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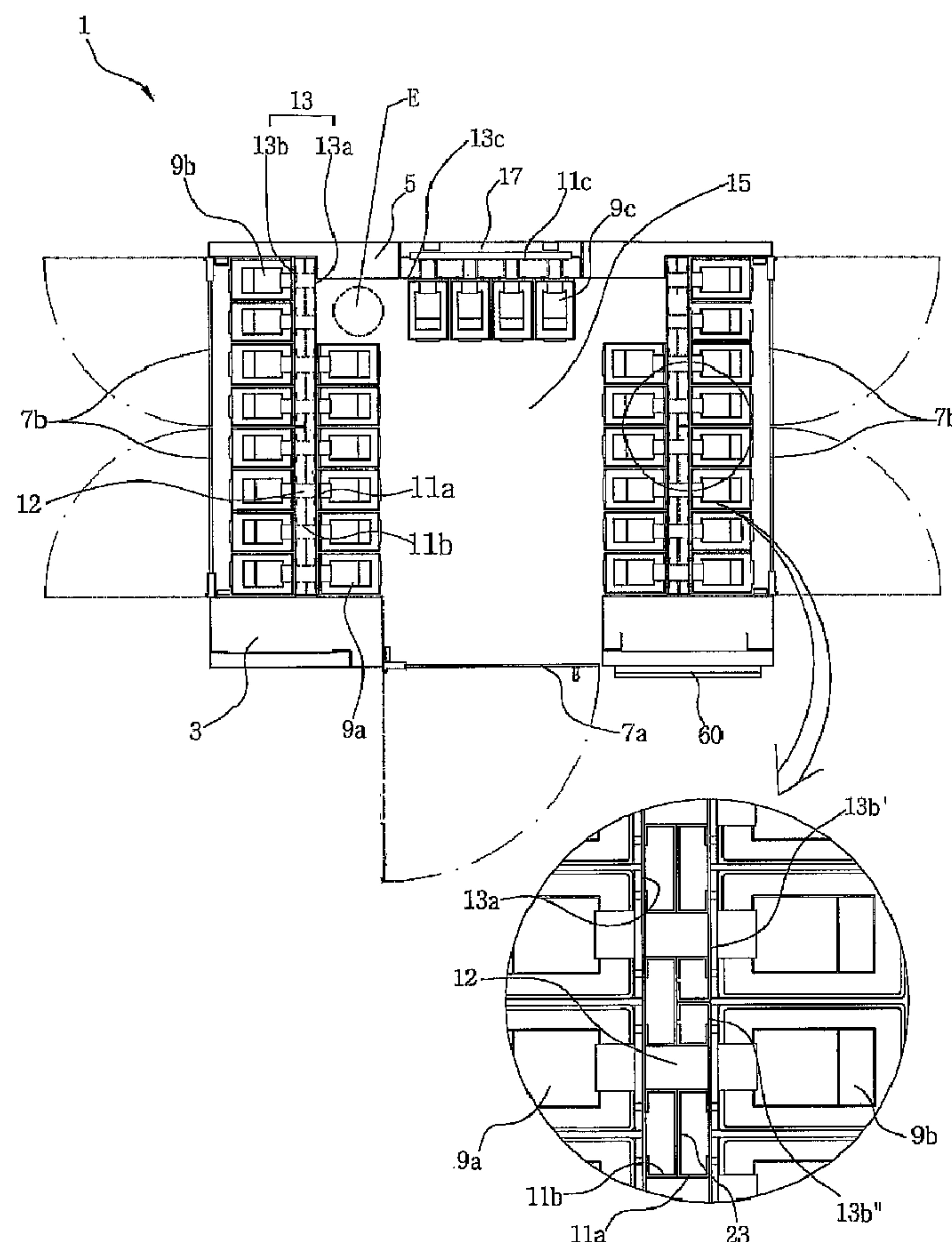
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(54) Title: APPARATUS FOR DISPENSING AND PACKAGING TABLETS



(57) Abrégé/Abstract:

The present invention relates to a pharmaceutical automation system. More particularly, it relates to an automatic tablet dispensing and packaging system, comprising a tablet dispensing unit having a body including sides, said tablet dispensing unit including

(57) **Abrégé(suite)/Abstract(continued):**

cassette array plates having tablet cassettes disposed thereon, said cassette array plates being positioned in a substantially surrounding alignment within said body such as to reserve a free space within said surrounding alignment, wherein: - a first side of said body is adapted to be opened thereby allowing access to the free space within said surrounding alignment from a location external to the tablet dispensing unit, and - at least one of said cassette array plates faces toward the free space within said surrounding alignment, wherein tablet cassettes disposed on said at least one of said cassette array plates can be detached therefrom by accessing said free space through said first side.

ABSTRACT

The present invention relates to a pharmaceutical automation system. More particularly, it relates to an automatic tablet dispensing and packaging system, comprising a tablet dispensing unit having a body including sides, said tablet dispensing unit including cassette array plates having tablet cassettes disposed thereon, said cassette array plates being positioned in a substantially surrounding alignment within said body such as to reserve a free space within said surrounding alignment, wherein:

- a first side of said body is adapted to be opened thereby allowing access to the free space within said surrounding alignment from a location external to the tablet dispensing unit, and

- at least one of said cassette array plates faces toward the free space within said surrounding alignment, wherein tablet cassettes disposed on said at least one of said cassette array plates can be detached therefrom by accessing said free space through said first side.

APPARATUS FOR DISPENSING AND PACKAGING TABLETS**Technical Field**

5 The present invention relates to a pharmaceutical automation system. In more detail, it relates to an automatic tablet dispensing and packaging system having compact structured tablet cassette array plates on which tablet cassettes containing different set of
10 tablets are attached and arranged.

Background Art

 An automatic tablet dispensing and packaging system is a machine which automatically sorts medicine prescribed by a doctor and wraps up dosage in a bag . It is generally
15 equipped with a plurality of tablet cassettes containing different sets of tablets, which are installed on the main body of a system with various arrangements, and controlled to dispense prescribed tablets as one dosage or more. The tablets dispensed from cassettes are transferred to a
20 packaging unit, via a hopper positioned beneath a dispensing unit, so as to pack the dosages into bags and seal the bags.

 Several automatic tablet dispensing and packaging systems have been designed to fulfil the function as
25 mentioned above.

 Korean Utility Model No. 2002-5029 discloses a large size automatic tablet dispensing and packaging system capable of accommodating 300 or more tablet cassettes. A cassette-mounting table on which is installed multi-stacked

tablet cassettes can slide out for cassette replacement or tablet refill. Although such a sliding type system enables spatial repositioning and can contain a large number of tablet cassettes in a minimum space, its manufacturing cost is high due to the complicated structure. In addition, the maintenance work associated to such as structure is relatively difficult.

An example of a mid size automatic tablet dispensing and packaging system accommodating between 100 and 300 tablet cassettes is shown in Korean Patent Application No. 1986-2173. It discloses tablet cassette array plates in a horizontal alignment in a shelf construction. Another example is described in Korean Patent Application No. 1990-12411, which discloses polar array of tablet cassettes in a vertical alignment. Compared to the large size systems, the mid size automatic tablet dispensing and packaging systems have a limited space for installing cassettes and do not permit the repositioning of the mounting table, although the structure of such systems is relatively simple.

A deficiency of conventional shelf type systems is that they typically require elongated hoppers to guide the tablets released from cassettes down to the packaging units because the tablet cassettes are arrayed in a horizontal alignment. Accordingly, the packaging time in the packaging units is delayed since horizontally elongated hoppers hold the tablets released thereon for a longer period of time.

Further, the conventional shelf type system requires a wider side wall of the system because tablet cassettes are stacked toward all directions.

Further, the shelf type system requires a significant amount of vertical space as well since the hopper must be positioned at an appropriate inclined angle so as to convey tablets released from cassettes to the exit of the hopper. It increases the total height of the hopper and the system, thereby deteriorating space efficiency. To resolve the problem mentioned above, a conveyor belt for receiving tablets dropped from cassettes has been utilized, thus tablets move to a small hopper installed in the middle of the system. However, the above solution represents a further complication to the system and introduces a delay in the packaging time.

Furthermore, in the shelf type system, the tablets have to drop to the surface of a hopper, and then roll or bounce in the hopper for a longer period of time. Therefore, tablets can be contaminated by the debris/dust generated and accumulated at the hopper, which may lead to an increase of danger factors because even a slight amount of the tablet debris, if mixed with another prescription, may cause a negative medical affect on patients.

Accordingly, ejection paths of cassettes and the hopper surface should be cleaned regularly. However, the cleaning as well as the maintenance of system parts demands a lot of time for disassembling and assembling the system.

A horizontal type system known in the art discloses a largely elongated hopper, enabling it to receive tablets dropped from cassettes in horizontal alignment. In addition, a conveyor belt is installed beneath the exit of the hopper for guiding the dropped tablets to the packaging

unit. Therefore, a horizontal type system requires the larger bottom space to align tablet cassettes in horizontal array, and deteriorates space efficiency because the upper space above tablet cassettes can not be utilized.

5 A furtherdisadvantage is that the released tablets drop to the conveyor belt via the hopper surface and therefor take a longer period of time, thereby decreasing the tablet packaging speed. Further, it is also necessary to disassemble all the system in order to clean tablet
10 debris and dust accumulated on the hopper or the conveyor belt, thereby increasing the maintenance time.

 Accordingly, the conventional mid size dispensing and packaging systems present several problems such as deteriorating space efficiency, delay of tablet packaging
15 time, and difficulty in cleaning or maintenance work.

Summary of the Invention

 The present invention overcomes at least some of the disadvantages of the shelf type or the horizontal type of
20 the conventional mid size dispensing and packaging systems. Accordingly, it is an object of the present invention to provide an automatic tablet dispensing and packaging system having compact structured tablet cassette array plates, in which tablet cassettes containing different set of tablets
25 are arranged. Thereby it leads to minimizing the size of a hopper guiding the tablets to a packaging unit installed at the lower part of the system, to reducing the time of packaging, to minimizing the debris or dust of tablets.

Another object is to improve machine space efficiency by enabling more tablet cassette accommodation in a limited machine space of the shelf type or the horizontal type dispensing and packaging system.

5 Another object is to provide a compact dispensing and packaging system which can accommodate a greater number of tablet cassettes while reserving the space within the system for an operator to conveniently work on tablet cassettes for cassette replacement or cassette tablet
10 refill.

A still further object is to increase the time efficiency for cleaning and maintenance work by employing removable cassette array plates capable of attaching tablet cassettes.

15 To accomplish the above objects, the present invention provides a mid size dispensing and packaging system having compact structured cassette array plates. More particularly, it provides an apparatus for an automatic tablet dispensing and packaging system, which
20 collects tablets released from tablet cassettes aligning on the cassette array plates of a dispensing unit, and packages tablets in a packaging unit placed at the lower part of a system. The tablet cassette array plates are installed as surrounding alignment along the interior of
25 the system, thereby reserving the free space within the system.

In accordance with a broad aspect, the invention provides an automatic tablet dispensing and packaging

system comprising:

- 5 (a) a tablet dispensing unit having a body including sides, said tablet dispensing unit including cassette array plates having tablet cassettes disposed thereon, said cassette array plates being positioned in a substantially surrounding alignment within said body such as to reserve a free space within said surrounding alignment, wherein:
- 10 - a first side of said body is adapted to be opened thereby allowing access to the free space within said surrounding alignment from a location external to the tablet dispensing unit, and
- 15 - at least one of said cassette array plates faces toward the free space within said surrounding alignment, wherein tablet cassettes disposed on said at least one of said cassette array plates can be detached therefrom by accessing said free space through said first side; and
- 20 (b) a packaging unit for collecting and packaging a tablet which is released from said tablet cassettes, wherein said packaging unit is disposed below said tablet dispensing unit.

25 **BRIEF DESCRIPTION OF THE DRAWINGS**

Figure 1 is a front view of an automatic tablet dispensing and packaging system depicting the system structure in accordance with the present invention.

Figure 2 is a plane view of an automatic tablet

dispensing and packaging system depicting the system structure in accordance with the present invention.

Figure 3 is a side view of an automatic tablet dispensing and packaging system depicting the system
5 structure in accordance with the present invention.

Figure 4 is a side view showing an embodiment attaching the tablet cassette array plate at the rear frame of a system in accordance with the present invention.

Figure 5 is an illustration depicting the system
10 having one part of a removable tablet cassette array plate detached in accordance with the present invention.

Figure 6 is a plane view showing an embodiment having a tablet cassette array plate detached from a rear frame of a system in accordance with the present invention.

Figure 7 is a plane view showing an opened door and
15 having tablet cassette array plates at the front of a system in accordance with the present invention.

Figure 8 is a front view showing a door and having tablet cassette array plates at the front of the system in
20 accordance with the present invention.

Figure 9 is an imaginary front view of the conventional shelf type system having an equivalent number of tablet cassettes as the present invention.

25 Detailed Description

Hereinafter, referring to appended drawings, the distinctive structures and elements of the embodiments of the present invention are described in detail.

Figure 1 through Figure 6 show an embodiment having conventional glass doors, where tablet cassettes are not installed, constructed on the front and each side frame of a system.

5 As shown in Figure 1 and Figure 2, a system 1 provides a front frame 3 and a rear frame 5 respectively, at the front and rear parts of the system. A hinged door 7a is installed beside the middle part of the front frame 3, and a control unit 60 is installed at the front door.

10 A tablet cassette array plate 13c attaching tablet cassettes 9c is provided at the middle part of the rear frame 5, and an opening element 17 is installed behind the back surface of the array plate. The opening element 17 and the tablet cassette array plate 13c are bound by the
15 fastening elements 21c, 21d.

Further, at each side panel of the front frame 3 and the rear frame 5, are provided hinged doors 7a, 7b, but may be replaced by sliding doors. Particularly, the opening element 17 installed at the middle of the rear frame 5 can
20 employ either a sliding type or a hinged type door.

At the interior of each door 7b, the tablet cassettes 9a, 9b are each respectively installed on one side of array plates 13a, 13b. The opposite side of the tablet cassette array plates 13a, 13b include protrusion elements 11a, 11b
25 vertically aligned along the vertical line of each cassette. By facing both protrusion elements 11a, 11b, an ejection path for tablets is formed. Further, the tablet cassettes are positioned in a configuration within the inside surface of the system thereby defining a free space

15 within the system 1.

Meanwhile, among a pair of tablet cassette array plates 13 positioned on each side of the system 1, the tablet cassette array plate 13a facing toward the free space 15, is a fixed type array plate which is fastened on both front and rear frame by a screw. The fixed type array plate 13a and the tablet cassette array plate 13b facing toward the door 7b are bound by a fastening element 21a. The fastening element 21a as shown in Figure 1 is a bolt, and penetrates a contact portion 23 formed by facing the protrusion elements 11a, 11b.

The tablet cassette array plates 13b facing toward the door 7b are divided into a constant width along the longitudinal direction, thereby each divided array plates is removable.

The removable tablet cassette array plates 13b employ a fastening element 21b, which corresponds to the fastening element 21a for the tablet cassette array plates 13a. The corresponding fastening element 21b as shown in Figure 1 is a nut having a groove on the head part for easy rotating using even coins. Further, the nut has a stopping element 24 at the bottom of the fastening element 21b to prevent it from dropping even when the nut and the fastening element 21a are separated completely.

As shown in Figure 4, the fastening elements 21c, 21d for combining the opening element 17 and the tablet cassette array plates 13c installed at the rear frame 5, can be constructed similar to the fastening elements 21a, 21b for combining a pair of tablet cassette array plates

13. The conventional opening means, for example, a hinged type door can replace the opening element 17.

It is desirable that the tablet cassette array plate 13c installed at the middle of the rear frame 5, is as long
5 as the width of the free space 15.

Figure 6 is a side view showing an embodiment having the tablet cassette array plate 13c detached from a rear frame 5.

As shown in Figure 2, the installing space for the
10 fixed type tablet cassette array plate 13a should secure an empty space E so as to avoid interfering with the tablet cassettes installed at tablet cassette array plate 13c. When we consider an embodiment as shown in Figure 6, we can install tablet cassettes at the empty space E.

15 If the number of a vertical array line of tablet cassettes installed at the rear frame 5 is 4 as shown in Figure 2, the number of installed tablet cassettes is not changed even when the embodiment shown in Figure 6 is considered. However, if the number of a vertical array line
20 of tablet cassettes is over 4, the embodiment in Figure 2 can still have installed a larger number of tablet cassettes than the embodiment in Figure 6.

In addition to the embodiments shown in Figure 1 through Figure 6, the embodiments shown in Figures 7 and 8
25 can increase the number of tablet cassettes by replacing conventional glass door with door 7c having tablet cassette array plate 13d, wherein door 7c can be opened. The door 7c is connected to the system 1 via a hinge member. The front and back part of the door can be opened respectively, and

the tablet cassette array plate 13d having a plurality of tablet cassettes 9d is installed on the inside of the door. Namely, the tablet cassette array plates 13a, 13b are installed in surrounding alignment along the interior of the system and fixed to the front and rear frames 3 and 5. Furthermore, the tablet cassette array plate 13d attaching a plurality of tablet cassettes 9d is installed on the interior of the door 7c that hinges on the system 1.

In the door 7c depicted in Figure 7, tablet cassettes 9d are placed on only one side of the tablet cassette array plate 13d. However, if necessary, it is possible to place tablet cassettes at both sides of the tablet cassette array plate in a similar manner as for the tablet cassette array plates 13a, 13b and 13c installed in the system 1. Furthermore, the door 7c, mentioned above, can be placed not only at the front of a system 1, but also on any side including the front, rear, left, or right side of the system 1.

Hereinafter, referring to the apparatus mentioned above, the operation procedures and the effectiveness of the embodiments of the present invention are described in detail.

An automatic tablet dispensing and packaging system in accordance with the present invention is classified as a mid size system, generally accommodating about 100 to 300 tablet cassettes. The number of tablet cassettes, of course, can be below 100 or over 300 by controlling the size of a tablet cassette, if necessary.

By operating the machine, the tablets released from

the tablet cassettes 9a, 9b, 9c, 9d installed on the tablet cassette array plates 13a, 13b, 13c, 13d of the system 1 are transferred to a hopper 40, via an ejection path 12 constructed on the back side of the tablet cassette array plates 13a, 13b, 13c, 13d. Thereafter, tablets collected at the hopper 40 are guided to a packaging unit 50 so as to pack dosage into bags.

The hopper 40 in the present invention can be reduced to the more compact size than the elongated hopper of a conventional shelf type system, because every ejection paths 12 can be accommodated in the internal area, which surrounds the free space 15 of the system 1. Accordingly, the embodiment as shown in Figure 1 through Figure 6 can accommodate about 160 normal sized tablet cassettes, and the embodiment as shown in Figures 7 and 8 can accommodate about 200 normal sized tablet cassettes.

If one were to place 160 tablet cassettes simply in a rectangular alignment as in a conventional shelf type machine, the shape of the resulting system would be elongated as denoted by the one-dot chain line in Figure 9. It is obvious that such a system would have an even more elongated shape for accommodating 205 cassettes. Therefore, compared to the wall area occupied by tablet cassettes, the area for the conventional shelf type machine is about 2.6 times greater than that required by the present invention.

Furthermore, a conventional shelf type system requires an elongated hopper as denoted by the one-dot chain line in Figure 9. Accordingly, it requires a hopper of a greater height to accommodate an appropriate inclined

angle so as to convey tablets swiftly. This results in an increase in the total height of the hopper and of the system, thereby deteriorating space efficiency. To avoid a higher hopper, a conveyor belt system can be considered.

5 However, it has disadvantages including a more complicated system and the time delay as mentioned previously. Meanwhile, the size of a hopper 40 in present invention fits in a compact quadrilateral shape, thereby reducing the need for a conveyor belt system for receiving tablets

10 dropped from the elongated hopper as would be required in a conventional horizontal type system. Consequently, an automatic tablet dispensing and packaging system having the fixed cassette tables in accordance with the present invention maximizes the machine space efficiency by optimal

15 cassette capacity in a unit space.

Furthermore, when tablet debris and dust are accumulated on the hopper 40 or the wall surface of an ejection path 12 in the process of transferring tablets to a packaging unit 50, the present invention provides the

20 possibility to detach a tablet cassette array plate and expose the wall surface of an ejection path to outside, thereby allowing cleaning the system easily. A contaminated surface of the hopper 40 is also easy to clean after detaching from a system by a normal way because it is fixed

25 beneath the lower part of the ejection paths.

The method for detaching a tablet cassette array plate 13b for cleaning or maintenance work is as follows. First, opening the door 7b installed at the side or front of a system 1. Next, rotating the nut, the fastening

element 21b, installed on the divided and removable tablet cassette array plate 13b', 13b" to be cleaned or mended, and then separating the bolts from the fastening element 21a. By separating the fastening element 21a from fastening
5 element 21b, each divided and removable tablet cassette array plate 13b', 13b" can be detached easily from the fixed tablet cassette array plate 13a. Figure 5 is an illustration depicting the system in which the divided and removable tablet cassette array plates 13b', 13b" have been
10 detached from their array plate .

Referring to Figure 7, the tablet cassette array plate 13c formed on the rear frame 5 can be also detached by the method as mentioned above. Further, the array plate 13c can also be easily detached by replacing the tablet
15 cassette array plate installed on a door with a removable plate, and by employing an identical opening element as an opening element 17 behind the back side of the cassette plate. Accordingly, the cleaning or maintenance work can be processed easily owing to exposing the ejection path 12
20 after having proceeded with the above detaching method.

The free space 15 is an essential element in the present invention to allow exchange of empty tablet cassettes 9a and/or 9c since these tablet cassettes are installed as fixed type instead of sliding type. Namely,
25 among a pair of the tablet cassette array plates 13, the tablet cassette 9b facing toward the door 7b can be easily exchanged while opening the door 7b. The tablet cassette array plate installed at the inside of the door 7c is also easily exchangeable by the front opening. Meanwhile, the

tablet cassette 9a and 9c facing toward the interior of the system 1 can be exchanged after opening the door 7a or 7c which is positioned at the front frame of the system 1. Namely, the cassettes are exchanged by utilizing the free
5 space 15 defined in the middle of the system 1. Accordingly, a system operator conveniently works on exchanging the tablet cassettes 9a and/or 9c facing toward the interior of the system 1 without any interference with other structural elements by opening the door 7a.

10 As discussed above, an advantage of the present invention is that the compact structured tablet cassette array plate enables the smaller wall space, and the stacking structure of tablet cassettes enables the smaller base space, thereby minimizing the installation space for a
15 machine.

The present invention provides an automatic tablet dispensing and packaging system having the fixed type cassette tables of a shelf type or a horizontal type machine, instead of sliding type cassette tables, thereby
20 maximizing the machine space efficiency by optimal cassette capacity in a unit space.

Furthermore, a compact hopper construction decreases the time period for transferring the released tablets to a packaging unit, and reduces the time for contaminating the
25 tablets, thereby substantially improving the packaging time.

Further, the removable tablet cassette array plate enables the easy operation due to the smaller weight of the tablet cassette array plate. In addition, it contributes to

reduce the time for cleaning and maintenance work of the tablet ejection paths.

Furthermore, the tablet cassettes can be exchanged easily by utilizing the doors installed at the front and
5 rear frame. Particularly, the free space formed in the middle of a system enables an easy replacement of cassettes or tablet refill in the cassettes, thereby maximizing satisfaction of the pharmacists and system operators.

Since those having ordinary knowledge and skill in
10 the art of the present invention will recognize additional modifications and applications within the scope thereof, the present invention is not limited to the embodiments and drawings described above.

What Is Claimed Is:

1. An automatic tablet dispensing and packaging system comprising:

5

(a) a tablet dispensing unit having a body including sides, said tablet dispensing unit including cassette array plates having tablet cassettes disposed thereon, said cassette array plates being positioned in a substantially surrounding alignment within said body such as to reserve a free space within said surrounding alignment, wherein:

10

- a first side of said body is adapted to be opened thereby allowing access to the free space within said surrounding alignment from a location external to the tablet dispensing unit, and

15

- at least one of said cassette array plates faces toward the free space within said surrounding alignment, wherein tablet cassettes disposed on said at least one of said cassette array plates can be detached therefrom by accessing said free space through said first side; and

20

(b) a packaging unit for collecting and packaging a tablet which is released from said tablet cassettes, wherein said packaging unit is disposed below said tablet dispensing unit.

25

2. An automatic tablet dispensing and packaging system according to claim 1, further comprising a door positioned

on the first side of said body, wherein said door selectively enables access to said free space within said surrounding alignment.

5 3. An automatic tablet dispensing and packaging system according to claim 2, comprising a cassette array plate positioned inside said door.

10 4. An automatic tablet dispensing and packaging system according to any one of claims 1 to 3, wherein said system comprises a front frame and a rear frame.

15 5. An automatic tablet dispensing and packaging system according to claim 1, further comprising protrusion elements positioned on said cassette array plates, said protrusion elements forming ejection paths for tablets released from tablet cassettes disposed on said cassette array plates.

20 6. An automatic tablet dispensing and packaging system according to any one of claims 1 to 3 and claim 5, wherein said cassette array plates comprise a fixed type cassette array plate and a removable type cassette array plate, wherein said fixed type cassette array plate is attached to
25 the body of said tablet dispensing unit, and wherein said removable type cassette array plate is releasably fastened to said fixed type cassette array plate by fastening elements.

7. An automatic tablet dispensing and packaging system according to claim 6, wherein said removable cassette array plate is comprised of a plurality of plates.

5 8. An automatic tablet dispensing and packaging system according to claim 1, comprising a second side of said body being adapted to be opened thereby allowing access to said at least one cassette array plate from a location external to the tablet dispensing unit.

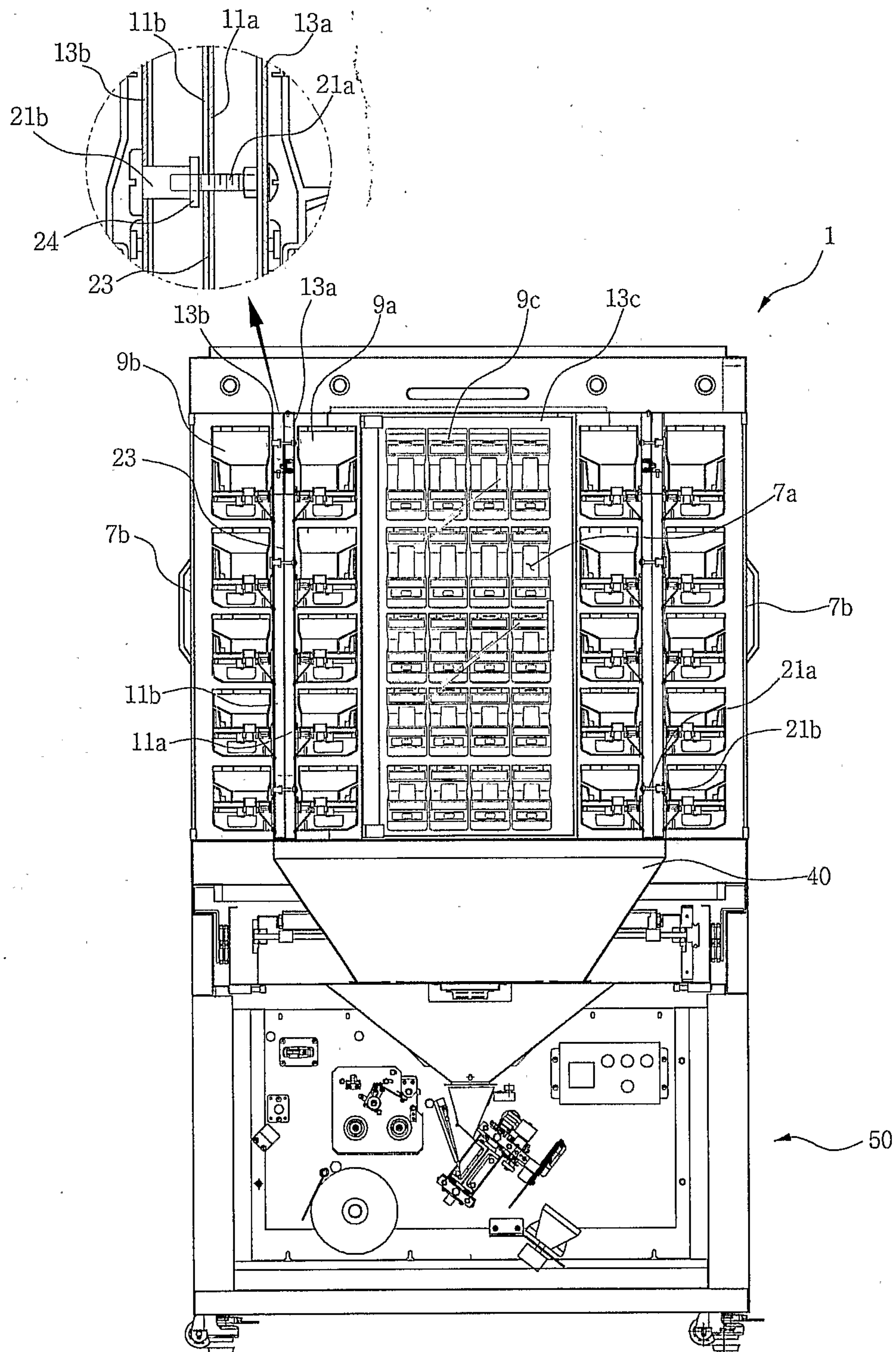
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9. An automatic tablet dispensing and packaging system according to claim 8, further comprising a door positioned on the second side of said body, wherein said door selectively enables access to said at least one cassette
15 array plate from a location external to the tablet dispensing units.

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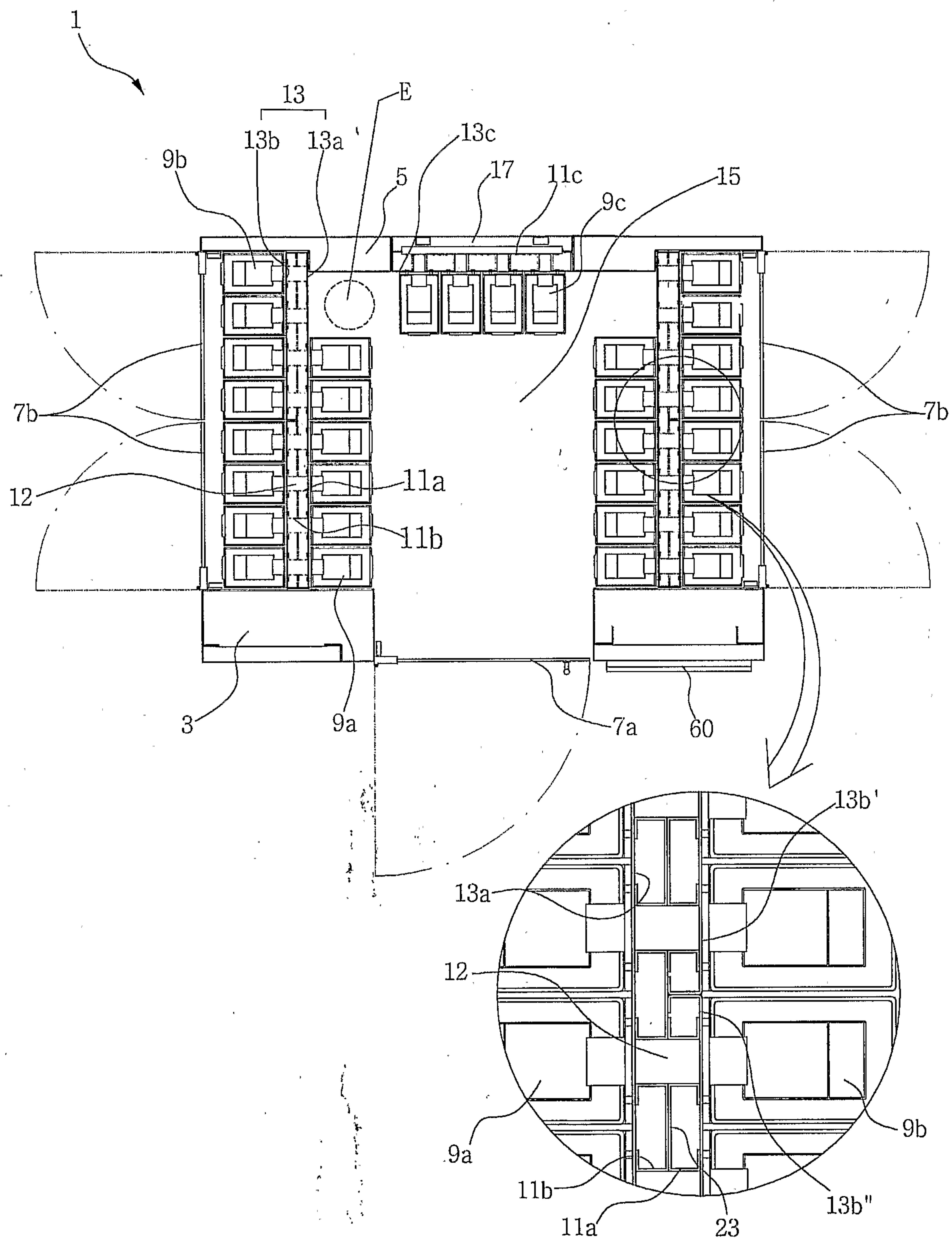
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Fig. 1



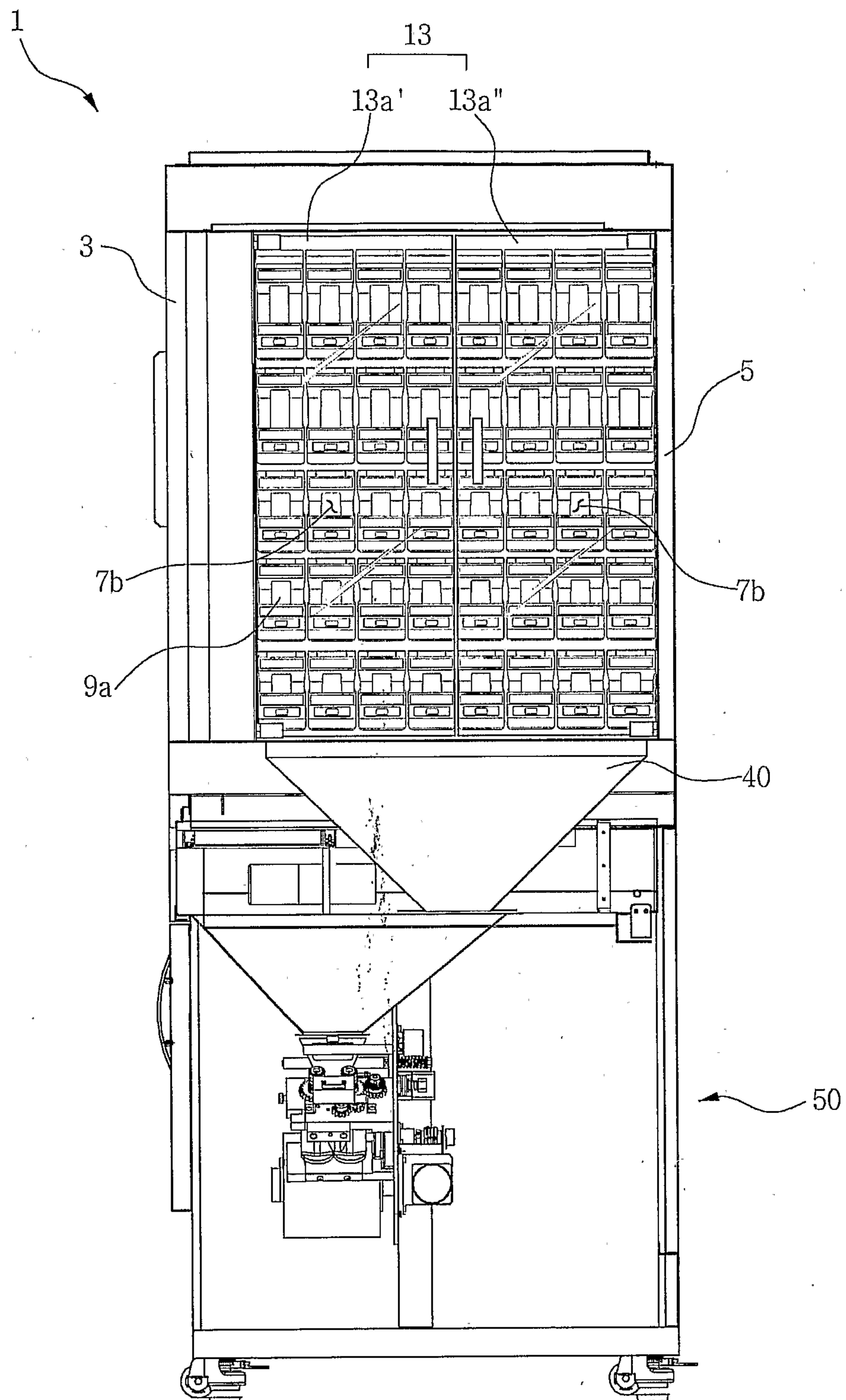
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Fig. 2



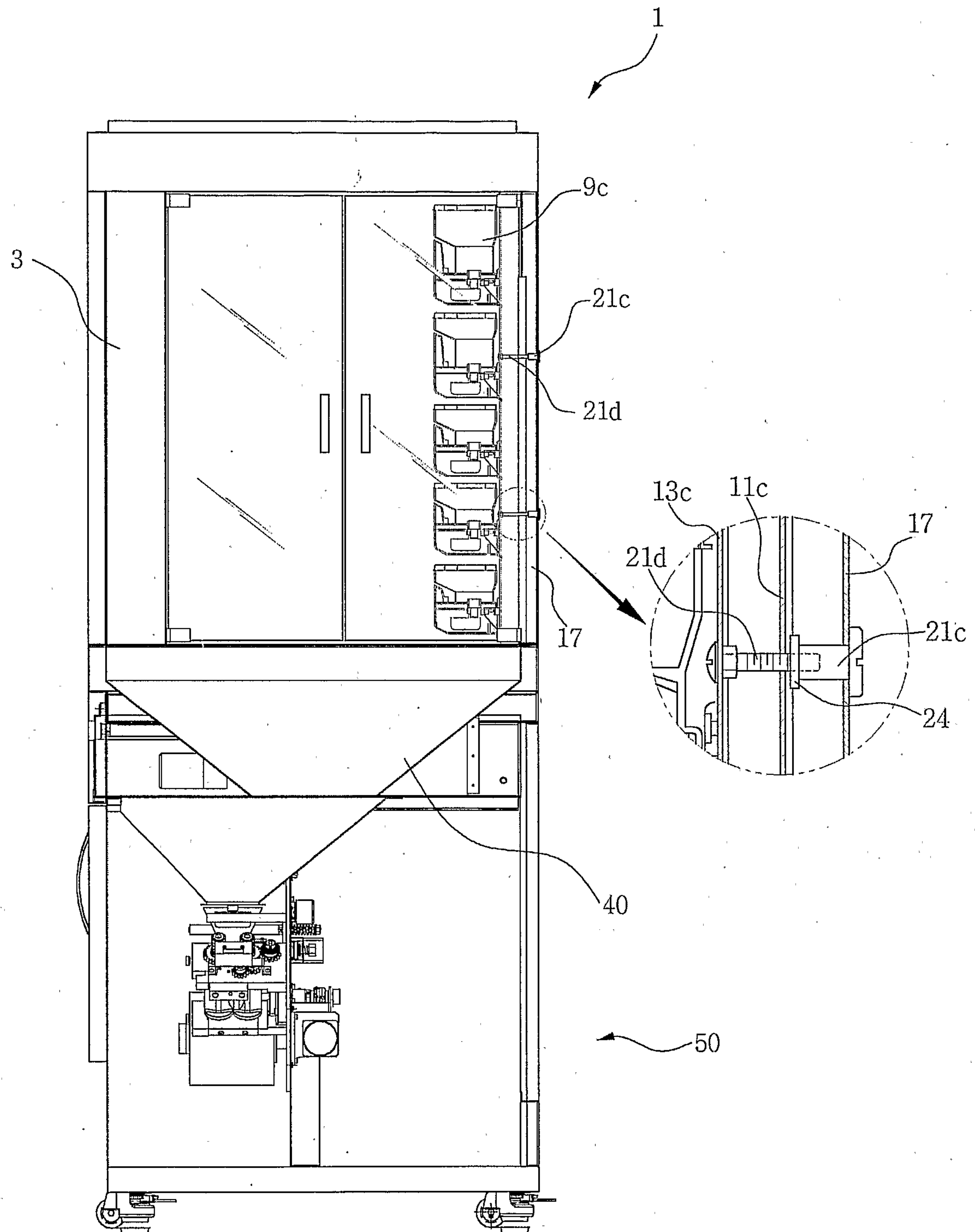
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Fig. 3



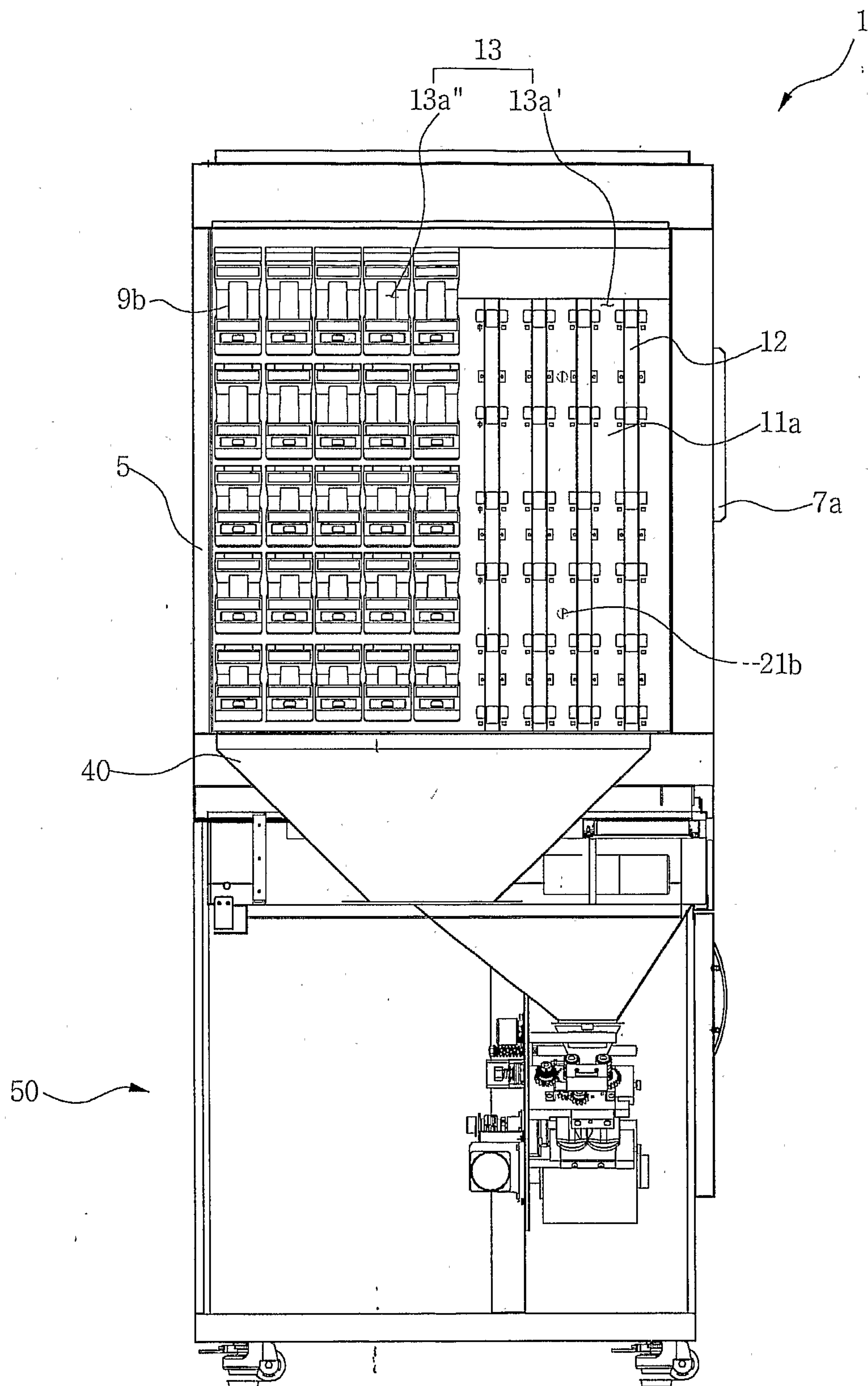
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Fig. 4



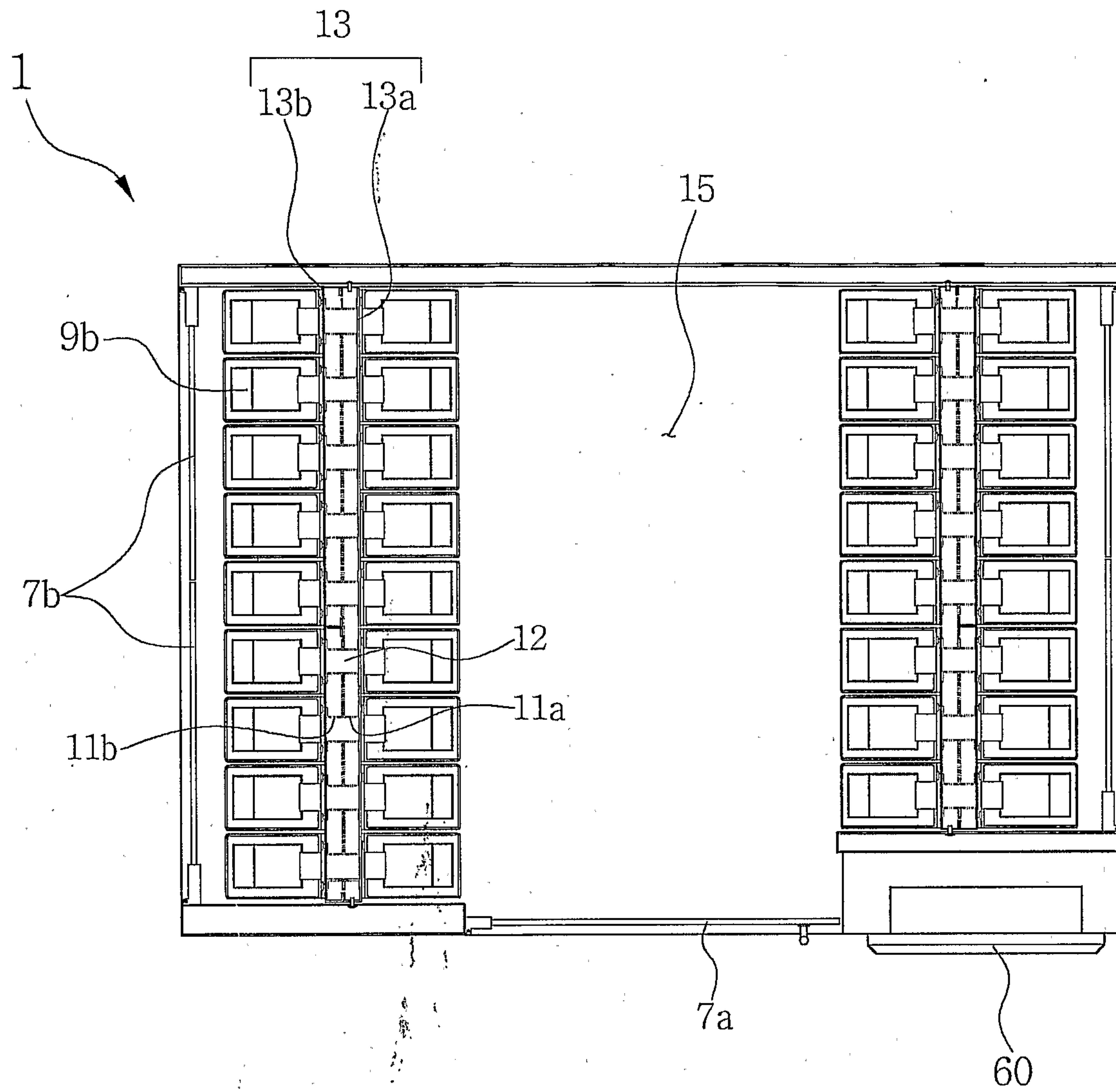
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Fig. 5



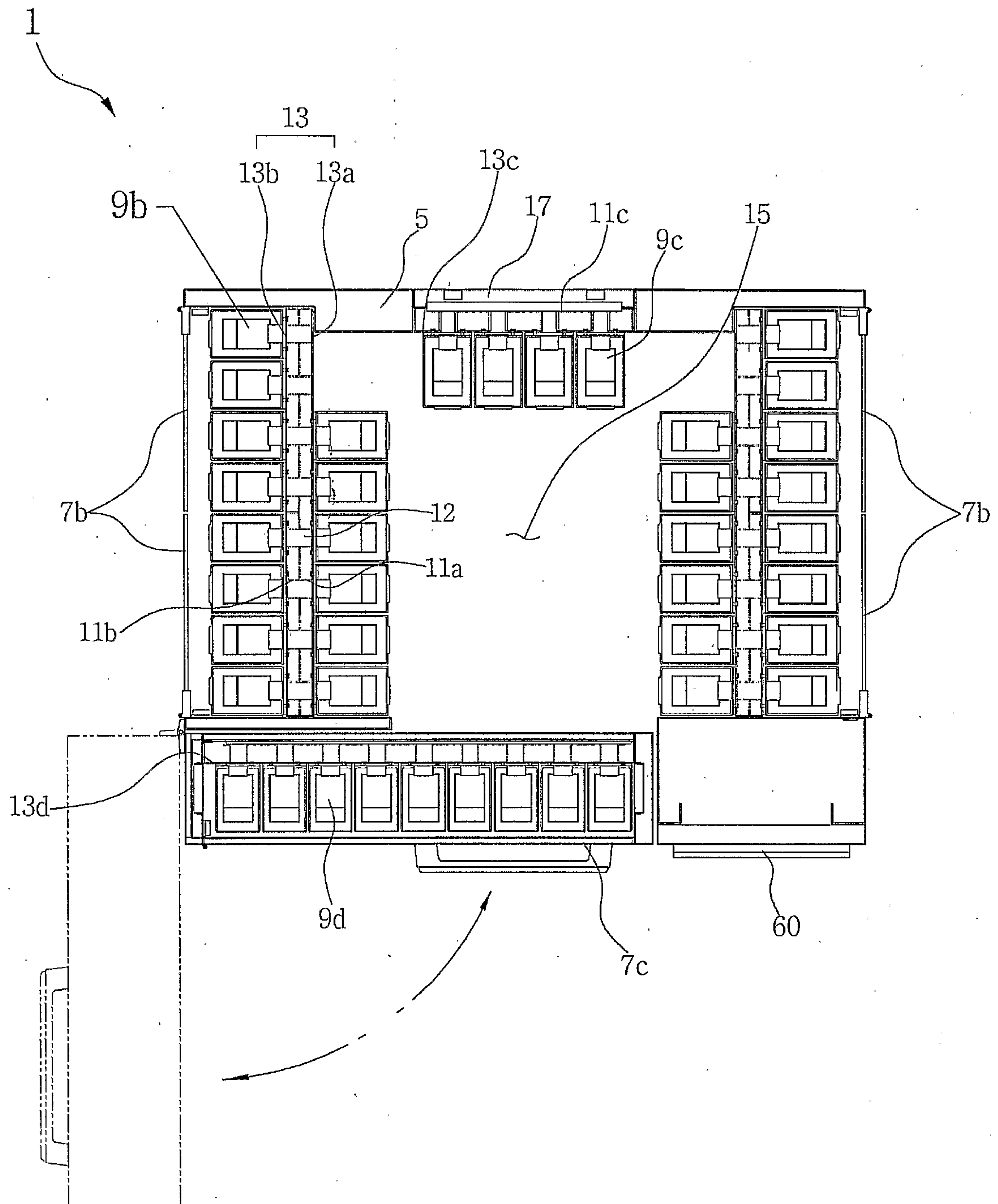
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Fig. 6



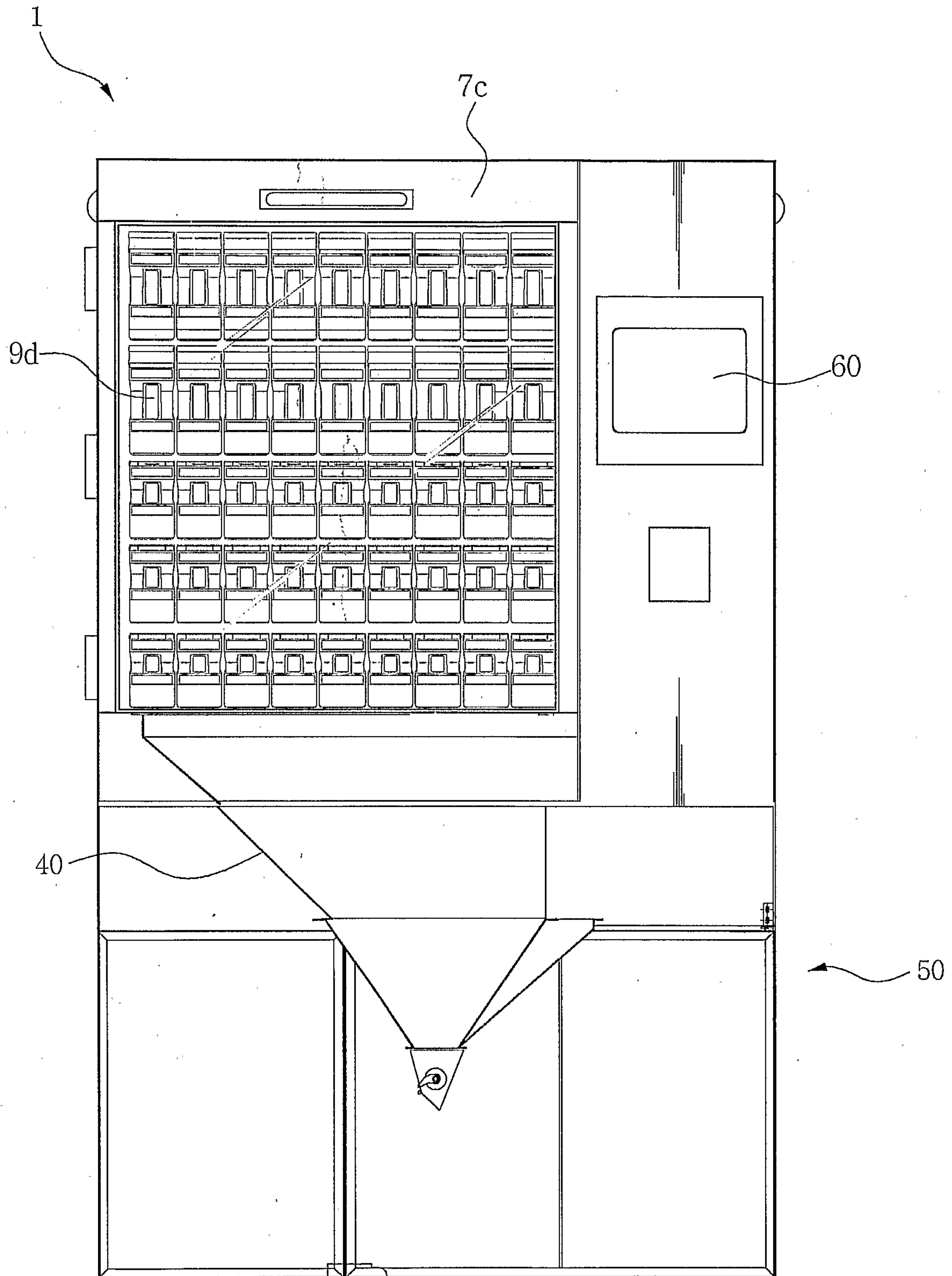
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Fig. 7



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Fig. 8



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Fig. 9

