

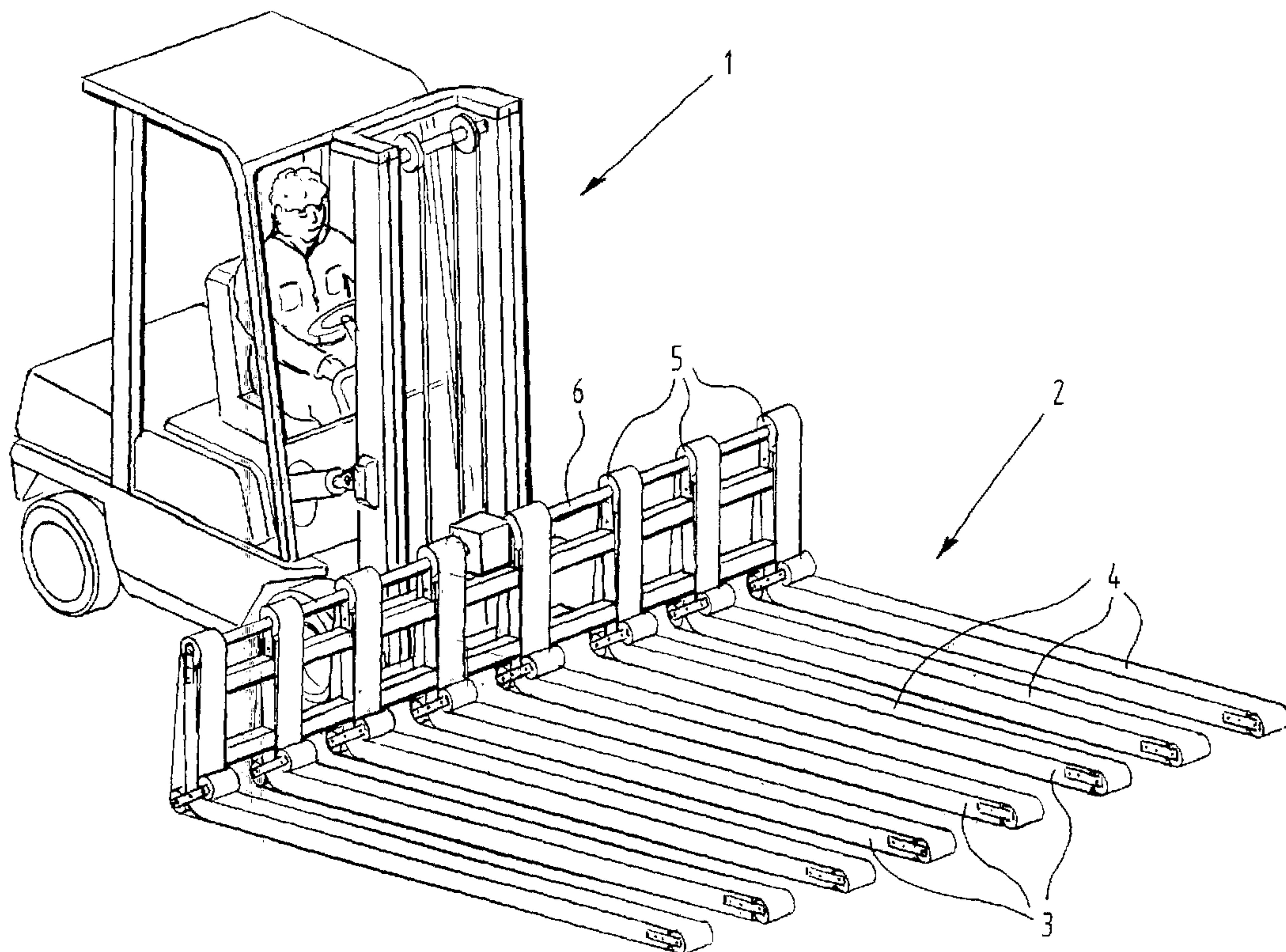


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(54) Title: APPARATUS AND METHOD FOR MOVING OR POSITIONING WIDER OR NARROWER OF OBJECTS



(57) Abrégé/Abstract:

The invention relates to an apparatus (1) for displacing objects which can be picked up, which comprises a fork-like member (2) provided with teeth (3) for picking up the objects, transporting means (4) connected to this member, means for moving the fork-like member vertically, and control means for the transporting and moving means. The apparatus is distinguished by at least one

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pair of mutually adjacent teeth (3) of the folk-like member which is equipped with one flexible carrier (4) arranged on each tooth (3) and drivable in longitudinal direction of the tooth. When the pots (10) are set down this carrier (14) can impart a determined speed to the pots (10) such that the distance between two rows of set-down pots standing perpendicularly of the direction of the teeth can be regulated in a flexible manner by way of adjusting the speed of the carrier.

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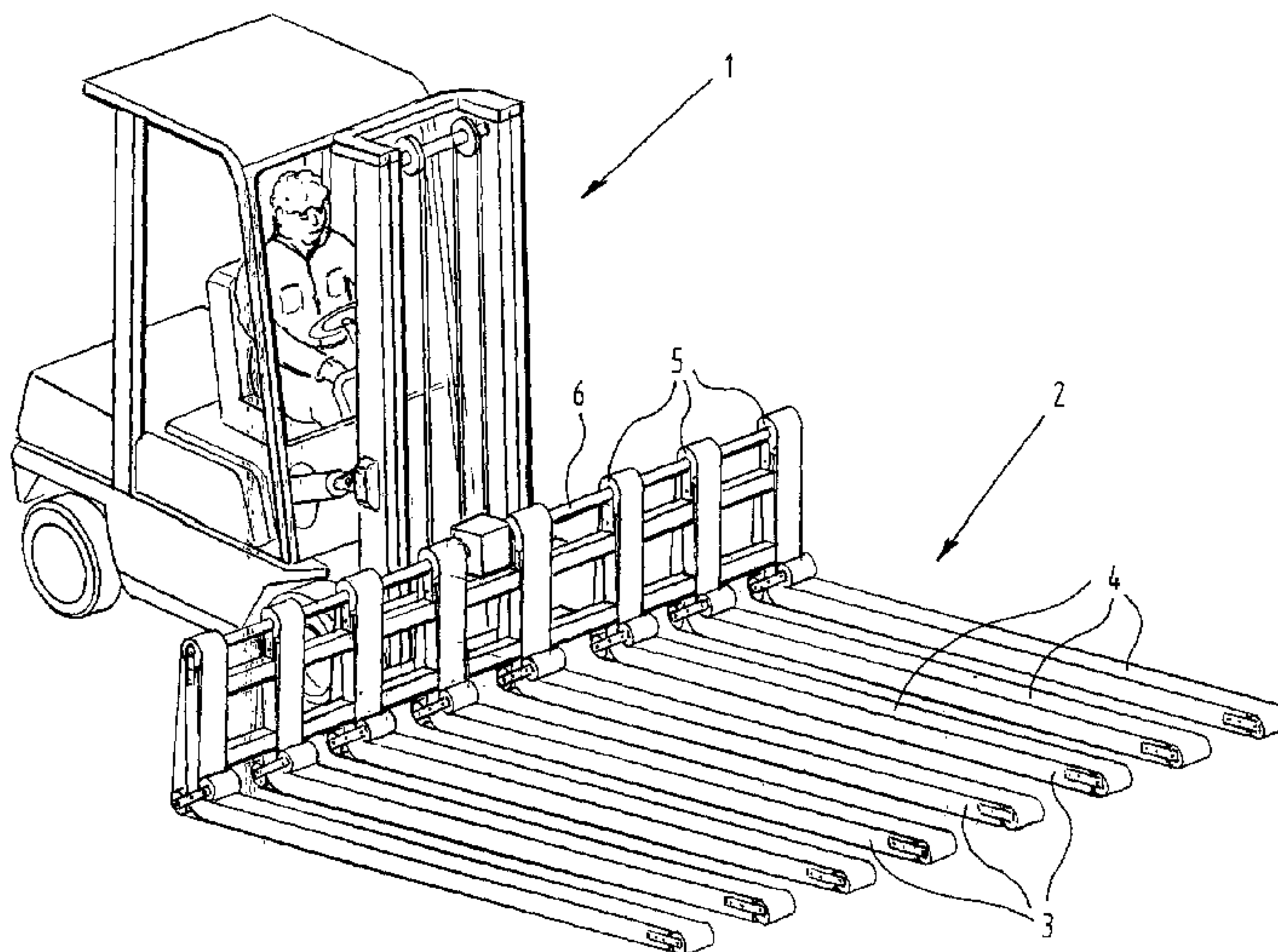
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(54) Title: APPARATUS AND METHOD FOR MOVING OR POSITIONING WIDER OR NARROWER OF OBJECTS



(57) **Abstract:** The invention relates to an apparatus (1) for displacing objects which can be picked up, which comprises a fork-like member (2) provided with teeth (3) for picking up the objects, transporting means (4) connected to this member, means for moving the fork-like member vertically, and control means for the transporting and moving means. The apparatus is distinguished by at least one pair of mutually adjacent teeth (3) of the folk-like member which is equipped with one flexible carrier (4) arranged on each tooth (3) and drivable in longitudinal direction of the tooth. When the pots (10) are set down this carrier (14) can impart a determined speed to the pots (10) such that the distance between two rows of set-down pots standing perpendicularly of the direction of the teeth can be regulated in a flexible nanner by way of adjusting the speed of the carrier.



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APPARATUS AND METHOD FOR MOVING OR POSITIONING
WIDER OR NARROWER OF OBJECTS

The invention relates to an apparatus for displacing
5 objects which can be picked up, comprising:

- a fork-like member provided with teeth for picking up
the objects,
- transporting means connected to this member,
- means for moving the fork-like member vertically,
- 10 - control means for the transporting and moving means.

Such apparatuses are generally known in the form of a
fork-lift truck equipped with a fork, and are traditionally
used in the displacement of objects such as flower pots.
These objects must be provided with an edge or protruding
15 portion allowing it to be picked up between the teeth of the
fork. The standard flower pot for instance comes to mind here
which is embodied as a pot with a protruding portion.

In the displacement of objects it may be advantageous to
change the arrangement of the objects, and it may sometimes
20 be wished to place the objects further apart or closer
together. When the above described apparatus is used in a
plant nursery, it will be desired for instance to be able to
place the plant pots wider apart so that the growth of the
plants is enhanced.

25 Such an apparatus can be embodied for this purpose with
flaps arranged on the teeth, as known from the document 890
237 7. These flaps can be driven such that not all objects
are set down simultaneously, but for instance one of two rows
of objects are placed and the objects held on the fork by the
30 flaps can be placed elsewhere. Objects can hereby be so
placed wider apart, but the distance between the placed
objects cannot here be adjusted as a variable.

The apparatus according to the invention has devised a

more convenient solution herefor, and proposes a new system which has the feature that at least one pair of mutually adjacent teeth of the fork-like member is equipped with one flexible carrier arranged on each tooth and drivable in
5 longitudinal direction of the tooth. When the pots are set down this carrier can impart a determined speed to the pots such that the distance between two rows of set-down pots standing perpendicularly of the direction of the teeth can be regulated in a flexible manner by way of adjusting the speed
10 of the carrier.

The carrier can for instance be embodied according to the invention as a toothed belt or chain.

When such a carrier is loaded with the weight of the pots, it may happen that forces are exerted in the transverse
15 direction of the carrier. In order to prevent the carrier shifting here, it is preferably equipped with means for holding the flexible carrier in its place relative to the teeth in the case of transverse load.

In the case of for instance a chain, this can be
20 provided with fingers for holding the chain in its place relative to the teeth in the case of transverse load.

In the preferred embodiment of the invention one flexible carrier is arranged on all teeth of the fork-like member, wherein these carriers are preferably driven by one
25 common drive shaft. In this way the cost of the apparatus is limited to a minimum.

It will be the wish to be able to adjust precisely the mutual distance between the successive rows of objects for placing. In order to regulate this distance the apparatus
30 according to the invention is provided with a controller which can adjust the speed of the flexible carriers.

It is particularly advantageous if this controller can regulate the speed of the flexible carriers as a function of

the speed of the transporting means. It is thus possible for instance to constantly regulate the net speed of the objects relative to the position where the objects come to stand, and the mutual distance between the set-down rows is determined
5 by this constant speed and the original mutual distance.

The invention likewise relates to a method for displacing objects which can be picked up, wherein a fork-like member provided with teeth picks up and subsequently sets down objects at another location.

10 As already stated above, it can be advantageous here to place the objects further apart or closer together. For this purpose the method according to the invention is distinguished by regulating the speed of the objects relative to the teeth, during picking up or setting down of the
15 objects which can be picked up, by means of flexible carriers movable in longitudinal direction on the teeth, wherein each tooth has a maximum of one carrier. The regulating of this speed thus adjusts the mutual distance between the rows of objects set down perpendicularly of the tooth direction.

20 In the method according to the invention it is usual for all the objects to be picked up at the same time by the fork and to be transported to the destination. The speed of the picked-up objects relative to the teeth is then regulated so as to be lower than the transporting speed of the teeth such
25 that the set-down objects are set down in rows where the mutual distance between the rows is greater than their mutual distance when the objects are picked up.

In the preferred method the objects for picking up are disposed in a checkerboard pattern. This is a much used
30 arrangement in plant nurseries, since a determined space is thus provided between the pots whereby the plants can grow unimpeded. After a time however the plants will increase in size and it will be desired to place them even further apart.

To this end according to a method of the invention, the plants can all be picked up simultaneously and then be set down elsewhere, wherein the speed of the flexible carrier relative to the teeth is regulated during setting down such
5 that the set-down objects from two adjacent rows have a mutual distance which is greater than their mutual distance in the original checkerboard pattern.

It will sometimes also be desired to place objects closer together. In the case of plant pots this could be the
10 case when it is wished to transport the plants to a shop or market, and as many pots as possible are preferably transported simultaneously in a truck.

For placing together of objects the invention provides a method wherein the speed of the flexible carrier relative to
15 the teeth during setting down is regulated by means of the controller so as to be higher than the transporting speed of the teeth such that the set-down objects have a mutual distance which is smaller than their mutual distance when the objects are picked up.

20 The invention will be further elucidated with reference to the following figures:

Figure 1 is a perspective view of an apparatus according to the invention;

Figure 2 shows a cross-section of three teeth of an
25 apparatus according to the invention which are picking up pots;

Figure 3 shows a section in longitudinal direction of a tooth of an apparatus according to the invention;

Figure 4 shows a section in transverse direction of a
30 tooth of an apparatus according to the invention;

Figure 5 shows a series of pots disposed in a checkerboard pattern, and the resulting pattern after picking up and subsequently setting-down the pots according to a

method of the invention.

Figure 1 shows a fork-lift truck 1 provided with a fork 2 with teeth 3. Each tooth 3 is equipped with a flexible carrier 4 which is coupled by means of a drive wheel to a common drive shaft 6, whereby carriers 4 are movable in longitudinal direction relative to teeth 3.

This flexible carrier can be formed by a chain or a belt, wherein the choice depends among other things on the nature of the objects it is wished to transport, and of course also on the cost-price of the two types of carrier.

Carrier 4 can for instance be arranged on tooth 3 by means of drive wheel 5 and three guide wheels 7, 8, 9 as shown in figure 3.

Figure 4 shows in cross-section a carrier 12 embodied as a chain, wherein some of the links of the chain are provided with fingers 13 so that the chain does not come off under transverse load. The tooth is provided on the sides with rods 14 for the bearings of guide wheel 7.

The objects for moving are for instance flower pots 10 with an edge 11 which can be picked up between teeth 3, wherein the edges 11 support on carriers 4 as shown in figure 2.

Machines are generally available in plant nurseries which set down the plant pots in a checkerboard pattern, since it has been found that this pattern is very suitable for a uniform, unobstructed growth of the plants. After a time however, the plants will have increased in size and it will be desired to place them even further apart.

Figure 5 illustrates the preferred method of the invention, wherein the pots 10 in a checkerboard pattern are all picked up simultaneously by fork 2 (figure 5A). This takes place by carrying the fork downward to a height where the teeth lie lower than the edge of the pots. The driver

then moves in the direction of the rows of pots such that the teeth lie along the edges of all pots for transporting. The fork is then moved upward, and the pots can be transported by fork-lift truck 1 to the desired destination. Upon arrival at
5 the desired destination the fork is moved downward such that the pots almost touch the ground. The fork-lift truck then reverses and the carrier is driven at a speed which is lower than the speed at which the truck is reversing.

In this manner the pots are pushed row by row from the
10 carriers and the set-down objects from two mutually adjacent rows have a mutual distance which is greater than their mutual distance in the original checkerboard pattern, as shown in figure 5B.

The speed of the carriers during setting down of the
15 pots can either be regulated constantly or regulated as a function of the travel speed of the fork-lift truck. This latter method is particularly useful because the driver does not then have to reverse at a constant speed during setting down, and the pots can still be placed wider apart at a
20 constant distance between the rows.

The lower the carrier speed is regulated as a function of the reversing speed, the further apart the rows will come to stand, wherein the mutual distance between two rows can thus be precisely adjusted, and is given by the product of
25 the original mutual distance and the quotient of the fork-lift truck speed and the carrier speed. This quotient thus determines the difference in mutual distance between two rows before and after the pots are set down, and this quotient must therefore be regulated constantly if it is wished that
30 this difference be constant.

This method can of course be repeated many times in order to place the pots further and further apart as the size of the plants increases. The plants can also be placed closer

together again when it is wished for instance to transport them to a market or a shop. The method is herein identical to that described above, with the difference that the carrier speed must be regulated so as to be faster than the reversing
5 speed of the fork-lift truck during the setting-down.

The invention is of course not limited to the above described embodiments, and can for instance be modified for the purpose of picking up other objects, or can be embodied with different drive shafts, whereby the carriers can be
10 driven at a different speed. Many other variants can thus be envisaged which all fall within the domain of the invention.

CLAIMS

1. Apparatus for displacing objects which can be picked up, comprising:

5 - a fork-like member provided with teeth for picking up the objects,

- transporting means connected to this member,

- means for moving the fork-like member vertically,

- control means for the transporting and moving means,

10 **characterized in that** at least one pair of mutually adjacent teeth of the fork-like member is equipped with one flexible carrier arranged on each tooth and drivable in longitudinal direction of the tooth.

2. Apparatus as claimed in claim 1, **characterized in**
15 **that** the flexible carrier is provided with means for holding the flexible carrier in its place relative to the teeth in the case of transverse load.

3. Apparatus as claimed in claim 1 or 2, **characterized in that** the flexible carrier is a toothed belt.

20 4. Apparatus as claimed in claim 1 or 2, **characterized in that** the flexible carrier is a chain.

5. Apparatus as claimed in claims 2 and 4, **characterized in that** the chain is provided with fingers for holding the chain in its place relative to the teeth in the case of
25 transverse load.

7. Apparatus as claimed in any of the foregoing claims, **characterized in that** the transporting and moving means are a fork-lift truck.

8. Apparatus as claimed in any of the foregoing claims,
30 **characterized in that** one flexible carrier is arranged on all teeth of the fork-like member.

9. Apparatus as claimed in claim 8, **characterized in that** all flexible carriers are driven by means of a common

drive shaft.

10. Apparatus as claimed in any of the foregoing claims, **characterized in that** the speed of the flexible carriers is adjusted via a controller.

5 11. Apparatus as claimed in claim 10, **characterized in that** the speed of the flexible carriers can be regulated as a function of the speed of the transporting means using the controller.

10 12. Method for displacing objects which can be picked up, wherein a fork-like member provided with teeth picks up and subsequently sets down objects at another location at a determined transporting speed, **characterized in that** during picking up or setting down of the objects which can be picked up, the speed of the objects relative to the teeth is
15 regulated by means of flexible carriers movable in longitudinal direction on the teeth, wherein each tooth has a maximum of one carrier.

13. Method as claimed in claim 12, wherein the objects are all picked up at the same time, **characterized in that**
20 when the objects are set down the speed of the picked-up objects relative to the teeth is regulated so as to be lower than the transporting speed of the teeth.

14. Method as claimed in claim 13, wherein the objects for picking up are disposed in accordance with a checkerboard
25 pattern consisting of rows placed perpendicularly of the forks, **characterized in that** the speed of the flexible carrier relative to the teeth is regulated during setting down such that the distance between two set-down rows is greater than their mutual distance in the original
30 checkerboard pattern.

14. Method as claimed in claim 12, wherein the objects are all picked up at the same time, **characterized in that** the speed of the flexible carrier relative to the teeth during

setting down is regulated so as to be higher than the transporting speed of the teeth.

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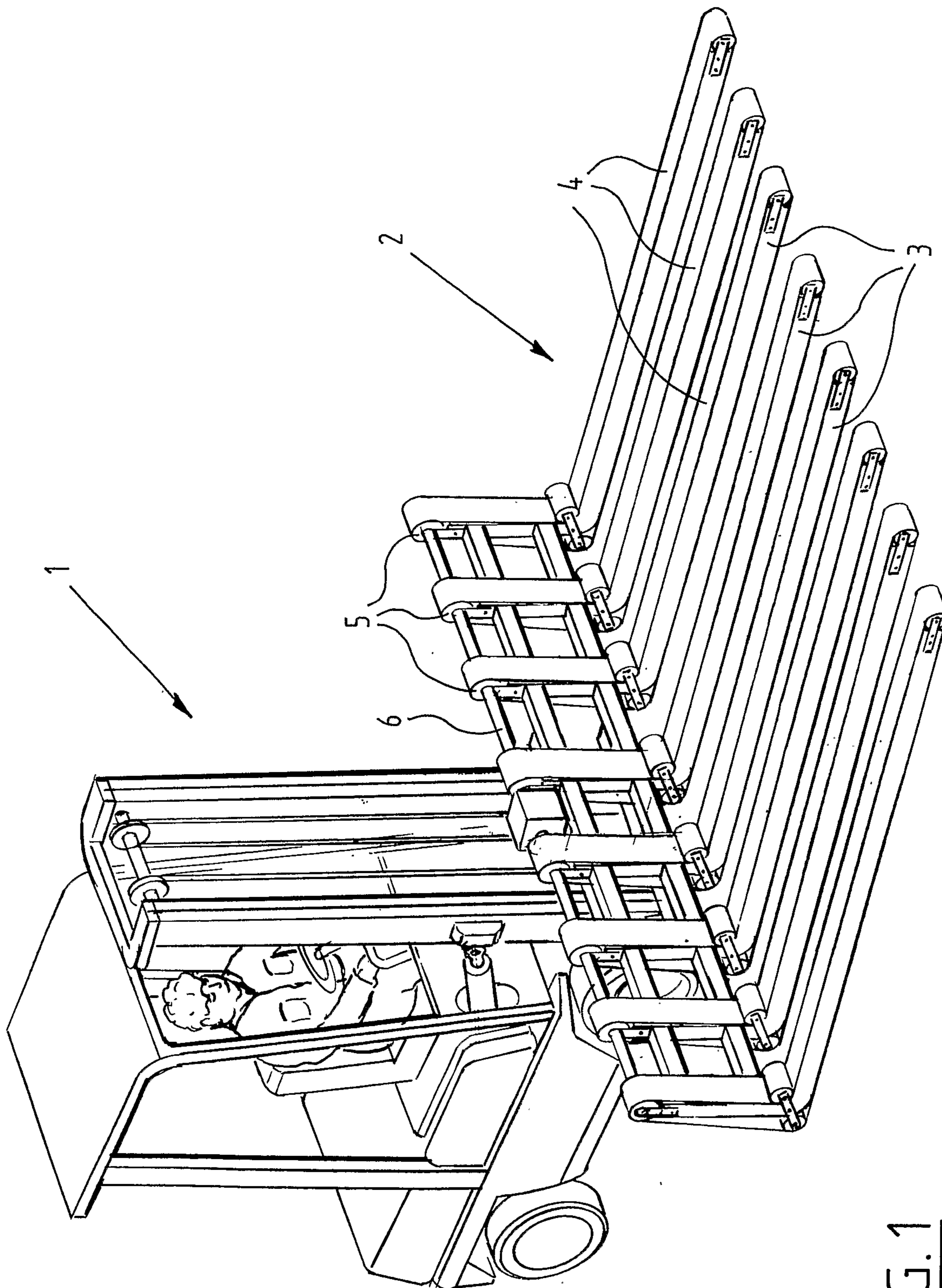


FIG. 1

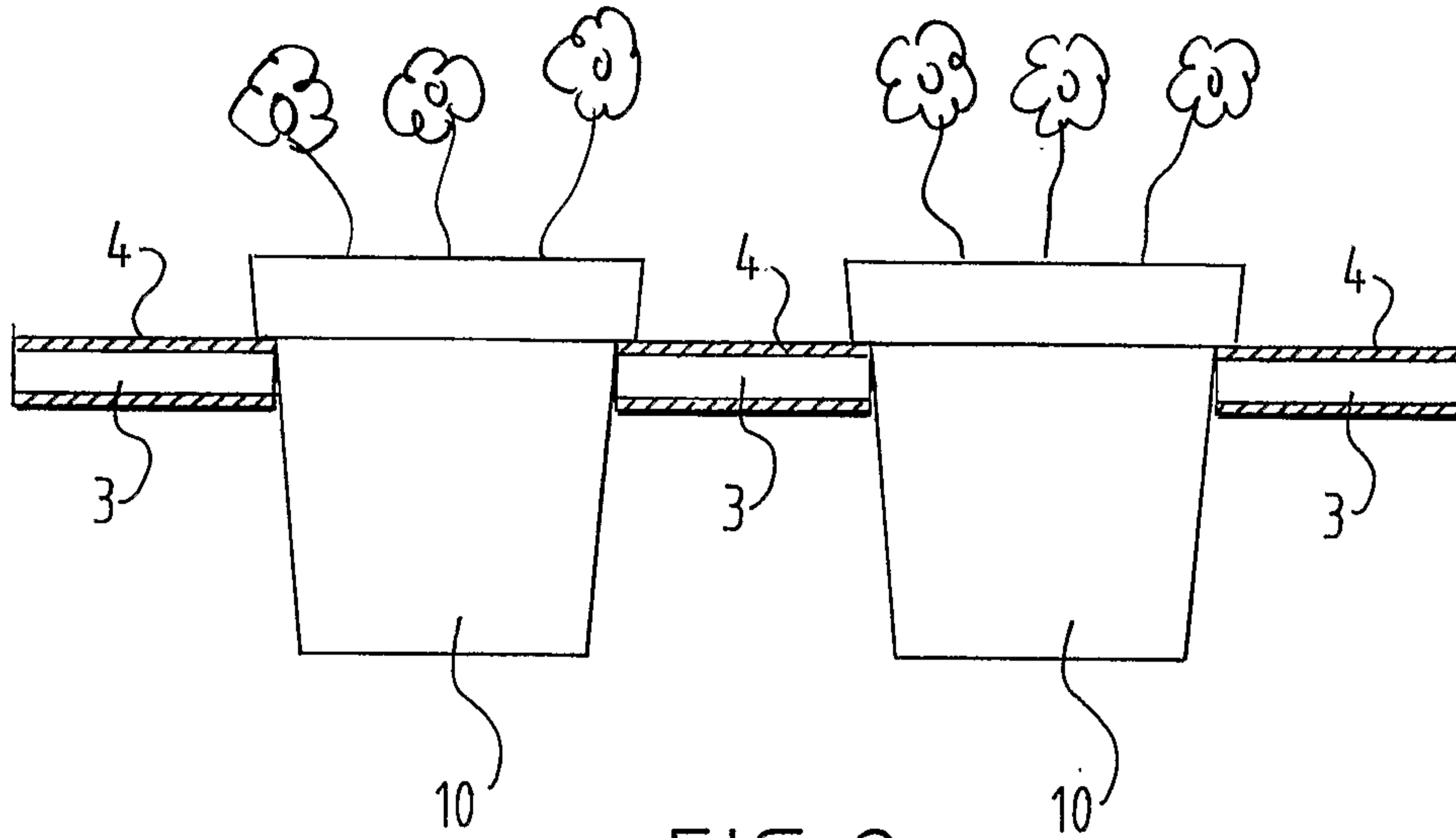


FIG. 2

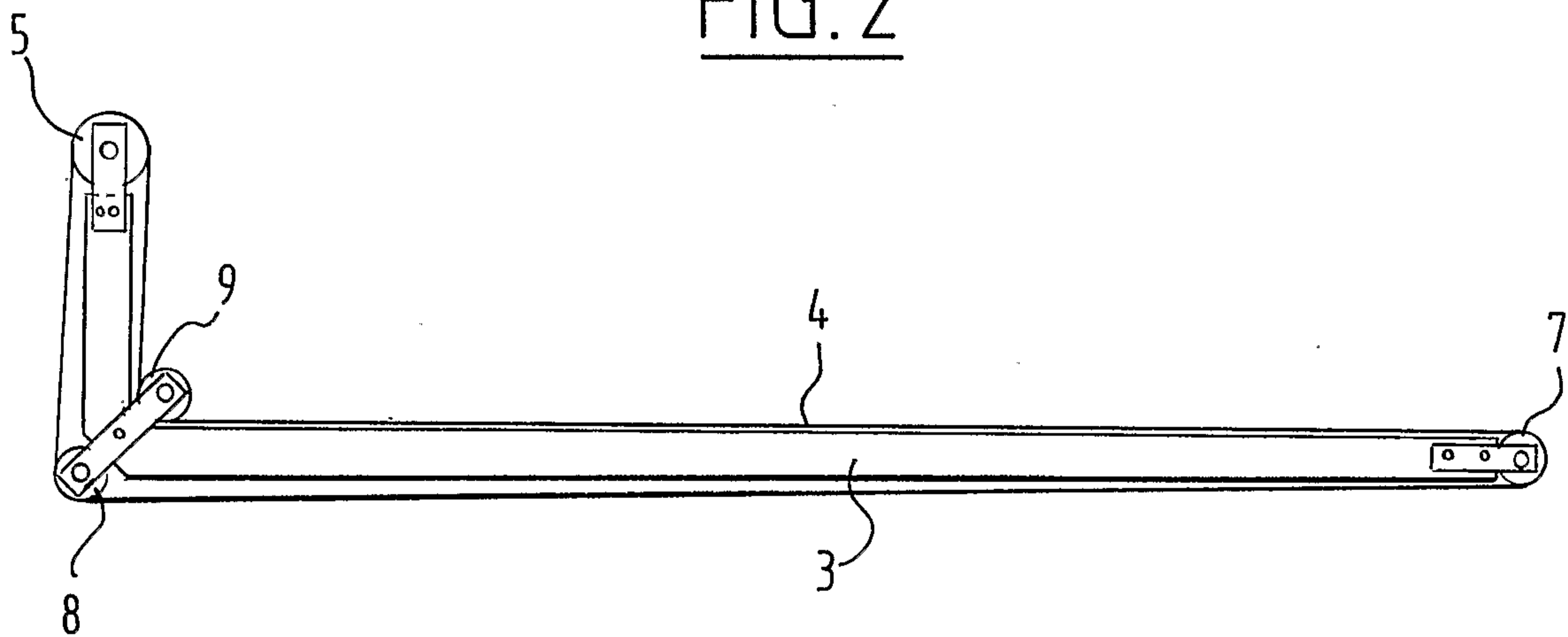


FIG. 3

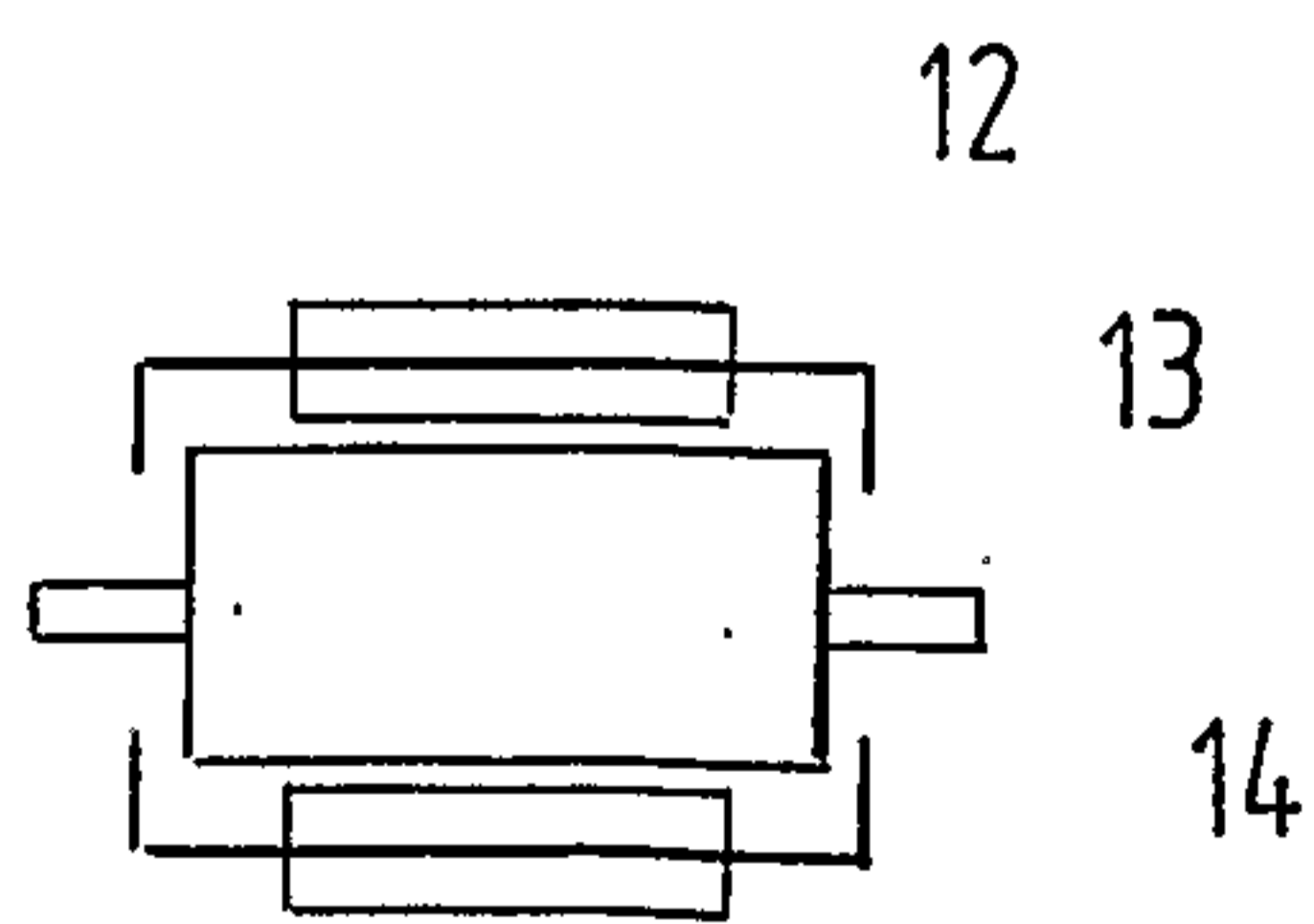


FIG. 4

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FIG. 5A

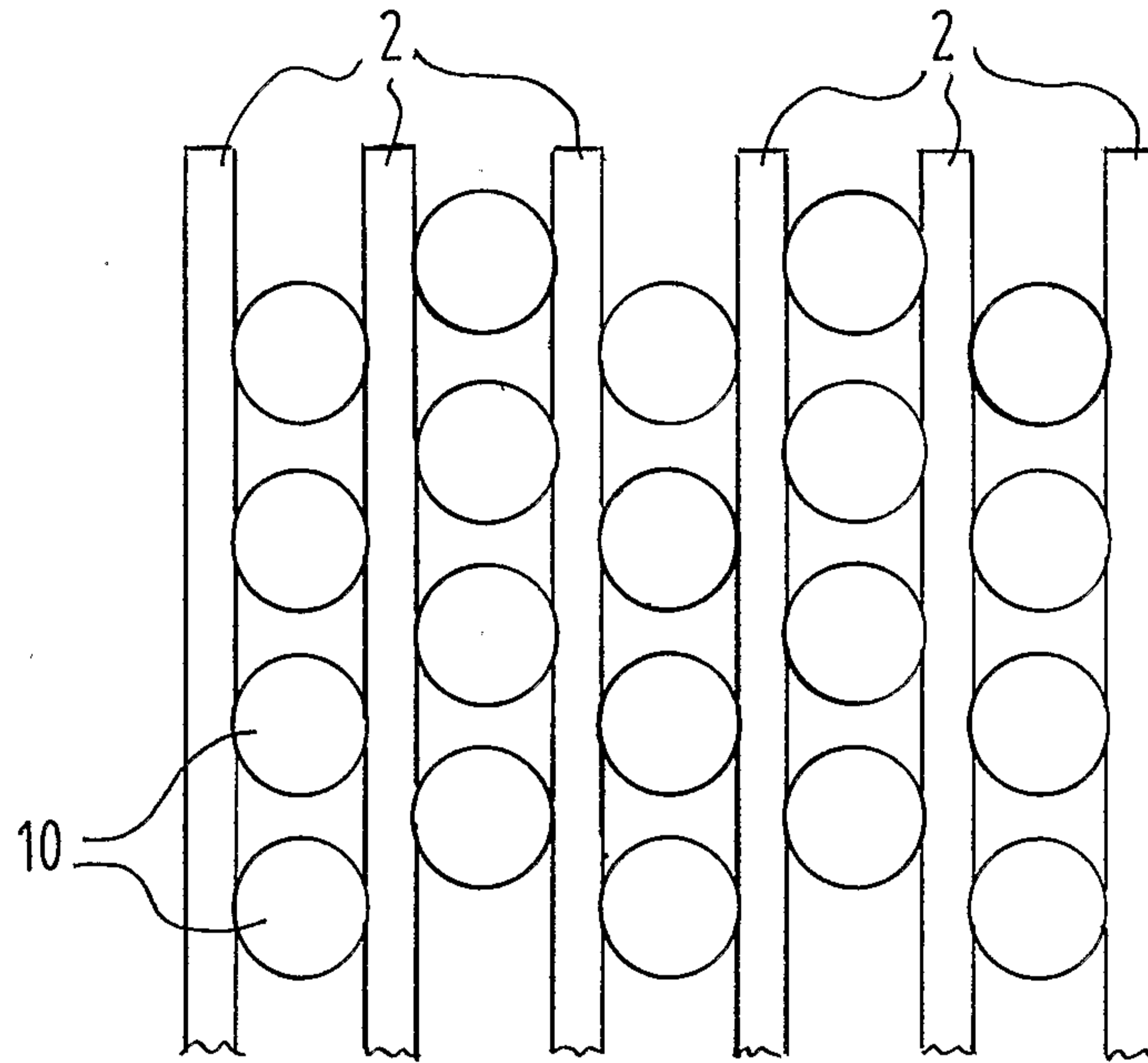


FIG. 5B

