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(71) Applicant: **Seiko Instruments Inc.**
Chiba-shi, Chiba (JP)

(72) Inventors:
- **Sekiya, Hiroaki**
  Mihama-ku, Chiba-shi, Chiba (JP)
- **Seino, Takumi**
  Mihama-ku, Chiba-shi, Chiba (JP)

(74) Representative: **Sturt, Clifford Mark et al**
Miller Sturt Kenyon
9 John Street
London WC1N 2ES (GB)

(54) Printer apparatus

(57) A printer apparatus which improves operationality during maintenance such as releasing paper jams or head cleaning and which has a reduced number of parts. The printer apparatus (10) has a cam mechanism (141-143) which operates with opening of the cover member (130) to release the biasing force normally acting on the head block (180) and at the same time moving the head block out of contact with the platen (193).

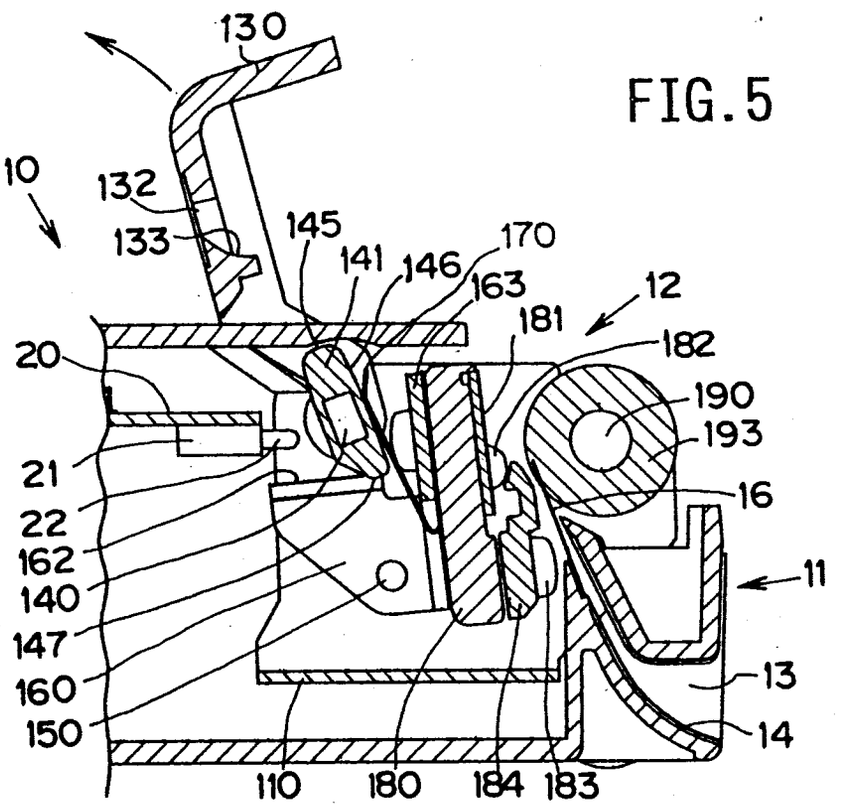

FIG.5

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Description

[0001] 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 operationality particularly such as upon paper jamming or head cleaning.

[0002] Thermal printers are structured to form a desired image on a recording paper by using a thermal head.

[0003] 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 dealing with jammed 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 moved away from the platen roller.

[0004] 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 providing the space described above. Also two detection switches are required in order to separately detect the state of the release lever and the state of the cover member, thereby complicating the structure.

[0005] Moreover, when a small line thermal printer is provided with a release lever, the release lever has a rotational support shaft arranged in the vicinity of the paper exit port of the printer housing. In many cases, this shaft is set at a location distant from the rotational support shaft of the thermal head. Consequently, a mechanism is required to transmit the operating force of the release lever, which increases the number of parts required.

[0006] On the other hand, there is known a thermal printer, for example from Japanese Patent document Layed-open No. H7-309052, which is structured to enable a thermal head to be moved away from a platen roller by opening a cover member without requiring a release operation by a release lever.

[0007] This apparatus has a cam member that rotates with opening and closing of the cover member. At an open position of the cover member, the thermal head is forced against the pressing force of a leaf spring by the cam member, thereby moving the thermal head away from the platen roller.

[0008] In this structure, however the pressing force of the leaf spring continues to act on the thermal head even when the head is moved away from the platen roller. This requires a large operating force during opening of the cover member. It is therefore difficult to open the space for head cleaning and the space for paper insertion or paper jam removal.

[0009] The apparatus with the release lever necessitates two detecting switches to detect the release lever state and the cover member state, and further a mechanism to transmit the operating force of the release lever. Thus, there is a disadvantage of incurring an increase in the number of parts. Further, there is a necessity of increasing the space for operating the release lever because the operating force required for the release lever is large. This increases the apparatus size and requires a mechanism to transmit the operating force of the release lever, which has disadvantage of an increase in the number of parts.

[0010] In the apparatus arranged to move the thermal head away from the platen roller by opening the cover member, the pressing force of an elastic member increases as the thermal head moves away from the platen roller. Accordingly, it is difficult to open the cover member to a large extent.

[0011] The present invention has been made in view of the above and it is an object thereof to provide a line thermal printer which can improve the operationality during maintenance, such as removing a paper jam or for head cleaning, and which can reduce the number of parts to achieve a reduction in size.

[0012] According to the present invention there is provided a housing having an opening;

a platen rotatably arranged within the housing;
a head block having a printing portion, and arranged to be moveable in and out of contact with the platen roller;
a resilient biasing means for biasing the head block in to contact with the platen;
a cover member arranged for opening the opening when open and closing the opening when closed; and
a cam mechanism arranged to operate with opening and closing of the cover member so that the head block is biased into contact with the platen by the resilient biasing means when the cover member is closed, and when the cover member is open both the head block is moved away from the platen and the resilient biaising means no longer acts to bias the head block into contact with the platen.

[0013] Preferably, the printer apparatus comprises a printer frame detachably mounted in the housing; the printer frame supporting the platen, a head unit on which is mounted the head block, and the resilient biasing means; wherein the cover member has a rotational shaft on which the cam mechanism is mounted.

[0014] Beneficially the printer frame incorporates therein as a single unit the principal parts such as the platen roller, the head unit support plate for supporting the head block, the resilient biasing means, the cover member, and the pressurising cam. Accordingly, the assembling of the principal parts into the housing is easy

to perform. It is also possible readily to access the principal parts by taking the unit portion out of the housing, thus facilitating part exchange during conducting maintenance. However, it is possible to perform cleaning of the head portion only by opening the cover.

[0015] Further, the pressurising cam is preferably 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 resilient biasing means when in the closed position of the cover member.

[0016] Advantageously, if the pressurising cam is rotated by interacting with opening and closing of the cover member; when opening the cover member, the pressurising 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 pressurising cam is brought out of contact with the resilient biasing means. Accordingly, the pressing force by the second cam surface is released to smoothly carry out releasing of the head block.

[0017] Further, the pressurising cam is preferably provided with a pressing force receiving surface for receiving a pressing force of the resilient biasing means, when in a position immediately before completing opening of the cover member.

[0018] Advantageously, if the pressurising cam is rotated by interacting with opening and closing of the cover member, when in a position immediately before completing opening of the cover member, the second cam surface of the pressurising cam is placed out of contact with the resilient biasing means. After the pressing force against the resilient biasing means by the second cam surface is released, the resilient biasing means comes into abutment against the pressing force receiving surface to thereby add the pressing force to an opening force of the cover member, thus retaining the cover member in the open position.

[0019] Further, the pressurising cam is preferably provided with a third cam surface for pressing, during closing of the cover member, against a movable piece of a detecting switch arranged inside the housing.

[0020] Advantageously, since the third cam surface of the pressurising cam moves the movable piece of the detecting switch during opening and closing movements 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.

[0021] An embodiment of the present invention will now be described by way of further example only and with reference to the accompanying drawings, in which:

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

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

Fig. 3 is a sectional view showing a state that the cover member shown in Fig. 2 is opened;

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

Fig. 5 is a sectional view showing a state that the cover member shown in Fig. 4 is opened.

[0022] 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.

[0023] 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.

[0024] 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. These sleeves 120 are formed integral with a cover member 130 via arms 131 so that the cover member 130 is opened and closed by rotating the sleeves 120.

[0025] Also, the sleeves 120 have respective axial bores (not shown) in which is fitted respective ends of a support shaft 140 which is rectangular in cross section. The support shaft 140 has arranged thereon three pressurising cams 141 - 143. These pressurising 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; a second cam face 145 for urging against a leaf spring 170; 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.

[0026] The pressurising cam 141 is also 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, detection is made of the open/close state of the cover member 130 and the release state of a head block 180, hereinafter described.

[0027] A head block support shaft 150 is rotatably attached at respective ends to the side plates 111, 112 of the printer frame 110 on the undersides of the sleeves 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 protions 162 inwardly bent to face each other.

[0028] Bend piece portions 162 are pressed by the respective first cam face 144 of the pressurising cams 141, 143 so that the head block 180 can be released as described later.

[0029] Each head unit support arm 160, 161 is formed integral with a head unit support plate 163. The head unit support plate 163 is formed with recesses 164 - 167

to receive the leaf spring 170 in the form of pressing pieces 171 - 174 which act on the pressurising cams 141 - 143.

[0030] The leaf spring 170 in a generally rectangular U-shape and one upright thereof together with the aluminum head block 180 is attached to one surface of the head unit support plate 163 with a plurality of screws 24 (refer to Figs. 4 and 5). The leaf spring 170 is provided with the pressing pieces 171 - 174 which are folded back and upwards with respect to the said surface of the head block 180. That is, the pressing pieces 171 - 174 are extended to the backside of the head unit support plate 163 so as to face the pressurising cams 141 - 143 by passing through the recesses 164 - 167 of the head unit support plate 163.

[0031] The head block 180 is fixed with a ceramic substrate 181 having a heating element (print head), not shown, on a surface thereof. The ceramic substrate 181 is provided, at a lower portion thereof, with a seal portion 182 to seal a driver or the like provided 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. Cover 184 is fixed by a screw 183.

[0032] 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 the attaching location of the sleeves 120. The support shaft 190 has attached thereon a platen roller 193. The support shaft 190 is provided on an end side 191, with a platen drive 194. This platen drive gear 194 is arranged when accommodated inside of the housing 10 of the printer unit 100, to mesh with a drive gear of a drive mechanism, not shown, provided on an interior side of the housing 10.

[0033] The housing 10 is provided with an insertion hole 13 at a front 11 on a lower side thereof. In cross-section the insertion hole 13 has the shape of a horn so that a printing paper 30 can be readily inserted thereto. The insertion hole 13 has a guide portion 14 formed by a surface moderately curved upwardly so that the printing paper 30 inserted in the insertion hole 13 can be guided upward.

[0034] Further inside the insertion hole 13 is provided with a guide passage 15 upwardly extending to a junction portion between the head block 180 and the platen roller 193. The end of the guide passage 15 is provided with a guide sheet 16 extending to the neighbourhood of the junction between the head block 180 and the platen roller 193.

[0035] 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.

[0036] If a printing paper 30 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 the peripheral surface of the platen roller 193.

[0037] 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 printing. 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 is discharged outwardly through the exit port 132 while being guided by the guide portion 133.

[0038] To effect printing a power supply switch (not shown) on the side of housing 10 is first turned on, and then a printing paper 30 is inserted through the insertion hole 13 on the front 11 side of the housing 10. The printing paper 30 can be readily inserted because of the cross-sectional horn shape of the insertion hole 13. The printing paper 30 is guided toward the upper guide passage 15 by the guide portion 14.

[0039] 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.

[0040] 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 thereof.

[0041] As the printing operation progresses (line thermal type) 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. The tip of the printing paper 30 is fed toward the exit port 132 while being guided by the guide portion 133 curved toward the front 11 side of the housing 10 and is discharged from the exit port 132.

[0042] When the printing on the printing paper 30 has 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 and rotation of the platen roller 193 stops.

[0043] In the case of a paper jam occurring during the printing operation, the paper jam can be released by the following procedure.

[0044] That is, the cover member 130 is turned in the direction indicated by the arrow (counter clockwise) 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, by which the support shaft 140 attached to the sleeve 120 is also rotated. This causes the three pressurising cams 141 - 143 secured to the support shaft 140 to rotate counter clockwise.

[0045] During rotation of these pressurising cams 141 - 143, the pressurising cam 141 at a third surface 147 moves away from a movable piece 22 of the detecting switch 21. By the removal of pressing force on the mov-

able piece 22, detection is made of opening of the cover member 130 and release of the head block 180.

[0046] At this time, the pressurising cams 141 - 143 pressing the respective pressing pieces 171 - 174 of the leaf spring 170 gradually move such that the second surfaces 145 move away from these pressing pieces 171 - 174, thereby releasing the pressing force on the pressing piece 171 - 174.

[0047] Also, at this time, the pressurising cams 141, 143 provided at respective ends of the support shaft 140 move such that their first cam surfaces 144 depress downward the bend portions 162 of the head unit support arms 160, 161. Due to this depression force, the head unit support arms 160, 161 are rotated counter clockwise about a head block support shaft 150, thereby gradually moving the head block 180 mounted on the head unit support plate 163 away from the platen roller 193.

[0048] The second surfaces 145 of the pressurising 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 a reduction in depression force when the first cam surfaces 144 of the pressurising cams 141, 143 act on the bend piece portions 162. Consequently, the head block 180 is smoothly released due to the rotation of the head unit support plate 163.

[0049] 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 on to leaf spring receiving surfaces 146 of the pressurising cams 141 - 143. The urging force of the pressing pieces 171 - 174 against the leaf spring receiving surface 146 is in a direction corresponding to opening of the cover member 130 (in a counter clockwise direction). Accordingly, the cover member 130 is acted upon by this force and the cover member 130 is held in the open position.

[0050] 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 release a printing paper 30 jammed, for example, between the head block 180 and the platen roller 193.

[0051] Also, since the thermal head 181 is exposed to the opening portion 12 of the housing 10 as stated above, it is easy to perform maintenance such as head cleaning.

[0052] In this manner, in the present embodiment, the pressurising cams 141 - 143 rotate with opening and closing of the cover member 130. Consequently, when the cover member 130 is in a closed position, the leaf spring 170 exerts a force so that the head block 180 is press-contacted with the platen roller 193. When the cover member 130 is in an open position, the leaf spring 170 force is released and the head unit support plate 163 thereby causes the head block 180 to be moved away from the platen roller 193.

[0053] Accordingly, smooth operations are ensured for opening the cover member 130 and releasing the head block 180.

[0054] In the present embodiment, the printer frame 110 is made as a unit incorporating all of the principal parts, such as the 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 pressurising cams 141 - 143 for bringing the head block 180 into and out of contact with the platen roller 193 by interacting with the opening operation of the cover member 130. Accordingly, assembly into the housing 10 is facilitated. Also, the principal parts can be accessed by taking the unit portion out of the housing 10, thus facilitating maintenance such as the exchange of parts.

[0055] In the present embodiment, when the cover member 130 is at an open position, the pressurising cams 141 - 143 through their first cam surfaces 144 depress against the respective bend piece portions 162 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 pressurising cams 141 - 143 move away from the leaf spring 170. Accordingly, the pressing force provided by the second cam surface 145 acting against the leaf spring 170 is released and the first cam surface 144 requires a decreased pressing force for acting on the bend piece portion 162, thus improving operationality.

[0056] 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 pressurising cams 141 - 143 move away from the leaf spring 170 to release the pressing force acting on the leaf spring 170. Thereafter, the pressing pieces 171 - 174 of the leaf spring 170 act against the leaf spring receiving surface 146 of the pressurising cams 141 - 143. Accordingly, the pressing force is added to the opening movement of the cover member 130 to retain the cover member 130 in an open position, requiring no lock mechanism.

[0057] Also, in the present embodiment, the movable piece 22 of the detecting switch 21 is operated by the third cam surface 147 when opening the cover member 130. Accordingly, it is possible to detect with only one detecting switch 21 the opening and closing of the cover member 130 as well as contact and noncontact of the head block with the platen roller. Thus, the number of parts can be reduced.

[0058] As explained above in a line thermal printer according to the present invention, the pressurising cam rotates with opening and closing of the cover member and releases the head block and the pressing force acting thereon. Accordingly, it is possible to improve the operationality of conducting maintenance such as dealing with paper jamming or head cleaning.

Claims

1. A printer apparatus comprising:

   a housing having an opening;
   a platen rotatably arranged within the housing;
   a head block having a printing portion, and arranged to be moveable in and out of contact with the platen roller;
   a resilient biasing means for biasing the head block in to contact with the platen;
   a cover member arranged for opening the opening when open and closing the opening when closed; and
   a cam mechanism arranged to operate with opening and closing of the cover member so that the head block is biased into contact with the platen by the resilient biasing means when the cover member is closed, and when the cover member is open both the head block is moved away from the platen and the resilient biaising means no longer acts to bias the head block into contact with the platen.

2. A printer apparatus according to claim 1, further comprising:
   a printer frame detachably mounted in the housing; the printer frame supporting the platen, a head unit on which is mounted the head block, and the resilient biasing means.

3. A printer apparatus according to claim 1, wherein the cover member has a rotational shaft on which the cam mechanism is mounted.

4. A printer apparatus according to claim 2, wherein the cam mechanism is provided with a first cam surface for acting on a predetermined portion of the head unit when the cover member is open, and a second cam surface for acting on said resilient biasing means when cover member is closed.

5. A printer apparatus according to claim 1, wherein the cam mechanism is provided with a pressing force receiving surface for receiving the biasing force of the resilient biasing means as the cover member is opened.

6. A printer apparatus according to claim 1, wherein the cam mechanism is provided with a third cam surface for actuating a detecting switch as the cover member is closed.

FIG. 1

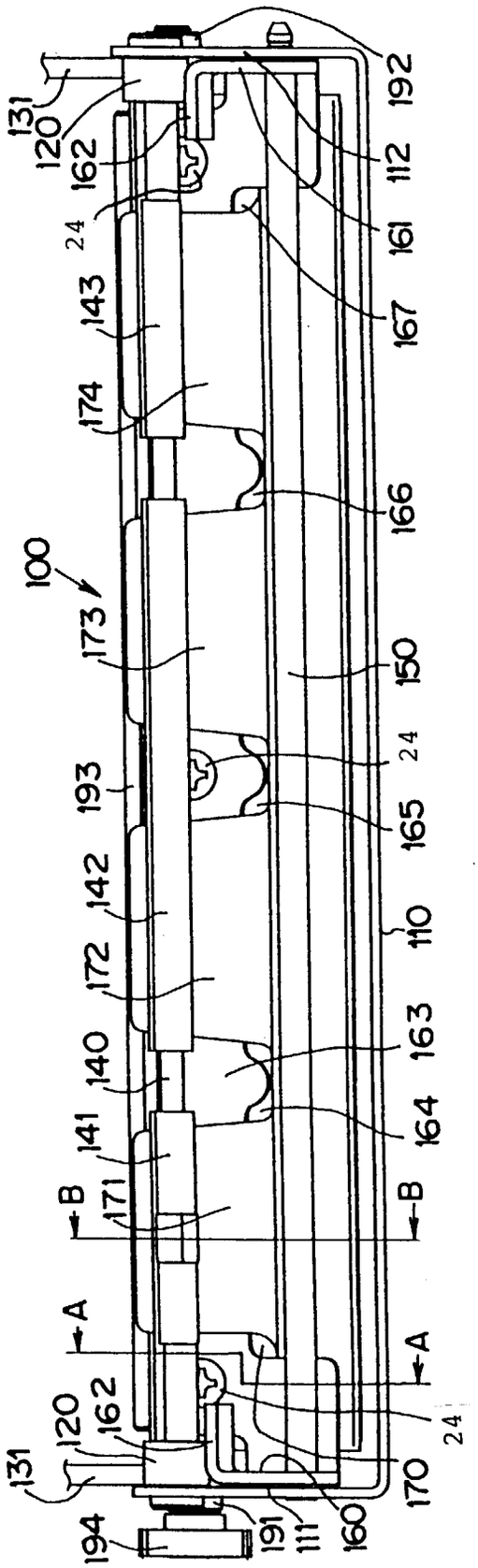
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FIG. 2

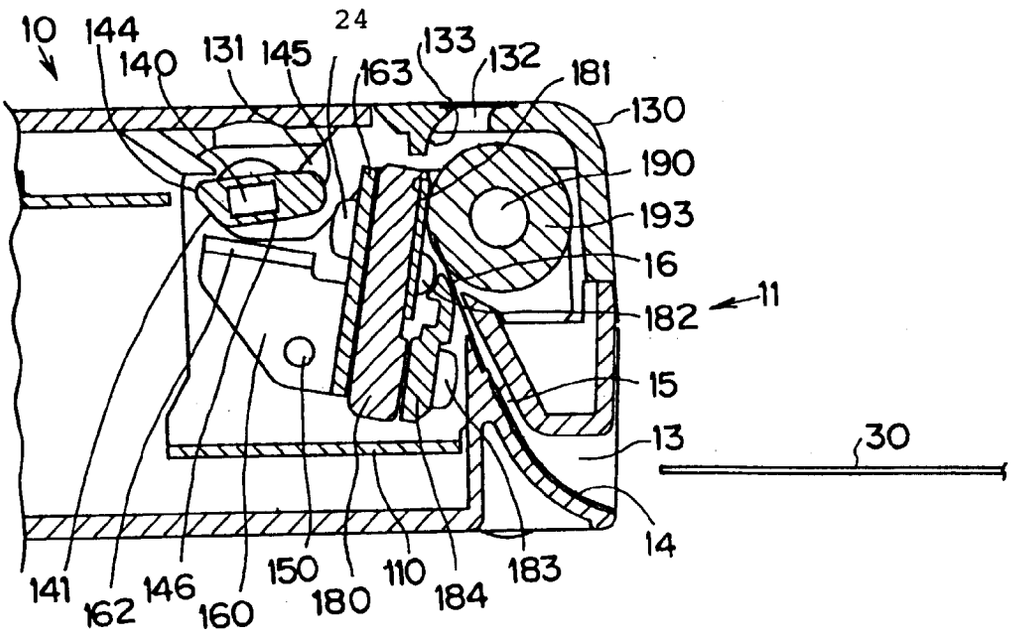
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FIG. 3

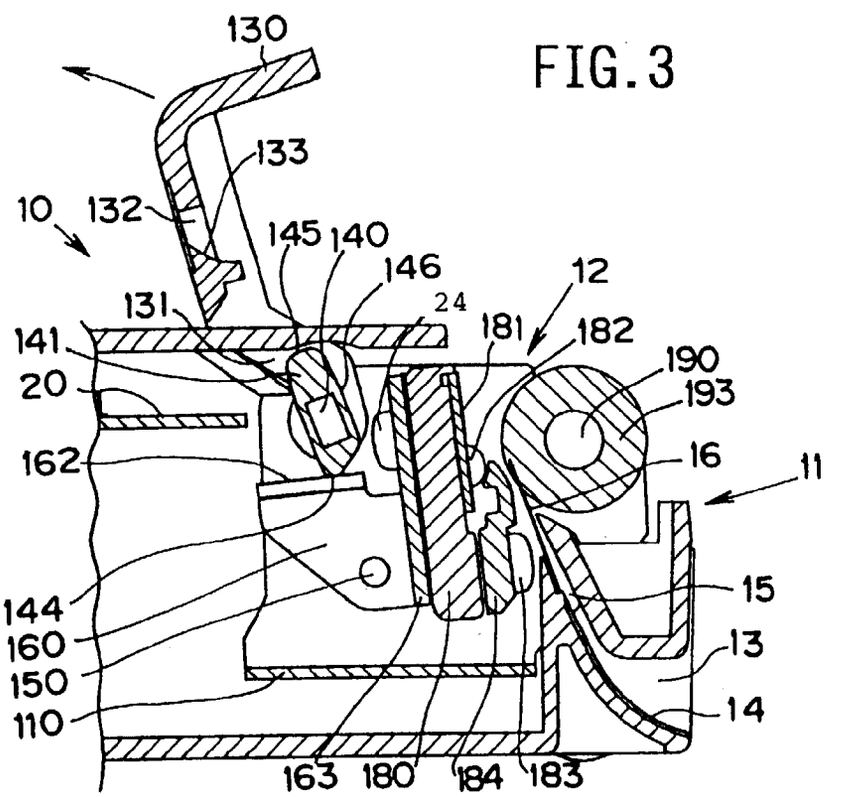
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FIG.4

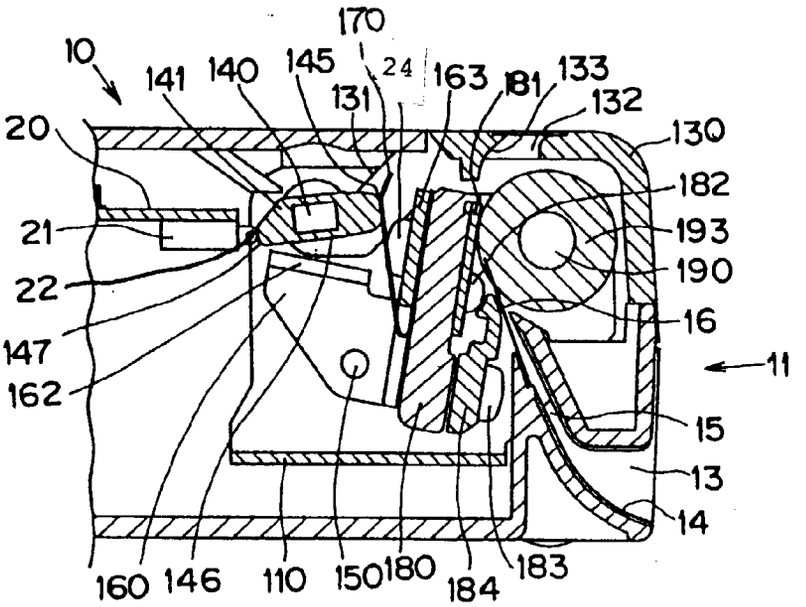
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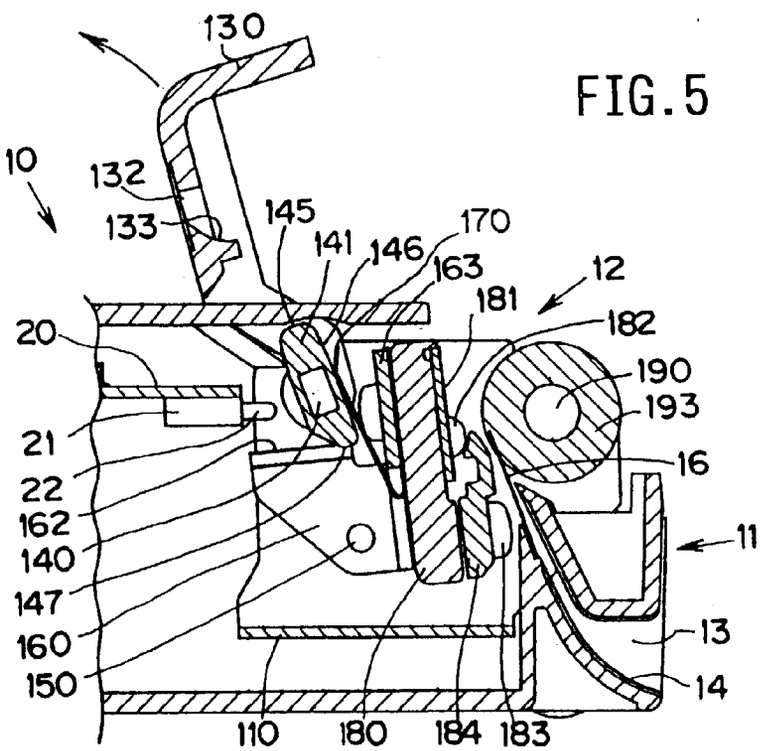
FIG.5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