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(54) Thermal printer particularly for labels.

(57) A thermal printer, particularly for labels, of the type using a continuous band of heat-sensitive material (19) to print on a paper web (5), the band of heat-sensitive material (19) and the paper web (5) being made to pass between a thermal head (10) and a print roller (9), and being driven by separate motors, so that feeding of the band of heat-sensitive material (19) can be stopped at the end of each printing phase, means being provided to move the head (10) away from the roller (9) each time the band of heat-sensitive material (19) is stopped.

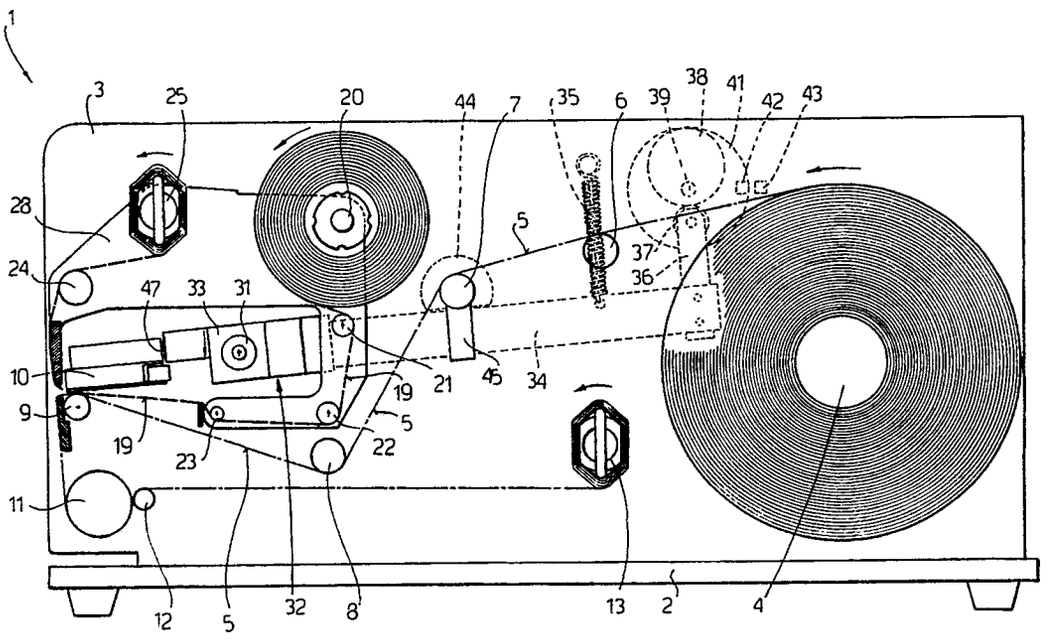

FIG. 1

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THERMAL PRINTER PARTICULARLY FOR LABELS

The subject of the present invention is a thermal printer using a continuous band of heat-sensitive material on which selected points are heated to print on a suitable support, normally a paper web. The invention also concerns a procedure for optimizing use of the band of heat-sensitive material.

Printers of the above type are already known and are used in a wide variety sectors.

In the present description, for the sake of simplicity only, specific reference will be made to label printing, for example printing bar codes on labels that are fed as a continuous web and are rewound by the machine after printing, it being understood that they may also be "burst" immediately after printing, without being rewound.

The band of heat-sensitive material consists of a thin film of plastic material with a coating of waxy ink which, by means of a special thermal head, is brought to melting temperature and transferred to the paper web, with which it is in contact at least during printing.

In the known printers, the band heat-sensitive material and the paper web are fed simultaneously, even when the thermal head is not printing. This results in a considerable waste of heat-sensitive material which, in view of its characteristics, is much more costly than the paper web.

The aim of the invention is to optimize use of a band of heat-sensitive material in a printer of the above type.

Another aim of the invention is to achieve this optimization with extremely simple and reliable means.

According to the invention the band of heat-sensitive material is fed only during printing on the paper web and is stopped at the end of each printing phase.

The band of heat-sensitive material and the paper web are therefore driven by separate motors and means are provided for lifting the head away from the print roller against which it presses the band of heat-sensitive material and the paper web during the operating phase.

These means preferably consist of a pivoted lever operated by a stepping motor to which the head is made fast.

The stepping motor permits perfect synchronization of the movement of the head and that of the band of heat-sensitive material, and is provided with means of resetting the head position each time the machine is started up.

The printer according to the invention is preferably of the cantilever type, i.e. with the various operating parts supported on pivots or shafts projecting from a vertical side panel. Since it is easier in this type of printer for the head to shift out of line with the print roller, means are provided for regulating the print head and in particular for keeping the print head axis always perfectly parallel to the generatrices of the print roller.

Further features of the invention will become clearer from the detailed description that follows, which refers to a purely exemplary and therefore non-limiting embodiment, illustrated in the attached drawings, in which:

Figure 1 is a side view of a thermal printer according to the invention, without the outer casing and showing in broken lines part of the head driving means which are not on view;

Figure 2 is a view of the printer from the opposite side with respect to figure 1;

Figure 3 is a plan view from above of the printer in figures 1 and 2.

With reference to these figures, number 1 indicates the printer according to the invention as a whole, including a base 2 and a vertical side panel 3 in the form of a rectangular plate.

Projecting spindles or shafts are fixed to the side panel 3 to support the various operating parts of the printer, and also to drive the paper web and the band of heat-sensitive material, as will now be described.

In particular, an idle shaft 4 is provided on the right-hand side of the printer with reference to figures 1 and 3, onto which a paper web 5 is loaded for printing. The paper web 5, whose path is indicated by broken lines in figure 1, passes over guide rollers 6, 7 and 8, over a motor-driven rubber roller 9, opposed to the thermal head 10 which will be described later, then over another motor-driven roller 11, with which a tape tension roller 12 may cooperate, and is then rewound on a roller 13, also motor-driven. The rollers 9, 11 and 13 are driven by the same motor 14, the shaft 15 of which drives the rollers 9 and 11 by means of a timing belt 16 which passes over a tension roller 17, and the paper rewind roller 13 by means of an elastic belt 18. The roller 9 has a free wheel coupling so that if necessary rollers 9 and 11 can turn at different speeds, depending on whether the printed labels are to be rewound onto the rewinding roller 13 or "burst" after printing.

The roll of heat-sensitive material, indicated by number 19, is mounted on the idle shaft 20. The path of the band of heat-sensitive material 19 is also indicated by dashes and dots in figure 1, in which it can be seen that it passes first over guide rollers 21, 22, 23, between the head 10 and the rubber print roller 9 and then over another guide

roller 24 to be rewound on a motor-driven roller 25. The roller 25 is driven by a motor 26 by means of a belt transmission 27 (see figure 3).

As can be seen from figure 1, the entire path of the band of heat-sensitive material 19 passes over that of the paper web 5. Preferably, the whole assembly for the band of heat-sensitive material 19, in particular the elements indicated by reference numbers 19 to 25, are contained in a cartridge with two opposed side plates 28 and 29, which can be mounted on the side panel 3 by means of appropriate guide spindles projecting from the side panel or borne on the cartridge. In particular, the guide roller 24 provided on the cartridge is tube-shaped, so that it can accommodate a guide spindle mounted to project from the side panel 3, whilst a projecting hollow spindle 31 is fixed on the outer side panel 29 of the cartridge and fits into a hollow spindle 31 in the side panel 3 of the printer (see figure 3). However, the cartridge containing the roll of heat-sensitive material is not covered specifically by this invention, therefore the spindles from 20 to 25 can be considered integral with the side panel 3 of the printer.

According to the invention, the thermal head 10 is mounted at the end of a lever 32 pivoted around the spindle 31. In particular, the lever 32 includes a plate 33 which supports the printhead 10 pivoted around the spindle 31 and a rod 34 extending from the back of the side panel 3 and subject at an intermediate point to the action of elastic means, in particular a spring 35 which tends to keep the rod 34 raised, thus keeping the head 10 lowered onto the print roller 9.

At the end of the rod 34 an arm 36 is provided with an end roller 37 in contact with the edge of a cam 38 mounted on the shaft 39 of a stepping motor 40. The cam 38 has an outer flange 41 integral with it, with a perfectly circular edge concentric with the shaft 39 of the motor 40.

In figure 1 the thermal head 10 is shown in the printing position, i.e. lowered onto the rubber roller 9, against which it presses the paper web 5 and the band of heat-sensitive material 19. A rotation of the cam 38 causes the rod 34 to be lowered and thus raises the head 10 disposed on the opposite side with respect to the fulcrum 32, as shown for example in figure 2.

To bring the stepping motor 40 into the exact reset position each time the machine is started up, special locators are provided, consisting for example of a permanent magnet 42 and a Hall effect sensor made fast respectively to the flange 41 and the side panel 3 of the printer or vice versa.

The head 10 can also be raised manually, to a greater extent than that permitted by the cam 38, by means of a cam 44 which acts on top of the rod 34 and can be operated by means of a lever 45, provided at the free end of a spindle 46 made fast to the cam 44 and passing through the drive roller 7 of the paper web 5. This manual raising of the head is normally carried out when the roll of heat-sensitive material 5 and/or the paper web 19 are replaced.

From what has been described, it will be obvious how the invention operates.

Considering that the motors 14, 25 and 40 are governed by a control logic that operates to pre-set programs according to the printing operation to be performed, when the machine is started up, the stepping motor 40 automatically moves to the reset position identified by the magnets 42 and 43.

During the actual printing phase, the motors 14 and 26 are both operated to feed the paper web 5 and the band of heat-sensitive material 19 respectively. As soon as there are "gaps" in the printing, while the motor 14 continues to feed and rewind the paper web 5, the motor 26 is stopped to halt feeding of the band of heat-sensitive material 19, and at the same time the stepping motor 40 causes the head 10 to be raised by means of the cam 38. It has been found that the use of a stepping motor 40 to raise the head 10 has great advantages over other systems in that the movement of the head and that of the band of heat-sensitive material 19 can be perfectly synchronized.

From figure 3 it can be seen that the head 10 is mounted on the supporting plate 33 by means of a spindle 47 the axis of which is perpendicular to the axis of the print roller 9, so that the head can oscillate around said spindle and be regulated if necessary so that its plane is perfectly parallel to the axis of the roller 9.

Moreover, according to a characteristic of the printer according to the invention, a slit 48 is made in the supporting plate 33 of the head parallel to the axis of the print roller 9 and such as to define a protruding block 49 to which the spindle 47 supporting the head 10 is fixed. The slit 48 has a widening 50 at the end, thus imparting a certain elasticity to the block 49, the position of which can be adjusted relative to the body of the plate 33 by means of an adjusting screw 51 which produces a rotation of the head around a substantially vertical axis at right angles to the axis of the print roller 9. Therefore, by turning the operating screw 51, the axis of the head can be brought perfectly parallel to the generatrices of the roller 9, thus achieving perfect adjustment of the azimuth of the head.

Obviously the invention is not limited to the particular embodiment described above and illustrated in the attached drawings but numerous changes can be made to its details without departing from the scope of the invention.

Claims

1. A process for optimizing use of a band of heat-sensitive material (19) in a thermal printer in which said band of heat-sensitive material and a web of the material to be printed (5) are fed between a thermal head (10) and a print roller (9), characterized in that provision is made for the band of heat-sensitive material (19) to be stopped at the end of each printing phase.

2. A process according to claim 1, characterized in that the band of heat-sensitive material (19) and the web of material to be printed (5) are driven by separate motors.

3. A process according to claim 1 or 2, characterized in that provision is made for the thermal head (10) to be moved away from print roller (9) each time feeding of the band of heat-sensitive material (19) is stopped.

4. A process according to claim 3, characterized in that the head (10) is driven by a stepping motor (40).

5. A thermal printer, of the type using a band of heat-sensitive material (19) to print on a web (5), of paper for example, the band of heat-sensitive material (19) and the web (5) being passed between a thermal head (10) and a print roller (9), characterized in that two separate motors (26, 14) are provided to feed the band of heat-sensitive material (19) and the paper web (5), the motor (26) being blocked to stop feeding of the band of heat-sensitive material (19) at the end of each printing phase.

6. A printer according to claim 5, characterized in that means are provided for driving the head (10), in particular to move the head (10) away from the print roller (9) each time the motor (26) controlling feeding to the band of heat-sensitive material (19) is stopped.

7. A printer according to claim 6, characterized in that said means of driving the head (10) are controlled by a stepping motor (40).

8. A printer according to any one of claims 5 to 7, characterized in that the head (10) is mounted at the end of a lever (32) pivoted around spindle (33) at the other end of which a cam (38) of said stepping motor (40) is brought into engagement by elastic means (35).

9. A printer according to any one of claims 5 to 8, characterized in that locators (42, 43) are provided to bring the stepping motor (40) into the reset position, these locators consisting in particular of a permanent magnet and a Hall effect sensor, one made fast to the shaft (39) of the stepping motor (40) and the other made fast to the fixed structure of the printer, or vice versa.

10. A printer according to any one of claims 5 to 9, characterized in that provision is made for a cam (44) acting on a lever (32), that can be operated manually to move the head (10) away from the roller (9).

11. A printer according to any one of claims 1 to 10, characterized in that the band of heat-sensitive material (19) is loaded into a re-usable cartridge.

12. A printer according to any one of claims 5 to 11, characterized in that the head (10) is supported on a plate (33) of the lever (32) pivoted around said spindle (31), the bond between the head (10) and the supporting plate (33) being such that the axis of the head can be adjusted in two planes at right angles to each other and both parallel to the axis of the print roller (9), so that it can be brought perfectly parallel to the axis of the roller (9).

13. A printer according to claim 12, characterized in that a slit (48) is made in said plate (33) parallel to the axis of the print roller (9), open at one end and widening at the other end (50), said skit defining a protruding block (49), to which the head (10) is hinged, the position of the block (49) and thus of the head (10) being adjustable relative to the body of the plate (33) by means of an adjusting screw (51).

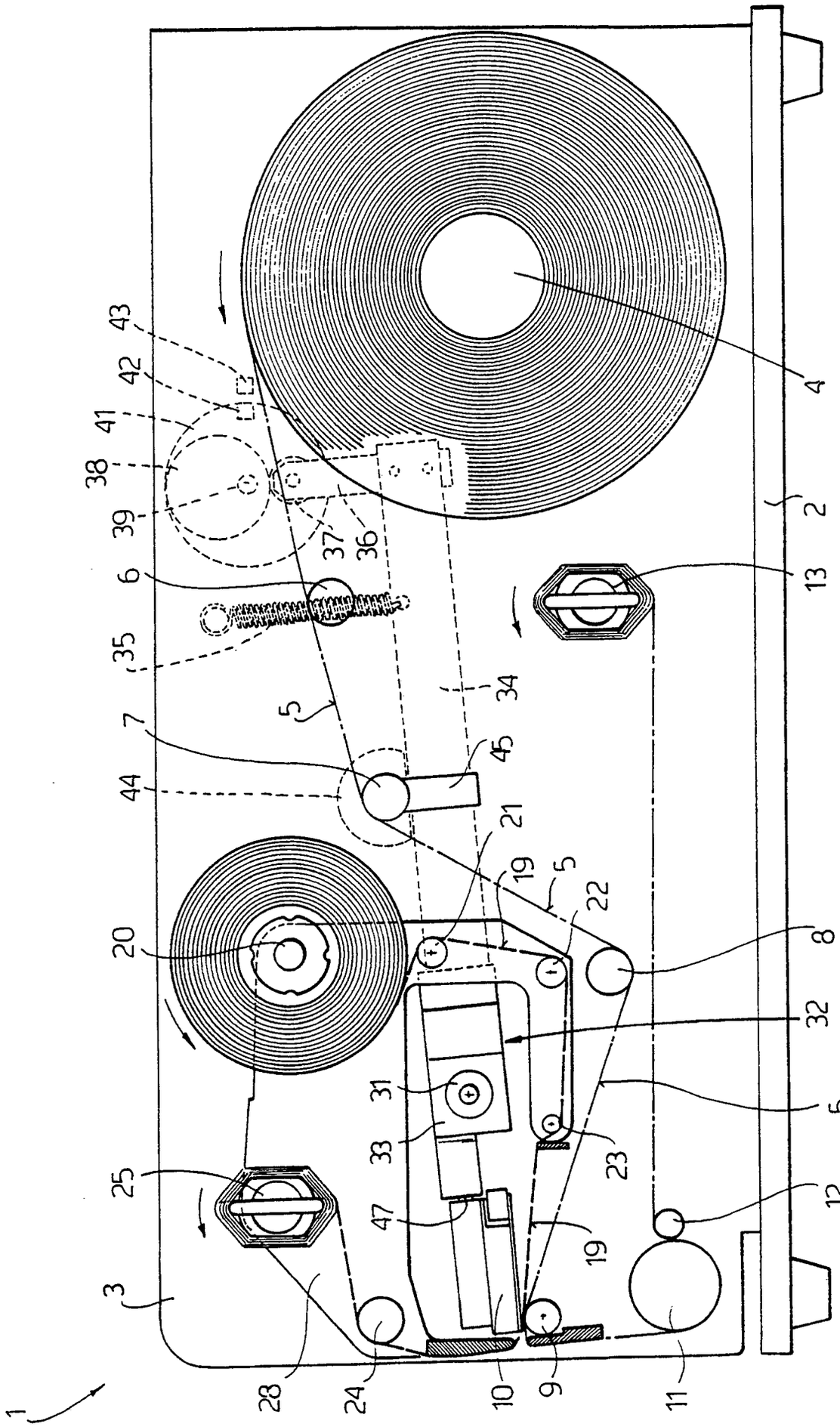
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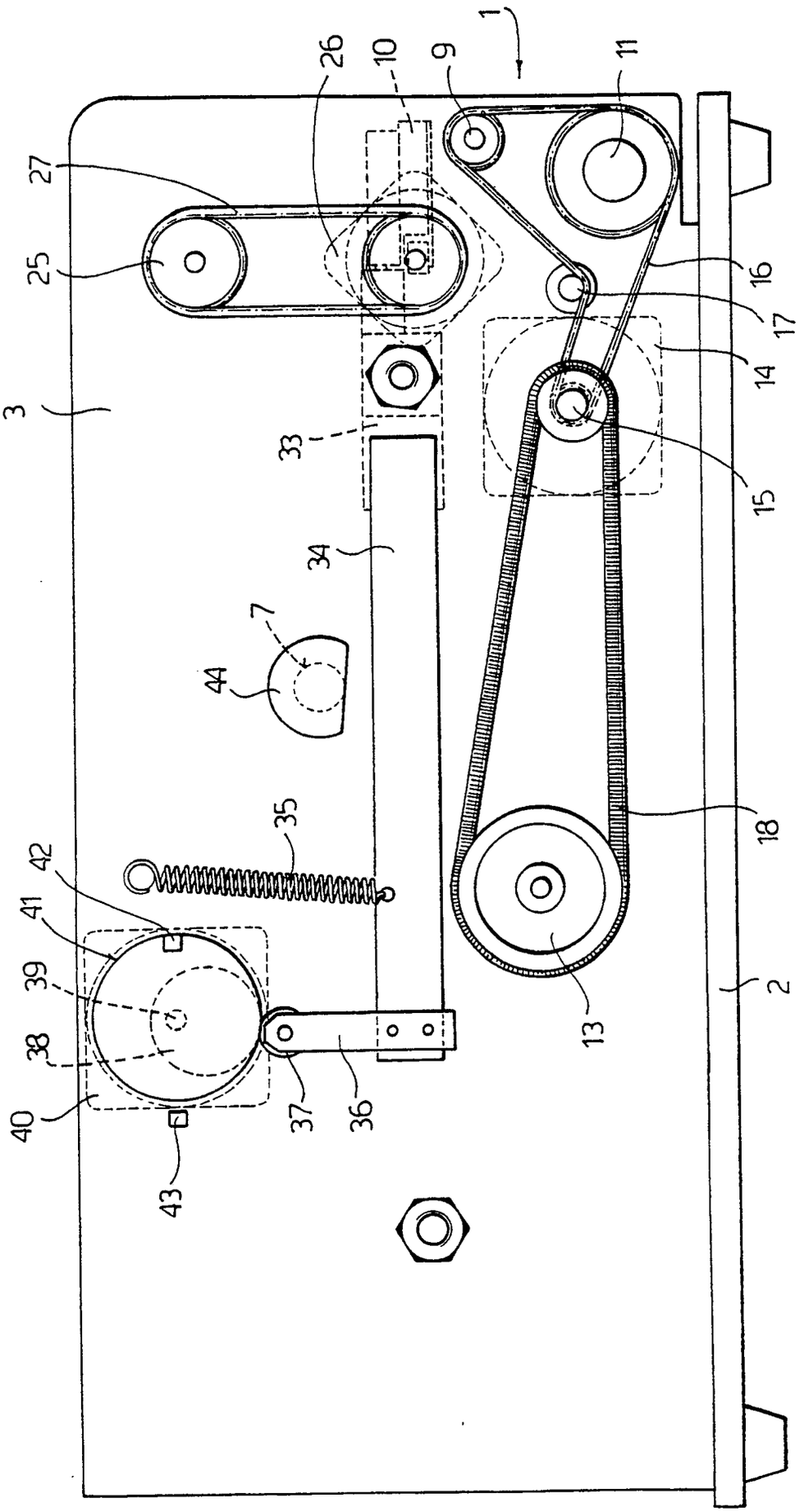
FIG. 1

FIG. 2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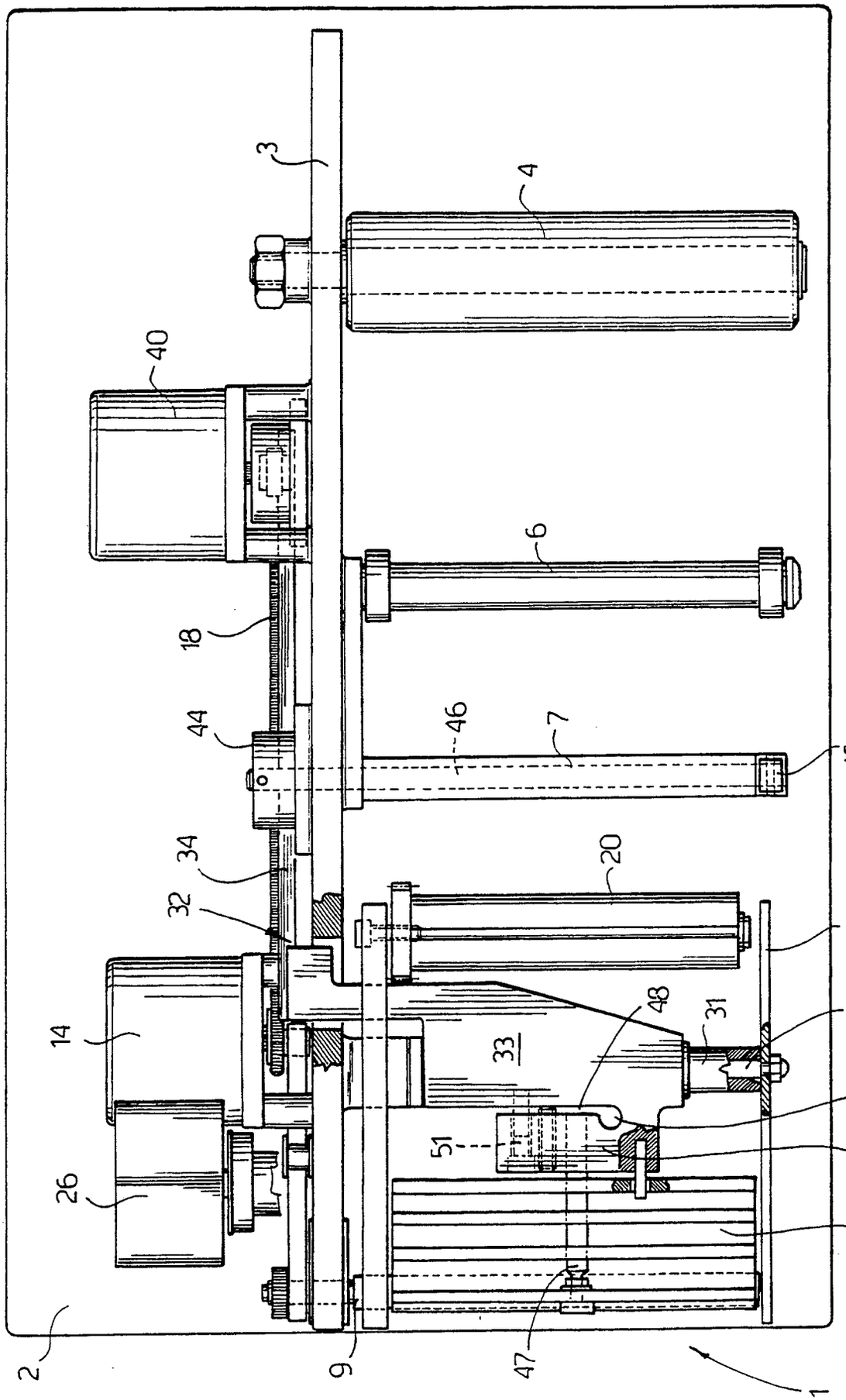

FIG. 3