

SPECIFICATION
THERMAL PRINTER

Technical Field

The present invention relates to a small-sized line thermal printer used for a portable electronic device such as a receipt issuing machine.

Background Art

Heretofore, a small-sized line thermal printer is widely used for a portable electronic device such as a receipt issuing machine.

As this type of thermal printer is required to be readily portable, a small-sized, light one is desired.

Therefore, heretofore, a body frame is made of metal such as a thin steel plate and a paper guide made of plastic for guiding recording paper to a printing part between a platen roller and a thermal head is installed as disclosed, for example, in Unexamined Japanese Patent Application No. Hei. 4-140175.

In such a thermal printer, a platen roller 104 and a head support part 103 are provided to a body frame 102 made of plastic as shown in Fig. 6, for example. Predetermined printing is executed on thermal recording paper by attaching a thermal head 130 on the side of the platen roller 104 of the head support part 103 so that thermal recording paper is held between the thermal head and the platen roller and pressing the thermal head 130 attached to the head support part 103 on the platen roller 104 by a torsion coil spring 107.

Further, there is also another conventional thermal printer in which a body frame is formed integrally with a paper guide from plastic material such as polycarbonate.

However, in such conventional type thermal printers, there are the following problems:

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That is, in the case of the above conventional type thermal printers, as the paper guide 121 is made of plastic material, charge cannot be discharged from the paper guide if thermal recording paper 100 is electrified and the thermal head 130 may be broken by a spark and others.

Further, as the paper guide 121 is also electrified, there is a problem that the thermal recording paper 100 cannot be guided to the vicinity of the thermal head 130 and the thermal recording paper is hard to insert.

As the platen roller 104 is arranged apart from the bottom of the printer in view of space for gears for driving the platen roller, the paper guide 121 cannot be formed as a part of the body frame 102. Therefore, as the paper guide 121 is made of another member, the number of parts is increased and as a result, the cost is increased.

Even if the paper guide 121 is formed as a part of the body frame 102, there is also a problem that it is difficult to increase an angle at which thermal recording paper 100 is wound on the platen roller 104 and precision in feeding paper is not satisfactory.

Furthermore, if the body frame is also made of plastic material as in the other conventional types, the frame must be formed in thick to enhance the rigidity. As a result of this, miniaturization cannot be sufficiently achieved.

The present invention was made in view of the problems and difficulties accompanying the conventional thermal printers. Therefore, an object of the present invention is to provide a thermal printer capable of increasing an angle at which thermal recording paper is wound on a platen roller without generating static electricity.

Another object of the present invention is to provide a thermal printer small in size and light in weight, which requires the small numbers of parts and components.

THE DESCRIPTION OF THE INVENTION

A thermal printer according to the present invention includes a metallic body frame for supporting at least one of a thermal head and a platen roller for holding recording paper in a printing position and a paper guide for guiding the recording paper to the printing position. In the thermal printer of the invention, the paper guide at least in the vicinity of the printing position is integrated with the body frame.

According to the above constitution, as the paper guide for guiding recording paper to the printing paper is integrated with the metallic body frame, static electricity is discharged via recording paper even if the recording paper is electrified and the paper guide is never electrified. As a result, as no spark is generated between the vicinity of a printing position of the paper guide and the thermal head, the paper guide can be arranged in the vicinity of the printing position and thermal recording paper can be readily and smoothly inserted.

In addition, as the paper guide is not made of plastic material in the case of the present invention, the thickness can be reduced, as the paper guide is integrated with the body frame, the number of parts can be reduced and as a result, a small-sized, light and low-priced thermal printer can be obtained.

Also, in the case of the present invention, the paper guide in a position in which recording paper is inserted is integrated with the body frame, is bent upward approximately along the width of paper and is provided with a bend-raise portion on which recording paper is slid.

In this case, as static electricity generated on recording paper is discharged via the bend-raise portion by integrating the bend-raise portion which comes in contact with the recording paper with the frame, the carried recording paper can be prevented from

being electrified and bad effect upon the thermal head by static electricity can be prevented.

As an angle at which recording paper is wound on the platen roller can be increased by the bend-raise portion and in addition, area in which the paper guide and the recording paper are in contact is reduced by the bend-raise portion, a running load is not increased even if the recording paper is wet, the recording paper is smoothly run and high quality printing is enabled.

Further, in the case of the present invention, the paper guide is provided with a step relative to the bottom of the body frame along the direction of the width of recording paper so as to approach the platen roller.

According to the above constitution, the shape along the platen roller of the paper guide can be readily obtained without working so that the paper guide is large-sized, the bend-raise portion provided with desired height can be obtained and hereby, the paper guide high in rigidity and precision can be obtained.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plan showing the whole constitution of an embodiment of a thermal printer according to the present invention, Fig. 2 is a side view showing the constitution of a printing part in the embodiment and shows a state in which a lever member is pushed down.

Fig. 3 is a side view showing the constitution of the printing part in the embodiment of the present invention, Fig. 4 is a side view showing the constitution of a driving part in the embodiment and Fig. 5 is a side view showing the vicinity of the lever member in the embodiment.

Further, Fig. 6 is a side view showing the constitution of a conventional type thermal printer.

THE MODE EMBODYING THE INVENTION

Referring to Figs. 1 to 5, the best embodiment for realizing a thermal printer according to the present invention will be described in detail below.

Fig. 1 is a plan showing the whole constitution of a thermal printer equivalent to this embodiment, Fig. 2 is a side view showing the constitution of a printing part and shows a state in which a lever member is pushed down and a thermal head presses a platen roller, Fig. 3 is a side view showing the constitution of the printing part and shows a state in which the lever member is pulled up and a thermal head is separated from a platen roller, Fig. 4 is a side view showing the constitution of a driving part and Fig. 5 is a side view showing the vicinity of the lever member.

As shown in Fig. 1, a thermal printer 1 equivalent to this embodiment is provided with a body frame 2 made of metal such as cold-rolled steel (SPCC), and a printing part 3, a platen roller 4 and a driving motor 5 for driving the platen roller 4 are attached to the body frame 2.

The body frame 2 is formed by bending the bottom 2c and a pair of side walls 2a and 2b by sheet metal working. A paper guide 21 described later is formed on the rear side of the body frame 2. The width of each frame side wall 2a and 2b is set to a dimension slightly larger than the width of a roll paper S described later.

The printing part 3 is constituted by the thermal head 30 and a fixing plate 31. A predetermined electrode is formed on the surface of the thermal head 30 and is connected to a circuit board not shown. The thermal head 30 is fixed to a long flat fixing plate 31 made of metal such as a soft iron plate.

Arms 31a and 31b are bent at both ends of the fixing plate 31 so that each bent width is approximately equal to the inside width of the body frame 2. These arms 31a and 31b are attached

to a supporting shaft 6 suspended in parallel with the platen roller 4 on both sides of the body frame 2 so that the arms can be turned freely. Further, a torsion coil spring 7 required for the thermal head 30 to press the platen roller 4 is attached to the supporting shaft 6. In this case, as shown in Fig. 1, spring portions 7b and 7c are formed on both side of a fitting portion 7a in the shape of approximately a letter C in the center of the torsion coil spring 7. The supporting shaft 6 is attached with it piercing the torsion coil spring 7, the arms 7d and 7e press the fixing plate 31 and the fitting portion 7a is pressed by a supporting portion 2d provided to the bottom 2c of the body frame 2 and fitted to the supporting portion. Hereby, the thermal head 30 presses the platen roller 4 toward the bottom 2c from the top.

A protruded portion 31c fitted to a guide portion 80 of a lever member 8 for raising the fixing plate 31 is integrated with the end on the side of the lever member 8 of the fixing plate 31.

The tongue-like protruded portion 31c is protruded from one side wall 2b of the body frame 2. The tongue-like protruded portion 31c is bent on the reverse side to the side on which the thermal head 30 is fixed and is further provided with a portion for contact for regulating the turning of the lever member 8.

In the meantime, the platen roller 4 is respectively attached to the both side walls 2a and 2b of the body frame 2 via platen bearings 41a and 41b so that the platen roller can be rotated freely. As Figs. 1 and 4, the torque of the rotation shaft 50 of the driving motor 5 is transmitted to a gear 9 fixed at one end of the platen shaft 40 of the platen roller 4 via gears 10, 11 and 12. The driving motor 5 is connected to a circuit board not shown via a lead wire 51 and a connector 52.

The lever member 8 for switching pressure upon the platen roller 4 by the thermal head 30 or release is attached to the other end of the platen roller 4 so that the lever member can be turned

freely. The lever member 8 is made of resin such as polycarbonate and the guide portion 80 is formed in the vicinity of the center of the turning.

As shown in Figs. 2 and 5, the guide portion 80 is formed approximately in a circular arc and is provided with a guide face 80a which extends from the center of the turning toward a grip 81 of the lever member 8. As shown in Fig. 5, slight clearance is formed between the guide face 80a of the guide portion 80 and the protruded portion 31c of the fixing plate 31 in a state in which the lever member 8 is pushed down. Further, a concave portion 80b for fitting with the protruded portion 31c of the fixing plate 31 is formed at the end on the side of the grip 81 of the guide portion 80.

As shown in Figs. 2 and 3, the paper guide 21 for guiding roll paper S extended from thermal recording paper rolled cylindrically to a printing position in which the thermal head 30 and the platen roller 4 come in contact is formed on the rear side of the bottom 2c of the body frame 2 with a part of the bottom 2c of the body frame 2 bent.

An introducing portion 21a along the shape of the platen roller 4 is formed by curving the paper guide 21 on the side of the platen roller 4. In this case, the end 21c of the introducing portion 21a enters the vicinity of a part in which the thermal head 30 and the platen roller 4 come in contact, that is, the vicinity of the printing position.

In the meantime, as shown in Fig. 1, grooves 24 and 25 are respectively formed on both sides at the end on the rear side of the paper guide 21 and a bend-raise portion 21b is formed in a part between the these grooves 24 and 25 so that the bend-raise portion is protruded on the side of the platen roller 4. The bend-raise portion 21b is extended approximately in parallel with the platen roller 4, that is, in the direction of the width of roll paper S

and is formed by bending for example so that the section is approximately in the shape of a mountain.

Further, the paper guide 21 provided with these introducing portion 21a and the bend-raise portion 21b is slightly raised by drawing for example. That is, the paper guide 21 is provided with a step h relative to the bottom 2c so as to approach the platen roller 4.

As shown in Fig. 2, the top of the bend-raise portion 21b is formed so that the top is approximately as high as the lower part of the platen roller 4.

In this embodiment constituted as described above, when roll paper S is installed, the grip 81 of the lever member 8 is grasped by fingers and raised. As a result, the guide face 80a of the guide portion 80 of the lever member 8 and the protruded portion 31c of the fixing plate 31 come in contact, the fixing plate 31 is raised as the lever member 8 is turned and pressure upon the platen roller 4 by the thermal head 30 is released. When the lever member 8 is further raised, the protruded portion 31c of the fixing plate 31 is fitted to the concave portion 80b of the guide portion 80 of the lever member 8 and as shown in Fig. 3, the lever member 8 is fitted with the grip 81 of the lever member 8 standing relative to the bottom 2c of the body frame 2. In this state, the end of roll paper S is inserted between the platen roller 4 and the introducing portion 21a of the paper guide 21 from the rear side of the paper guide 21.

In the meantime, if roll paper S is printed, the grip 81 of the lever member 8 is grasped and pushed down on the rear side.

As a result, the fitting between the protruded portion 31c of the fixing plate 31 and the concave portion 80b of the guide portion 80 of the lever member 8 is released and as shown in Fig. 2, the fixing plate 31 is pressed upon roll paper S on the platen roller 4 by the pressure of the torsion coil spring 7. In this state,

the thermal head 30 is driven, the platen roller 4 is rotated to carry roll paper S and predetermined printing is executed on the roll paper S.

According to this embodiment constituted as described above of the present invention, as the paper guide 21 provided with the introducing portion 21a for guiding roll paper S in a direction in which the roll paper S is wound on the platen roller 4 is integrated with the metallic body frame 2, static electricity is discharged via the body frame even if the roll paper S is electrified and the paper guide 21 is never electrified. As a result, as no spark is generated between the end 21c of the introducing portion 21a and the thermal head 30 and the end of the introducing portion can be arranged extremely near the platen roller 4, roll paper S can be readily and smoothly inserted.

In the case of this embodiment, as roll paper S and the bend-raise portion 21b of the paper guide 21 are always in contact when the roll paper S is printed, static electricity generated on the roll paper S is released via the bend-raise portion 21b and the roll paper S is never electrified. As a result, the above bad effect upon the thermal head 30 by static electricity can be prevented.

Further, as area in which roll paper S and the paper guide 21 are in contact is small because the roll paper is in contact with only the bend-raise portion 21b, a running load between the roll paper S and the paper guide 21 can be reduced if the roll paper S is wet. In addition, as an angle at which roll paper S is wound on the platen roller 4 is increased by the bend-raise portion 21b and ability in feeding paper is enhanced, high quality printing by the smooth running of the roll paper S is enabled.

Furthermore, in the case of this embodiment, as the paper guide 21 is provided with a step h relative to the bottom 2c of the body frame 2 so that clearance between the paper guide and the

platen roller 4 is reduced, the introducing portion 21a in a shape along the platen roller 4 and the bend-raise portion 21b formed so that it is high as desired can be readily obtained without working the paper guide 21 so that it is larger and hereby, the paper guide 21 high in rigidity and precision can be obtained.

Moreover, in the case of this embodiment, as plastic material is not used for the material of the paper guide 21, the paper guide can be thinned and the thermal printer can be miniaturized.

Also as the paper guide 21 is integrated with the body frame 2, the number of parts is reduced and the cost can be reduced.

In addition, in this embodiment, as the thermal head 30 can be separated from the platen roller 4 by raising the lever member 8, an interval between the thermal head 30 and the platen roller 4 can be increased and there is also effect that the platen roller 4 can be readily cleaned.

The present invention is not limited to the above embodiment and various variation is allowed.

For example, the shape, the thickness and others of the introducing portion and the bend-raise portion respectively formed in the paper guide are not limited to those in the above embodiment, design can be varied within the scope of the present invention and the shape, the material and others of the body frame may be also varied suitably.

Applicability to Industry

As described above, the thermal printer according to the present invention is useful for a printer for a portable electronic device such as a receipt issuing machine and is particularly suitable for using as a small-sized line thermal printer.



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WHAT IS CLAIMED IS

1. A thermal printer provided with a metallic body frame (2) for supporting at least one of a thermal head (30) and a platen roller (4) for holding recording paper in a printing position between them and a paper guide (21) for guiding said recording paper to said printing position, wherein:

at least said paper guide (21) in the vicinity of said printing position is integrated with said body frame (2).

2. A thermal printer according to Claim 1, wherein:

said paper guide (21) is integrated with said body frame (2) in a position in which said recording paper is inserted; and
said paper guide is provided with a bend-raise portion (21b) extended approximately in the direction of the width of said recording paper, bent upward and on which said recording paper is slid.

3. A thermal printer according to Claim 1 or 2, wherein:
said paper guide (21) is provided with a step (h) relative to the bottom (2c) of said body frame (2) at both ends in the direction of the width of said recording paper so as to approach said platen roller (4).

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