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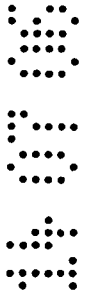
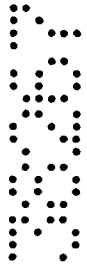
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(56) Related Art
US 4421019

ABSTRACT

Disclosed is apparatus for selectively depositing a predetermined number of products, especially cracker biscuits. Apparatus includes a dispensing stack of said products, gate means for closing the bottom of said stack, and holding means operative within said stack. The arrangement is such that the holding means is adapted to retain said stack above a predetermined number of products, so that when the gate means is opened, the predetermined number of products are dispensed. Also disclosed is a method of utilising said apparatus to dispense products to a receptacle.



AUSTRALIA

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COMPLETE SPECIFICATION STANDARD PATENT

Application Number:

Lodged:

Invention Title: **BISCUIT DEPOSITOR**

The following statement is a full description of this invention, including the best method of performing it known to :- us

BISCUIT DEPOSITOR

TECHNICAL FIELD

The present invention relates to the handling and deposition of rough shaped and dimpled biscuits, particularly but not exclusively rice crackers and the like.

BACKGROUND ART

It is known for various applications to deposit a predetermined number of crackers or similar products in a plastic tray structure. For example, in 'cracker and dip'-type products, it is often desired to place a small, predetermined number of crackers in a receptacle in the tray, the tray also including a small depression filled with another substance such as a dip. Such products are sold as snacks.

However, it is not straightforward to handle products such as rice crackers reliably. The nature of the surface of such products is that when they are slid across each other, their rough surfaces tend to cause binding and interlocking between individual crackers. Moreover, as the surfaces are irregular, when stacked each cracker does not occupy a uniform height. The height occupied by each cracker depends in part upon the interlocking of dimples and raised parts between crackers.

Conventionally, depositors used an assumption of uniform height for each cracker to wipe off the required number of crackers from the bottom of the stack.

Figure 1a depicts a prior art stacking depositor utilizing uniform biscuits. The depositor 10 includes stack 11 of substantially uniform crackers 12. When required, the pusher 13 removes 3 biscuits from the bottom of the stack across surface 14 into the tray (not shown). This works well for a flat, relatively uniform product.



Figure 1b illustrates the difficulties that arise when this prior art procedure is used with a cracker having a less even surface. Rice crackers, with a rough surface, often dimpled appearance and non-uniform thickness provide a good example. When the pusher 13 wipes the three products from the bottom of stack 12a, it is common that the top biscuit being wiped is crushed by the machine, leading to product wastage. Further, simply moving the surfaces of the top of batch 15a from the bottom of the stack involves two rough, non-uniform surfaces rubbing against each other. Accordingly, the surface of one or both of the crackers may be damaged as the crackers wipe past each other. It will be appreciated that the non-uniform surface of rice crackers means that the extent of interlocking is essentially random. Accordingly, the variance in the height required for the wiper makes the process unviable due to the great extent of product wastage.

SUMMARY OF THE INVENTION

It is accordingly an object of the present invention to provide an improved biscuit depositor, and method for depositing, which is suitable for use with non-uniform, rough-textured product.

According to one aspect, the present invention provides apparatus for selectively depositing a predetermined number of products, said apparatus including a dispensing stack, gate means for closing the bottom of said stack, and holding means operative within said stack, the arrangement being such that the holding means is adapted to retain said stack above a single product, so that when the gate means is opened, a single product can be dispensed; wherein the holding means are two or more sets of pins adapted to fit in between individual products in said stack to support balance of said stack above a predetermined number of individual products and wherein said pins are inserted into, and retracted from, said stack in such a manner as to fit between individual products in the stack, thereby holding the stacked products above the open gate and preventing them from passing through the gate when opened; and wherein said sets of pins are located so as to enter said stack from opposing sides.

It will be appreciated that the ability to dispense single products allows for a stack of any predetermined number to be dispensed. It simply requires iterations of the gate and holding means to release the desired number of single products.

Operating on a single product only makes it much simpler to deal with possible variations in product height. Preferably, the holding means is shaped and arranged so that it can readily cope with small variations in thickness, for example by having a pointed or angled working surface.

It has been observed in trials that a much better rate of dispensing with a much lower product breakage rate can be achieved than with the prior art 'height measurement' type of approach.

In addition, where the holding means are one or more pins adapted to fit in between individual products in a stack, it has been found to be particularly advantageous that two such sets of pins are provided, each of which is adapted to enter the stack from opposing sides. Being relatively thin, they can be fitted in between the products without needing to lift or separate the products from one another. This can be done by having one or more such pins positioned outside the stack at a height approximate to the expected position of the top of the uppermost product that is to be deposited during that cycle. The pins are then inserted between said products at the appropriate time, whereupon they will restrain the products above from dropping, while the products below are deposited.

The positioning of the sets of pins on opposing sides of the stack means that each set is required to travel a maximum distance of half the diameter of the individual products, making it far less likely that the products will be disturbed by the pins, resulting in lower rates of breakage and higher potential throughput of the depositing apparatus.

In particular, this arrangement has operational advantages over prior art systems, such as that disclosed in US Patent No. 4,421,019 by Hocking *et al*, which discloses the use of a single, flat side gate mounted to one side of the product stack.

By products are meant crackers including rice crackers, biscuits, cookies, and similar products.

According to another aspect, the present invention provides a method of dispensing products, including the steps of:

- (a) providing a stack of products, supported at the bottom by a first retaining means and positioned in a fixed position relative to said receptacle;
 - (b) operating a second retaining means so as to support all of said products, except the bottom-most product;
 - (c) removing said first retaining means so as to allow the bottom-most product to be deposited to said receptacle;
 - (d) replacing said first retaining means;
 - (e) disengaging said second retaining means to allow the bottom of the remaining stack to become supported by said first retaining means;
- steps (b) to (e) being repeated until the required quantity of products are dispensed, wherein the second retaining means conforms to the holding means described above.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the present invention will now be described with reference to the accompanying drawings, in which:

Figures 1A and 1B are schematic illustrations of the operation of prior art deposition technique;

Figure 2 illustrates, in sectional elevation, features of one embodiment of the inventive apparatus;

Figure 3 illustrates in plan the same embodiment; and

Figure 4 in plan an arrangement where an array of depositors according to the present invention is operated in parallel.

DESCRIPTION

Figures 1a and 1b illustrate the prior art arrangement and deficiencies with such an arrangement, as previously described.

Turning to Figure 2, one implementation of the present invention is disclosed. It will be appreciated that many elements of the embodiment may be substituted with equivalent mechanical components. For example, the tube may be of a different shape; slide gates may utilize an entirely different configuration, and the pin cylinders may operate in a different manner.

Turning to Figures 2 and 3, there can be seen a tube 3 which is filled with rice crackers 11 forming a stack 12. Although the present invention is described in relation to rice crackers, the present invention is suitable for any similar, rough textured product. Indeed the present invention can be used with conventional, flat textured products if desired.

At the base of tube 3 is a slide gate 4, which supports the stack 12. There are disposed on either side of the tube 3 pin cylinders 2. These pin cylinders 2 are adapted to move into the face of the tube 3 and out again under the control of the overall apparatus. Such control arrangements are well understood and will not be described in detail. The pin cylinders may be operated by any suitable means, for example, pneumatically, hydraulically or electrically.

The pin cylinders, as can be better seen in figure 3, are tipped with a blunt, curved tip. This assists in separating the products, as will be described in further detail below. It is noted, however, that alternative shapes for the ends of the pin, and entirely alternative arrangements, are contemplated within the scope of the present invention.

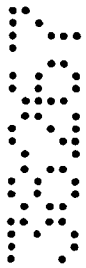
The positioning of the sets of pins on opposing sides of the stack means that each set is required to travel a maximum distance of half the diameter of the individual products, making it far less likely that the products will be disturbed by the pins, resulting in lower rates of breakage and higher potential throughput of the depositing apparatus.

A typical operation of the apparatus will now be described. Prior to operation, tube 3 is prefilled with crackers 12 so as to form stack 11. The slide gates 4 are closed, so as to support the stack 11. Pin cylinders 2 are retracted so as to not impinge on stack 11.

The operation of the depositor commences upon a suitable command being received. Typically, this command may be received from the tray forming machine, to indicate that a tray is in position ready to receive the crackers. Upon commencement, the pin cylinders extend within tube 3 so as to support the stack 12, other than the bottom cracker in the stack. Gates 4 then open so as to allow a single cracker – the bottom-most cracker in the stack 12 – to drop into the tray below. Gates 4 then shut. The pin cylinders then retract, allowing the stack to fall slightly. This cycle can be repeated as often as required, so as to deposit the required number of crackers 12 into the tray (not shown).

It will be appreciated that whilst it is preferred that the crackers drop directly into a suitable tray orifice, the cracker could be simply stacked onto a conveyor or the like for later deposition. It will also be appreciated that the present invention readily allows for a variable number of crackers to be both deposited one by one, so as to form stacks or packages of any desired number.

Figure 5 illustrates a practical working arrangement, in which six depositors are operating in parallel. It will be appreciated that the depositors may be arranged differently, in different numbers or in different configurations as is



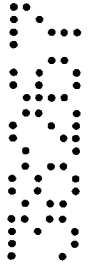
suitable to the rest of the packing line. Utilising the arrangement shown in Figure 5, trials have shown that a continuous rate of 120 crackers per minute can be achieved. The breakage of crackers is dependent upon the degree of deformity of each item. However, with reasonable quality product breakage of less than 1 in 500 crackers has been achieved. This is a significant improvement over the wiping-type depositor.

Occasionally, where the height of the bottom-most cracker is greater than optimum, the bottom-most cracker may be undesirably positioned directly adjacent the pins of the pin cylinders. This may lead to the pins piercing the edge of the cracker as they are deployed. This in turn prevents the pierced cracker from dropping into the tray when the gates open. This can lead to an incorrect number of crackers being deposited in the tray. The same effect may happen where a cracker is present in the stack which has an 'oval' shape such that its largest dimension is greater than the inside diameter of the stack cylinder, preventing both it and the crackers above it from falling freely through the cylinder.

In order to overcome this issue, a detection system may be installed, such as a photo-electric cell, which will detect those trays where insufficient numbers of crackers are present. When this is detected, a 'purge cycle' may be operated, wherein the gates and pins are opened concurrently, i.e. the gates open before the pins extend, allowing the cracker that has been pierced by the pins to drop out. The system may be set to a timer, that might allow approximately 2 crackers to drop out before the pin cylinders deploy. The system then returns to normal operation following this purge cycle.

For best results with rice crackers specifically, it is preferred that their maximum height fall within the range 6.3 mm to 6.5 mm. However, it is possible to successfully handle rice crackers having a height ranging between 3 mm and 6.5 mm.

It will be appreciated that variations and additions are possible within the spirit and scope of the invention.



CLAIMS

1. Apparatus for selectively depositing a product, said apparatus including a dispensing stack of said products, gate means for closing the bottom of said stack, and holding means operative within said stack, the arrangement being such that the holding means is adapted to retain said stack above the bottom-most product, so that when the gate means is opened, the bottom-most product can be dispensed; wherein the holding means are two or more sets of pins adapted to fit in between individual products in said stack to support balance of said stack above a predetermined number of individual products and wherein said pins are inserted into, and retracted from, said stack in such a manner as to fit between individual products in the stack, thereby holding the stacked products above the open gate and preventing them from passing through the gate when opened; and wherein said sets of pins are located so as to enter said stack from opposing sides.
2. The apparatus of claim 1, wherein the holding means have a pointed or angled working surface.
3. The apparatus of any preceding claim, wherein the insertion and retraction of said pins is actuated by pin cylinders.
4. The apparatus of any preceding claim, wherein the gate means is a sliding gate.
5. The apparatus of any preceding claim, wherein the products are substantially disc-shaped and have a rough surface.
6. The apparatus of claim 5, wherein the products are biscuits or crackers.
7. The apparatus of claim 6, wherein the products are rice crackers.



8. The apparatus of any previous claim, wherein the predetermined number of products is a single product.
9. A method of dispensing products to a receptacle, including the steps of:
- (a) providing a stack of products, supported at the bottom by a first retaining means and positioned in a fixed position relative to said receptacle;
 - (b) operating a second retaining means so as to support all of said products, except the bottom-most product;
 - (c) removing said first retaining means so as to allow the bottom-most product to be deposited to said receptacle;
 - (d) replacing said first retaining means;
 - (e) disengaging said second retaining means to allow the bottom of the remaining stack to become supported by said first retaining means;
- steps (b) to (e) being repeated until the required quantity of products are dispensed; wherein said second retaining means is a holding means as defined in any one of claims 1 to 8.

DATED this 27th Day of JUNE, 2006

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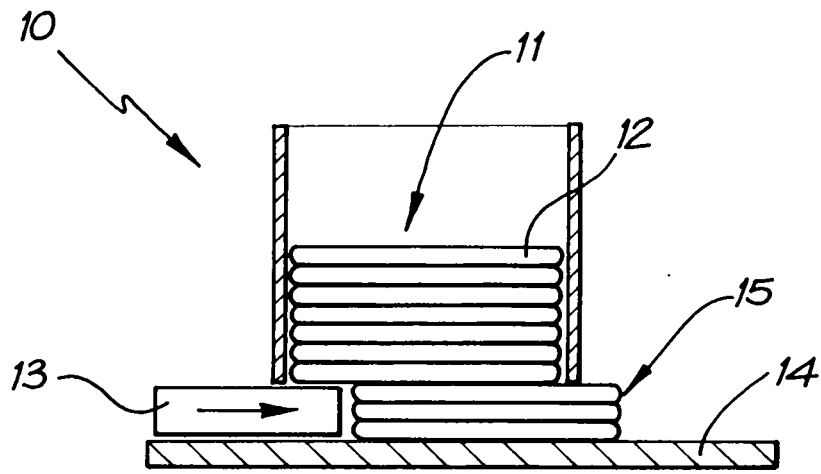


FIG. 1A
PRIOR ART

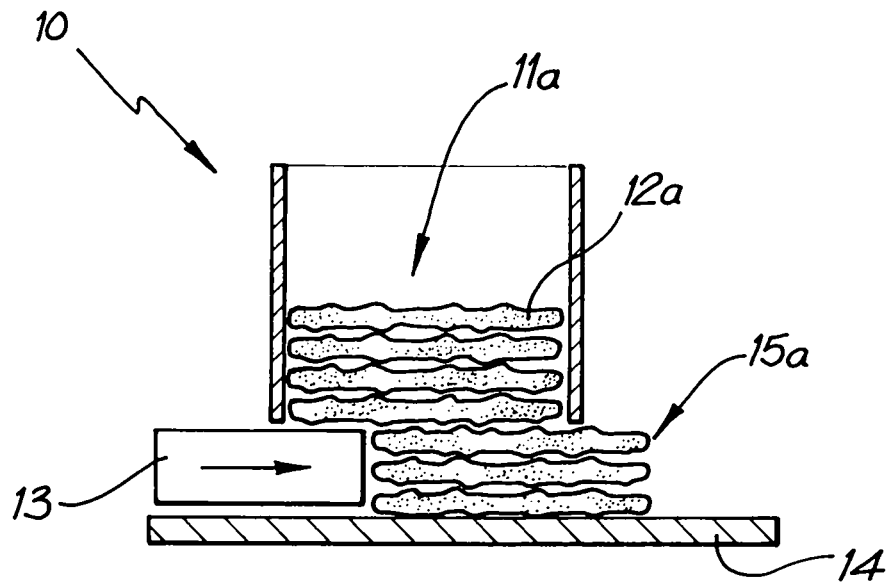


FIG. 1B
PRIOR ART

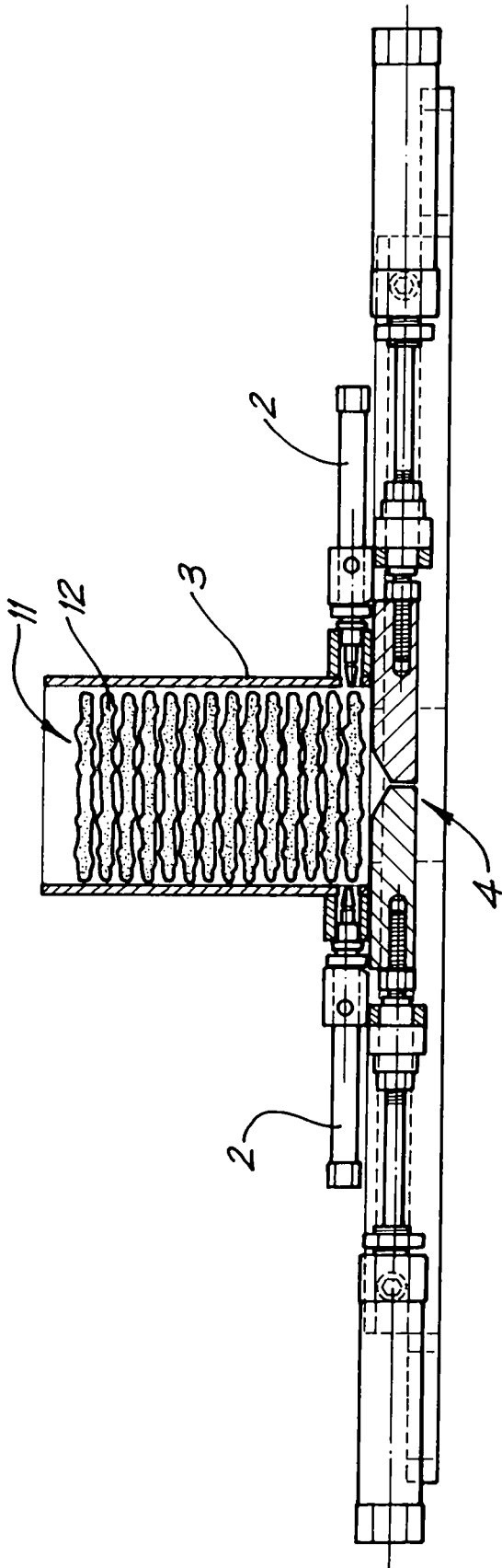


FIG. 2

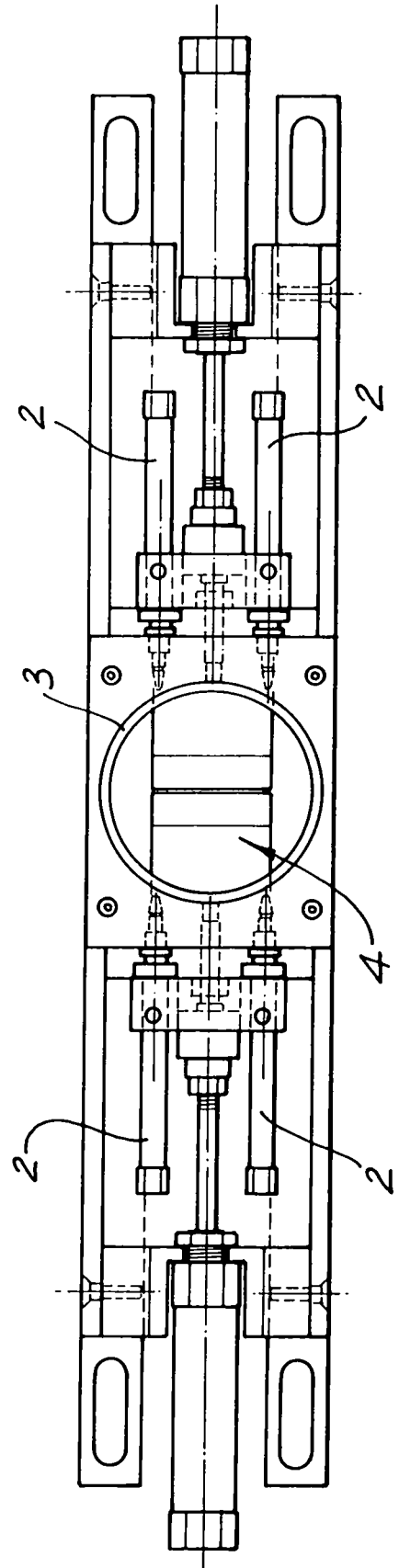


FIG. 3

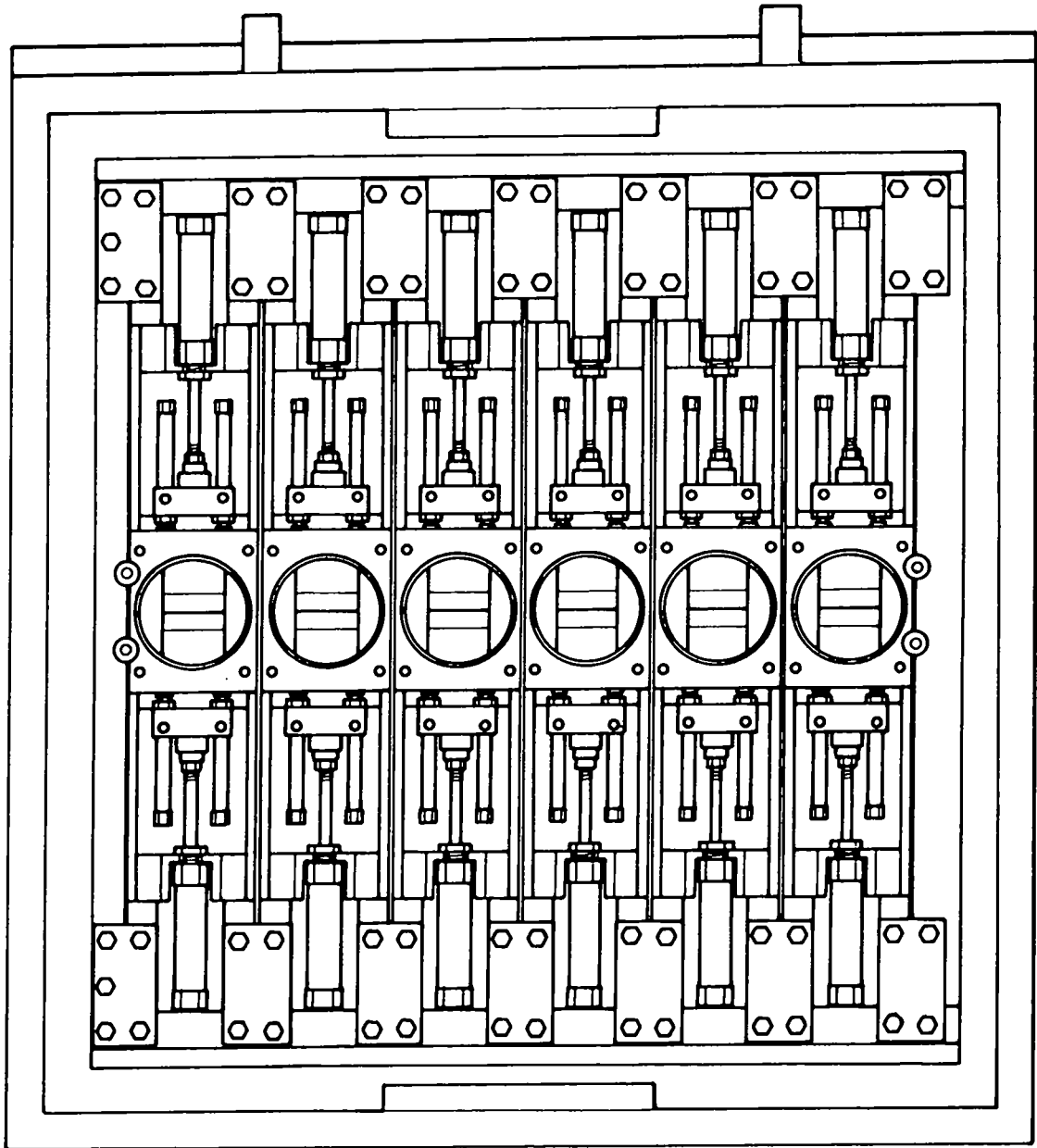


FIG. 4