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⑤④ **Goods discharge mechanism and goods storage and discharge system of an automatic vending machine.**

⑤⑦ A goods discharge mechanism of an automatic vending machine is disposed in the vicinity of the lower end of a vertical goods passage of a goods storage shelf. Said passage being designed to store cylindrical goods (23, 23a), said discharge mechanism being designed to discharge said goods one by one in accordance with discharge commands. The discharge mechanism includes a first and a second retainer member (9, 10) a solenoid (7) and a transmission mechanism (13, 15) designed to transmit the movement of said solenoid (7) to both of said retainer members (9, 10) so as to move them alternately into and out of said goods passage. The two goods discharge mechanisms of adjacent goods storage shelves are arranged in back-to-back relation with the transmission mechanisms and said solenoids of each of the goods discharge mechanisms being superimposed one above the other between said two adjacent goods storage shelves.

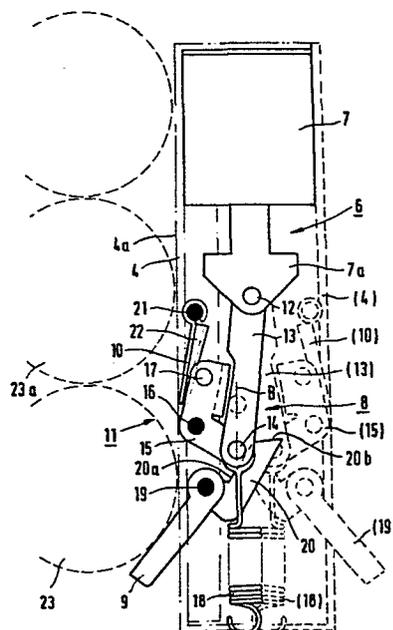


FIG. 2 A

GOODS DISCHARGE MECHANISM AND GOODS
STORAGE AND DISCHARGE SYSTEM OF AN
AUTOMATIC VENDING MACHINE

1 The invention relates to a goods discharging mechanism
according to the first portion of claim 1 and to a
goods storage and discharge system of an automatic vend-
ing machine having a plurality of storage shelves for
5 goods arranged in parallel rows, according to the first
portion of claim 2.

Figure 1 shows the general arrangement of a typical
automatic vending machine having goods storage shelves
10 of the serpentine type.

Referring to Fig.1, the body 1 of an automatic vending
machine has three parallel storage shelves 3 disposed in
the front to rear direction, each of which has a winding
15 goods passage 2. A plurality of cylindrical goods is
stored in the rolling position in each of said goods pas-
sages 2. Reference numeral 6 denotes a goods discharge

- 1 mechanism disposed at the lower end of the respective goods discharge passages. 5 is an outlet provided within a front panel, through which the goods are discharged.
- 5 The combination of the goods storage shelves and the goods discharge mechanisms will be referred to below as the goods storage and discharge system to which the present invention pertains.
- 10 The goods discharge mechanism, as a constituent part of the goods storage and discharge system generally includes a solenoid, a transmission mechanism and first and second retainer members which are adapted to be alternately extended into and retracted from the associated goods passage.
- 15 The first and second retainer members are adapted to retain the lowermost article and the article second from bottom, respectively, when they are extended.

On the other hand there is an increasing demand for automatic vending machines capable of accommodating a large number of goods. To this end, recently it has been found advisable to add another row of storage shelving, i.e. to mount four shelves in one vending machine. There is also a requirement for reduced dimensions of automatic vending machines, due to the restrictions on installation space.

To this end, an effective measure is to reduce the width of the goods discharging mechanism disposed in the adjacent rows of the goods storage shelves to diminish the space required for the assembly of the storage shelves. Out of the component parts of the goods discharge mechanism installed between adjacent rows of storage shelves, the solenoid occupies a comparatively large space. But there is a practical limit to the reduction of the size of this solenoid.

1 Therefore usually the thickness of the goods discharge
mechanism is determined by the height of the solenoid,
which imposes a limit on the reduction of the installation
space occupied by the goods storage shelves and hence,
5 on the size of the automatic vending machine as a whole.

The invention as claimed is intended to remedy these draw-
backs. It solves the problem of how to provide a goods
discharge mechanism and a goods storage and discharge sys-
10 tem which do not necessitate substantial installation space
even if the solenoid's dimensions are rather large.

According to the invention, the solenoid and the transmission system of each of the goods dis-
15 charging mechanisms are disposed at one side, while two
goods discharging mechanisms are arranged in the space be-
tween two adjacent storage shelves. It is therefore poss-
ible to save the space for installation of the storage
shelves, which in turn contributes to a reduction in the
20 size of the automatic vending machine as a whole.

The invention is described in detail below with reference
to drawings which only illustrate specific embodiments in
which:

25

Fig.1 is a schematic sectional view of a conventional goods
storage and discharge system;

Figs. 2A and 2B are side elevation views of goods discharge
30 mechanism in accordance with the present invention;

Fig. 3 is a rear elevation view of the mechanism in Fig.2A;

Fig. 4 shows the state in which the discharge mechanisms in
35 Fig.2 are superimposed;

1 Fig. 5A is a schematic sectional view of a goods storage
and discharge system of the invention;

Fig. 5B shows the arrangement of the goods storage and
5 discharge mechanism of the invention by comparison with the
conventional arrangement;

Figs. 6A and 6B are side elevation views of another goods
discharge mechanism in accordance with the present invent-
10 ion; and

Fig. 7 is a rear elevation view of the goods discharge mech-
anism shown in Fig. 6A.

15 Hereinafter first a preferred embodiment of the present in-
vention will be described with reference to Figs. 2 to 5,
in which the same reference numerals are used to denote the
identical parts or members as those in Fig. 1.

20 Firstly, the constructional design of each of the goods
discharge mechanisms will be explained with specific refer-
ence to Figs. 2 and 3 which show the goods discharge mech-
anism in the stand-by state. In these two figures, the goods
discharge mechanism 6 is illustrated as including a solen-
25 oid 7, a transmission member 8, a first retainer member 9
and a second retainer member 10. These constituent parts
are supported by a base plate 4 which also serves as the goods
transfer surface 4a (see Fig. 2) of the goods passage. The
solenoid 7 and the transmission mechanism 8 are disposed
30 on the left side of the central axis A of base plate 4.

A retainer assembly 11 comprising the retainer members 9
and 10 is disposed so as to extend over the entire width of
base plate 4 across the centre axis A. The reference number
35 7a designates the movable core of said solenoid 7.

1 The transmission mechanism 8 includes a Γ -shaped connect-
ing plate 13 which is connected at one end to the movable
core 7a by a pin 12, while a push-up piece 15 is connected
to the other end of said connecting plate 13 by pin 14.

5

The push-up piece 15 is bent into a \angle -shape with its cent-
ral portion supported by a stationary hub 16 fixed to the
base plate 4 so as to rotate around the axis of hub 16. The
push-up piece 15 carries at its end opposite to pin 14 an
10 engaging pin 17 to engage with the second retainer member
10.

Reference numeral 18 denotes a tension spring which is re-
tained at one end by the pin 14 and by the base plate 4 at
15 the other end, thereby biasing, via the medium of connect-
ing plate 13, the movable core 7a in the direction opposite
to the direction of attraction of solenoid 7.

The first retainer member 9 is supported at one end by a
20 stationary hub 19 fixed to the base plate 4 so as to rot-
ate around the axis of hub 19 in order to move to
and away from the goods transfer surface 4a of the base
plate 4. The first retainer member 9 has an engaging piece
20 which is formed integrally therewith and is adapted for
25 engagement with engaging pin 14 of said push-up piece 15.

The engaging piece 20 is provided with two engaging surfaces
20a, 20b adapted for engagement with pin 14. In the stand-
by state shown in Fig.2, the engaging surface 20a engages
30 with pin 14 so as to support the first retainer member 9,
while the latter is projected above the goods transfer sur-
face 4a. A line B illustrates the locus of motion of the
pin 14. The engaging surface 20b is disposed at an inclined
angle to the line B when it is engaged by the said pin
35 14.

1 The second retainer member 10 is supported at one end by
a stationary hub 21 fixed to the base plate 4 so as to rot-
ate around the axis of hub 21 to move to and away from the
goods transfer surface 4a. Said second retainer member 10
5 is provided with a projection 22 for engagement with the
engaging pin 17 of the push-up piece 15.

Reference numerals 4b, 4c denote openings formed in the base
plate 4 to permit the first and second retainer members 9,
10 10 to be projected into the space above the goods transfer
surface 4a. The lowest goods and the articles second from
bottom are designated by reference numerals 23 and 23a,
respectively.

15 In operation, when the selling command is issued with the
mechanism in the state shown in Fig. 2A, solenoid 7 is ener-
gized to attract the movable core 7a, overcoming the force
of the tension spring 18. As the movable core 7a is attract-
ed, connecting plate 13 is moved accordingly to cause the
20 rotation of push-up piece 15. As a result of this rotation,
engaging pin 17 of the push-up piece 15 raises the second
retainer member 10 to project it into the space above the
goods transfer passage 4a into engagement with the article
23a second from bottom.

25

In this state the pin 14 of connecting plate 13 slides on
the engaging surface 20a of the engaging piece 20 of the
first retainer member 9 to leave the engaging surface 20a.
Consequently the first retainer member 9 loses its support,
30 so that it is rotated or swung when pushed by the article
and disappears from goods transfer surface 4a. Meanwhile,
the lowest article 23 is discharged in the direction of the
arrow C (Fig. 2B).

35 In this state, first retainer member 9 is prevented from

1 rotating because the engaging surface 20b is designed to
be engaged by pin 14 of connecting plate 13.

After completion of the discharge of the lowest article 23,
5 solenoid 7 is de-energized to permit movable core 7a to be
retracted by the force of tension spring 18 back to the
position shown in Fig. 2A. Consequently the first retainer
member 9 is moved to the position above the goods transfer
10 13, while the second retainer member 10 is reset to the
position beneath the goods transfer surface 4a, after being
removed from the push-up operation provided by push-up
piece 15.

15 Consequently the second article 23a is disengaged from the
second retainer member 10 and is pushed by the following
goods into contact with the first retainer member 9. In
this state, the article 23a is now the lowest article.

20 In the goods discharging mechanism of this design, the sol-
enoid 7 and the transmission mechanism 8 are disposed on
one side (left side in Fig. 2A) of the centre axis A of base
plate 4. Therefore even if two goods discharge mechanisms
are arranged back-to-back as illustrated in Fig. 2A and as
25 shown by the broken line and numerals in (), both mechanisms
can discharge without any failure. Fig. 4 shows such an
arrangement as viewed from the same side as solenoid 7.
In order to make the actions clearer, one of the goods
discharge mechanisms is hatched and the parts there-
30 of are denoted by the reference numerals in ().

Thus in the goods storage and discharge system Z of the in-
vention two goods discharge mechanisms 6 are arranged back-
to-back between adjacent rows of storage shelves, so that
35 transmission mechanisms 8 and the solenoids 7 of the two

1 mechanisms are superimposed on each other.

Below a detailed description will be given with reference to Fig. 5, in which the same reference numerals are used 5 to denote the identical parts or members as those used in Fig. 2. In the automatic vending machine shown in Fig.5, there are four rows of storage shelves 3a,3b,3c, 3d disposed back to front within the body 1 of the vending machine.

10 Two goods discharge mechanisms 6a,6b are located between the goods passages 2 of two adjacent storage shelves 3a,3b in back-to-back relation. Moreover two goods discharge mechanisms 6c,6d are disposed between the goods passages 2 of two adjacent storage shelves 3c,3d in back-to-back 15 relation. The goods discharge mechanism 6a is positioned in the vicinity of the goods passage 2 of the storage shelf 3a, while goods discharge mechanism 6b is positioned in the vicinity of the goods passage 2 of storage shelf 3b. The mechanisms 6c and 6d are disposed in the vicinity of the 20 goods passages of storage shelves 3c, 3d respectively.

Reference numeral 24 denotes a chute common to all the storage shelves 3 and designed to guide the goods discharged by the discharge mechanisms 6 toward the outlet 5 provided in 25 the front panel.

The automatic vending machine further has an inner door 26, an anti-theft door 27, a cooler 28 and a blower 29 for the circulation of chilled air.

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In the goods storage and discharge system for automatic vending designed in accordance with the invention, the storage shelves occupy much less space than in the conventional arrangement. In fact, in the conventional automatic 35 vending machines, the storage shelves are mounted as shown

1 by the line composed of two dots and dashes, so that only
one goods discharge mechanism 6 is located between two ad-
jacent storage shelves. In this case, it is necessary to
provide a mounting space D corresponding to the height H
5 of the goods discharge mechanism 6 in each of the spaces
between adjacent storage shelves 3.

Therefore if the conventional arrangement of goods discharge
mechanism is used, it is necessary to provide additional
10 installation space denoted by E, resulting in the corres-
pondingly increased size of the automatic vending machine
as a whole.

Fig. 5B shows a conventional arrangement in which the con-
15 ventional goods discharge mechanisms are arranged back-to-
back, as well as the arrangement of the goods discharging
mechanisms of the invention disposed in superimposed and
back-to-back relation. More specifically, the conventional
arrangement is shown in the upper half of Fig. 5B, while
20 the arrangement according to the invention is shown in the
lower half of Fig. 5B. It will be seen that the additional
space E is required by the conventional arrangement. In
other words, the goods discharge and storage system of the
invention requires less installation space for the storage
25 shelves, as stated above.

The goods discharge mechanism of the goods storage and dis-
charge system of the invention may be designed as shown in
Figs. 6A, 6B and 7.

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This goods discharging mechanism will be explained in more
detail below. In Figs. 6A, 6B and 7, the same reference
numerals have been used to denote the identical parts or
members as those in Figs. 2A, 2B and 3.

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1 In Figs. 6A,6B and 7, solenoid 7 and the transmission mechanism 8 are arranged on one side of the centre axis A of base plate 4, as is the case in goods discharge mechanism as shown in Fig.2(see Fig.7).

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The transmission mechanism connected to movable core 7a includes a T-shaped connecting plate 13. Reference number 30 designates a guiding plate for the connecting plate. This guiding plate 30 is fixed to base plate 4 and holds
10 the connecting plate 13 slidably.

The first retainer member 9 comprises two plates 9a, 9b. Plate 9a has a bent end which is rotatably attached to a stationary hub 31 fixed to base plate 4, while the other
15 end is also bent and connected to a bent end of the other plate 9b by a common pin 32, such that the first retainer member 9 can be flexed around pin 32. The other end of plate 9b is also bent and is rotatably attached to a pin 33 which penetrates connecting plate 13. The second retainer
20 member 10 comprises two plates 10a, 10b which are assembled in the same way as plates 9a,9b of said first retainer member 9.

According to this arrangement, when the solenoid 7 is energized in the state shown in Fig. 6A, the movable core 7a
25 is attracted as shown in Fig. 6B to cause the motion of the connecting plate 13.

When connecting plate 13 moves, pin 33 is moved accordingly
30 to make second retainer member 10 project into the space above the goods transfer surface 4a, while retracting first retainer member 9, to permit the lowest article to be discharged. After the sale, i.e. discharge, of the article, the solenoid is de-energized so that the state shown in Fig.6A
35 is resumed due to the action of spring 18. This goods

1 discharge mechanism can be used in the same manner as
that in the embodiment shown in Fig. 5.

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C L A I M S :

- 1 1. A goods discharge mechanism of an automatic vending
machine disposed in the vicinity of the lower end of a
vertical goods passage of a goods storage shelf, said
passage being designed to store cylindrical goods(23) in
5 position for rolling, said discharge mechanism being des-
igned to discharge said goods one by one in accordance with
discharge commands, characterized in that it comprises:
a first retainer member(9) designed to be extended into and
retracted from said goods passage so as to engage, when
10 extended, the lowest goods (23) to prevent the latter
from being discharged; a second retainer member (10) de-
signed to be extended into and retracted from said goods
passage so as to engage, when extended, with the goods
23a second from the bottom goods (23) to prevent said goods
15 from being discharged; a solenoid(7) with a movable core(7a)
designed to be attracted and biased in the direction oppo-
site to the direction of attraction; and a transmission mech-
anism (13,15) designed to transmit the movement of said
solenoid (7) to both of said retainer members(9,10) so as
20 to move them alternately into and out of said goods passage;
wherein the engaging portion between said goods and the re-
spective retainer members(9,10) has a width substantially
equal to the width of said goods, the combination of said
transmission mechanism(13,15) and said solenoid(7) is dis-
25 posed on one side of said goods passage, whereby, when two
sets of discharge mechanisms are arranged back-to-back, said
transmission mechanism and said solenoid of the two dis-
charge mechanisms are disposed side by side, along a line
substantially parallel to said side of the goods passage.
- 30 2. A goods storage and discharge system having a plurality of
storage shelves in an automatic vending machine , each of
which has a vertical goods passage designed to store cylind-
rical goods(23, 23a) in rolling position, said shelves being
arranged in parallel rows, and goods discharge mechanisms
35 in the vicinity of the lower ends of said goods passages of

1 the respective storage shelves and designed to discharge
the goods (23,23a) one by one in accordance with the dis-
charge commands, wherein each of said goods discharge
mechanisms includes: a first retainer member (9) designed
5 to be extended into and retracted from an associated goods
passage so as to engage, when extended, the lowest goods
(23) to prevent the latter from being discharged; a second
retainer member (10) designed to be extended into and re-
tracted from said goods passage so as to engage, when ex-
10 tended, with the goods (23a) second from bottom goods (23)
to prevent said goods from being discharged; a solenoid (7)
with a movable core (7a) designed to be attracted and bias-
ed by a spring (18) in the direction opposite to the direct-
ion of attraction; and a transmission mechanism (13,15)
15 to transmit the motion of said core (7a) to both of said
retainer members (9,10), so as to move them alternately into
and out of said goods passage; wherein the engaging portion
between said goods and the respective retainer members (9,10)
has a width substantially equal to the width of said goods,
20 the combination of said transmission mechanism and said
solenoid is disposed on one side of the associated goods
passage, while said goods discharge mechanisms of the ad-
jacent goods storage shelves are arranged in back-to-back
relation with the transmission mechanisms and said solenoids
25 of each of the goods discharge mechanisms are superim-
posed one above the other.

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FIG. 1

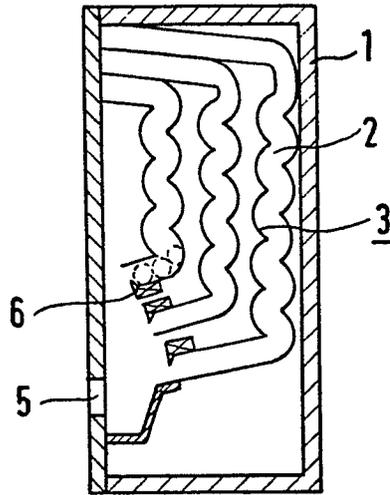


FIG. 4

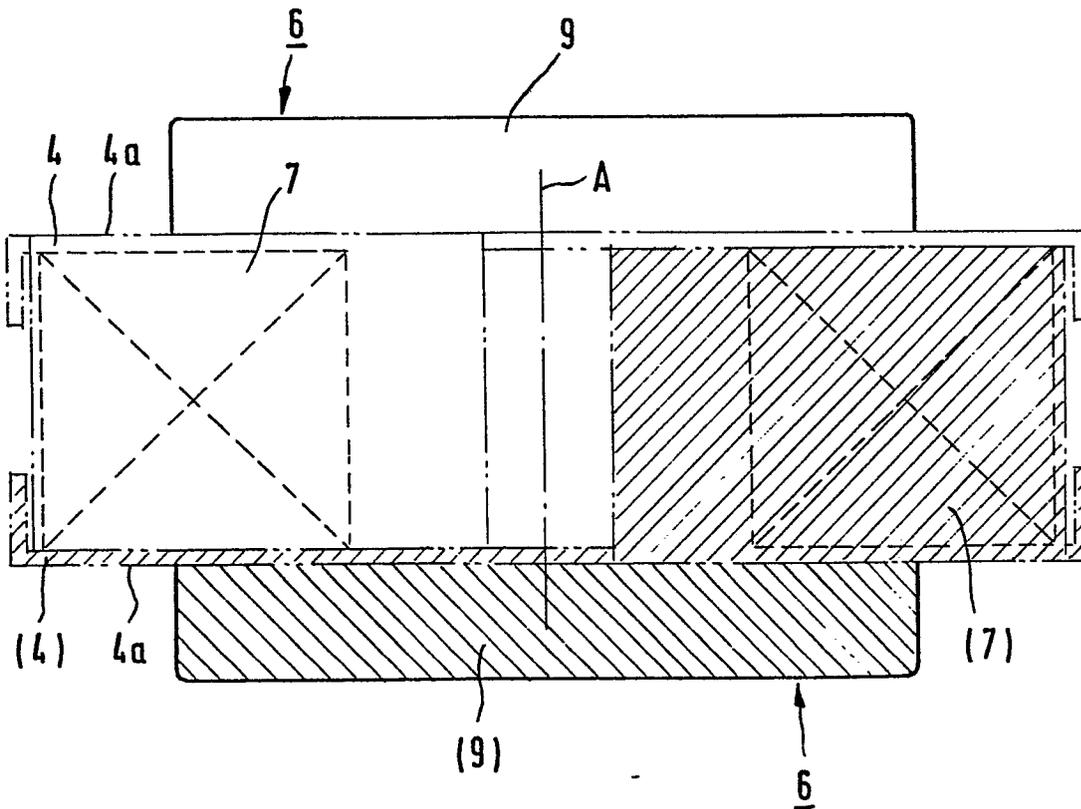


FIG. 2A

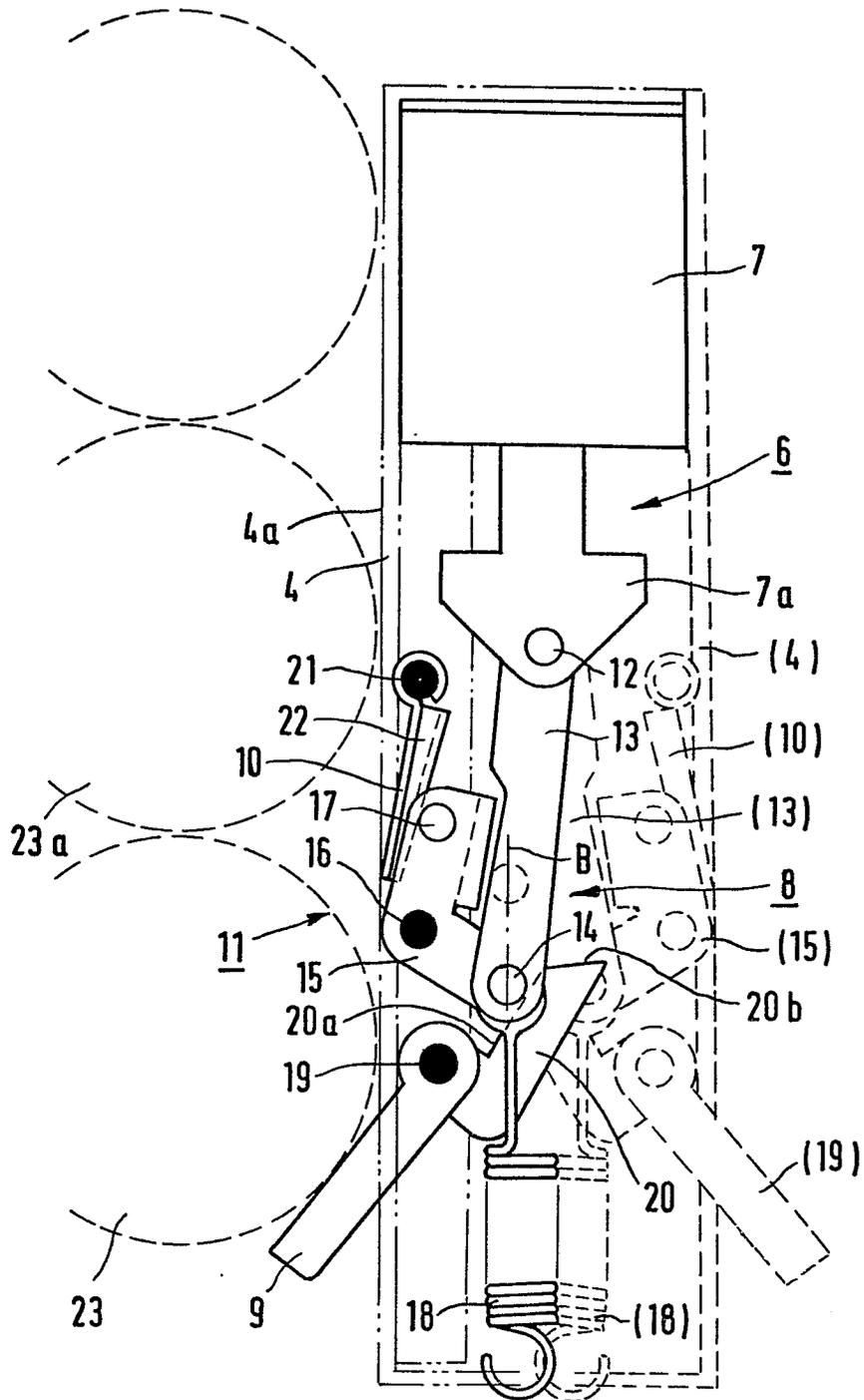


FIG. 2 B

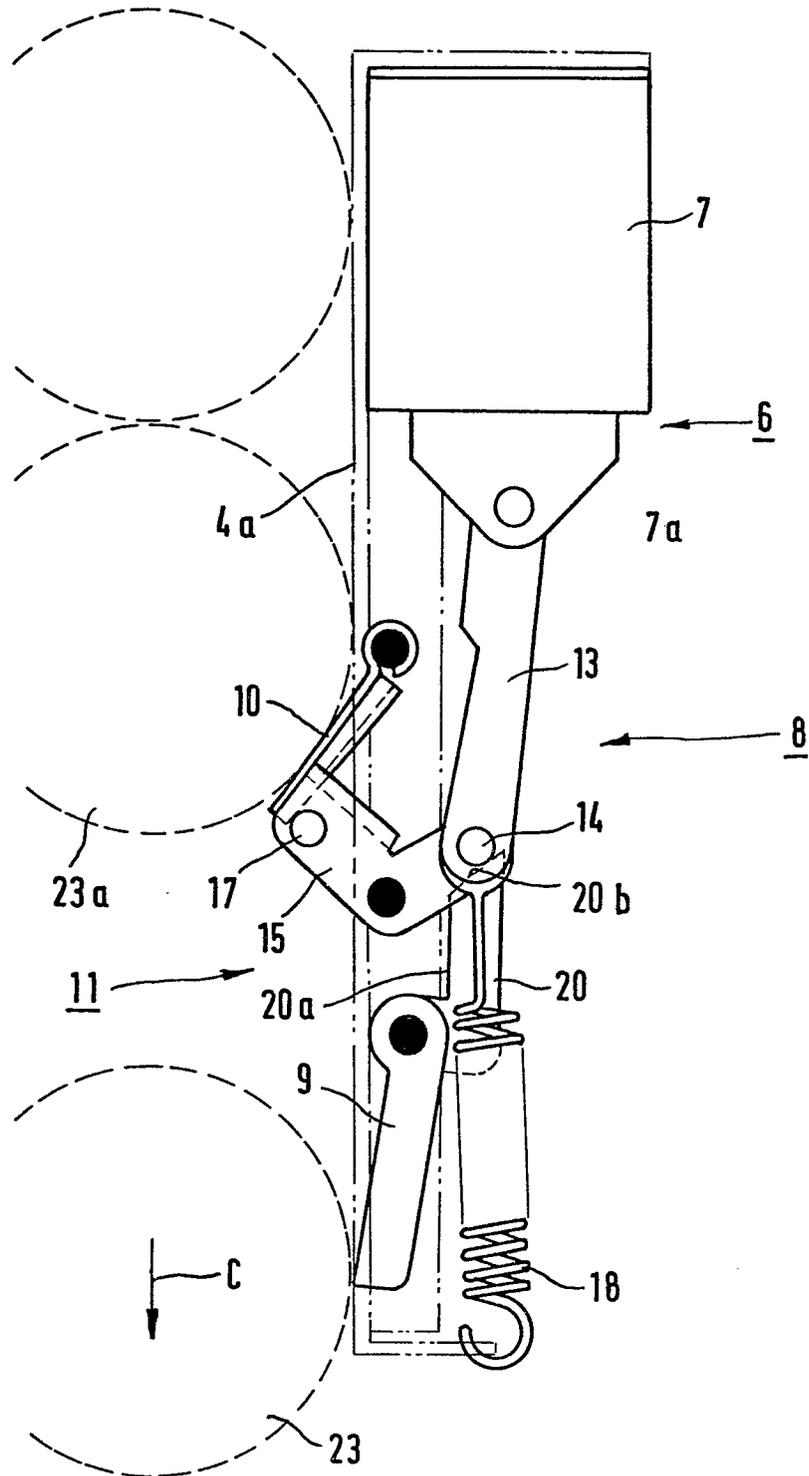


FIG. 3

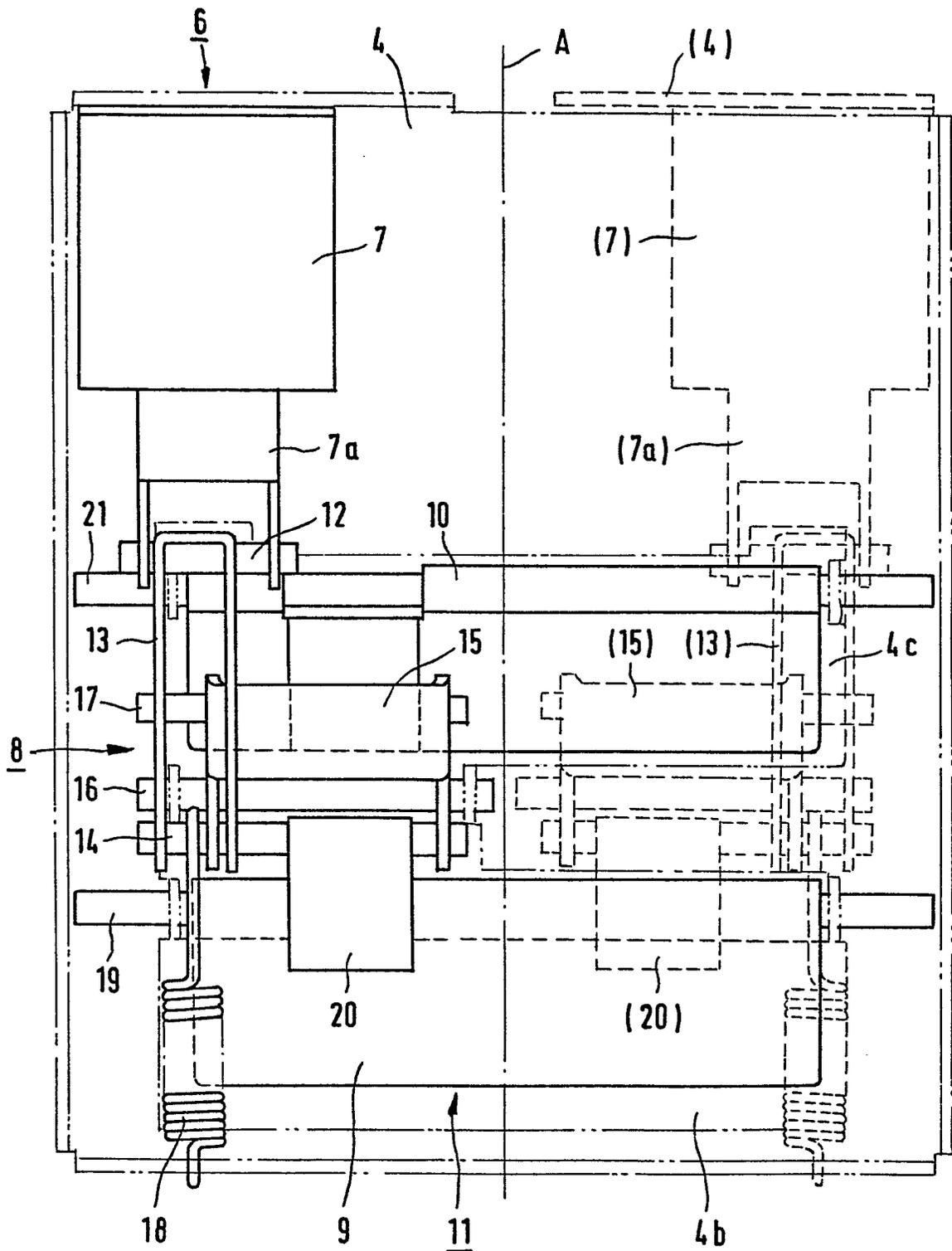


FIG. 5 A

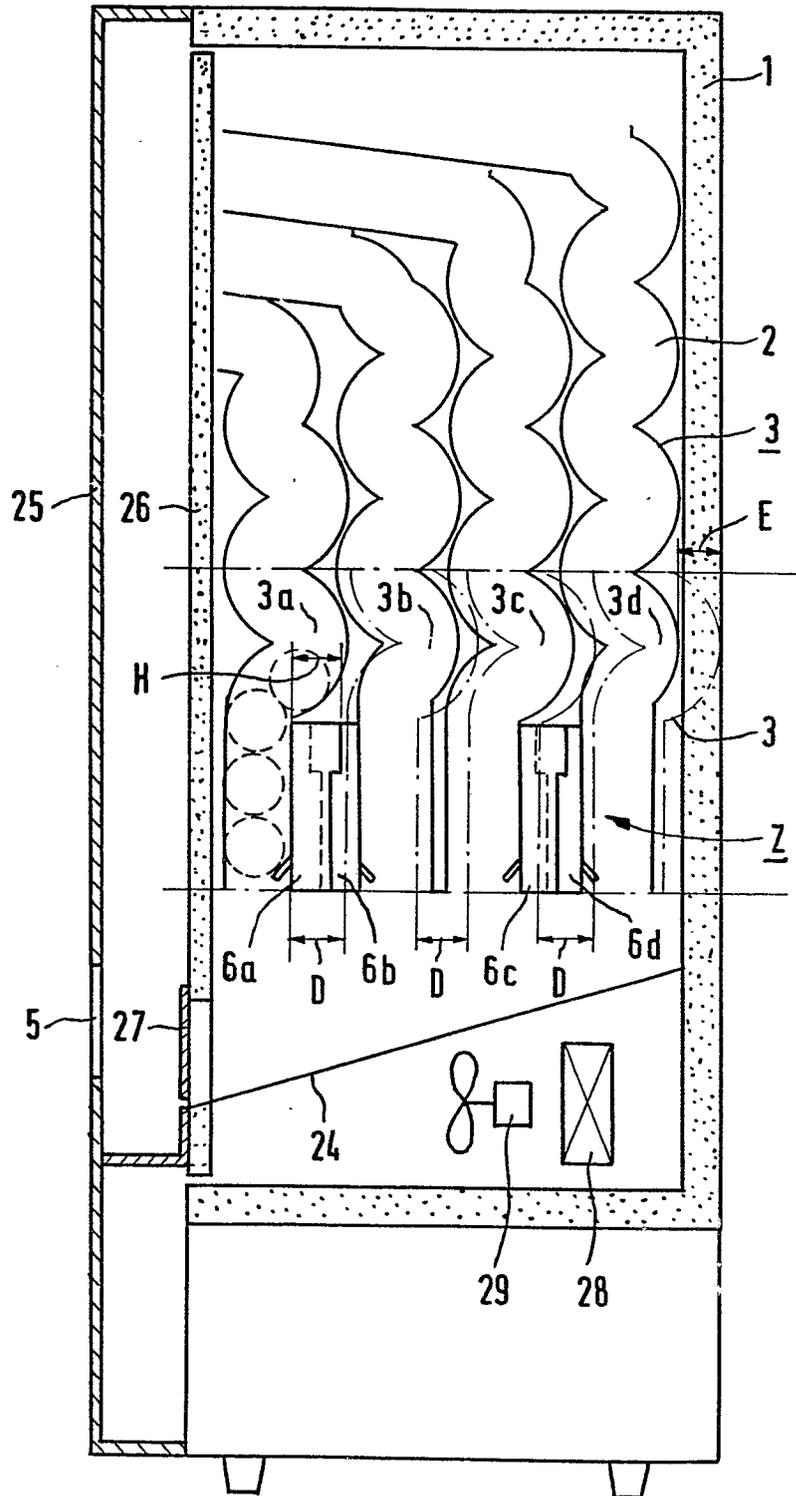


FIG. 5 B

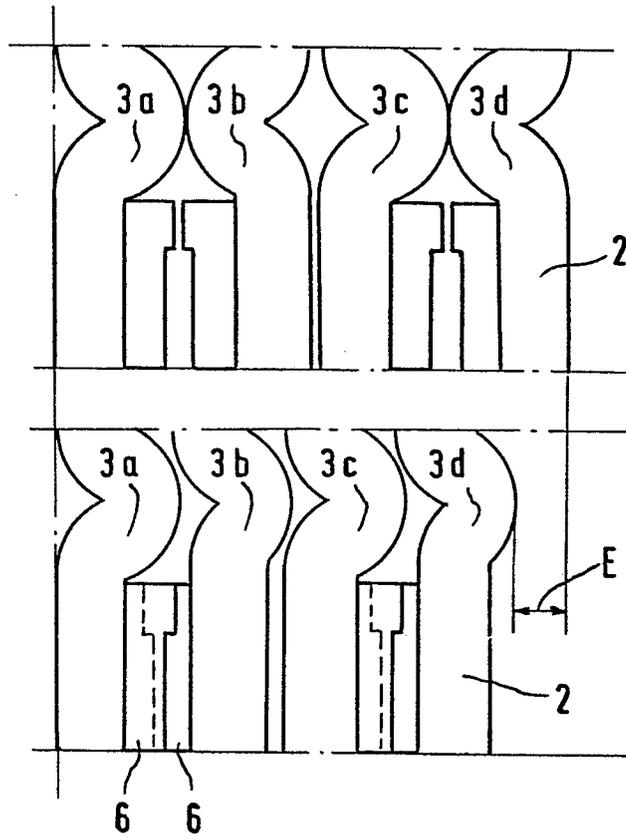


FIG. 6 A

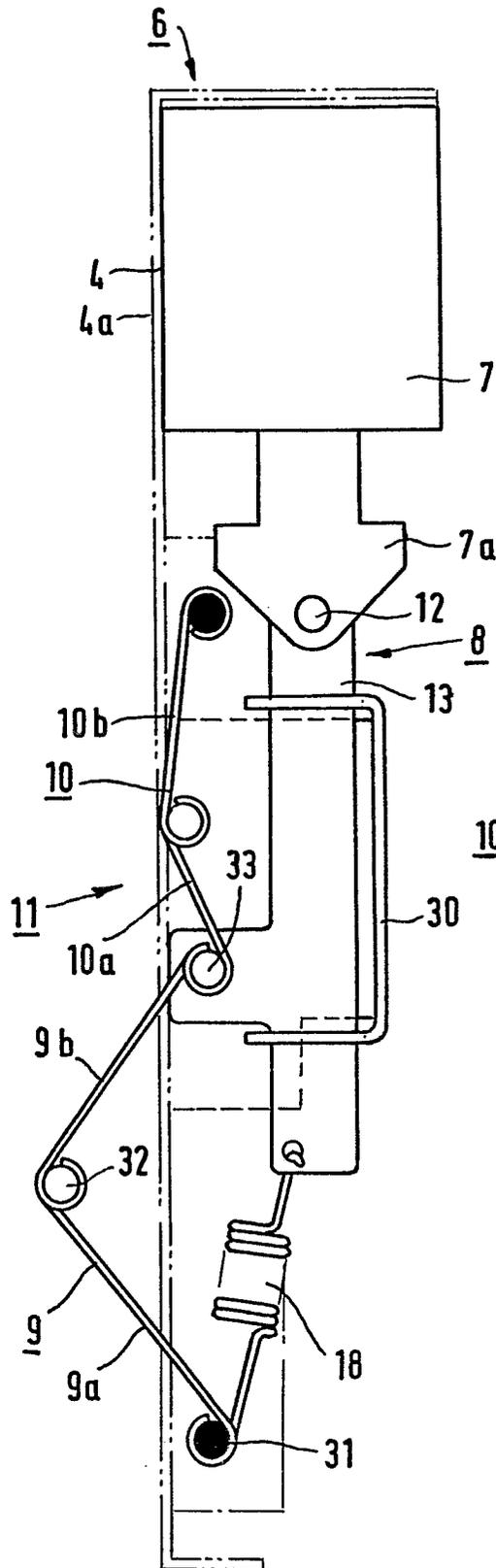


FIG. 6 B

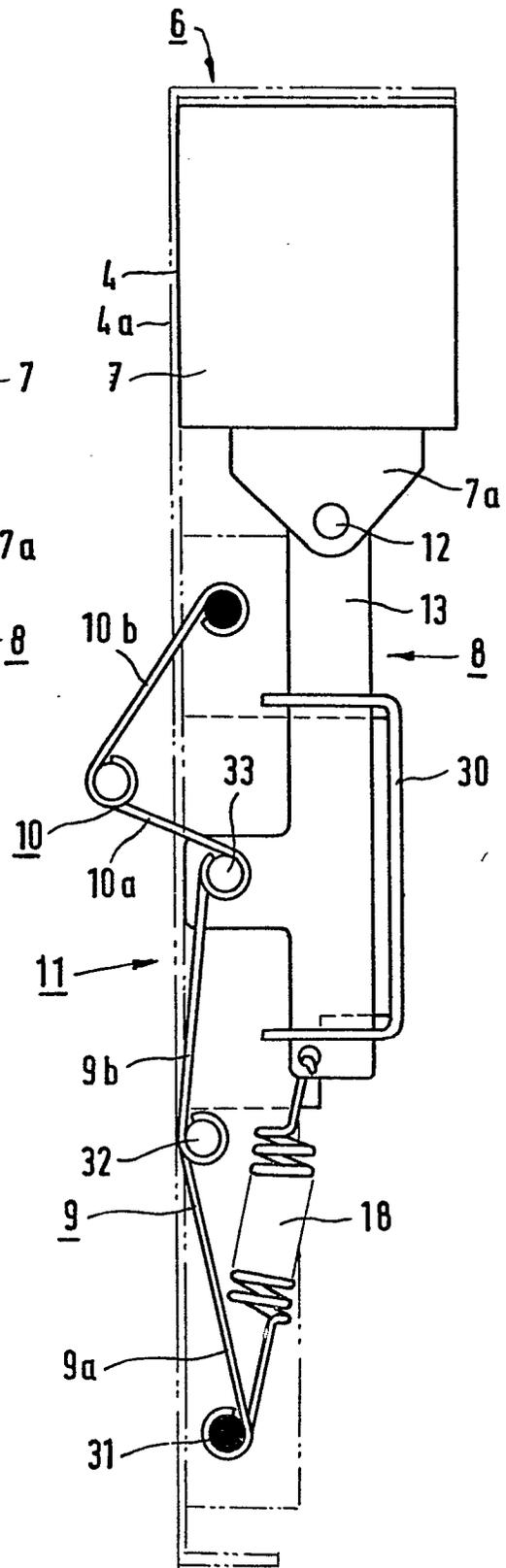
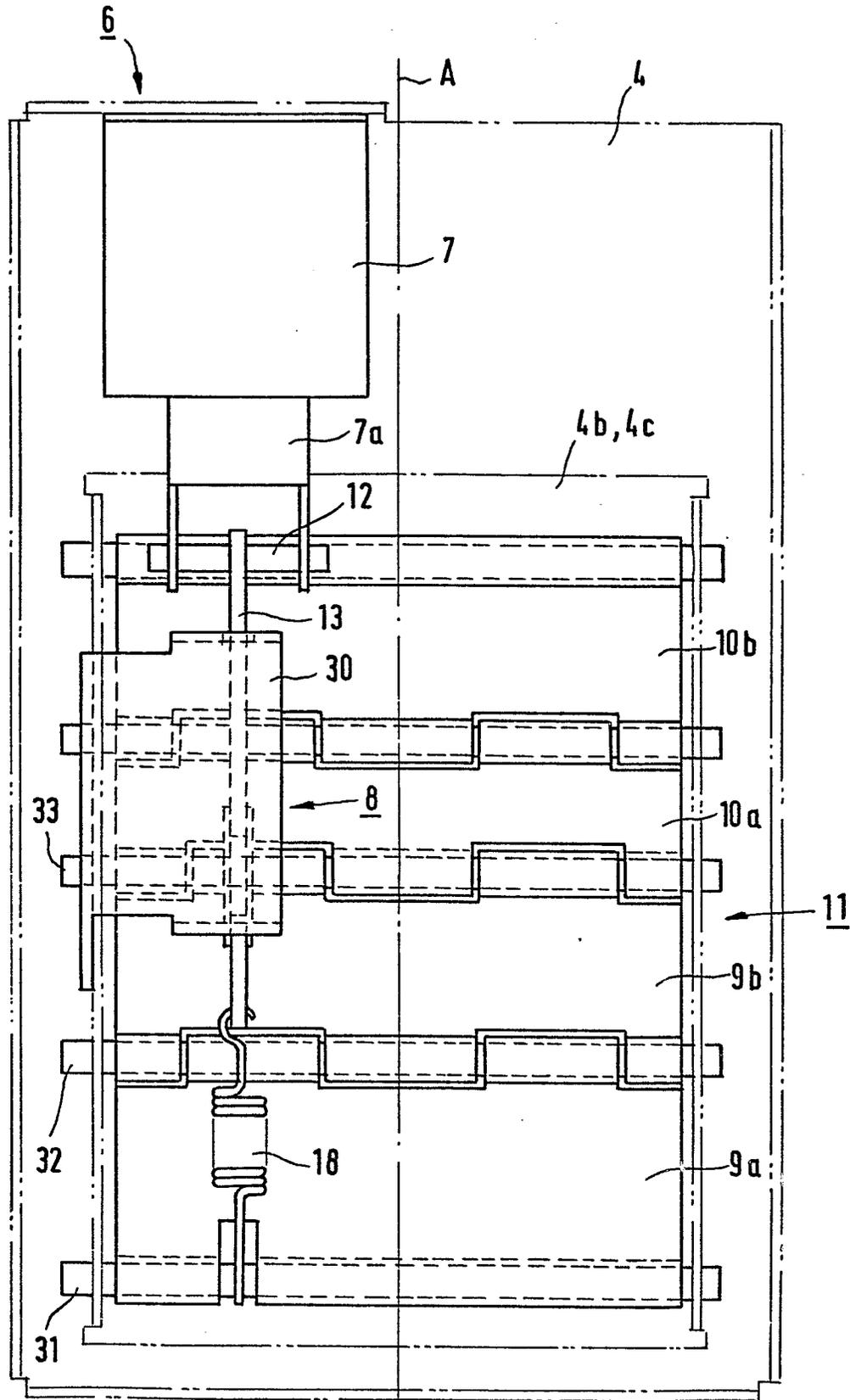


FIG. 7





DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
Y	<p><u>US - A - 3 602 403</u> (F.D. KLEM)</p> <p>* abstract; column 2, line 25 - column 3, line 11; figures 1-4*</p> <p style="text-align: center;">--</p>	1,2	G 07 F 11/16 G 07 F 11/04
Y	<p><u>DE - B - 1 045 134</u> (P. KLOCKE)</p> <p>* column 3, lines 26-34; figures 1,2 *</p> <p style="text-align: center;">--</p>	1,2	
A	<p><u>US - A - 3 158 289</u> (C. VAN BRUNT)</p> <p>* column 6, line 71 - column 7, line 4; figures 4,8 *</p> <p style="text-align: center;">--</p>	1,2	TECHNICAL FIELDS SEARCHED (Int.Cl. 3) G 07 F 11/00 - 11/10 11/16 11/22 11/24 11/28 - 11/34 11/42 11/46 11/48
A	<p><u>US - A - 2 837 237</u> (J.M. STEWART)</p> <p>* column 6, lines 24-52; figure 8 *</p> <p style="text-align: center;">--</p>	1,2	
A	<p><u>US - A - 3 498 497</u> (J.W. BAXENDALE)</p> <p>* figure 3 *</p> <p style="text-align: center;">--</p>	1,2	
A	<p><u>US - A - 3 831 806</u> (J.C. LINDSEY)</p> <p>* figure 1 *</p> <p style="text-align: center;">-----</p>	1,2	CATEGORY OF CITED DOCUMENTS X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons &: member of the same patent family, corresponding document
<p>The present search report has been drawn up for all claims</p>			
Place of search	Date of completion of the search	Examiner	
The Hague	17-02-1982	RUDOLPH	