

12 EUROPEAN PATENT APPLICATION

21 Application number: 85107209.0

51 Int. Cl.⁴: B 41 F 21/04
 B 65 H 5/12

22 Date of filing: 11.06.85

30 Priority: 12.07.84 JP 105492/84 U

43 Date of publication of application:
 15.01.86 Bulletin 86/3

84 Designated Contracting States:
 DE FR GB

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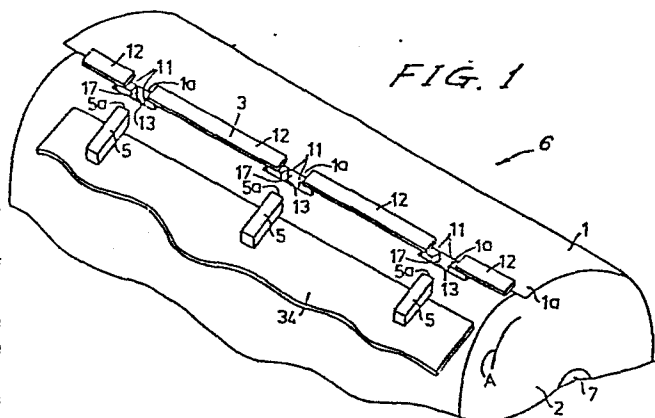
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64 Sheet clamp and release mechanism.

57 A sheet clamp and release mechanism for use in a printer or the like for releasing a sheet of print paper from a platen includes a clamp radially movably mounted on a rotatable cylindrical platen for holding the sheet against an outer peripheral surface of the platen when the clamp is moved radially inwardly toward the platen, a shifter assembly operatively coupled to the platen for shifting the clamp radially outwardly away from the platen when the sheet is to be released from the platen, and guide members disposed adjacent to the outer peripheral surface of the platen for releasing the sheet end from the clamp and platen in response to rotation of the platen. The clamp is composed of a plurality of radially movable displacing members spaced along the platen and a plurality of pressers joined to the displacing members for pressing the sheet down against the platen. The guide members are disposed in circumferential registry with respective slots defined in the displacing members for passing through the slots, respectively, to engage the sheet end to remove the same from the clamp upon rotation of the platen.



- 1 -

TITLE OF THE INVENTION

SHEET CLAMP AND RELEASE MECHANISM

BACKGROUND OF THE INVENTION

The present invention relates to a sheet clamp
5 and release mechanism for use in a printer or the like, and
more particularly to a sheet clamp and release mechanism
capable of releasing a sheet of print paper from a platen
at a high speed and reliably.

Various printing machines or printers are known
10 which print sheets of print paper in a variety of different
ways. One of widely used printing processes is to print a
sheet of paper disposed around a platen while the platen is
being rotated about its own axis in one full revolution.
The conventional printer employing such a platen has a
15 sheet clamp and release mechanism composed of a clamp for
holding one end of the sheet down against the platen.
After the sheet has been printed upon rotation of the
platen in one direction, the platen is stopped and then
rotated again in the opposite direction to allow the sheet
20 to be discharged, from the end opposite to the clamped end,
by feed rollers or the like.

With the prior sheet clamp and release mechanism,
however, the platen has to be stopped temporarily before
the printed sheet is discharged, thus wasting a period of
25 time between the time right after the sheet has been

supplied and the time right before the printed sheet is discharged. Since the platen must be rotated in the opposite directions, the motor for driving the platen suffers a reduced service life, and an electric circuit is necessary for controlling the rotation of the motor in the opposite directions. As a consequence, the conventional sheet clamp and release mechanism is complex and costly to manufacture.

SUMMARY OF THE INVENTION

10 It is an object of the present invention to provide a sheet clamp and release mechanism having a clamp mounted on a platen and movable away from the platen for releasing a sheet of paper from the platen at a high speed and reliably.

15 According to the present invention, there is provided a sheet clamp and release mechanism including a clamp radially movably mounted on a rotatable cylindrical platen for holding the sheet against an outer peripheral surface of the platen when the clamp is moved radially inwardly toward the platen, a shifter means operatively coupled to the platen for shifting the clamp radially outwardly away from the platen to displace an end of the sheet radially outwardly away from the platen when the sheet is to be released from the platen, and a guide means
25 disposed adjacent to the outer peripheral surface of the

- 3 -

platen for releasing the end of the sheet from the clamp and platen in response to rotation of the platen.

For releasing the sheet from the platen, the shifter means is actuated to displace the clamp away from the platen to let the sheet end be displaced radially outwardly from the platen. As the platen is continuously rotated, the guide means engages and removes the sheet end from the clamp to release the sheet from the platen. When the sheet end is released from the clamp, the clamp is readied for clamping an end of a next sheet. Therefore, sheets can be attached to and released from the platen in succession in a reduced period of time while the platen is kept rotated in one direction only. Since a motor for rotating the platen is not required to be reversed in rotation, the motor does not suffer from stresses, the service life thereof is extended, and no control circuit is necessary for rotating the platen in opposite directions. Therefore, the sheet clamp and release mechanism is relatively simple in construction and can be manufactured inexpensively. Inasmuch as a succession of sheets can be printed when the platen is continuously rotated in one direction without interruption or reversal, the rate of printing the sheets can be increased.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be described in detail

- 4 -

by way of illustrative example with reference to the accompanying drawings, in which;

FIG. 1 is a perspective view of a sheet clamp and release mechanism according to the present invention;

5 FIGS. 2 and 3 are fragmentary longitudinal cross-sectional views of the sheet clamp and release mechanism, showing the same in clamping and unclamping positions, respectively;

10 FIGS. 4 and 5 are fragmentary enlarged transverse cross-sectional views of the sheet clamp and release mechanism, illustrating the clamping and unclamping positions of FIGS. 2 and 3, respectively;

FIG. 6 is a cross-sectional view taken along line VI - VI of FIG. 2;

15 FIG. 7 is a cross-sectional view taken along line VII - VII of FIG. 2; and

FIGS. 8 through 10 are schematic side elevational views showing the manner in which a sheet of print paper is released from the platen by the sheet clamp and release
20 mechanism.

DETAILED DESCRIPTION

As shown in FIGS. 1 through 3, a sheet clamp and release mechanism, generally designated by the reference numeral 6, for use in a printer, for example, according to
25 the present invention is essentially composed of a platen 2

of the printer, a clamp 3 mounted on the platen 2, a shifter assembly 4 for shifting the clamp 3 away from the platen 2, and guide members 5 for guiding a printed sheet of paper as it is released from the clamp 3.

The platen 2 is of a cylindrical shape around which a sheet of print paper 1 (FIG. 1) can be wound. The platen 2 is supported on a shaft 7 for rotation therearound, the shaft 7 being rotatably supported by means of bearings 9 (only one shown in FIGS. 2 and 3) on a chassis 8 of the printer. The shaft 7 is operatively coupled to a suitable driving unit (not shown) such as a geared motor and can be rotated thereby at a constant speed in the direction of the arrow A (FIG. 1). A pad 10 of rubber is fixedly disposed around the peripheral surface of the platen 2 for preventing the attached sheet 1 from being displaced or slipped off position and also for giving the sheet 1 a resilient backing support for allowing a print head (not shown) to contact the sheet 1 thoroughly for producing clearer printed characters and/or images.

The clamp 3 is mounted on the outer peripheral surface of the platen 2 and extends parallel to the shaft 7, the clamp 3 being movable radially toward and away from the platen 2. The clamp 3 comprises a plurality (three in the illustrated embodiment) of displacing members 11 spaced in the axial direction of the platen 2 and movable toward

- 6 -

and away from the platen 2, and a plurality of elongate
pressers 12 joined to the displacing members 11 in line
with each other in parallel relation to the shaft 7 for
pressing an end 1a of the sheet 1 down against the rubber
5 pad 10.

The displacing members 11, when displaced toward
the platen 2, are fitted respectively in holders 13 mounted
in the platen 2. When the displacing members 11 are moved
away from and toward the platen 2, they are slidably guided
10 by the holders 13, respectively. As illustrated in FIGS. 4
and 5, the holders 13 have respective holes 14 defined by
tubular members 14a projecting radially inwardly toward the
central axis of the platen 2. Levers 15 are mounted
respectively on the displacing members 11 and project
15 radially inwardly into the platen 2 toward the shaft 7
through the respective holes 14 of the holders 13. The
levers 15 have flanges 15a, respectively, positioned on
radially inward ends thereof. The displacing members 11
are normally urged to move radially inwardly into the
20 platen 2 under the resilient forces of compression coil
springs 16 disposed around the tubular members 14a between
the flanges 15a and the bottoms of the holders 13.

Two of the pressers 12 are disposed between the
three displacing members 11, and the other two pressers 12
25 are positioned at axial ends of the platen 2. The pressers

12 are fixed to radially outward ends of the displacing members 11 and movable therewith radially inwardly and outwardly of the platen 2. When the displacing members 11 are moved to their radially inward position, the pressers 5 12 are depressed against the rubber pad 10. The displacing members 11 have substantially central slots 17, respectively, opening radially outwardly for allowing the guide members 5 to move therethrough across and past the clamp 3 without colliding with it when the clamp 3 is in 10 its radially outward position. As shown in FIGS. 4 and 5, the displacing members 11 and the pressers 12 jointly have a gripper 18 defined therebetween where they are fixed to each other, the gripper 18 serving to grip the end 1a of the sheet 1 therein. The gripper 18 is in the form of a 15 mouth defined between the pressers 12 and slanted surfaces 11a of the displacing members 11, the mouth being progressively opened in one circumferential direction of the platen 2 for allowing the sheet end 1a to be easily inserted into the gripper 18.

20 The clamp 3 is moved radially outwardly away from the platen 2 by the shifter assembly 4 when the sheet 1 is to be attached to and released from the platen 2.

 As illustrated in FIGS. 2, 4 and 5, the shifter assembly 4 is generally composed of a pusher ring 19 25 mounted on the shaft 7 adjacent to one of the bearings 9

and spaced axially from the platen 2, and a cam mechanism 20 disposed in the platen 2. The pusher ring 19 which is substantially in the form of a hollow cylinder has a central hole 21 through which the shaft 7 extends. The
5 pusher ring 19 is axially movable but nonrotatable with respect to the shaft 7. The pusher ring 19 has a pair of pins 22a, 22b projecting radially outwardly from its outer periphery in diametrically opposite relation to each other.

The pins 22a, 22b are operatively coupled to levers 23a, 23b, respectively. Since the levers 23a, 23b are identical to each other in construction and operation, only the lever 23a is shown in FIGS. 6 and 7 and will be described.

In FIGS. 6 and 7, the lever 23a is pivotally supported at its intermediate portion by a pivot shaft 25
15 on a bracket 24 mounted on the chassis 8. The lever 23a has a substantially U-shaped recess 26 defined in one end thereof, the pin 22a being slidably fitted in the recess 26. The lever 23a also has an aperture 27 defined in an opposite end thereof and to which an arm 28 (shown by the
20 two-dot-and-dash line) of a solenoid 28a, for example, is connected. The arm 28 is movable in the direction of the arrow B when the solenoid 28a is energized. Therefore, in response to energization of the solenoid 28a, the arm 28 turns the lever 23a clockwise (FIGS. 6 and 7) about the
25 pivot shaft 25 to the position of FIG. 7 for moving the

- 9 -

pusher ring 19 by means of the pin 22a axially on the shaft 7 toward the platen 2.

As shown in FIGS. 2 and 3, the cam mechanism 20 mounted in the platen 2 includes a rod 29 supported axially on the platen 2 for rotation therewith and extending along the shaft 7, and a plurality of shifter cams 30 mounted on the rod 29 at spaced intervals equal to the intervals at which the displacing members 11 are spaced. The rod 29 is supported axially slidably on brackets 31 fixedly disposed in the platen 2 and held in radial alignment with the levers 15 of the displacing members 11. The rod 29 has one end 29a projecting axially out of the platen 2 slidably through a hole 32 defined in an axial end of the platen 2, the end 29a being held against an annular end surface 19a of the pusher ring 19 before the pusher ring 19 is axially moved toward the platen 2. The end 29a of the rod 29 is covered with a wear-resistant cap 29b of a slippery material held slidably against the end surface 19a of the pusher ring 19 so that the rod end 29a can smoothly slide on the end surface 19a while the rod 29 is rotating with the platen 2.

The shifter cams 30 mounted on the rod 29 have slanted cam surfaces 30a, respectively, inclined radially inwardly in a direction away from the pusher ring 19. The radially inward ends of the levers 15 are held in sliding

contact with the slanted cam surfaces 30a, respectively.
A compression coil spring 33 is disposed around the rod 29
between one of the brackets 31 and one of the cams 30 for
normally urging the cams 30 and hence the rod 29 to move
5 toward the pusher ring 19. The cams 30 are attached to the
rod 29 and contact the levers 15 such that when the pusher
ring 19 is in the position shown in FIG. 2 prior to its
movement toward the platen 2, the radially inward ends of
the levers 15 are positioned on the radially innermost or
10 bottom portions of the slanted cam surfaces 30a close to
the rod 29.

The sheet clamp and release mechanism 6 of the
foregoing construction will operate as follows: For
attaching the sheet 1 to the platen 2 or removing the sheet
15 1 from the platen 2, the solenoid 28 is energized the
pusher ring 19 is moved in the direction of the arrow C by
the levers 23a, 23b as shown in FIG. 6 to push the end 29a
of the rod 29 as illustrated in FIG. 7. The rod 29 is
axially moved in the direction of the arrow D in FIG. 2
20 against the resilient force of the spring 33, causing the
slanted cam surfaces 30a to shift the levers 15 radially
outwardly for moving the displacing members 11 radially
outwardly out of the holders 13. Therefore, the clamp 3 is
moved radially outwardly away from the platen 2 as shown in
25 FIGS. 3 and 5. When the cam mechanism 20 is rotated with

- 11 -

the platen 2, the cap 29b on the rod end 29a slides on the annular end surface 19a of the pusher ring 19. As a consequence, the axial movement of the pusher ring 19 is smoothly transmitted to the rod 29 to shift the clamp 3

5 radially outwardly without fail. At the time the clamp 3 is in the radially outward position, the outer ends 11b, at the mouth opening, of the slanted surfaces 11a of the displacing members 11 which define the mouth of the gripper 18 are positioned substantially in alignment with the outer

0 peripheral surface of the rubber pad 10, as shown in FIG. 5. When attaching the sheet 1 to the platen 2, therefore, the end 1a of the sheet 1 can smoothly be guided along the rubber pad 10 and the slanted surfaces 11a into the gripper 18. The end 1a of the sheet 1 thus inserted in the gripper

5 18 is clamped by the clamp 3 when the solenoid 28 is de-energized to move back the cams 30 for allowing the levers 15 to move radially inwardly to the position shown in FIGS. 2 and 4. When removing the sheet 1 from the platen 2, the end 1a of the sheet 1 is positioned more radially outwardly

) than the outer peripheral surface of the rubber pad 10 since the clamp 3 has been displaced radially outwardly, as shown in FIG. 5.

As illustrated in FIG. 1, the guide members 5 are supported on an end of a plate 34 fixed to the chassis of the printer and spaced slightly radially outwardly from the

platen 2 (see FIGS. 4 and 5). The guide members 5 are spaced along the platen 2 in circumferential registry with the respective slots 17, and are smaller in width than the corresponding slots 17. When the clamp 3 is in its
5 radially outward position, the guide members 5 can pass through the slots 17, respectively, upon rotation of the platen 2 for releasing the end 1a of the sheet 1 from the platen 2. The guide members 5 have distal ends 5a located more radially inwardly than the end 1a of the sheet 1 as it
10 is displaced radially outwardly by the clamp 3 as shown in FIG. 5.

FIGS. 8 through 10 show the manner in which the sheet 1 is released from the platen 2 while the platen 2 is in rotation.

15 When the sheet 1 is printed on the platen 2 while the platen 2 is being rotated, the clamp 3 is displaced radially inwardly to hold the sheet end 1a against the platen 2 as shown in FIG. 8.

For releasing the sheet 1, the solenoid 28 is
20 energized to enable the shifter assembly 4 to move the clamp 3 radially outwardly away from the platen 2, thus displacing the sheet end 1a more radially outwardly than the distal ends 5a of the guide members 5 as indicated by the dotted line in FIG. 9. When the platen 2 is rotated in
25 the direction of the arrow A, the guide members 5 pass

- 13 -

respectively through the slots 17 in the clamp 3 and engage the sheet end 1a. Continued rotation of the platen 2 enables the guide members 5 to remove the sheet end 1a out of the gripper 18 and hence from the platen 2, whereupon
5 the sheet 1 is guided slidably onto the guide members 5 and the plate 34, from which the sheet 1 will be discharged out of the printer.

Therefore, the sheet 1 can be released from the platen 2 and discharged out of the printer at a high speed
10 and reliably without fail while the platen 2 is continuously rotated in one direction. When the sheet 1 is released from the platen 2 as shown in FIG. 10, the clamp 3 is readied for clamping a next sheet of paper on and around the platen 2. Accordingly, a succession of sheets can
15 speedily be attached to and released from the platen 2 for printing operation at a higher rate of speed.

Although a certain preferred embodiment of the present invention has been shown and described in detail, it should be understood that various changes and
20 modifications may be made therein without departing from the scope of the appended claims.

- 14 -

We claim:

1. A sheet clamp and release mechanism comprising:

(a) a rotatable cylindrical platen for supporting a sheet around an outer peripheral surface thereof;

5 (b) a clamp radially movably mounted on said platen for holding said sheet against said outer peripheral surface of said platen when said clamp is moved radially inwardly toward said platen;

(c) shifter means operatively coupled to said
10 platen for shifting said clamp radially outwardly away from said platen to move an end of said sheet radially outwardly away from said platen when said sheet is to be released from said platen; and

(d) guide means disposed adjacent to said outer
15 peripheral surface of the platen for releasing said end of the sheet from said clamp and platen in response to rotation of said platen.

2. A sheet clamp and release mechanism according to
20 claim 1, wherein said clamp comprises a plurality of displacing members spaced axially along said platen and movable radially toward and away from said platen, and a plurality of pressers joined to said displacing members and extending in line with each other axially along said platen
25 for pressing said sheet end against said outer peripheral

- 15 -

surface of said platen.

3. A sheet clamp and release mechanism according to claim 2, wherein said platen supports a plurality of axially spaced holders mounted on said outer peripheral surface thereof, said displacing members being slidably guided by said holders, respectively, when said displacing members are moved toward and away from said platen.

10 4. A sheet clamp and release mechanism according to claim 2, wherein said displacing members and pressers jointly define therebetween a gripper in the form of a mouth opening in a circumferential direction of said platen for insertion therein of said end of the sheet.

15

5. A sheet clamp and release mechanism according to claim 4, wherein said displacing members have slanted surfaces partly defining said gripper and inclined radially inwardly in said circumferential direction, said slanted surfaces having ends at an opening of said mouth which are aligned with said outer peripheral surface of the platen when said clamp is displaced radially outwardly away from said platen.

20 6. A sheet clamp and release mechanism according to

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- 16 -

claim 2, wherein said clamp includes a plurality of springs acting on said displacing members for normally urging said displacing members to move radially inwardly toward said platen.

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7. A sheet clamp and release mechanism according to claim 2, wherein said displacing members have respective levers projecting radially inwardly into said platen, said shifter means comprising a plurality of shifter cams
10 disposed in said platen and movable axially therein for shifting said levers radially outwardly to displace said displacing members radially outwardly away from said platen.

15 8. A sheet clamp and release mechanism according to claim 7, including a shaft on which said platen is mounted for rotation thereabout, said shifter means further including a pusher ring axially movably but nonrotatably mounted on said shaft, a rod axially movably mounted on said
20 platen and having one end held in sliding contact with an end surface of said pusher ring, said shifter cams being mounted on said rod, and a solenoid energizable for axially moving said pusher ring to move said rod and said shifter cams thereof for displacing said displacing members
25 radially outwardly away from said platen.

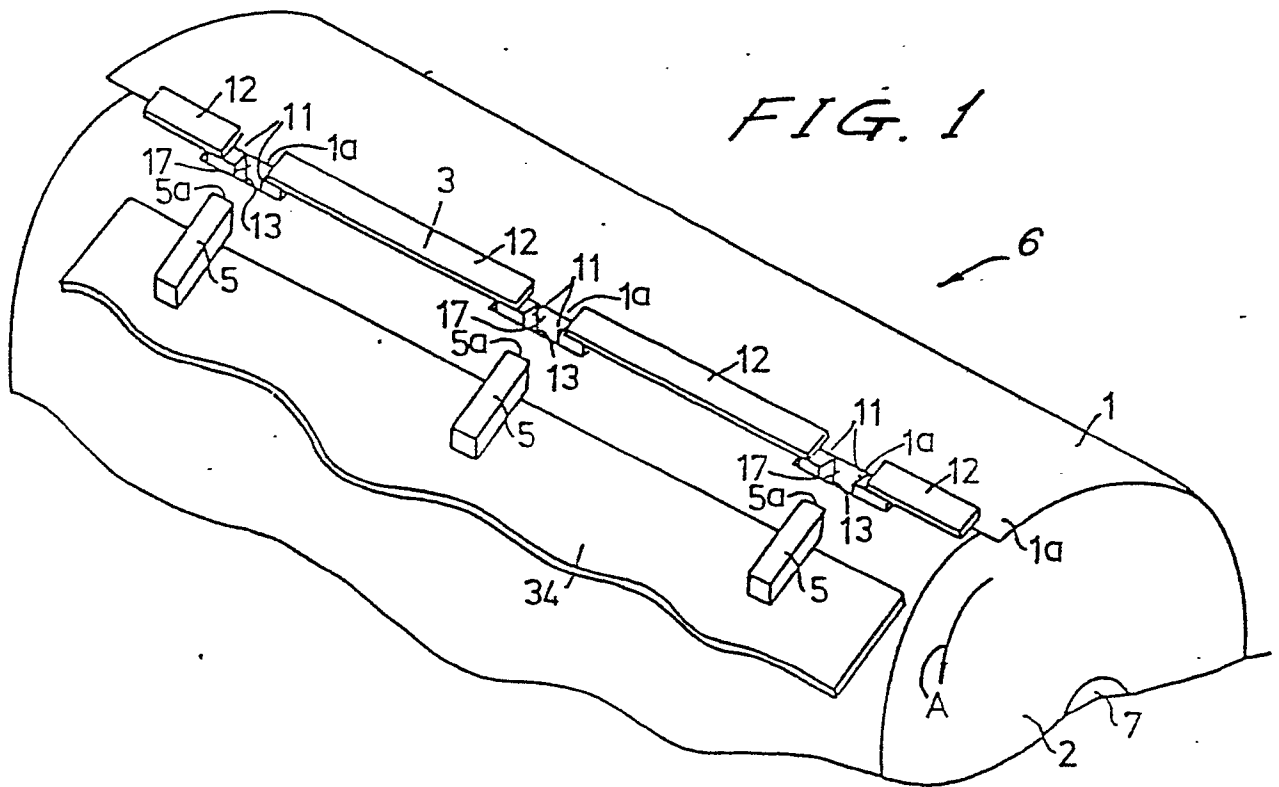
- 17 -

9. A sheet clamp and release mechanism according to claim 8, wherein said shifter means also includes a spring acting between said platen and one of said cams for normally urging said rod to move said cams in a direction
5 to displace said displacing members radially inwardly toward said platen.

10. A sheet clamp and release mechanism according to claim 2, wherein said displacing members have slots,
10 respectively, opening radially outwardly, said guide means comprising a fixed plate and a plurality of guide members mounted on said fixed plate at spaced intervals in circumferential registry with said slots for passing
respectively through said slots in response to rotation of
15 said platen for engaging said sheet end to remove the same from said clamp.

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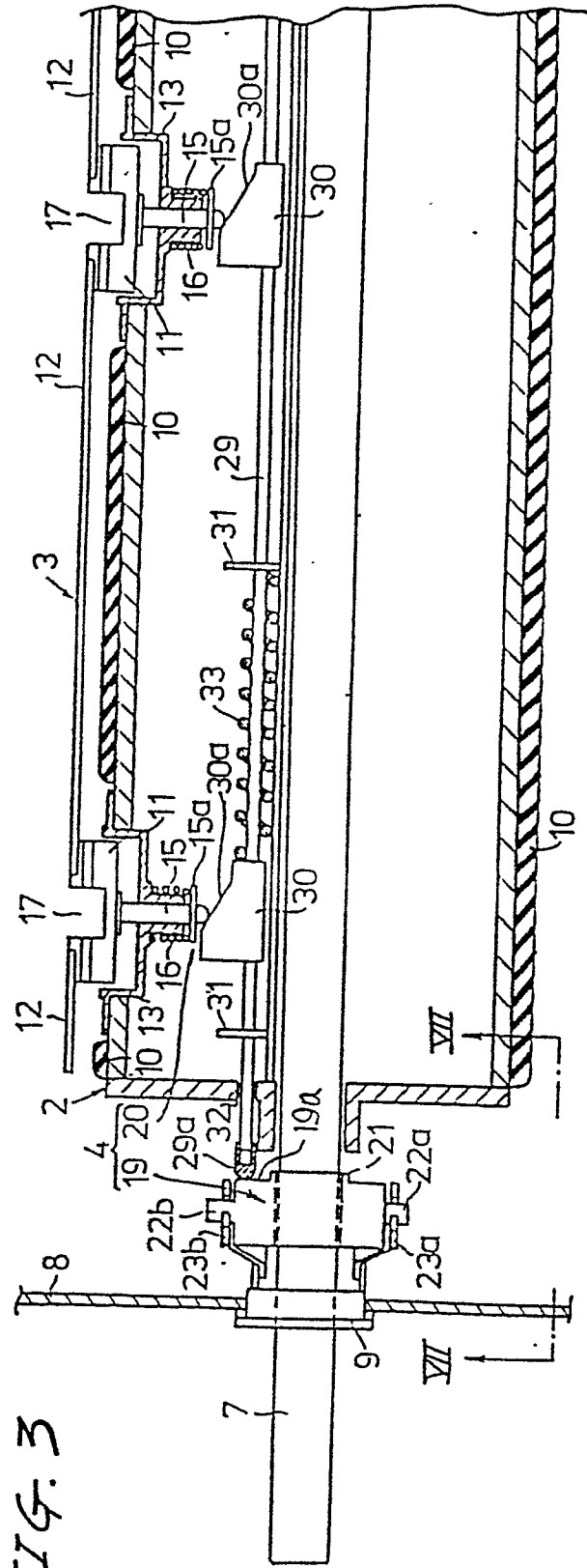
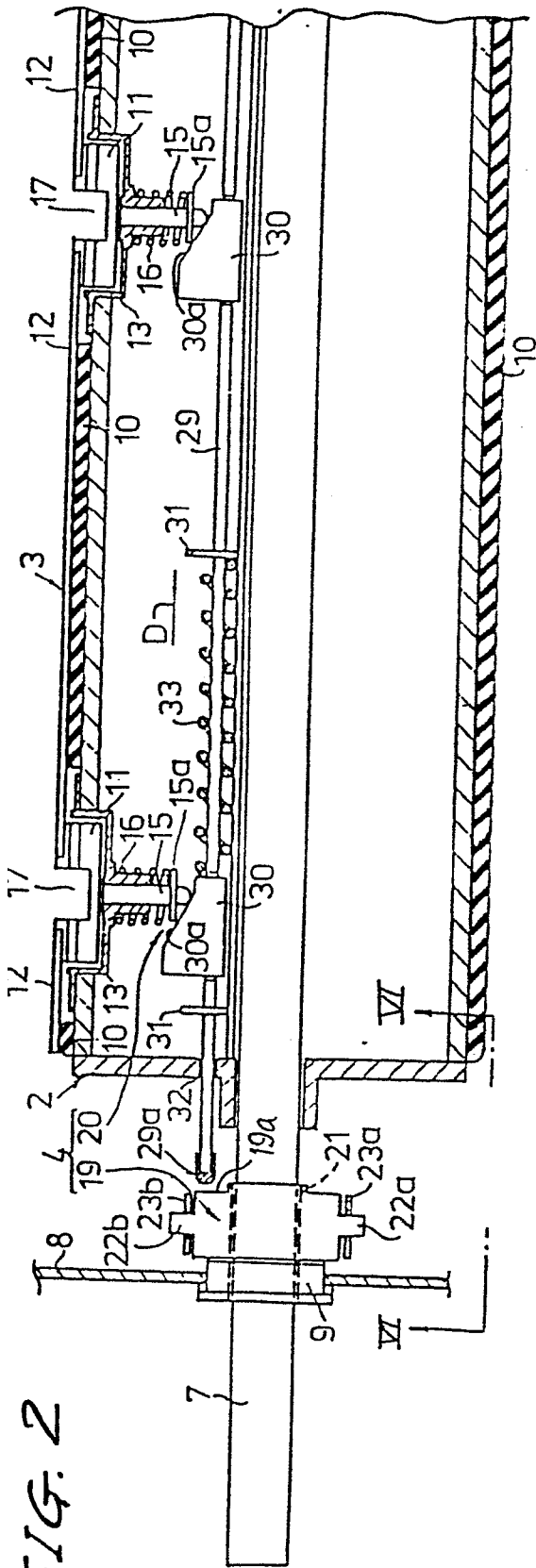


FIG. 4

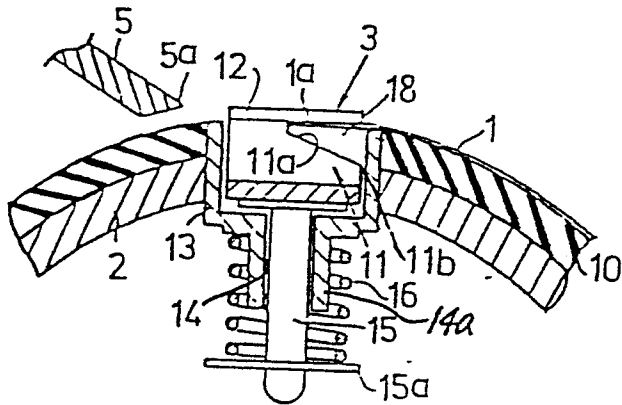


FIG. 5

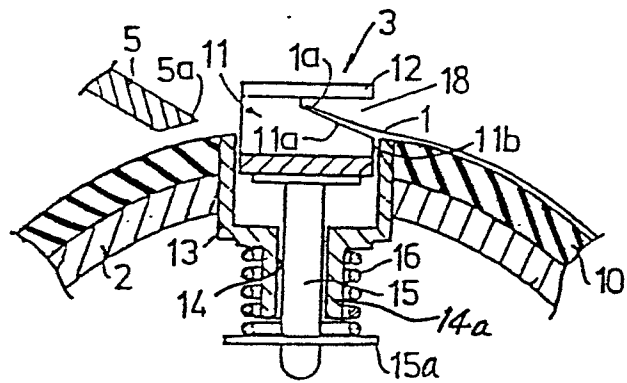


FIG. 6

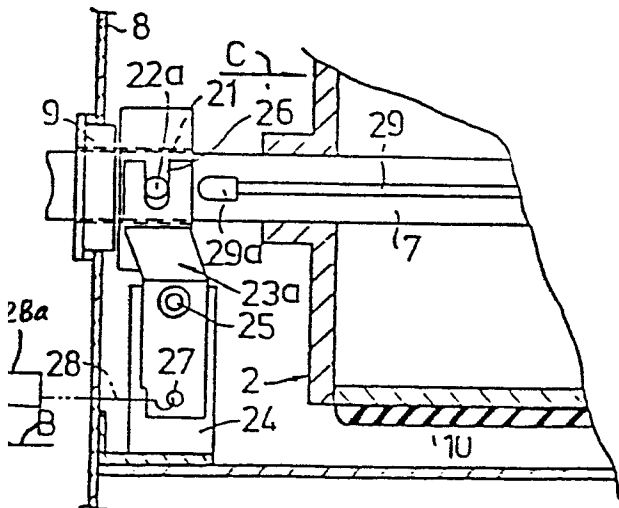
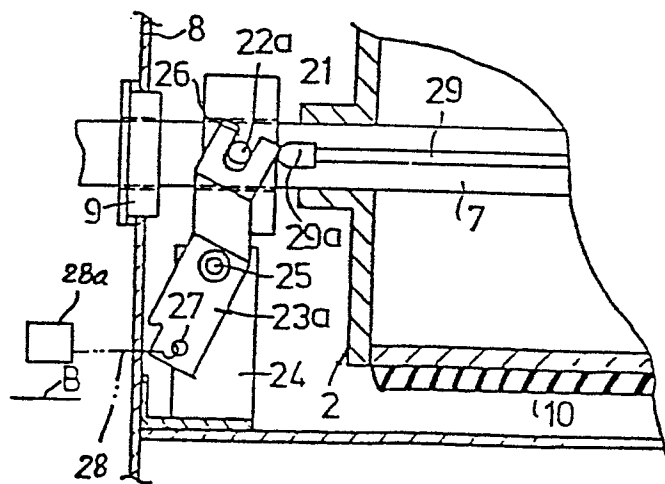


FIG. 7



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FIG. 8

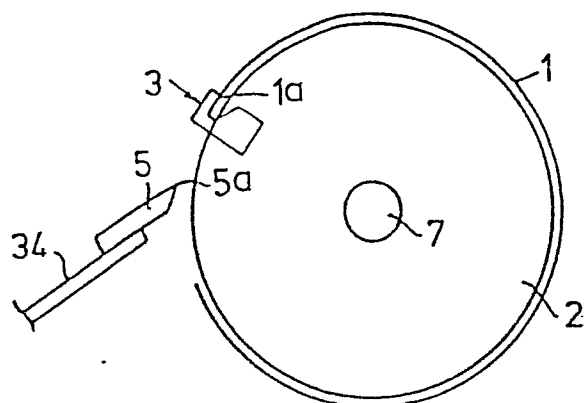


FIG. 9

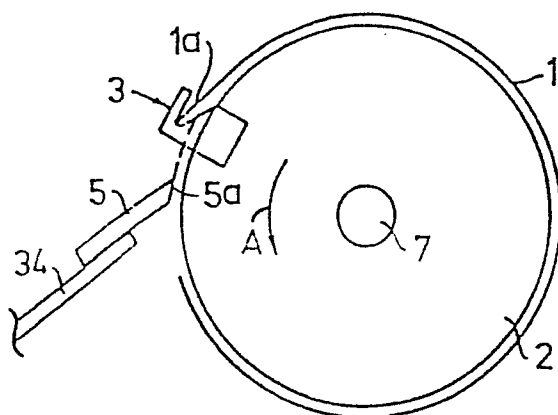


FIG. 10

