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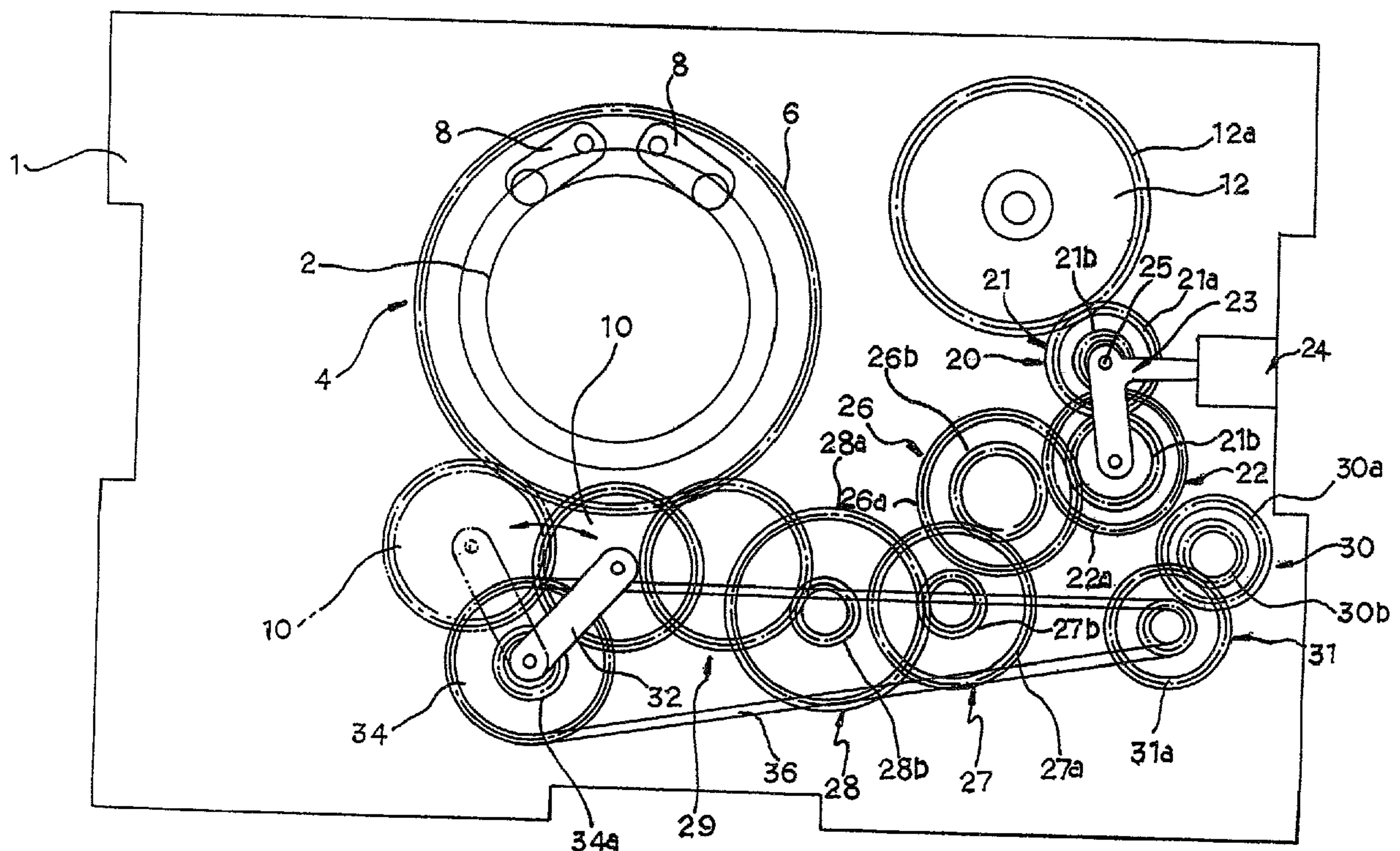
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(54) Title: POWER TRANSMITTING DEVICE OF A TAPE RECORDER



(57) Abrégé/Abstract:

A power transmitting device of a tape recorder capable of easily transmitting power to a tape loading unit or reel tables includes a loading system driving gear for transmitting the power to the tape loading unit to transmit a tape toward a drum, and a reel-system driving gear for driving the reel tables, in which the gears are selectively driven to receive the power of a capstan motor via transmission and rotating gears operated by a magnetic force and a spring to effectively drive the tape loading unit or the reel tables. By driving the tape loading unit and reel tables with the power of the capstan motor, one motor can be removed to further minimize the deck size.



ABSTRACT OF THE DISCLOSURE

A power transmitting device of a tape recorder capable of easily transmitting power to a tape loading unit or reel tables includes a loading system driving gear for transmitting the power to the tape loading unit to transmit a tape toward a drum, and a reel-system driving gear for driving the reel tables, in which the gears are selectively driven to receive the power of a capstan motor via transmission and rotating gears operated by a magnetic force and a spring to effectively drive the tape loading unit or the reel tables. By driving the tape loading unit and reel tables with the power of the capstan motor, one motor can be removed to further minimize the deck size.

POWER TRANSMITTING DEVICE OF A TAPE RECORDER

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to a tape recorder, and more particularly to a power for properly transmitting rotational force of a capstan motor to loading and reel systems.

DESCRIPTION OF THE PRIOR ART

Generally, tape recorders for recording or reproducing signals on a magnetic tape which is transmitted along a predetermined path have units such as a drum with heads on a deck, a tape travelling system for transmitting the tape seated on reel tables, a tape loading system for closely contacting the tape to the drum side, and reel-table driving system.

Accordingly, a conventional tape recorder separately includes a loading motor for driving the tape loading unit and a capstan motor for driving the reel tables.

However, the tape recorder is gradually minimized currently, and a deck size must be further minimized in case of a subminiature camcorder of a pocket size. Despite of this requirement, the conventional tape

recorder has the loading motor for transmitting the tape toward the drum on the deck as well as the capstan motor for travelling the tape and driving the reel tables, so that the deck is limited in minimizing its size, and increasingly gains weight.

SUMMARY OF THE INVENTION

The present invention is devised to solve the above-described problems. Therefore, it is an object of the present invention to provide a power transmitting device of a tape recorder, wherein power of a capstan motor for loading a tape and driving reel tables is properly transmitted without requiring an additional loading motor, thereby simplifying its structure.

To achieve the above object of the present invention, there is provided a power transmitting device of a tape recorder which receives a power from a capstan motor to drive both a tape loading system for loading a tape toward a drum and reel table system. Here, a power transmitting device of the tape recorder includes a power transmitting device formed of a transmission gear for performing forward and backward rotation by the capstan motor, a rotating gear for swinging at a predetermined angle around a shaft by being brought into meshing engagement with the transmission gear, and a first power driving unit having a first gear mounted on a deck for transmitting rotational force of the capstan motor to the loading system by being selectively brought into meshing engagement with the rotating gear. Additionally, a second

power driving unit has a relay gear mounted on the deck for transmitting the rotational force of the capstan motor to the reel system by being selectively brought into meshing engagement with the rotating gear, and a positioning controller prevents the rotating gear from being pushed to deviate when driving either first or second power driving unit by the power transmitting device.

Preferably, the transmission gear of the power transmitting device has a first gear in meshing engagement with a gear at the capstan motor, and a second gear in meshing engagement with a first gear of the rotating gear. Moreover, the rotating gear has a first gear being selectively brought into meshing engagement with the second gear of the transmission gear and the relay gear of the second power driving unit. The power transmitting device further has a swing arm for connecting the transmission gear to the rotating gear, and swinging around a predetermined shaft by the position controller.

It is preferable that the power transmitting device is provided with a lever which connects the transmission gear to be brought into meshing engagement with the rotating gear; and a pin which projects on the upper end of the lever at the rotating gear side.

The first power driving unit has a series of decelerating gears consisting of a plurality of gears consecutively arranged for receiving the power from the rotating gear to drive the tape loading system.

Meanwhile, the second power driving unit is constructed such that the relay gear receives the power from the power transmitting device, and driving and driven pulleys are connected by means of a timing belt

for transmitting the power from the relay gear to an idler.

According to the present invention, a preferred embodiment of the position controller has a driving coil mounted on a substrate, and a flanger attached with a permanent magnet opposite to the driving coil spaced apart therefrom by a predetermined distance, so that the flanger elastically swings by a spring around a shaft to regulate the position of the lever of the rotating gear.

Here, the flanger is preferably formed of a latch plate on one end of an arm extending to one side thereof to control the position of the projecting pin formed on the lever. Therefore, the flanger can swing around the shaft to release the locking of the projecting pin position when the power is applied to the driving coil, and control the position of the projecting pin by the restoring force of the spring when the power is blocked off.

Preferably, the position controller has a shaking lever rotatably connected to the end of a lever projecting on one side of the swing arm of the power transmitting device via a pin, a permanent magnet for swinging the shaking lever by a predetermined angle, a spring connected to one end of the lever of the swing arm and one end of the shaking lever, and a flanger having its first and second ends close to the permanent magnet of the shaking lever. In this case, the flanger is formed of a body mounted on the substrate, and the driving coil wound the body for supplying a predetermined current, so that the polarity of the first and second ends is determined by the current supplied to them to swing the swing arm by the interaction with the permanent magnet.

BRIEF DESCRIPTION OF THE DRAWINGS

The above objects and other advantages of the present invention will become more apparent by describing in detail a preferred embodiment thereof with reference to the attached drawings in which:

FIG. 1 is a schematic plan view showing a deck for illustrating a first embodiment of a power transmitting device of a tape recorder according to the present invention;

FIG. 2 is a view showing the construction of the principal portion of the power transmitting device shown in FIG. 1;

FIGs. 3A and 3B are views of respective operational states of the power transmitting device shown in FIG. 1;

FIG. 4 is a schematic plan view showing the deck for illustrating a second embodiment of the power transmitting device of the tape recorder according to the present invention;

FIG. 5 is a view showing the construction of the principal portion of the power transmitting device shown in FIG. 4;

FIG. 6 is a view of the operational state of the power transmitting device shown in FIG. 4; and

FIGs. 7 and 8 are a plan view and a front view respectively illustrating the construction of a flanger applied to the power transmitting device according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to a deck having a first embodiment of a power transmitting device according to the present invention which is schematically shown in FIG. 1, a rotary drum 2 installed on the center of the deck 1 is provided with a plurality of heads (not shown) for recording and/or reproducing signals on a tape. A tape loading unit 4 is placed around the outer circumference of the rotary drum 2 for transmitting the tape toward the rotary drum 2. The tape loading unit 4 is of an ordinary ring gear 6, and pole bases 8 are moved along a predetermined path in accordance with the rotation of the ring gear 6 to load the tape toward the rotary drum 2.

Also, the deck 1 has a pair of reel tables (not shown) to which an unshown tape cassette is safely mounted, and these reel tables are driven under a normal way by means of an idler 10. The above-described tape loading unit 4 and idler 10 selectively deliver the rotational force of a capstan motor 12 disposed on the deck 1 by employing a power transmitting device 20 to transmit the tape, thereby loading the tape or driving the reel tables.

The power transmitting device 20 has a transmission gear 21 and a rotating gear 22 both installed on a swing arm 23, in which a first gear 21a of the transmission gear 21 is brought into meshing engagement with a gear 12a of the capstan motor 12, and a second gear 21b thereof is in meshing engagement with a first gear 22a of the rotating gear 22. The power transmitting device 20 which functions by selectively delivering the power of the capstan motor 12 to the tape loading unit 4 and idler 10 is rotated from side to side around a shaft 25 by a positioning

controller 24 provided on one side of the swing arm 23 of the power transmitting device 20.

It is preferable that the positioning controller 24 serves to selectively swing the swing arm 23 of the power transmitting device 20 from left to right. The power of the capstan motor 12 is transmitted to the tape loading unit 4 via a first power transmitting device.

The first power transmitting device consists of a series of decelerating gears of first, second, third and fourth gears 26, 27, 28 and 29, wherein a first gear 26a of the first gear 26 is selectively brought into meshing engagement with a second gear 22b of the rotating gear 22 in the power transmitting device 20, and second gear 26b of the first gear 26 is in meshing engagement with a first gear 27a of the second gear 27. A second gear 27b of the second gear 27 is brought into meshing engagement with a first gear 28a of the third gear 28, and a second gear 28b of the third gear 28 is in meshing engagement with the fourth gear 29 which is in turn brought into meshing engagement with the ring gear 6 of the tape loading unit 4. Consequently, the power of the capstan motor 12 is transmitted to the first power transmitting device by means of the power transmitting device 20, and then properly decelerated by means of the first power transmitting device to drive the tape loading unit 4, thereby permitting the loading and unloading operations of the tape.

In addition to the first power transmitting device, the power of the capstan motor 12 is also transmitted to the idler 10 via a second power transmitting device. That is, the second power transmitting device is

formed such that the first gear 22a of the rotating gear 22 of the power transmitting device 20 is selectively brought into meshing engagement with a first gear 30a of a relay gear 30, and a second gear 30b of the relay gear 30 is in meshing engagement in with a gear 31a of a driving pulley 31.

Using a timing belt 36, the driving pulley 31 is connected to a driven pulley 34 which is connected to the idler 10 by an arm 32, and a gear 34a of the driven pulley 34 is in meshing engagement with the idler 10. Therefore, the power of the capstan motor 12 is transmitted to the idler 10 which in turn rotates the reel tables.

Hereinbelow, the operation of the power transmitting device according to the first embodiment of the present invention will be described.

Once the tape cassette is mounted on the reel tables of the deck 1, a cassette-in sensor (not shown) perceives the seating of the tape cassette to rotate the capstan motor 12, and the positioning controller 24 allows the swing arm 23 of the power transmitting device 20 to swing toward the first power transmitting device. Thus, since the second gear 22b of the rotating gear 22 provided in the power transmitting device 20 is brought into meshing engagement with first gear 26a of the first gear 26 in the first power transmitting device, the power of the capstan motor 12 is decelerated through the first to fourth gears 26, 27, 28 and 29 to be transmitted to the tape loading unit 4, thereby performing the loading and unloading operations of the tape.

At this time, the tape-loading speed can be set in an optimum state

by suitably designing the deceleration ratio of the series of decelerating gears of the first power transmitting device. As is well-known to public, speed-control sensors provided in the capstan motor 12 control the rotating speed of the capstan motor 12 to constantly and accurately control the tape loading speed of the tape loading unit 4.

When the tape is travelled once the tape loading is completed, the positioning controller 24 makes the swing arm 23 swing toward the relay gear 30 of the second power transmitting device. By this operation, the first gear 22a of the rotating gear 22 provided into the power transmitting device 20 is brought into meshing engagement with the first gear 30a of the relay gear 30, thereby rotating the relay gear 30. Accordingly, the power of the capstan motor 12 is transmitted to the idler 10 via the driving pulley 31 and driven pulley 34 which are linked to each other by means of the timing belt 36, and the idler 10 can rotate the reel tables.

The positioning controller 24 of FIG. 1 is illustrated in FIG. 2 in detail, which includes a shaking lever 42 rotatably connected by a pin 41 to the end of a lever 23a projecting on one side of the swing arm 23 of the power transmitting device 20. The shaking lever 42 has a permanent magnet with N and S poles on a predetermined portion thereof, and one end of the lever 23a of the swing arm 23 is elastically connected to one end of the shaking lever 42 by means of a spring 44.

The positioning controller 24 further includes a flanger 45 installed such that the permanent magnet 43 of the shaking lever 42 is

placed to be close to first and second ends 45a and 45b thereof. A coil 46 winds one side of the flanger 45 to permit both ends thereof to be connected to first and second switches 47 and 48, and the polarities of A and B portions of the flanger 45 are changed in accordance with the direction of current flowing through the coil 46.

Now, the positioning controller shown in FIG. 2 will be described in detail.

As described above, once the tape cassette is mounted on the reel tables of the deck 1, the cassette-in sensor perceives the seating of the tape cassette to rotate the capstan motor 12. At the same time, a power supplied is applied to the first switch 47 of the positioning controller 24 to allow the current to flow in the direction of an arrow "a" of the coil 46 shown in FIG. 2, so that the portion A of the flanger 45 has a polarity of S, and the portion B has of N.

As a result, since the first and second ends 45a and 45b of the flanger 45 have the polarity of N, the N pole of the permanent magnet 43 provided on the shaking lever 42 is subjected to the magnetic force of mutually repulsing with the second end 45b being the N pole, whereas the S pole of the permanent magnet 43 is inclined to attract the first end 45a being the N pole. Thus, as shown in FIG. 3A, the shaking lever 42 swings toward the first end 45a by as much as "θ", using a line X-X as a reference. Here, for the reason that the lever 23a of the swing arm 23 and shaking lever 42 are elastically connected by the spring 44 to be continuously pulled to each other, the spring 44 draws the lever 23a under the state shown in FIG. 3A to swing the lever 23a clockwise as

much as " θ' ", using the line X-X as the reference.

When the lever 23a of the swing arm 23 swings clockwise as described above, the second gear 22b of the rotating gear 22 in the power transmitting device 20 is brought into meshing engagement with the first gear 26a of the first gear 26 in the first power transmitting device to transmit the power of the capstan motor 12 to the first power transmitting device. The power decelerated through the first to fourth gears 26 to 29 is delivered to the tape loading unit 4 to perform the loading and unloading operations of the tape.

In case of travelling the tape under being completely loaded, the power supplied to the first switch 47, as shown in FIG. 2, is cut off but supplied to the second switch 48 to make the current flow in the direction "b" of the coil 46. Then, the portion A of the flanger 45 has the polarity of N, and the portion B thereof has of S, which are contrary to the circumstance of supplying the power to the first switch 47.

Therefore, when the polarity of the first and second ends 45a and 45b is converted into S, the N pole of the permanent magnet 43 provided on the shaking lever 42 becomes under the magnetic force attracting the second end 45b with each other, while the S pole of the permanent magnet 43 is under the influence of the mutually repulsing magnetic force with the first end 45a thereof. Accordingly, the shaking lever 42 shifts toward the second end 45b to be the state contrary to that shown in FIG. 3A.

By doing so, the lever 23a of the swing arm 23 at the state shown in

FIG. 3A swings counter-clockwise by the tension of the spring 44 to permit the first gear 22a of the rotating gear 22 to be brought into meshing engagement with first gear 30a of the relay gear 30 as shown in FIG. 2 with the consequence of blocking the power supply by means of the first power transmitting device and shifting the power of the capstan motor 12 to the second power transmitting device. Thus, the power is transmitted to the idler 10 through the driving and driven pulleys 31 and 34, so that the idler 10 can rotate the reel tables.

On the other hand, by swinging the shaking lever 42 of the positioning controller 24 by as much as, e.g., " θ ", under the state shown in FIG. 3A, the lever 23a swings as much as " θ' " by the tension of the spring 44. In other words, the lever 23a and shaking lever 42 form an angle of " $\theta - \theta'$ ", which denotes the state of continuously drawing the lever 23a by the spring 44. As a result, even though the power supplied to the first or second switch 47 or 48 is cut off, the lever 23a and shaking lever 42 can continuously swing and, therefore, the power of the capstan motor 12 can be transmitted to the first or second power transmitting device regardless of blocking the power supplied to the first or second switch 47 or 48.

According to the first embodiment of the power transmitting device of the tape recorder as described above, the power of the capstan motor is selectively transmitted to the first or second power driving unit via the power switching units, thereby loading the tape or driving the reel tables through the first and second power transmitting devices.

FIG. 4 is a schematic plan view showing a second embodiment of the

power transmitting device according to the present invention. Here, like parts are designated by corresponding reference numerals described with reference to FIG. 2, of which description will thus be omitted.

In the second embodiment of the present invention as shown in FIGs. 4 and 5, a power transmitting device 120 includes a transmission gear 121 in meshing engagement with the gear 12a of the capstan motor 12, a rotating gear 122 in meshing with the transmission gear 121 connected by a lever 100. Also, a first gear 126 and a relay gear 130 are installed on both sides of the rotating gear 122 for transmitting power toward the loading system or reel system via respective gears of the tape recorder as described above.

On one side of the power transmitting device 120, as shown in FIGs. 5 to 8, a driving coil 104 is mounted on a substrate 103 of the deck 1, and a flanger 106 is installed over the driving coil 104 maintaining a predetermined distance such that a permanent magnet 105 having polarities of N and S installed on the flanger 106 is opposite to the driving coil 104.

The flanger 106 can elastically swing by a spring 108 around a shaft 107 at one end thereof, and a latch plate 106b is formed on the end of an arm 106a extending on the other end of the flanger 106. The latch plate 106b catches a pin 100a formed on one end of the lever 100 for connecting the transmission gear 121 to rotating gear 122.

As shown in FIG. 4, the first gear 126 receives the power of the capstan motor 12 by the power transmitting device 120 to transmit it to the tape loading unit 4 via the second, third and fourth gears 27, 28

and 29, thereby performing loading and unloading operations of the tape. The relay gear 130 is in meshing engagement with the gear 31a of the driving pulley 31 connected to the driven pulley 34 which is connected to the idler 10 via the arm 32, using the timing belt 36. Here, the gear 34a of the driven pulley 34 is brought into meshing engagement with the idler 10 to transmit the power of the capstan motor 12, thereby rotating the reel tables.

The operation of the second embodiment of the present invention formed as above will be described below.

Once the tape cassette is seated on the reel tables on the deck 1, the unshown cassette-in sensor perceives the seating of the tape cassette to rotate the capstan motor 12, and the transmission gear 121 in meshing engagement with the gear 12a of the capstan motor 12 is rotated. Here, if the transmission gear 121 rotates clockwise, the rotating gear 122 connected by means of the lever 100 swings to be brought into meshing engagement with the first gear 126 to transmit the power to the tape loading unit 4 via the second, third and fourth gears 27, 28 and 29, thereby loading and unloading the tape.

At this time, the tape loading speed can be most properly set by suitably designing the deceleration ratio of the series of decelerating gears 126, 27, 28 and 29. Moreover, well-known speed-control sensors provided in the capstan motor 12 control the rotating speed of the capstan motor 12 to constantly and accurately control the tape loading speed.

Otherwise, if the transmission gear 121 rotates counter-clockwise,

the rotating gear 122 connected by means of the lever 100 is moved toward the relay gear 130 to be brought into meshing engagement therewith, so that the idler 10 is driven by means of the driving pulley 31 and driven pulley 34 which are connected by the timing belt 36 to rotate the reel tables.

However, during transmitting the rotational force of the capstan motor 12 to the first gear 126 and relay gear 130 while using the power transmitting device 120, the rotating gear 122 swings right to left in accordance with the rotational direction of the transmission gear 121 to be inclined to being into meshing engagement with the first gear 126 and relay gear 130. Consequently, if the rotational direction of the transmission gear 121 is changed at need under the state of being in meshing engagement with either one, the connection of the rotating gear 122 is altered.

Because of this reason, according to the second embodiment of the present invention, the inclination of the rotating gear 122 to swing can be forcibly regulated by a positioning controller as shown in FIGs. 6, 7 and 8. In more detail, when the rotating gear 122 swings in response to change of modes while the rotating gear 122 is in meshing engagement with either the first gear 126 or relay gear 130 to carry out corresponding modes, the driving coil 104 on the substrate 103 is supplied with the power to interact with the permanent magnet 105 opposite thereto, so that the flanger 106 elastically moves clockwise around the shaft 107 by means of the spring 108, as shown in FIG. 5.

Thereafter, the rotating gear 122 swings without being interrupted

to be brought into meshing engagement with the other gear to perform its corresponding mode. At this time, the power supplied to the driving coil 104 is blocked to return the flanger 106 to its original position by the restoring force of the spring 108.

Then, since the latch plate 106b at the end of the arm 106a extending to one side of the flanger 106 catches the pin 100a on the upper portion of the lever 100, the rotating gear 122 cannot be swung in spite of changing the rotational direction of the transmission gear 121 to securely transmit the required power.

In the second embodiment of the power transmitting device of the tape recorder according to the present invention as described above, the rotational force of the capstan motor can be properly transmitted to the loading or reel system. Furthermore, the required power can be necessarily transmitted by means of the positioning controller to improve the function of the tape recorder.

In addition, the power of the capstan motor is selectively transmitted to the first and second power transmitting devices via the power switching units, and the tape loading unit and reel tables are driven via the first and second power transmitting devices. Here, the loading motor is removed when compared with the conventional deck, which results in reducing size and weight of the deck to attain minimization. Moreover, cost and number of components are decreased to improve its productivity.

While the present invention has been particularly shown and described with reference to particular embodiments thereof, it will be

understood by those skilled in the art that various changes in form and details may be effected therein without departing from the spirit and scope of the invention as defined by the appended claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. In a power transmitting device of a tape recorder for receiving a power from a capstan motor to drive both a tape loading system for loading a tape toward a drum and reel table system, a power transmitting device of said tape recorder comprising:

power transmitting means formed of a transmission gear for performing forward and backward rotation by said capstan motor, and a rotating gear for swinging at a predetermined angle around a shaft by being brought into meshing engagement with said transmission gear;

first power driving means having a first gear mounted on a deck for transmitting rotational force of said capstan motor to said loading system by being selectively brought into meshing engagement with said rotating gear;

second power driving means having a relay gear mounted on said deck for transmitting the rotational force of said capstan motor to said reel system by being selectively brought into meshing engagement with said rotating gear; and

position-control means for preventing said rotating gear from being pushed to deviate when driving either first or second power driving means is driven by said power transmitting means.

2. A power transmitting device of a tape recorder as claimed in claim 1, wherein said power transmitting means comprises:

said transmission gear having a first gear in meshing engagement with a gear at said capstan motor, and a second gear in meshing engagement with a first gear of said rotating gear;

said rotating gear having a first gear being selectively brought into meshing engagement with said second gear of said transmission gear and said relay gear of said second power driving means; and

a swing arm for connecting said transmission gear to said rotating gear, and swinging around a predetermined shaft by said position-control means.

3. A power transmitting device of a tape recorder as claimed in claim 1, wherein said power transmitting means comprises a lever for connecting said transmission gear to be brought into meshing engagement with said rotating gear; and

a pin projecting on the upper end of said lever at said rotating gear side.

4. A power transmitting device of a tape recorder as claimed in claim 1, wherein said first power driving means comprises a series of decelerating gears consisting of a plurality of gears consecutively arranged for receiving the power from said rotating gear to drive said tape loading system.

5. A power transmitting device of a tape recorder as claimed in claim 1, wherein said second power driving means comprises said relay gear for receiving the power from said power transmitting means; and driving and driven pulleys connected by means of a

timing belt for transmitting said power from said relay gear to an idler.

6. A power transmitting device of a tape recorder as claimed in claim 1, wherein said position-control means comprises a driving coil mounted on a substrate, and a flanger attached with a permanent magnet opposite to said driving coil spaced apart therefrom by a predetermined distance, whereby said flanger elastically swings by a spring around a shaft to regulate the position of said lever of said rotating gear.

7. A power transmitting device of a tape recorder as claimed in claim 6, wherein said flanger comprises a latch plate on one end of an arm extending to one side thereof to control the position of said projecting pin formed on said lever.

8. A power transmitting device of a tape recorder as claimed in claim 6, wherein said flanger swings around said shaft to release the locking of said projecting pin position when the power is applied to said driving coil, and controls the position of said projecting pin by the restoring force of said spring when the power is blocked off.

9. A power transmitting device of a tape recorder as claimed in claim 1, wherein said position-control means comprises:

a shaking lever rotatably connected to the end of a lever projecting on one side of said swing arm of said power transmitting means via a pin;

a permanent magnet for swinging said shaking lever by a

predetermined angle;

a spring connected to one end of said lever of said swing arm and one end of said shaking lever; and

a flanger having its first and second ends close to said permanent magnet of said shaking lever.

10, A power transmitting device of a tape recorder as claimed in claim 9, wherein said flanger comprises:

a body mounted on said substrate, and said driving coil wound said body for supplying a predetermined current, whereby the polarity of said first and second ends is determined by the current supplied to them to swing said swing arm by the interaction with said permanent magnet.

FIG. 1

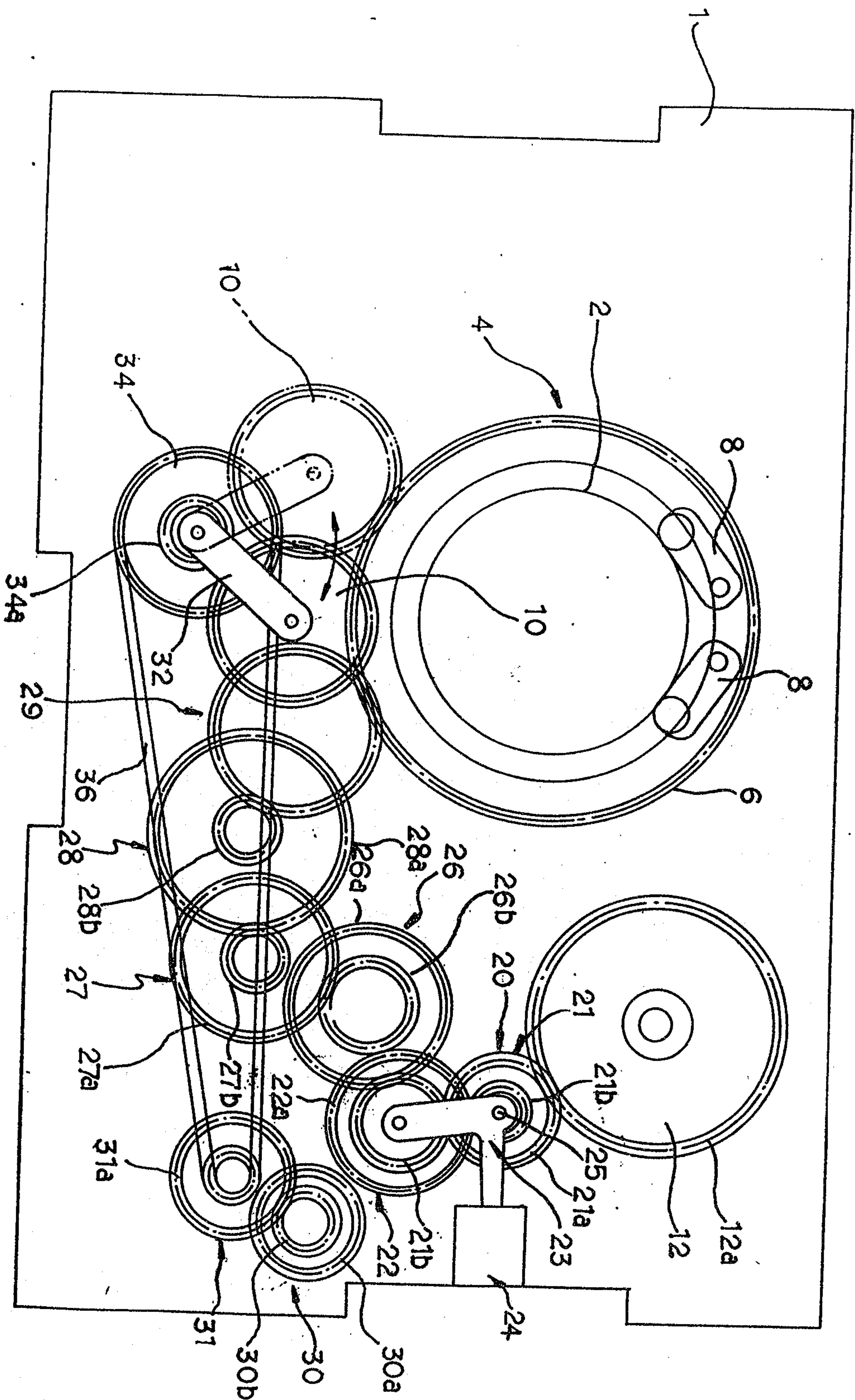


FIG. 2

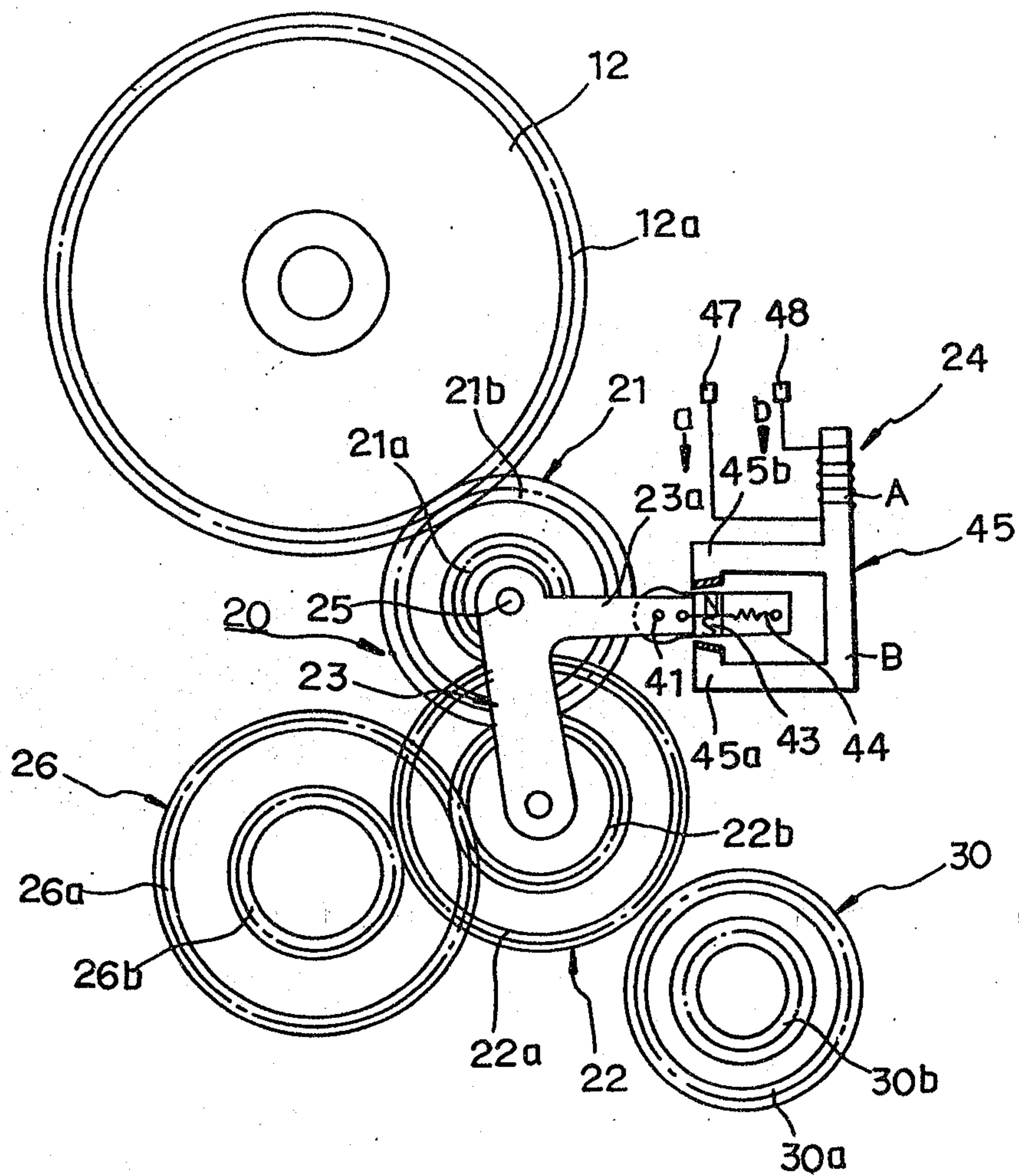


FIG. 3A

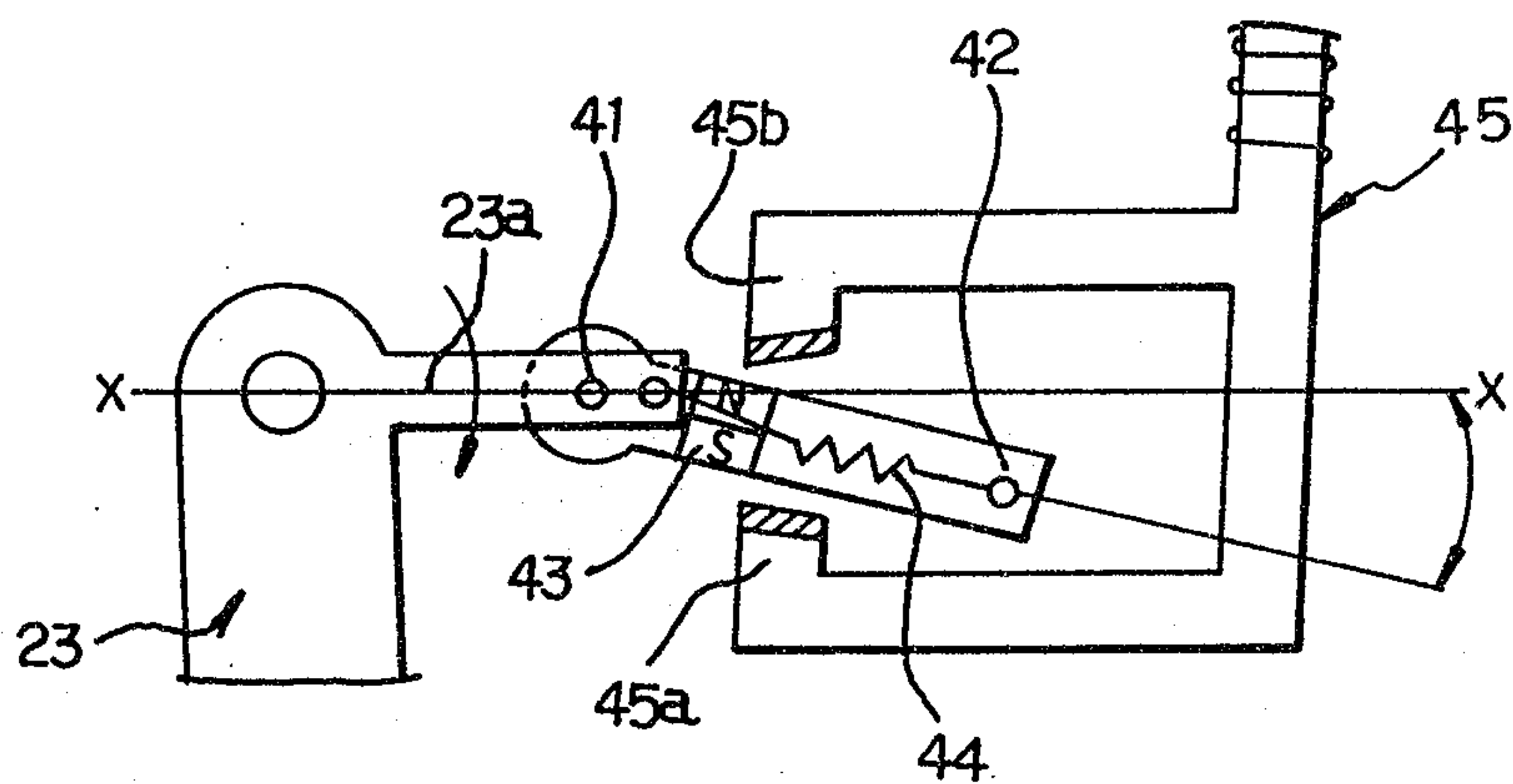


FIG. 3B

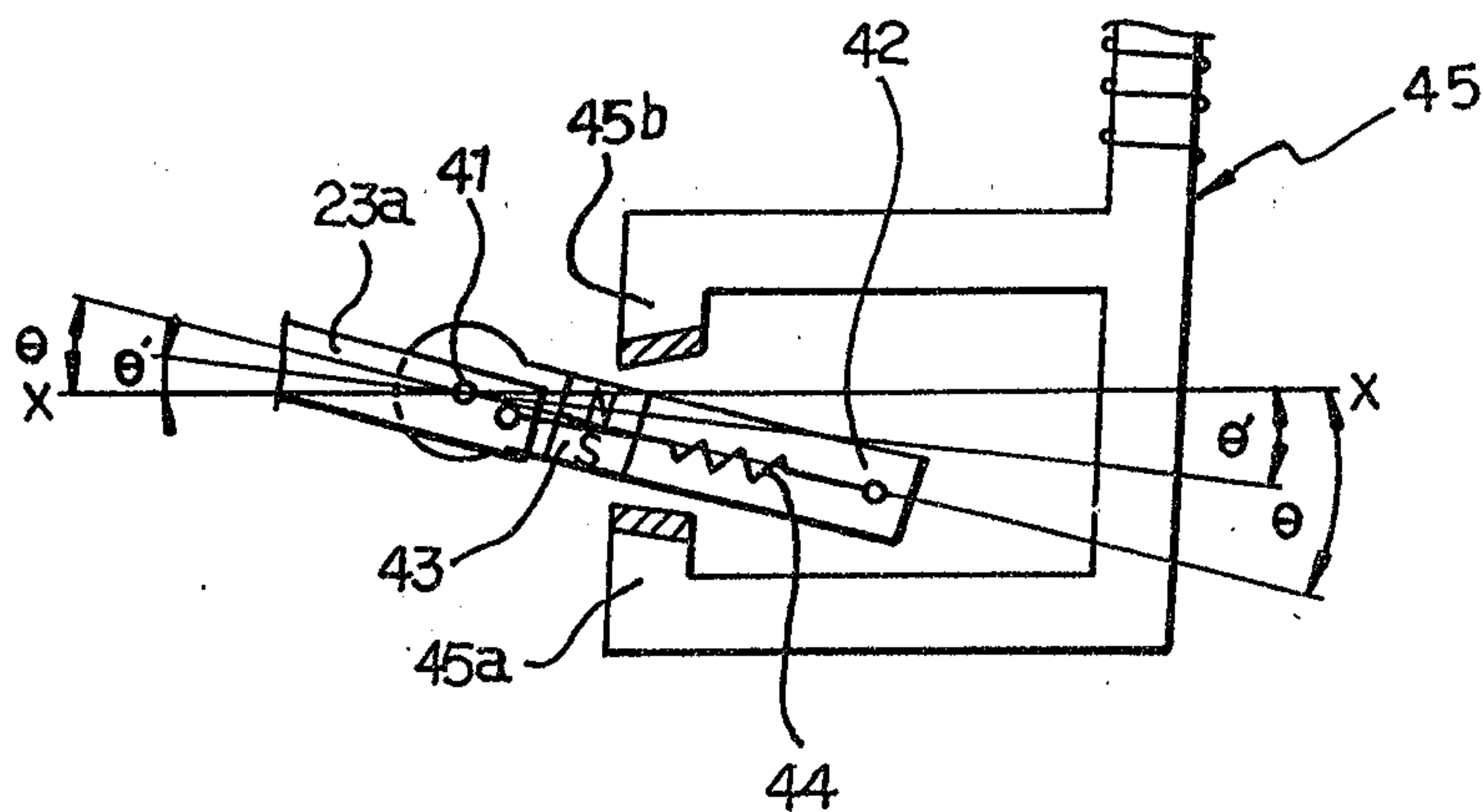


FIG. 4

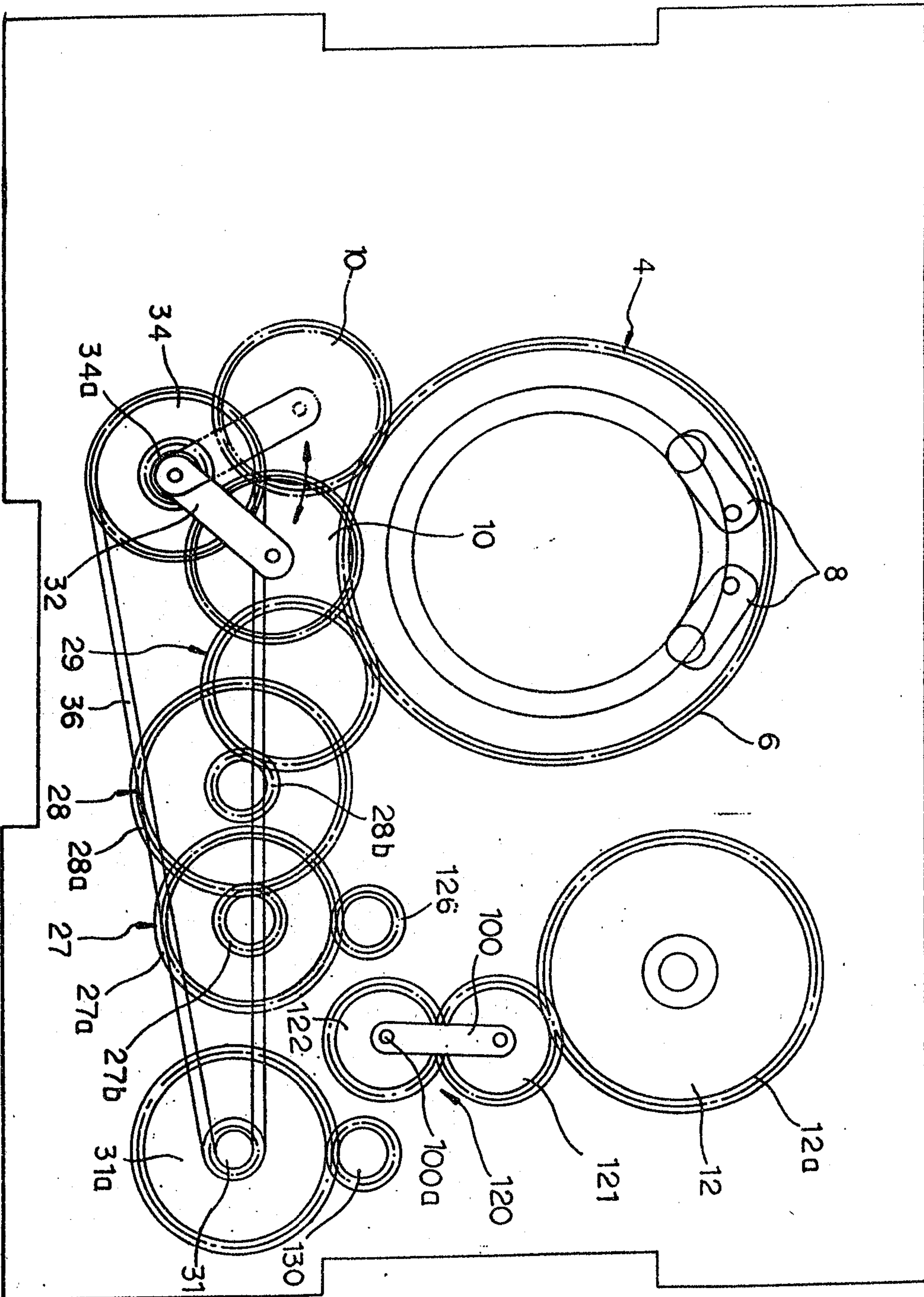


FIG. 5

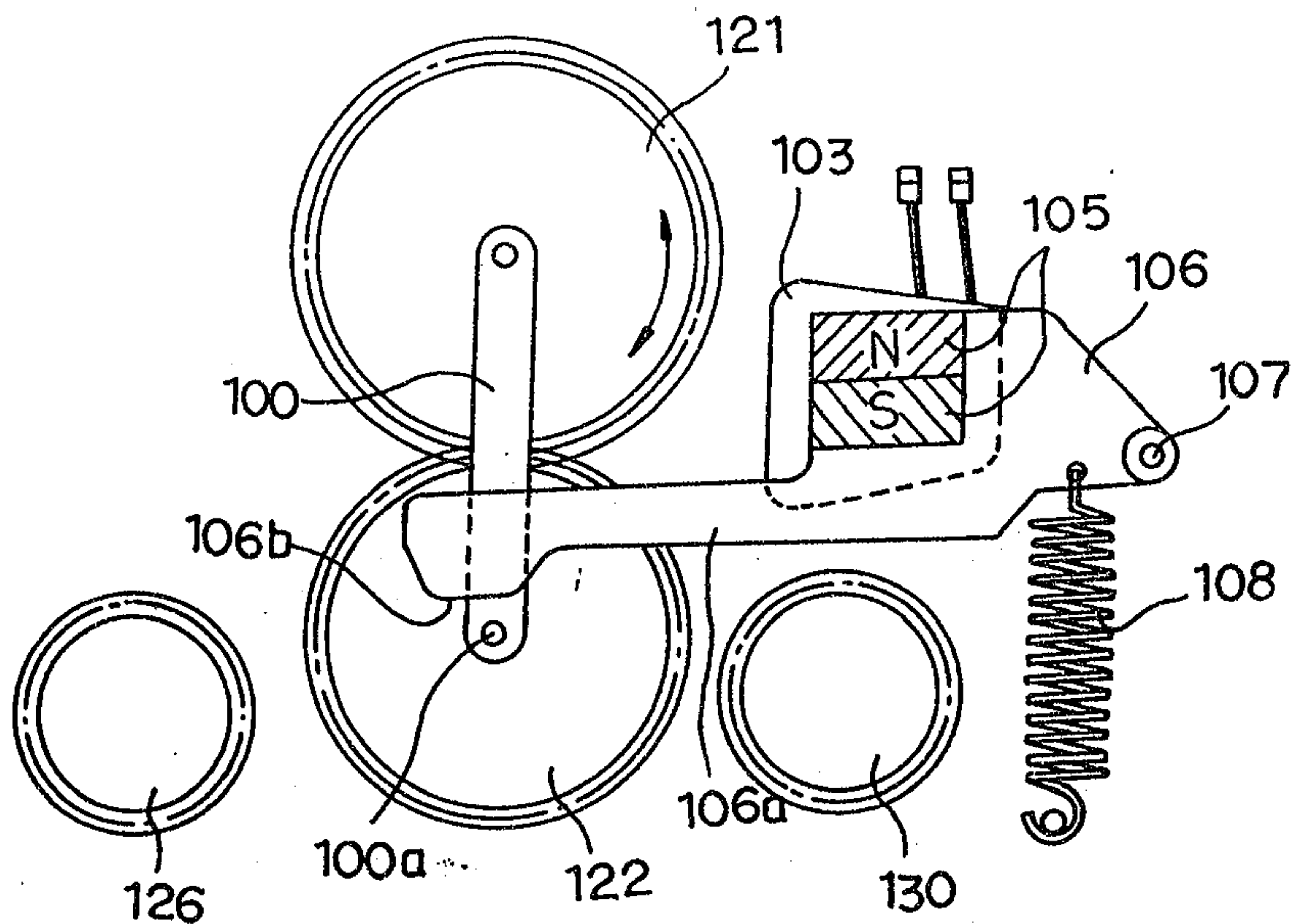


FIG. 6

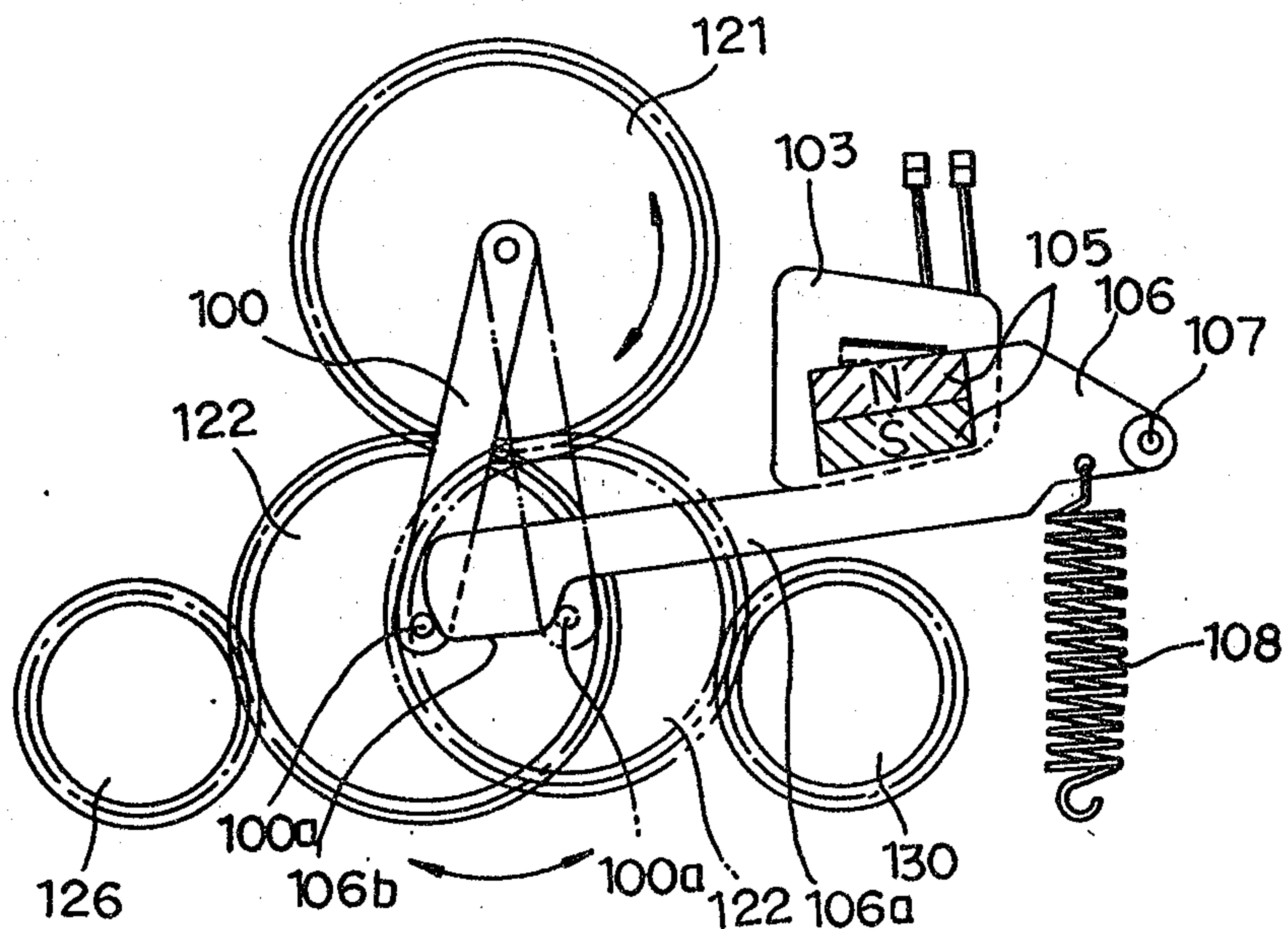


FIG. 7

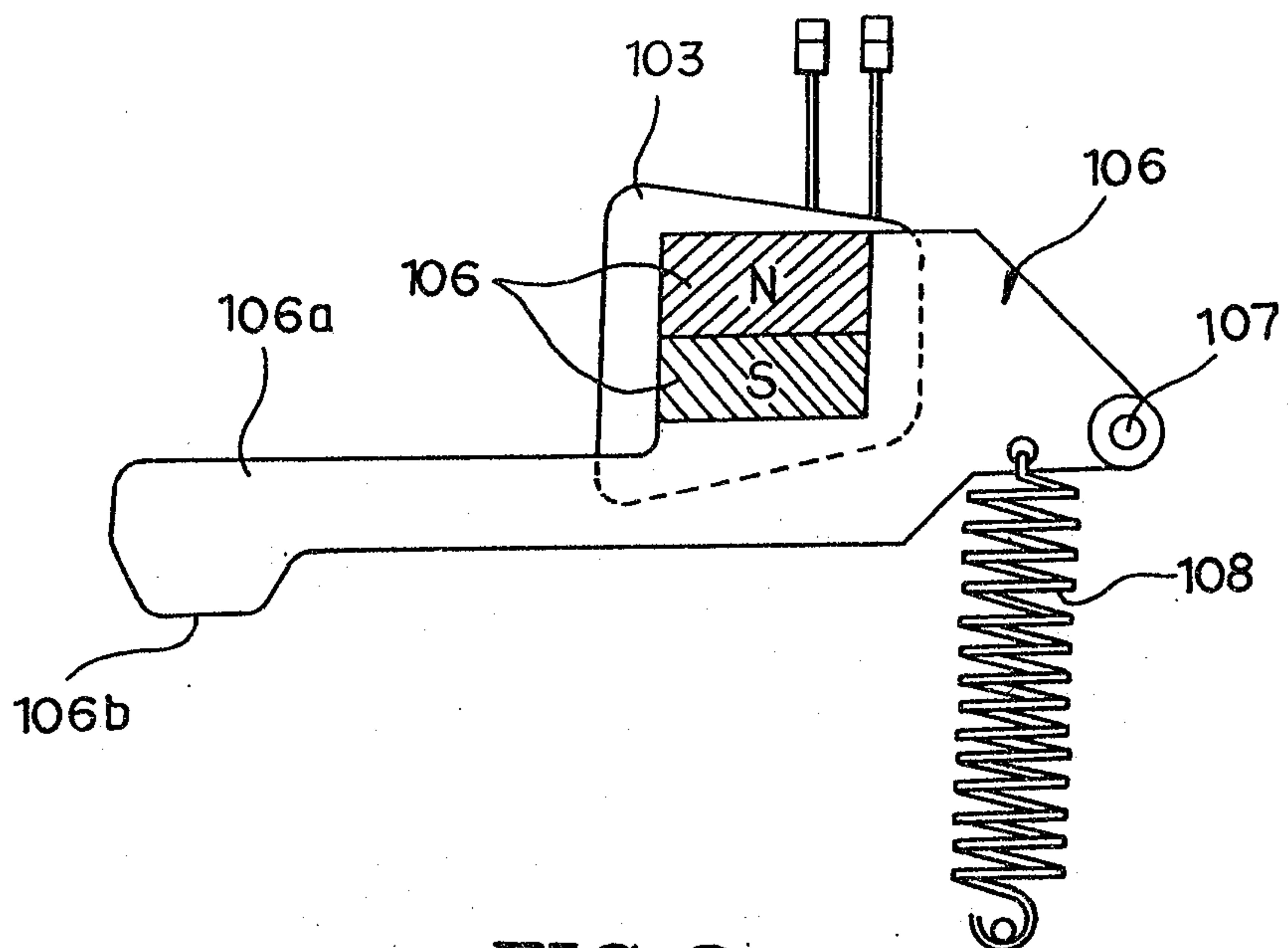
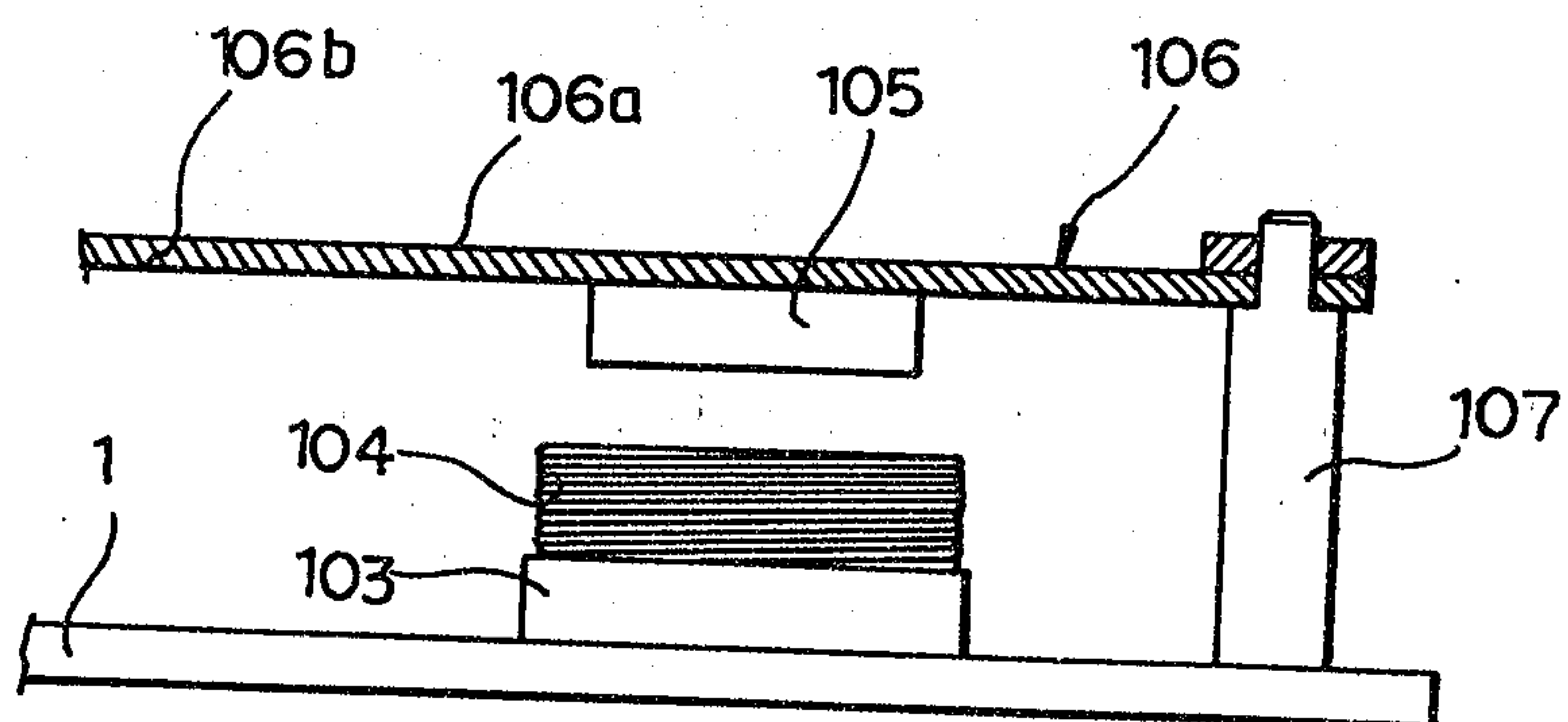


FIG. 8



Haskins & Clark

