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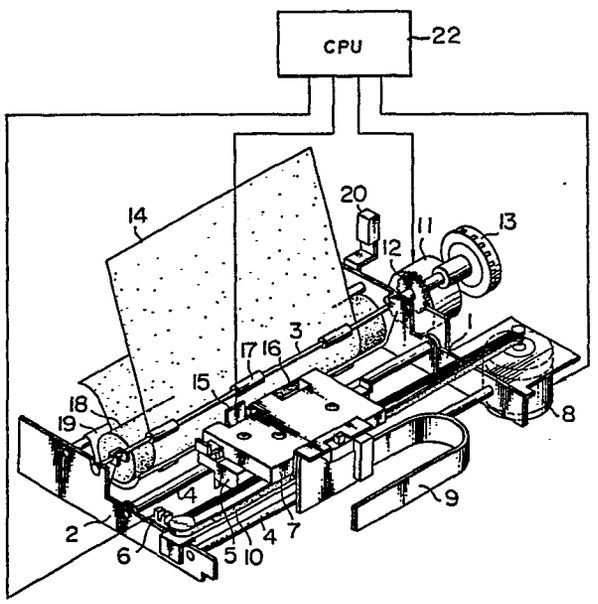
(54) **Thermal transfer printer.**

(57) A thermal transfer printer including a platen supporting a printing sheet, a carriage mounted for reciprocatory movement axially of the platen, a thermal head supported by the carriage, a plurality of heat generating elements mounted in the thermal head, an inked ribbon cassette detachably attached to the carriage, a pair of ribbon cores located in the inked ribbon cassette for rotation, and an inked ribbon wound on the pair of ribbon cores and extending therebetween. Printing of characters, symbols, etc., is performed on the printing sheet on the platen as the thermal head forces the inked ribbon against the printing sheet to transfer ink from the inked ribbon to the printing sheet by heat generated by the heat generating elements. The inked ribbon has a printing zone of a size large enough to accommodate two lines of characters, symbols, etc., one line superposed on the other, whereby one half-portion of the printing zone is used for printing characters, symbols, etc., along one line to the end of the inked ribbon by moving the inked ribbon as it is wound on one of the pair of ribbon cores and the other half-portion of the printing zone is used, after the inked ribbon cassette is turned over following completion of printing on the one half-portion of the printing zone, for printing characters, symbols, etc., along the other line while reversing the direction of movement of the inked ribbon and winding same on the other ribbon core.



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THERMAL TRANSFER PRINTER

BACKGROUND OF THE INVENTION

(1) FIELD OF THE INVENTION

This invention relates to thermal transfer printers, and more particularly it is concerned with a thermal transfer printer equipped with an improved inked ribbon cassette for containing an inked ribbon.

(2) DESCRIPTION OF THE PRIOR ART

In a thermal transfer printer, an inked ribbon used for printing characters and symbols on a printing sheet is replaced by a new one each time the old one is used up. It is economical to replace only the old inked ribbon by itself, but the inked ribbon replacing operation is time-consuming and troublesome to perform. It is simple and easy to replace the old inked ribbon together with a cassette, but the use of an inked ribbon cassette is uneconomical. This invention proposes to provide an improvement in inked ribbon cassettes of the prior art.

SUMMARY OF THE INVENTION

This invention has as its object the provision of a thermal transfer printer equipped with an improved inked ribbon cassette in which the cassette case accounts for a smaller proportion of the inked ribbon cassette

as a whole than in inked ribbon cassettes of the prior art.

According to the invention, there is provided a thermal transfer printer comprising an inked ribbon, a thermal head, a carriage for moving the thermal head and a control unit for controlling thermal transfer printing operations, wherein the improvement comprises an inked ribbon cassette for containing the inked ribbon constructed such that printing can be performed in a plurality of stages.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of the thermal transfer printer comprising one embodiment of the invention, showing its external appearance;

Fig. 2 is an exploded perspective view, shown on an enlarged scale, of the ribbon cassette as a whole of the thermal transfer printer shown in Fig. 1; and

Fig. 3 is a top plan view of the ribbon cassette shown in Fig. 2, showing its interior.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of the invention will now be described by referring to the accompanying drawings.

In Fig. 1, there is shown, in a perspective view, one embodiment of the thermal transfer printer according to the invention, showing its external

appearance. Fig. 2 is an exploded perspective view, shown on an enlarged scale, of the ribbon cassette as a whole. Fig. 3 is a top plan view of the ribbon cassette, showing its interior.

The characterizing feature of the invention is that the ribbon cassette of the thermal transfer printer is formed on its left and right sides with cutouts for receiving a thermal head, so that the ribbon cassette can perform the function of printing characters, symbols, etc., in two stages or in upper and lower half-portions of the inked ribbon.

Referring to Fig. 1, a plurality of shafts 4 are joined at opposite ends to side plates 1 and 2 for supporting a carriage 5 thereon for sliding movement. The carriage 5 supports thereon a ribbon cassette 7 and a thermal head 15. An inked ribbon 16 is contained in the ribbon cassette 7.

The carriage 5 is driven by a carriage motor 8 through a timing belt 10 for movement leftwardly and rightwardly in Fig. 1.

A line feed motor 11 transmits a motive force to a gear 12 supported by a shaft of a platen 18 to feed a printing sheet 14. Alternatively, the printing sheet 14 can be manually fed by turning a platen knob 13. The numeral 19 designates a printing sheet guide.

By moving a release lever 20 forwardly and rearwardly, sheet keep rollers 17 slidably supported by a shaft 3 can be moved between a position in which

they are maintained in pressing engagement with the surface of the printing sheet 14 wound on the platen 18 and a position in which they are out of engagement with the surface of the printing sheet 14.

The numeral 6 designates a home position sensor, and the numeral 9 a flat cable for passing a electric current to the thermal head 15.

The thermal transfer printer of the aforesaid construction is of a one-way printing system in which printing is performed only when the carriage 5 moves rightwardly. When the carriage 5 moves rightwardly, the inked ribbon 16 is taken up; when the carriage 5 moves leftwardly, the inked ribbon 16 is not taken up.

The carriage motor 8, line feed motor 11, home position sensor 6, thermal head 15 and a ribbon sensor which, although not shown, is operative to sense, for example, an end of the inked ribbon 16 are controlled by a central processing unit (CPU) 23.

Referring to Fig. 2 which is an exploded perspective view of the ribbon cassette 7, the ribbon cassette 7 comprises two cassette case members 31 and 34 secured together by a plurality of fixing screws 30 to provide a hollow case in which the inked ribbon 16 and a back tension mechanism 33 for imparting a back tension of a predetermined magnitude to the inked ribbon 16. The cassette case members 31 and 34 are each formed with cutouts 32A and 32B for receiving the thermal head 15 supported by the carriage 5.

Fig. 3 is a top plan view of the ribbon cassette 7 showing the internal structure of the ribbon cassette 7 by removing the cassette case member 31. The cassette case member 34 supports thereon a take-up shaft 21 and ribbon cores 35 and 36.

Operation of taking up the inked ribbon 16 will now be described by referring to the drawings, particularly Figs. 2 and 3.

In the aforesaid construction, when the thermal head 15 is arranged in such a manner that its heat generating elements, not shown, are opposed to a lower-half portion of the inked ribbon 16 and the ribbon cassette 7 is mounted in such a manner that the cassette case member 34 comes into contact with a top surface of the carriage 5, the thermal head 15 inserted in the cutout 32A forces the inked ribbon 16 against the sheet 14 and the inked ribbon 16 moves toward the ribbon core 36 as the carriage 5 is moved by the carriage motor 8.

Stated differently, the ribbon cassette 7 moves together with the carriage 5 as a unit so that the new inked ribbon 16 wound on the ribbon core 35 is fed through the back tension mechanism 33 to the thermal head 15.

The inked ribbon 16 is wound on the ribbon core 36 after moving past the thermal head 15 for performing printing. The ribbon core 36 is connected to a take-up shaft 21 located in the carriage 5 and

driven by the timing belt 10, to be driven thereby for rotation.

In the printing operation described, print marks are formed only at its lower half-portion as indicated by hatching in Fig. 2.

The inked ribbon 16 having the print marks formed only at its lower half-portion by the printing operation is fed from the ribbon core 35 and wound on the ribbon core 36, until only its terminal end portion remains on the ribbon core 36, until only its terminal end portion remains on the ribbon core 35. When it is sensed that the inked ribbon 16 has been fed from the ribbon core 35 with only its terminal end portion remained thereon, the ribbon cassette 7 is removed from the carriage 5 and mounted on the carriage 5 again after being turned over.

Stated differently, the ribbon cassette 7 is mounted in such a manner that the cassette case member 31 comes into contact with the top surface of the carriage 5, and the thermal head 15 is inserted in the cutout 32B. Thus, the heat generating elements, not shown, of the thermal head 15 are positioned against a portion of the inked ribbon 16 which has no print marks, and the ribbon core 35 on which only the terminating portion of the inked ribbon 16 is wound is connected to the take-up shaft 21.

If a command to start printing is given at this time, printing is performed by using only a half portion

of the inked ribbon 16 which remained unused in the previous printing operation, and the inked ribbon 16 is wound on the ribbon core 35 after performing printing.

In the embodiment shown and described hereinabove, the inked ribbon 16 has been shown and described as being used in such a manner that its lower half-portion is used in the first stage of operation and the rest of the inked ribbon 16 is used in the second stage of operation. However, the invention is not limited to this use of the inked ribbon 16 and similar results can be achieved by using an upper half-portion of the inked ribbon 16 in the first stage of operation and the rest of the inked ribbon 16 in the second stage of operation.

In the embodiment shown and described hereinabove, the cutouts 32A and 32B are formed on the left and right sides, respectively, of the front portion of the cassette case. However, this is not restrictive, and a single cutout may be formed substantially in the central portion of the front portion of the cassette case, not lopsidedly on the left side of the front portion as is the case with ribbon cassettes of the prior art, so that the ribbon cassette can be used by bring turned over and rotated.

Alternatively, cutouts may be formed substantially in the central portions or on the left side and on the right side of both front and rear portions of the cassette case, so that the ribbon cassette can

be used by being turned over as well as by being rotated.

In the embodiment shown and described hereinabove and the modified constructional forms described hereinabove, a spacer may be mounted at a top surface or a bottom surface of the ribbon cassette for adjusting height, so as to enable printing of characters and symbols to be performed in more than two stages of operation.

When the spacer is provided as described hereinabove, means for detachably attaching the spacer may be provided. Alternatively, means for fixedly supporting the spacer may be provided to the top surface of the carriage.

The thermal transfer printer provided with the improved inked ribbon cassette of the aforesaid construction can achieve the following effects. As described hereinabove, a roll of inked ribbon can be used to perform printing in a plurality of stages. This is conducive to a great reduction in running costs.

C L A I M S

1. A thermal transfer printer comprising:

an inked ribbon;

a thermal head;

a carriage for moving the thermal head; and

a control unit for controlling thermal transfer printing operations;

wherein the improvement comprises:

an inked ribbon cassette for containing the inked ribbon constructed such that printing can be performed in a plurality of stages.

2. A thermal transfer printer as claimed in claim 1, wherein the inked ribbon cassette is constructed such that it can be used by being turned over.

3. A thermal transfer printing as claimed in claim 1, wherein the inked ribbon cassette is constructed such that it can be used by being turned over and by being rotated.

4. A thermal transfer printing as claimed in Claim 2, wherein a cutout for receiving the thermal head is formed substantially in a central portion or on either side of the inked ribbon cassette.

5. A thermal transfer printer as claimed in claim 3, wherein cutouts for receiving the thermal head are formed substantially in central portions or on the left and right sides of front and rear portions, respectively, of the inked ribbon cassette.

6. A thermal transfer printer as claimed in

claim 2 or 3, wherein a spacer for adjusting height is mounted to at least one of a top surface and a bottom surface of the inked ribbon cassette.

7. A thermal transfer printer comprising:

a platen for supporting a printing sheet;

a carriage mounted for reciprocatory movement lengthwise of the platen;

a thermal head supported by the carriage;

a plurality of heat generating elements mounted in the thermal head;

an inked ribbon cassette detachably attached to the carriage;

a pair of ribbon cores located in the inked ribbon cassette for rotation; and

an inked ribbon wound on the pair of ribbon cores and extending therebetween, said inked ribbon being interposed between the printing sheet on the platen and the thermal head supported by the carriage and, as the thermal head forces the inked ribbon against the printing sheet, performing printing of characters, symbols, etc., on the printing sheet by transferring ink from the inked ribbon to the printing sheet by heat generated by the heat generating elements;

wherein the improvement resides in that:

said inked ribbon is constructed to have a printing zone of a size large enough to accommodate two lines of characters, symbols, etc., one line superposed on the other, whereby one half-portion of the printing

zone is used for printing characters, symbols, etc., along one line to the end of the inked ribbon by moving the inked ribbon as it is wound on one of the pair of ribbon cores and the other half-portion of the printing zone is used, after the inked ribbon cassette is turned over following completion of printing on the one half-portion of printing zone, for printing characters, symbols, etc., along the other line while reversing the direction of movement of the inked ribbon and winding same on the other ribbon core.

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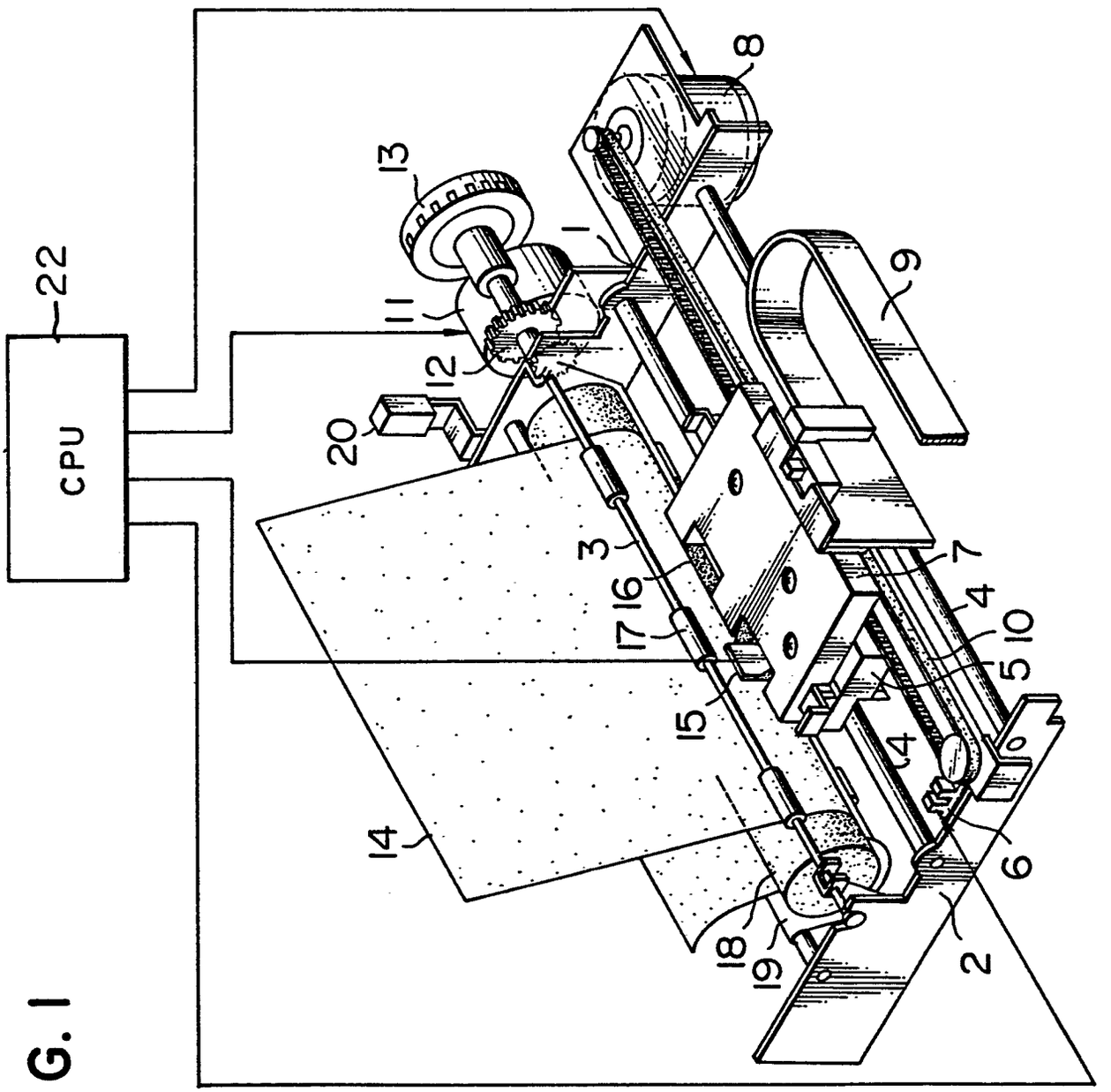

FIG. 1

FIG. 2

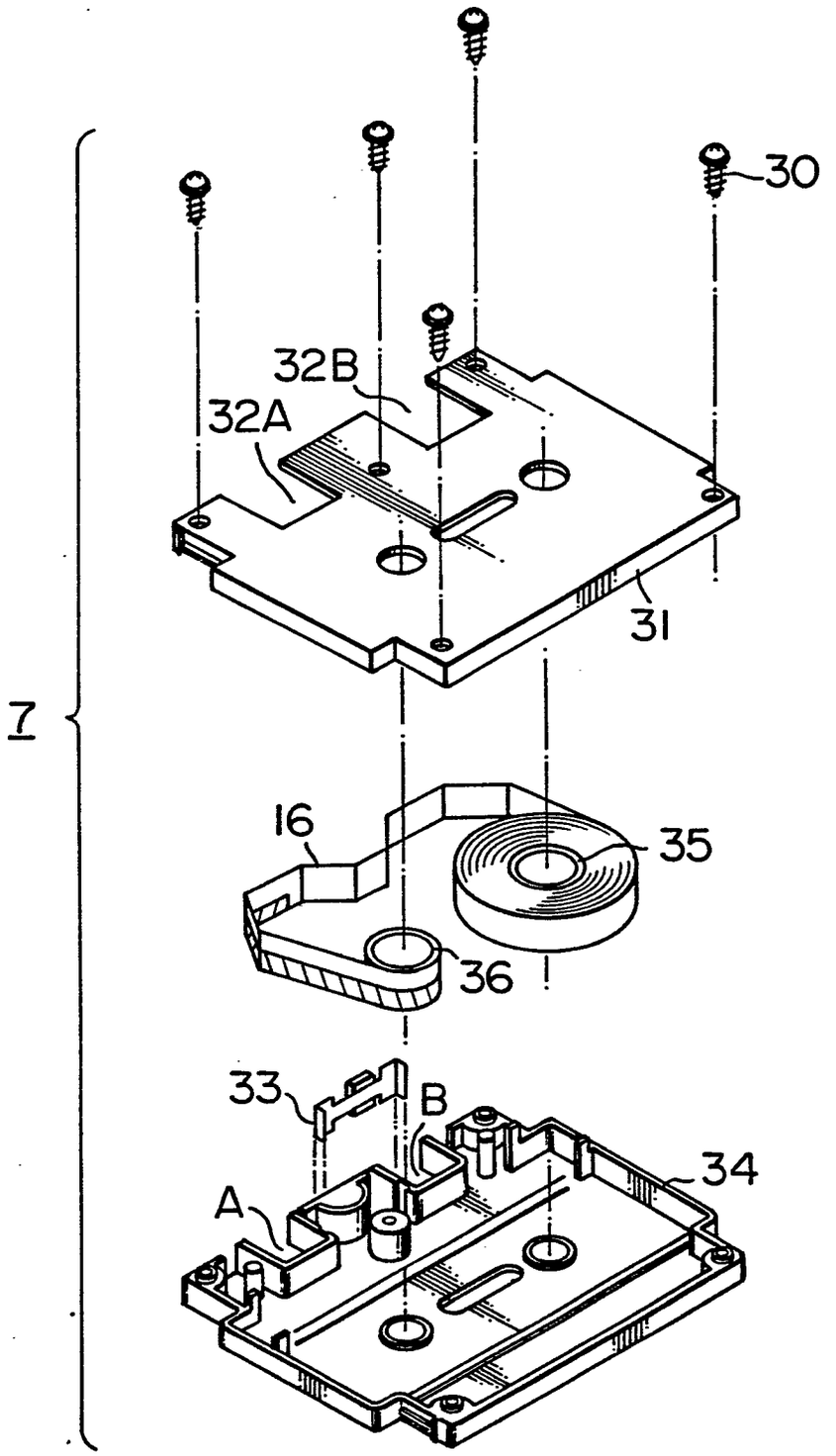

FIG. 3