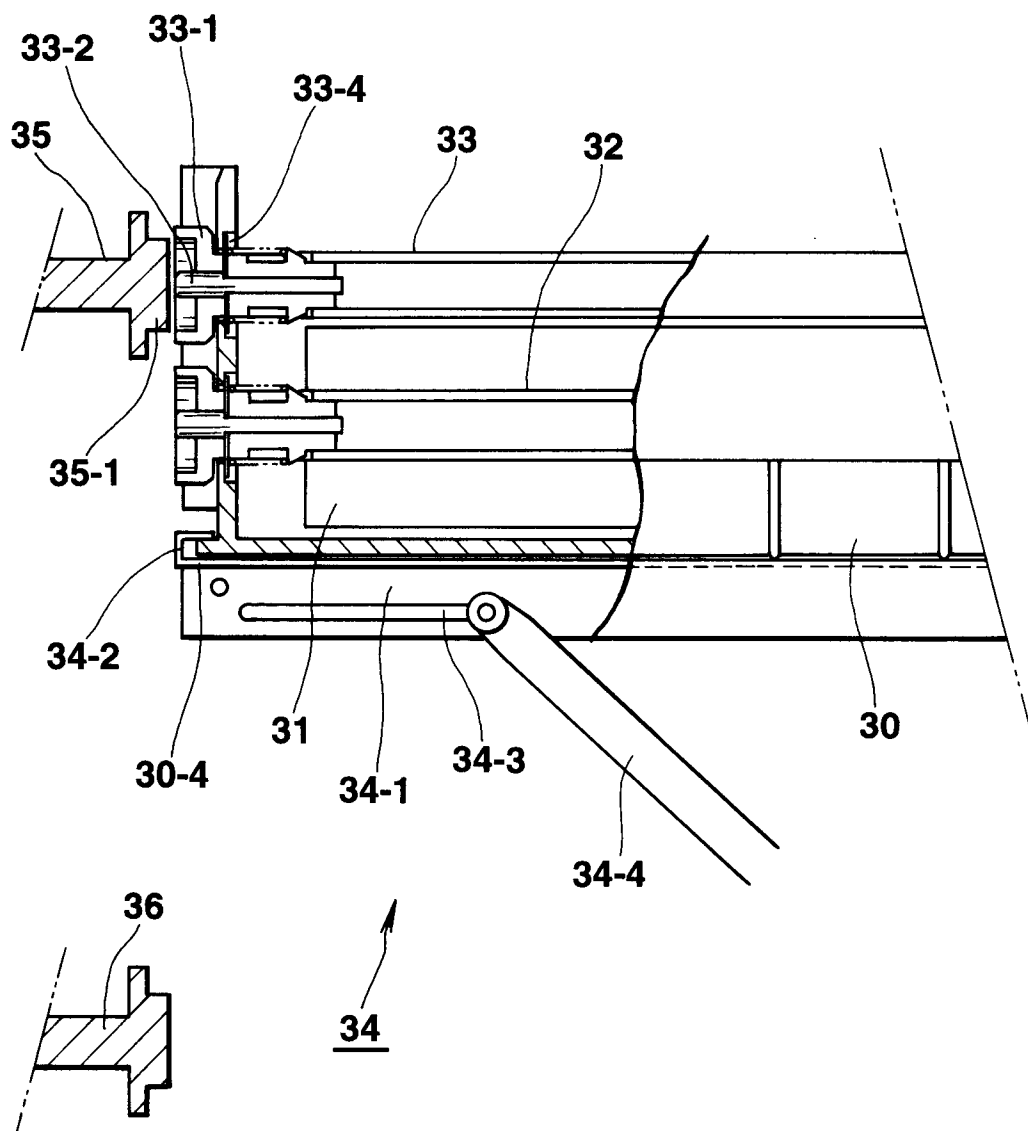


FIG.6

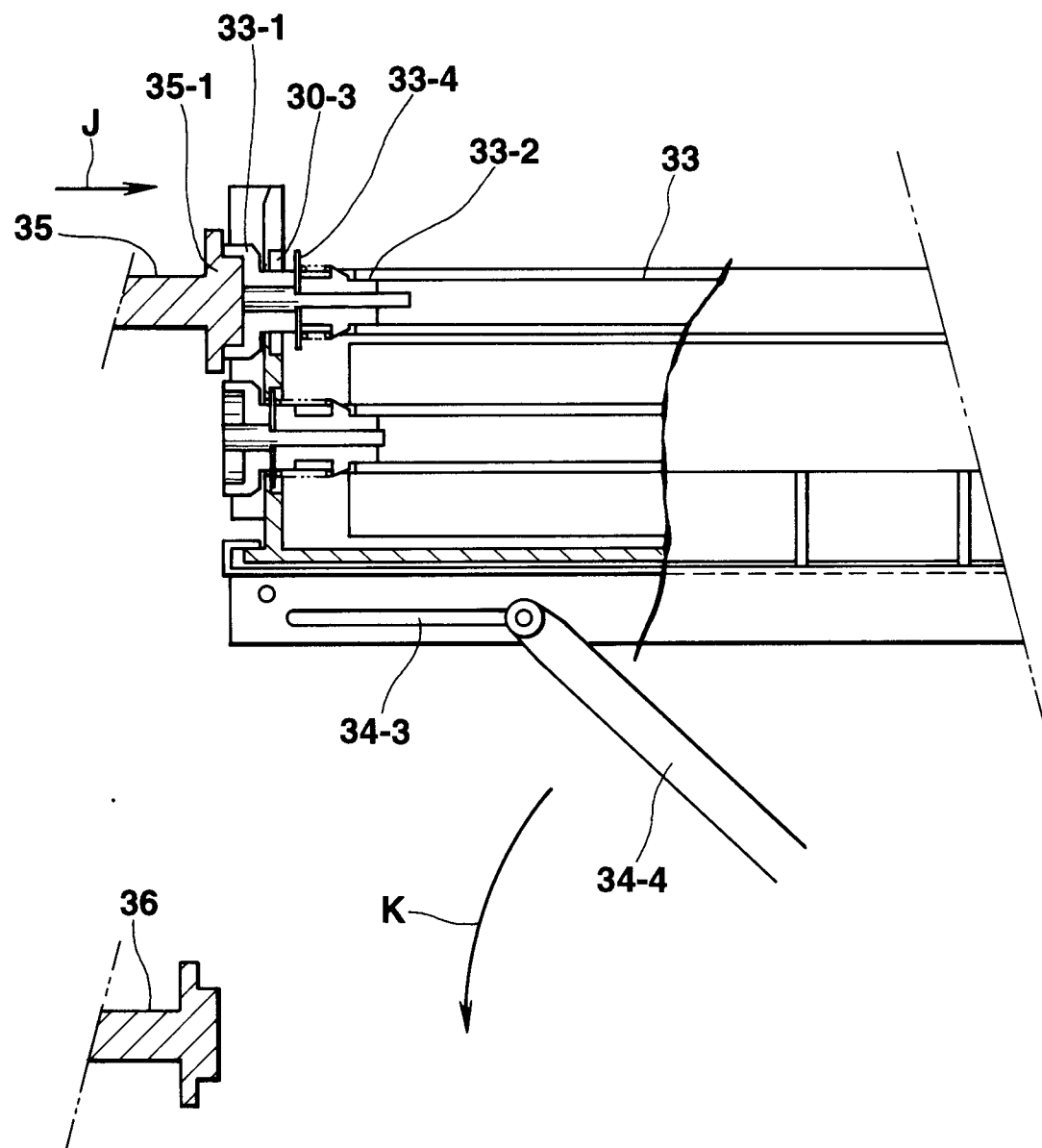


FIG.7

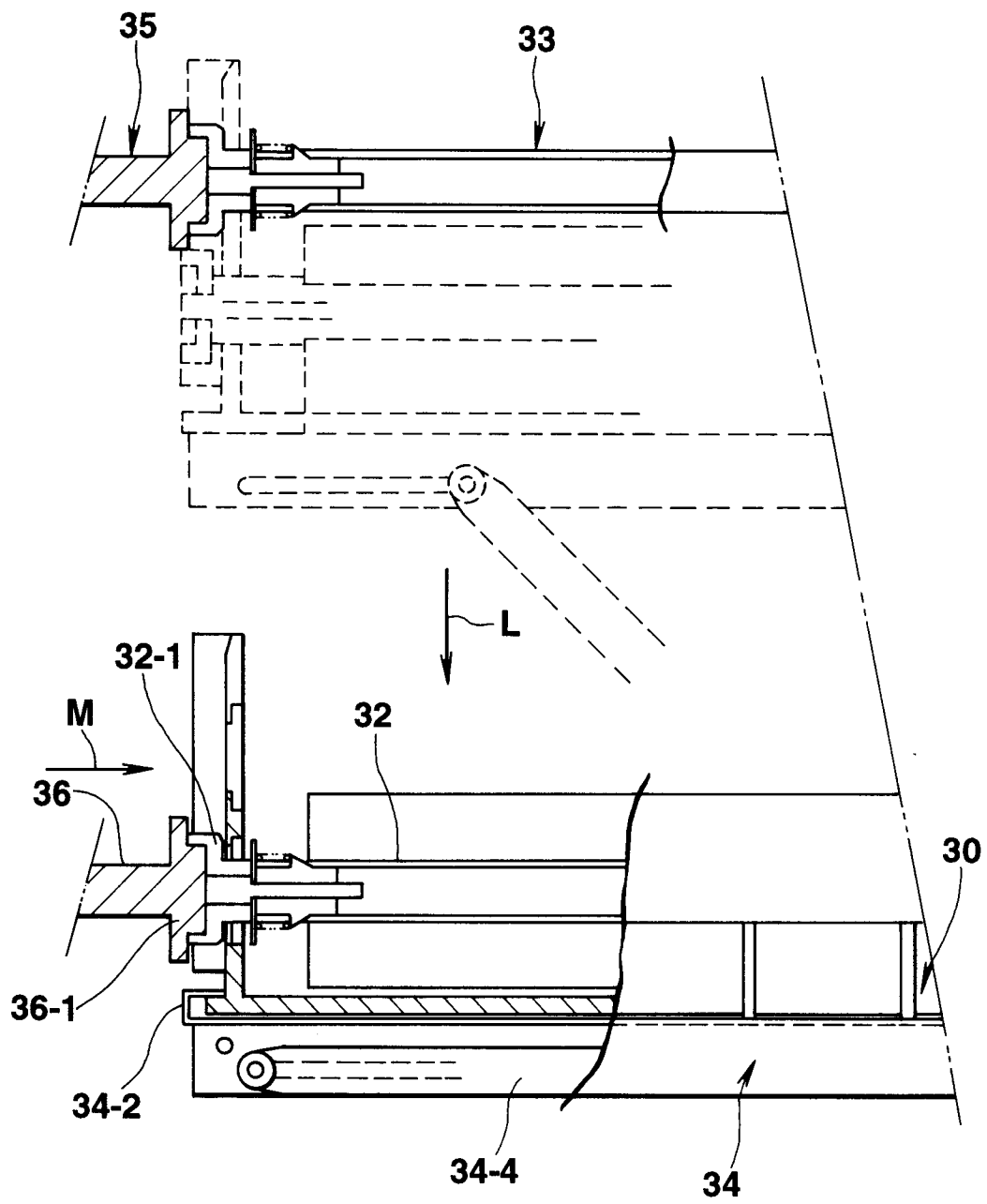


FIG.8

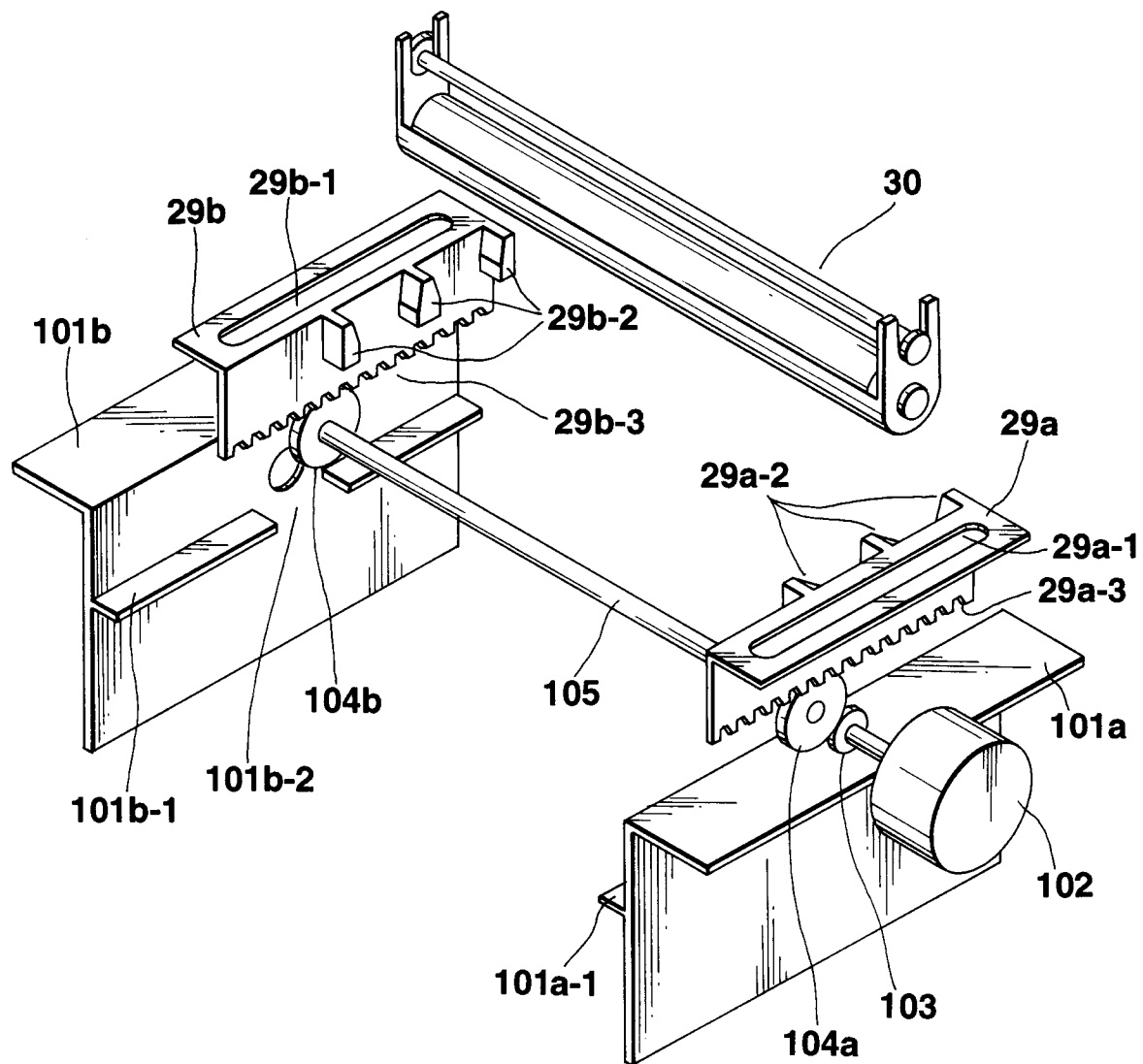
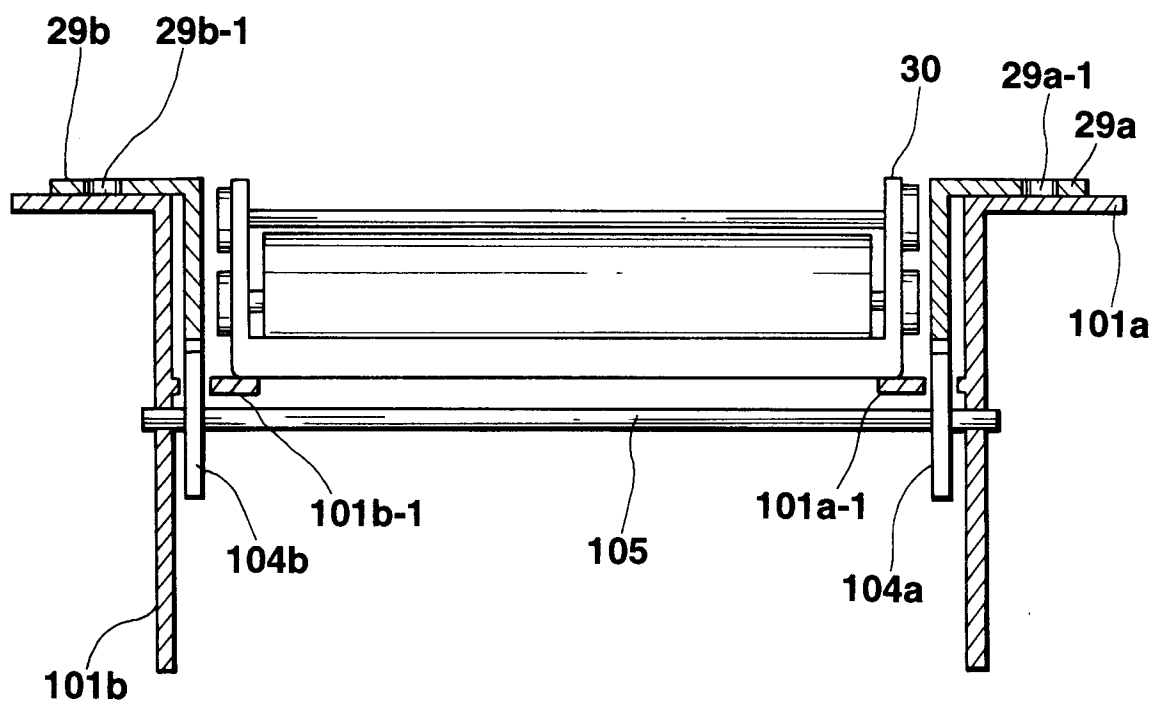


FIG.9





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 95101306.9
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 6)
X	<u>US - A - 4 898 484</u> (AOYAGI) * Fig. 19 *	1, 9, 12, 15	B 41 J 35/22 B 41 J 32/00 B 41 J 17/32
A	--	10, 11, 13, 14	B 41 J 2/325
X	<u>US - A - 5 248 207</u> (YAMAMOTO) * Fig. 5-7 *	1, 2, 5-7	
A	--	3, 4, 9, 12, 15	
X	<u>US - A - 4 913 572</u> (BEHRENS) * Abstract *	1	
X	<u>US - A - 4 673 304</u> (LIV) * Fig. 2, 3 *	1	
A	--	2-7, 9, 12, 15	TECHNICAL FIELDS SEARCHED (Int. Cl. 6)
A	<u>EP - A - 0 488 291</u> (CANON) * Fig. 5-7B *	1-7, 9, 12, 15	B 41 J
A	<u>DE - A - 4 031 191</u> (SIEMENS) * Totality *	9, 12, 15	

The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 10-05-1995	Examiner WITTMANN
CATEGORY OF CITED DOCUMENTS			
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		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	