

(Title of the Invention)

Printer Apparatus

Background of the invention

The present invention relates to a thermal printer for forming images on thermosensitive recording papers by using a thermal head, and more particularly to a thermal printer improved in operability particularly such as upon paper jamming or head cleaning.

Thermal printers are structured to form a desired image on a recording paper by using a thermal head.

In a smaller-type thermal printer of this kind, a thermal head is rotatably urged in press-contact with a platen roller through a pressing force of a pressing member such as a predetermined form of a leaf spring. During setting or jamming a thermosensitive recording paper, a cover member is opened and then a release lever arranged therein is rotated so that the pressing force of the leaf spring or the like is directly or indirectly released. Thus the thermal head can be placed distant from the platen roller.

With this structure, during maintenance for example, there is a necessity of operating the release lever after opening the cover member. Accordingly, the housing at an opening portion requires a space for operating the release lever in addition to a space for conducting maintenance. Thus there is a tendency toward increasing the apparatus size because of securing a space as above. Also, detection switches are required two in number in order to separately detect a state of the release lever and a state of the cover member, thereby complicating the structure.

Moreover, where such a small line thermal printer is structured requiring



a release lever, the release lever has a rotational support shaft arranged in the vicinity of the paper exit port of a housing and, in many cases, set at a location distant from a rotational support shaft of the thermal head. Consequently, there requires a mechanism to transmit an operating force of the release lever, incurring increase in number of parts.

On the other hand, there is a thermal printer disclosed, for example, in Japanese Patent Laying-open No. H7-309052 which is structured to enable a thermal head to be placed distant from a platen roller by interacting with opening and closing a cover member without requiring release operation by a release lever.

This apparatus has a cam member that rotates interacting with opening and closing the cover member. At an open position of the cover member, the thermal head is depressed against a pressing force of a leaf spring by the cam member, thereby moving the thermal head away from the platen roller.

In this structure, however, the pressing force of the leaf spring acts until the thermal head is completely distant from the platen roller. There requires a large operating force during opening the cover member. It is therefore expected that it is difficult to open a space for head cleaning despite a space for paper insertion or paper jam canceling can be separated.

In this manner, the apparatus requiring the former release lever necessitates two detecting switches to detect a release lever state and a cover member state, and further a mechanism to transmit operating force of the release lever. Thus, there is a disadvantage of incurring increase in number of parts. Further, there is a necessity of increasing the space for operating the release lever because the operating force by the release lever is increased. This increases the apparatus size and requires a mechanism to transmit the



operating force of the release lever, raising disadvantage of incurring increase in number of parts.

Also, in the apparatus structured to place the thermal head distant from the platen roller by interacting with opening and closing the cover member, the pressing force of an elastic member increases as the thermal head becomes distant from the platen roller. Accordingly, it is expected that there is difficulty in opening the cover member to a large extent.

Summary of the invention

The present invention has been made in view of the above circumstances, and it is an object to provide a line thermal printer that can improve the operability during conducting maintenance such as in paper jamming or head cleaning, and reduce the number of parts to achieve reduction in size.

A line thermal printer according to the present invention, comprises: a housing having an opening; a platen roller rotatably arranged within the housing; a head block arranged in and out of contact with the platen roller; a head unit support plate for supporting the head block in and out of contact with the platen roller; an elastic member for pressing the head block in a direction press-contacted with the platen roller; a cover member arranged on the housing for open and closure in a manner opening and closing the opening portion; and a pressurizing cam arranged interacting with opening and closing operation of the cover member, to bring the head block into press-contact with the platen roller by a pressing force of the elastic member when in a closing position of the cover member, and release the pressing force of the elastic member and press against a predetermined position of the head unit support plate to thereby move the head unit away from the platen roller when in an opening position of the cover member.



In this invention, the pressing cam, that is rotatable interacting with opening and closing the cover member, brings the head block into press-contact with the platen roller through a pressing force of the elastic member, when in a closing position of the cover member. When in the open position of the cover member, the pressing force of the elastic member is released and the head unit support plate is depressed at a predetermined position thereof to thereby bring the head block out of contact with the platen roller.

Further, a printer frame is detachably attached to the opening of the housing, the printer frame having the platen roller rotatably supported, a head unit support plate rotatably supported to support the head block and the elastic member, and further the cover member rotatably supported, wherein the cover member has, on a rotational shaft thereof, a pressurizing cam mounted thereon to release the pressing force of the elastic member when in the opening position of the cover member.

In this invention, the printer frame incorporates therein principal parts such as the platen roller, the head unit support plate for supporting the head block and the elastic member, the cover member, and the pressurizing cam, being made as a unit. Accordingly, the assembling of the principal parts into the housing is easy to perform. It is also possible to expose the principal parts outside by taking the unit portion out of the housing, facilitating part exchange during conducting maintenance. Incidentally, the head portion is possible to perform cleaning only by opening the cover.

Further, the pressurizing cam is provided with a first cam surface for pressing against a predetermined position of the head unit support plate when in the open position of the cover member, and a second cam surface for pressing against the elastic member when in the closing position of the cover member.

In this invention, if the pressurizing cam is rotated by interacting with opening and closing the cover member, when in the open position of the cover member, the pressurizing cam at the first cam surface presses against the predetermined portion of the head unit support plate so that the head block is gradually moved away from the platen roller. At this time, the second surface of the pressurizing cam is brought out of contact with the elastic member. Accordingly, the pressing force by the second cam surface is released to smoothly carry out releasing operation of the head block.

Further, the pressurizing cam is provided with a pressing force receiving surface for receiving a pressing force of the elastic member board, when in a position immediately before completing opening of the cover member.

In this invention, if the pressurizing cam is rotated by interacting with opening and closing the cover member, when in a position immediately before completing opening of the cover member, the second cam surface of the pressurizing cam is placed out of contact with the elastic member. After the pressing force against the elastic member by the second cam surface is released, the elastic member comes into abutment against the pressing force receiving surface to thereby add the pressing force to an opening force of the cover member, retaining the cover member in the open position.

Further, the pressurizing cam is provided with a third cam surface for pressing, when in the closing position of the cover member, against a movable piece of a detecting switch arranged inside the housing.

In this invention, since the third cam surface of the pressurizing cam moves the movable piece of the detecting switch by opening movement of the cover member, it is possible to detect, by only one detecting switch, opening and closing movement of the cover member and movement into and out of contact of



the head block with the platen roller.

Brief explanation of the drawings

Fig. 1 is a rear view showing a printer unit of a line thermal printer of the present invention;

Fig. 2 is a sectional view on line A-A of a printer unit in Fig. 1;

Fig. 3 is a sectional view showing a state that a cover member of Fig. 2 is opened;

Fig. 4 is a sectional view on line B-B of a printer unit in Fig. 1; and

Fig. 5 is a sectional view showing a state that a cover member of Fig. 4 is opened.

Description of the preferred Embodiment

An embodiment of the present invention will explained in detail hereinbelow with reference to the drawings.

Fig. 1 to Fig. 5 show one embodiment of a thermal printer of the present invention, wherein Fig. 1 shows a printer unit dismountably accommodated within a housing hereinafter referred to.

In these figures, a housing 10 has an opening 12 formed on an upper side of a front 11, for example as shown in Fig. 3 and Fig. 5. Through the opening 12, a printer unit 100 shown in Fig. 1 can be dismountably accommodated.

The printer unit 100 has a printer frame 110 generally in a rectangular U-shape as shown in Fig. 1. The printer frame 110 has sleeves 120 rotatably attached to its side frames 111, 112. This sleeve 120 is formed integral with a cover member 130 and an arm 131 so that the cover member 130 is opened and closed by rotating the sleeve 120.



Also, the sleeve 120 has an axial bore (not shown) in which is fitted an end of a support shaft 140 rectangular in cross section. The support shaft 140 is arranged thereon with three pressurizing cams 141 - 143. These pressurizing cams 141 - 143 are provided with a first cam face 144 for urging against a bend portion 162 of a head unit support arm 160, 161 hereinafter referred to, a second cam face 145 for urging against a leaf spring 170 hereinafter referred to, and a leaf-spring receiving face 146 for receiving a biasing force by a pressing piece 171 - 174 of the leaf spring 170 when releasing an urging force against the leaf spring 170 hereinafter referred to.

However, the pressurizing cam 141 is provided with a third cam face 147 for pressing against a movable piece 22 of a detecting switch 21 mounted, for example, on an interface board 20 or the like. By turning on/off the detecting switch 21, detections are made for an open/close state of the cover member 130 and a release state of a head block 180 hereinafter referred to.

Also, a head block support shaft 150 at respective ends is rotatably arranged to the side plates 111, 112 of the printer frame 110 on an underside of the sleeve 120. The head block support shaft 150 has, at respective ends, head unit support arms 160, 161. The head unit support arms 160, 161 respectively have, on their upper end sides, bend piece portions 162 inwardly bent to each other.

This bend piece portion 162 is pressed by the first cam face 144 of the pressurizing cam 141, 143 so that the head block 180 is released by the pressing as stated later.

Each head unit support arm 160, 161 has a head unit support plate 163 formed integral therewith. The head unit support plate 163 is formed with a recess 164 - 167 to extend the leaf spring 170, hereinafter referred to, at a



pressing piece 171 - 174 toward the pressurizing cam 141 - 143.

The head unit support plate 163 has, on a surface side, the leaf spring 170 in a generally rectangular U-shape and an aluminum head block 180 attached thereto through a plurality of screws 22. The leaf spring 170 is provided with the pressing piece 171 - 174 folded back upward. These pressing pieces 171 - 174 are extended to a backside of the head unit support plate 163 so as to face the pressurizing cam 141 - 143 through the recess 164 - 167 of the head unit support plate 163.

The head block 180 is fixed with a ceramic substrate 181 having a heating element (print head), not shown, on a surface side thereof. The ceramic substrate 181 is provided, at a lower portion thereof, with a seal portion 182 to seal a driver or the like structured by an IC. The head block 180 is provided, at a lower portion thereof, with a protection cover 184 to protect the seal portion 182 fixed by a screw 183.

Also, the side plates 111, 112 of the printer frame 110 rotatably support ends 191, 192 of the support shaft 190 at a location somewhat lower than an attaching location of the sleeve 120. The support shaft 190 is attached thereon with a platen roller 193. The support shaft 190 is provided, on an end side 191, with a platen drive gear 194. This platen drive gear 194 is arranged, when accommodated inside of the housing 10 of the printer unit 100, becomes mesh with a drive gear of a drive mechanism, not shown, provided on an interior side of the housing 10.

The housing 10 is provided with an insertion hole 13 at a front 11 on a lower side thereof. This insertion hole 13 is formed cross-sectionally in a horn form so that a printing paper 30 at its tip can be readily inserted thereto. The insertion hole 13 has a guide portion 14 formed by a surface moderately curved



upward so that the printing paper 30 inserted in the insertion hole 13 can be guided upward.

The insertion hole 13 is provided, at a deep portion, with a guide passage 15 upwardly extending to a junction portion between the head block 180 and the platen roller 193. The guide passage 15 is provided, at a deep portion, with a guide sheet 16 extending to a neighborhood of the junction between the head block 180 and the platen roller 193.

Here, a paper detecting sensor, not shown, is provided in the guide passage 15. When detecting a printing paper 30 inserted through the insertion hole 13, the afore-mentioned drive mechanism (not shown) is driven to rotate the platen roller 193.

If a printing paper 30 at a tip is forced in along the guide passage 15 and the guide plate 16 to the junction portion between the head block 180 and the platen roller 193, the rotation of the platen roller 193 causes the printing paper 30 to be wound over an peripheral surface of the platen roller 193.

An exit port 132 is provided in the cover member 130 at a location corresponding to the platen roller 193 to discharge a printing paper 30 after being printed. Also, the exit port 132 is provided with a guide portion 133 curved toward the front 11 of the housing 10. The printed printing paper 30 at a tip is discharged outward through the exit port 132 while being guided by the guide portion 133.

Where printing on a printing paper 30, a power supply (not shown) on a housing 10 side is first turned on, and then a printing paper 30 at a tip is inserted through the insertion hole 13 on the front 11 side of the housing 10. At this time, the printing paper 30 at the tip can be readily inserted because of the cross-sectional horn shape of the insertion hole 13. The printing paper 30 at the



tip is guided toward the upper guide passage 15 by the guide portion 14 moderately curved upward.

At this time, the insertion of the printing paper 30 is detected by a paper detecting sensor, not shown, provided in the guide passage 15 so that the drive mechanism, not shown, inside the housing 10 is driven to thereby rotate the platen roller 193.

When the tip of the printing paper 30 is inserted along the guide plate 16 to the junction of the head block 180 and the platen roller 193, the printing paper 30 is printed by the heating element (print head), not shown, of the head block 180 while being wound around the outer peripheral surface of the platen roller 193 by the rotation of the platen roller 193.

With printing operation (line thermal type) by the not-shown heating element (print head), the tip of the printing paper 30 is forced out toward the exit port 132 side of the cover member 130 by the rotation of the platen roller 193. At this time, tip of the printing paper 30 is fed toward the exit port 132 side while being guided by the guide portion 133 curved toward the front 11 side of the housing 10, discharged from the exit port 132.

When the printing on the printing paper 30 is ended and the rear end of the printing paper 30 is released from the platen roller 193, the driving mechanism, not shown, inside the housing 10 is stopped of drive and the platen roller 193 is stopped of rotation.

Meanwhile, in the case of occurring, for example, paper jamming during such a printing operation, the paper jamming can be avoided by the following procedure.

That is, the cover member 130 is turned in an arrow direction (counterclockwise) from a state as shown in Fig. 2 and Fig. 4 to a state as shown



in Fig. 3 and Fig. 5. At this time, the sleeve 120 shown in Fig. 1 is rotated together with rotation of the arm 131 of the cover member 130 in a same direction, by which the support shaft 140 attached to the sleeve 120 is rotated in the same direction. This causes the three pressurizing cams 141 - 143 secured to the support shaft 140 to rotate counterclockwise.

During rotation of these pressurizing cams 141 - 143, the pressurizing cam 141 at a third surface 147 is first detached from a movable piece 22 of the detecting switch 21. By the removal of pressing force on the movable piece 22, detections are made for opening of the cover member 130 and release of the head block 180.

At this time, the pressurizing cams 141 - 143 pressing the respective pressing pieces 171 - 174 of the leaf spring 170 gradually move at their second surfaces 145 away from these pressing pieces 171 - 174, thereby releasing the pressing force on the pressing piece 171 - 174.

Also, at this time, the pressurizing cams 141, 143 provided at respective ends of the support shaft 140 at their first cam surfaces 144 depress downward the bend portions 162 on an upper side of the head unit support arms 160, 161. Due to this depression force, the head unit support arms 160, 161 is rotated counterclockwise about a head block support shaft 150, thereby gradually moving the head block 180 mounted on a surface side of the head unit support plate 163 away from the platen roller 193.

At this time, the second surfaces 145 of the pressurizing cams 141 - 143 pressing against the pressing pieces 171 - 174 of the leaf spring 170 gradually move away from these pressing pieces 171 - 174, as stated above, and release the depression forces on the respective pressing pieces 171 - 174. Accordingly, there is reduction in depression force by the first cam surfaces 144 of the pressurizing



cams 141, 143 against the bend piece portions 162. Consequently, the head block 180 is smoothly release-operated due to the rotation of the head unit support plate 163.

When the cover member 130 is opened to immediately in front of an open position as shown in Fig. 3 and Fig. 5, the pressing pieces 171 - 174 at their tips shift toward a side of leaf spring receiving surfaces 146 of the pressurizing cams 141 - 143 and depressing these leaf spring receiving surfaces 146. The urging force of the pressing piece 171 - 174 against the leaf spring receiving surface 146 is in a direction of opening the cover member 130 (in a counterclockwise direction). Accordingly, the cover member 130 at a position immediately before opening thereof is urged by the urging force, and the cover member 130 is held in an open position.

In this manner, if the cover member 130 is opened, the housing 10 at its opening portion 12 is opened. It is accordingly easy to draw out a printing paper 80 jammed, for example, between the head block 180 and the platen roller 193.

Also, since the thermal head 181 is exposed out of the opening portion 12 of the housing 10 as stated above, it is easy to perform maintenance such as head cleaning.

In this manner, in the present embodiment, the pressurizing cams 141 - 143 rotates interacting with opening and closing operation of the cover member 130. Consequently, when the cover member 130 is at a closed position, the leaf spring 170 as an elastic member acts its pressing force so that the head block 180 is press-contacted with the platen roller 193 side. When the cover member 130 is at an open position, the leaf spring 170 is released of its urging force and the head unit support plate 163 is urged at a predetermined position, thereby causing the head block 180 to be moved away from the platen roller 193.

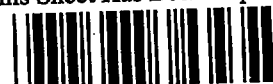


Accordingly, smooth operations are ensured for opening the cover member 130 and releasing the head block 180.

Also, in the present embodiment, the printer frame 110 is made as a unit incorporating principal parts, such as a platen roller 193, head unit support plate 163 for supporting the head block 180 and the leaf spring 170, the cover member 130, and the pressurizing cams 141 - 143 for bringing the head block 180 into and out of contact with the platen roller 193 by interacting with opening operation of the cover member 130. Accordingly, assembling into the housing 10 is facilitated. Also, the principal parts can be exposed outside by taking the unit portion out of the housing 10, facilitating maintenance such as of exchanging parts.

Further, in the present embodiment, where the pressurizing cams 141 - 143 are rotated interacting with opening and closing the cover member 130, when the cover member 130 is at an open position, the pressurizing cams 141 - 143 at their first cam surfaces 144 depress against the respective bend piece portions 162 arranged at a predetermined location of the head unit support plate 163. This causes the head unit support plate 163 to rotate and the head block 180 to move away from the platen roller 193. At this time, the second cam surfaces 145 of the pressurizing cams 141 - 143 move away from the leaf spring 170. Accordingly, the pressing force by the second cam surface 145 against the leaf spring 170 is released and the first cam surface 144 has a decreased pressing force onto the bend piece portion 162, improving operability.

Furthermore, in the present embodiment, when the cover member 130 is at a position immediately before completing opening, the second cam surfaces 145 of the pressurizing cams 141 - 143 are placed distant from the leaf spring 170 to release a pressing force against the leaf spring 170. Thereafter, the



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pressing pieces 171 - 174 of the leaf spring 170 give a pressing force against the leaf spring receiving surface 146 which is a pressing-force receiving surface for the pressurizing cams 141 - 143. Accordingly, the pressing force is added to an opening force for the cover member 130 to retain the cover member 130 in an open position, requiring no lock mechanism.

Also, in the present embodiment, the movable piece 22 of the detecting switch 21 is rendered movable through the third cam surface 147 by opening operation of the cover member 130. Accordingly, it is possible to detect, by only one detecting switch 21, opening and closing the cover member 130 as well as moving contacting and noncontacting of the head block with the platen roller. Thus, the number of parts can be reduced.

As explained above, according to a line thermal printer of the present invention, the pressurizing cam that rotates interacting with opening and closing the cover member releases the head block without undergoing a pressing force by the elastic member, thereby increasing the open amount. Accordingly, it is possible to improve operability during conducting maintenance such as in paper jamming or head cleaning.

Also, the third cam surface of the pressurizing cam moves the movable piece of the detecting switch by the opening movement of the cover member. Accordingly, it is possible to detect, by only one switch, the opening and closing movement of the cover member and the movement of the head block into and out of contact with the platen roller, reducing the number of parts.

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CLAIMS

WHAT IS CLAIMED IS:



1. A printer apparatus comprising:

- a housing having an opening portion;
- a platen roller rotatably arranged within the housing;
- a head block having a printing portion, and arranged in and out of contact with the platen roller;
- a head unit support plate for supporting the head block;
- an elastic member for pressing the head block in a direction press-contacted with the platen roller;
- a cover member arranged on the housing for open and closure in a manner opening and closing the opening portion; and
- a pressurizing cam arranged interacting with opening and closing operation of the cover member, to bring the head block into press-contact with the platen roller by a pressing force of the elastic member when in a closing position of the cover member, and release the pressing force of the elastic member and press against a predetermined position of the head unit support plate to thereby move the head unit away from the platen roller when in an opening position of the cover member.

2. A printer apparatus according to claim 1, further comprising:

- a printer frame detachably attached to the opening of the housing, the printer frame having the platen roller rotatably supported, a head unit support plate rotatably supported to support the head block and the elastic member, and further the cover member rotatably supported, wherein the cover member has, on a rotational shaft thereof, a pressurizing cam mounted thereon to release the

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pressing force of the elastic member when in the opening position of the cover member.

3. A printer apparatus according to claim 2, wherein the pressurizing cam is provided with a first cam surface for pressing against a predetermined position of the head unit support plate when in the open position of the cover member, and a second cam surface for pressing against said elastic member when in the closing position of said cover member.
4. A printer apparatus according to claim 1, wherein the pressurizing cam is provided with a pressing force receiving surface for receiving a pressing force of the elastic member board, when in a position immediately before completing opening of the cover member.
5. A printer apparatus according to claim 1, wherein the pressurizing cam is provided with a third cam surface for pressing, when in the closing position of the cover member, against a movable piece of a detecting switch arranged inside the housing.

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