

THERMAL TRANSFER PRINTER

The present invention relates to thermal transfer printers.

Colour thermal transfer printers which transfer
5 electrical images onto a sheet of paper, are known as video printers. In such colour thermal transfer printers, certain colour dyes coated on a film ribbon are vapourised in a desired pattern by a thermal print head, and the vapourised dyes are transferred onto
10 paper. Three colour dyes such as yellow, magenta and cyan are used to provide three separate colour picture units which are printed one on top of the other to produce a full colour image.

Fig. 1 illustrates a conventional colour thermal
15 transfer printer.

The printer is constructed in such a manner that the image is transferred to a sheet of paper 2, as it is rolled around the periphery of a platen drum 1 of a large diameter. A thermal print head 3 attached to or
20 detached from the periphery of platen drum 1 is installed on the upper part of the platen drum 1. A coloured ribbon from a cartridge 4 is positioned between the thermal print head 3 and the platen drum 1. A pair of guide rollers 6 for guiding the sheet of
25 paper 2 to the platen drum 1 is provided near the platen drum 1.

A conventional thermal transfer printer as constructed above has the disadvantage that the platen drum 1 must be of very large diameter as a sheet of paper 2 of a specific length, must be rolled around the entire periphery of the platen drum 1 without the ends of the sheet overlapping. The requirement for a large diameter platen drum increases the overall dimensions of the printer, particularly its height.

To improve this structural disadvantage, a thermal transfer printer as shown in Fig. 2 has recently been developed.

The newly developed thermal transfer printer, contrary to the aforesaid conventional printer, is constructed in such a manner that a sheet of paper is not rolled around a platen drum. That is, the size of the platen drum 1' which the thermal print head contacts, is reduced to a smaller diameter so that the whole sheet can no longer be rolled around the platen drum as before. Instead, the sheet of paper 2' passes around the platen drum 1' with a portion of the sheet being in contact with the drum at any time. A carrier conveys the sheet in a slow, progressive manner forward and backward for a predetermined and sufficient distance. The carrier includes a clamp 7 for clamping and releasing the front edge of the sheet of paper 2' by an operating means, a guide rod 7' for

guiding the clamp 7, and an extra driving means for forward and backward movement of the clamp 7.

Further, conventional thermal transfer printers require very long paper supply sections to provide
5 sufficient paper-carrying distance, which includes the paper guiding plate 9 for guiding a sheet of paper 2' along a curved path P starting at the upper rear of the paper tray 8, and a plurality of paper guiding rollers
10 10 located along path P. This particular conventional structure in which paper is supplied along a curved path P in the opposite direction to rotation of the platen drum 1', requires a very complicated power transmission mechanism. In addition, the conventional printer takes
15 an overly long time to carry the paper the long distance to the drum and to print while moving the sheets of paper forward and backward.

It is an aim of the present invention to alleviate at least some of the aforementioned problems. It is an object of the present invention to provide a thermal
20 transfer printer with a reduced external size a simplified power transmission mechanism, and a shortened printing time.

To accomplish the object, the invention provides a printer comprising:

25 a platen drum for supporting a recording sheet during formation of an image thereon;

means defining a path from a sheet supply station to a sheet outlet station via the platen drum;

means for advancing the recording sheet along the defined path;

- 5 a plurality of guide drums connected by an endless belt, adapted to define, with the platen drum, a closed path for returning the recording sheet to the platen drum for recording successive images thereon.

Guide plates for guiding the sheets of paper are preferably formed at proper intervals above the closed loop on the periphery of the drums of the printing section. Also preferably provided are a paper inserting section into which the sheets of paper from the paper supply section is inserted, and a paper extracting section from which the printed sheets of paper are drawn out.

It is desirable that one or more guide belts around every guide drum be rolled to allow the sheets of paper to move more smoothly along the closed loop around the drums.

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a schematic side view showing the major parts extracted from a conventional thermal transfer printer;

Fig. 2 is a schematic side view showing the major parts extracted from another conventional thermal transfer printer;

Fig. 3 is a schematic side view of the thermal transfer printer according to the present invention; and

Fig. 4 is a schematic side view showing the major parts extracted from the thermal transfer printer of the present invention shown in Fig. 3.

Referring to Figs. 3 and 4, the thermal transfer printer of the present invention comprises a paper supply section 100 from which sheets of paper are supplied, a printing section 200 in which pictures are printed on a sheet of paper, and paper discharging section 300 from which the printed paper is discharged.

The paper supply section 100 includes a paper tray 102 having a paper lifter 101, a cam 104, which draws the sheets of paper out from the tray 102 one sheet at a time, and roller guides 105 for guiding the drawn paper 103 into the printing section 200.

The printing section 200 includes a platen drum 201 of small diameter, a thermal print head 202, a ribbon 203, a cartridge 204 for the ribbon, and a pair of guide drums 205 and 205'. The platen drum 201 and two guide drums 205 and 205' are positioned on the

same plane, and guide plates 206 are provided around the drums to guide paper transfer. A plurality of capstans and/or pinch rollers 207 of small diameter are provided between the guiding plates 206. The two
5 guide drums 205 and 205' are rolled by a conveyor belt 208 and are ganged together. Further, a paper detecting sensor 209 is located between the platen drum 201 and guide drum 205.

Meanwhile, on the periphery of the drums 201, 205
10 and 205', and between the paper carrying closed loop Z, there are provided paper inserting section 210 through which sheets of paper from the paper supply section 100 are inserted, and paper extracting section 211 from which the printed paper is drawn out and into
15 paper discharging section 300.

A paper discharging section 300, provided adjacent the paper extracting section 211, includes a movable extracting guide 301, located near the paper extracting section 211, for selectively guiding sheets
20 of paper moving along the closed loop Z, paper discharging rollers 302 for discharging the sheets of paper guided by the movable extracting guide 301, and a receiving tray 303 for storing the discharged papers.

25 The operation of the thermal transfer printer according to the present invention is described below.

The paper 103 directed upward by lifter 101 of tray 102 is drawn out by cam 104, and the paper is inserted into inserting section 210 of the printing section 200 by guide roller guide 105. The paper
5 moves along the closed loop Z including two guide drums 205 and 205', platen drum 201, and guiding plates 206 embracing the drums, and is conveyed counter-clockwise as viewed to pass around platen drum 201 to be detected by sensor 209.

10 Meanwhile, printing is performed by the thermal print head 202 and ribbon 203 according to a conventional method. The front edge of the sheet coming off platen drum 201 and following the U-shaped path at the other end of the closed loop Z of guide
15 drums 205 and 205', again approaches platen drum 201. At this time, one colour-separated image has already been completed.

Then, the sheet again passes around platen drum 201 and by sensor 209 to print another colour-separated image, and the now twice-printed paper again
20 circles the loop and approaches platen drum 201, at which time the final colour-separated image is printed.

As described above, a full colour image is
25 produced after three circulations of the closed loop Z. When the sheet of paper, on which a full colour

image is printed, approaches the paper extracting section 211 during the third circulation of the closed loop Z, the extracting lever 301 operates to both allow the paper to exit loop Z through paper
5 extracting section 211 and to move it through paper discharging rollers 302. The roller guides 302 direct the sheet into paper discharging tray 303.

In the above operational description, the printing process is not described in detail since it
10 follows the conventional method.

The feature of the thermal transfer printer of the present invention is that the diameter of a platen drum is small, and that sheets of paper are carried through a closed loop including a plurality of drums
15 during printing. The closed loop requiring closely arranged drums and juxtapositioned roller guides greatly simplifies a power transmission structure over the conventional one. Furthermore, the present invention has the advantage of the printing speed
20 being very quick due to an operational characteristic whereby sheets of paper are sequentially carried in one direction through a closed loop.

While the invention has been particularly shown and described with reference to preferred embodiments
25 thereof, it will be understood by those skilled in the art that various changes in form and details may be

made therein without departing from the spirit and scope of the invention as defined by the appended claims.

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CLAIMS:

1. A printer comprising:

a platen drum for supporting a recording sheet during formation of an image thereon;

5 means defining a path from a sheet supply station to a sheet outlet station via the platen drum;

means for advancing the recording sheet along the defined path;

10 a plurality of guide drums connected by an endless belt, adapted to define, with the platen drum, a closed path for returning the recording sheet to the platen drum for recording successive images thereon.

2. A printer according to claim 1, further comprising a plurality of supply guide rollers associated with the sheet supply station.

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3. A printer according to claim 1 or claim 2, further comprising a thermal print head associated with the platen drum.

4. A printer according to any preceding claim, further comprising a plurality of drum guide rollers, provided near said drums, for guiding paper movement on said loop.

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5. A printer according to any preceding claim, further comprising a plurality of discharge roller guides associated with the sheet outlet station.

5 6. A printer according to any preceding claim arranged to print a sheet in a plurality of successive different colours in print operations separated by traverses through said loop.

10 7. A thermal transfer printer as claimed in any preceding claim, wherein two guide drums are provided, said closed loop is provided along the periphery of said guide drums and platen drum, guide plates for guiding papers are formed at proper intervals, and both a paper inserting section into which sheets of paper are inserted and a paper extracting section from which
15 printed sheets of paper are drawn out, are provided.

8. A printer as claimed in any preceding claim, wherein said platen and guide drums are on the same axis.

20 9. A printer according to any preceding claim, in which the platen roller is of smaller circumference than the length, along the path, of the sheet.



10. A printer according to any preceding claim, further comprising an ink ribbon and arranged to constitute a thermal transfer printer.

5 11. A thermal transfer printer as substantially hereinbefore described with reference to Figures 3 and 4 of the accompanying drawings.

