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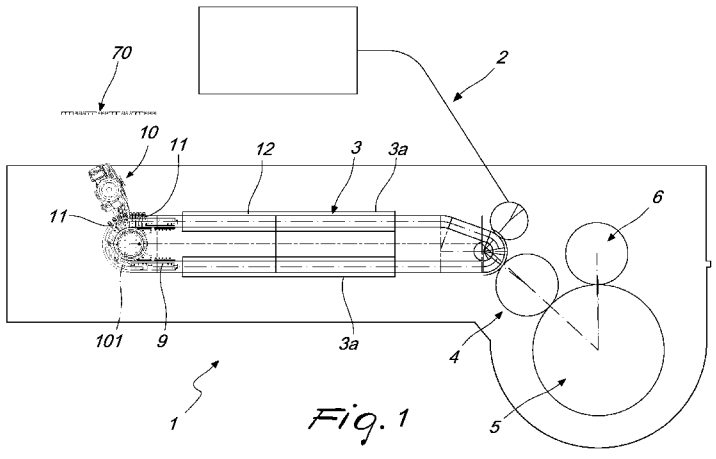

Fig. 1

(57) Abstract: An apparatus (1) for obtaining plastic containers which comprises a device (2) for feeding preforms, a device (3) for heating the preforms picked up by the feeding device (2), a device (4) for transferring the preforms heated by the heating device (3) to a blow-molding device (5) that is adapted to form the preforms into respective containers by blow-molding, the apparatus (1) comprising a supporting framework (9) for a plurality of grip chucks (11) that can be moved along a movement circuit (12) and are intended to carry a respective preform picked up by the feeding device (2) to the heating means (3) in order to transport it, when heated, to the transfer device (4), the grip chucks (11) having a respective retention head (11 a) that comprises at least one retention element (13a, 13b) designed to lock the neck of a respective preform into place; the apparatus comprises, along the extension (101) of the movement circuit (12), automated means (10) for changing the retention elements (13a, 13b), the automated means (20) being adapted to remove and store the retention elements (13a) to be replaced and to pick up, and couple with a respective grip chuck (11), retention elements (13b) that are different from the retention elements (13a) to be replaced.

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APPARATUS FOR OBTAINING PLASTIC CONTAINERS

Apparatuses for obtaining plastic containers are known and are widely used.

Typically such apparatuses, also known as blow-molding machines, comprise a device for feeding plastic preforms, a device for heating the preforms picked up by the feeding device, and a device for transferring the heated preforms from the heating device to a blow-molding device, which is adapted to provide, starting from such preforms, respective containers.

Blow-molding machines are generally complete with a device for unloading the containers from the blow-molding device.

Specifically, blow-molding machines have means of transferring the preforms from the feeding device to the blow-molding device.

Such transfer means are usually constituted by a supporting framework for a plurality of grip chucks.

Such grip chucks can be moved along a movement circuit and are intended to carry a respective preform picked up by the feeding device to the heating means, which are constituted typically by one or more heating tunnels, in order to transport it, when heated, to the transfer device and, then, to the blow-molding device.

Delving deeper into the details, the grip chucks have, in a downward region, a respective retention head, which comprises at least one retention element that is designed to lock the neck of a respective preform into position.

Usually, the retention element comprises a supporting body, which is deformable in a radial direction and can be inserted in the neck of a respective preform, and an abutment body, also known as a beaker, for axial positioning and advantageously for unloading the heated preform onto the transfer device.

Usually the supporting body is caused to rotate about an axis that is parallel to the longitudinal axis of the chuck so as to ensure, while passing

through the heating tunnel or tunnels, a uniform heating of the whole preform.

Very often, the same blow-molding machine is used to produce containers of different shapes and/or sizes.

For this reason, before beginning a new production, the blow-molding device had to be adjusted, in essence by replacement of the molds of the containers.

Traditionally the preforms to be used on each blow-molding machine (even if they were destined for the production of different containers) had the same "neck" and this made it unnecessary, at each change of format of the container, to adjust the grip chucks.

Recently the need has emerged to use the same blow-molding machine to produce containers that not only have different shapes or sizes but also different necks.

Evidently, this involves the necessity, in addition to changing the blow-molding devices, of which however there are a relatively low number (approximately 8-24 for each blow-molding machine), to also substitute the retention elements associated with each grip chuck.

Such operation is nowadays carried out manually and involves the removal of the retention elements (of which there are usually two, the body for supporting the neck and the abutment body or beaker): on average, for such substitution operation, between 40 and 50 seconds are needed for each grip chuck.

Considering that each blow-molding machine has between 300 and 600 grip chucks, it is clear that every change of format of the retention elements involves a machine shutdown time comprised between 3.5 hours and 8 hours, and such times are utterly incompatible with production needs.

The aim of the present invention is to eliminate, or at least to drastically reduce, the above-mentioned drawbacks.

Within this aim, an object of the invention is to provide an apparatus

for providing plastic containers that makes it possible, if necessary, to perform a change of format of the retention elements of the grip chucks in an extremely short time.

This aim and these and other objects which will become more apparent hereinafter are all achieved by an apparatus for providing plastic containers according to the appended independent claims.

Further characteristics and advantages of the invention will become more apparent from the description of a number of preferred but not exclusive embodiments of an apparatus for providing plastic containers according to the invention, which are illustrated by way of non-limiting example in the accompanying drawings wherein:

Figure 1 is a schematic view from above of an apparatus for providing plastic containers according to the invention;

Figures 2 to 13 are perspective views showing, in sequence, the steps of removal and storage of the retention elements to be replaced on the grip chucks;

Figures 14, 15 and 16 are enlarged-scale perspective views of the automated means engaged with the grip chucks; and

Figures 17 and 18 are enlarged-scale perspective views of the automated means proximate to the storage and pick-up region.

The present invention relates to an apparatus for providing containers, which is generally indicated with the reference numeral 1.

The apparatus 1 comprises a device 2 for feeding plastic preforms, a device 3 for heating the preforms picked up by the feeding device 2, a device 4 for transferring the heated preforms from the heating device 3 to a blow-molding device 5 which is adapted to provide, starting from the heated preforms, respective containers by blow-molding.

Typically, the apparatus 1 is provided with a device 6 for unloading the containers from the blow-molding device 5.

Delving deeper into the details, the apparatus 1 comprises a

supporting framework 9 for a plurality of grip chucks 11, which can be moved along a movement circuit 12 and are intended to carry a respective preform picked up by the feeding device 2 to the heating means 3 in order to transport it, when heated, to the transfer device 4.

For the purpose of example, the heating means 3 can comprise one or more heating tunnels 3a which can be traversed by the preforms supported by the grip chucks 11 during their movement along the movement circuit 12.

The grip chucks 11 have a respective retention head 11a, which comprises at least one retention element 13a, 13b that is designed to lock the neck of a respective preform into place.

According to the present invention, along the extension 101 of the movement circuit 12 there are automated means 10 for changing the retention elements 13a.

Such automated means 10 are associated or removably associable with the apparatus 1.

In particular, the automated means 10 are adapted to remove and store the retention elements 13a to be replaced and to pick up, and couple to a respective grip chuck 11, retention elements 13b that are different from the retention elements 13a to be replaced.

Advantageously, the retention element 13a, 13b comprises a supporting body 14a, 14b of the neck of a respective preform, and an abutment body 15a, 15b, also known as a beaker, for axial positioning and/or unloading of the heated preform onto the transfer device 4.

Typically, the supporting body 14a, 14b comprises a radially compressible/expandable head that can be inserted, by interference, in the neck of the preform, while the abutment body 15a, 15b can be constituted by a beaker-like body which is provided with a lower abutment edge that can be moved axially with respect to the supporting body 14a, 14b in order to axially position and/or unload the heated preform onto the transfer device 4.

According to a first embodiment, the automated means 10 are adapted to change the supporting body 14a or the abutment body 15a.

Advantageously, the automated means 10 are adapted to change both the supporting body 14a and the abutment body 15a.

The forming spindle 11 is connected kinematically, for example by means of a gear 11b, to first motor means, which are adapted to actuate the angular rotation, about the longitudinal axis 100 of the grip chuck 11, of at least one portion of the retention element 13a, 13b so as to support in rotation, about an axis parallel to the longitudinal axis 100 of the grip chuck 11, the preform, thus ensuring a uniform heating thereof.

As illustrated, the first motor means are adapted to actuate the angular rotation, about the longitudinal axis 100 of the supporting body 14a, 14b and, consequently, of the preform that is integrally associated with it.

With reference to the embodiment shown, each grip chuck 11 is connected to a supporting element 8, conveniently C-shaped, which can be moved on command along the extension 101 of the movement circuit 12 thanks to the action of entrainment means, not shown, which are constituted, for example, by a first chain provided with movement pins that pass through respective openings 8a defined in the supporting elements 8.

With reference to such embodiment, the first motors can be constituted by a second chain, which extends along the movement circuit 12, intended to be meshed, during the movement of the grip chucks 11 along the movement circuit 12, by the respective gearwheels 11b with the consequent rotation of the respective supporting body 14a, 14b.

The automated means 10 comprise an unloading device 20, which can be moved on command between a working position (shown in Figures 2 and 5) in which it is intended to remove at least one retention element 13a from a respective grip chuck 11, and an unloading position (shown in Figures 7 and 8) in which it stores, at a storage region 40, the retention element or elements 13a removed by the respective grip chuck 11.

The automated means 10 comprise, furthermore, a loading device 30.

Such loading device 30 in turn can be moved on command between a pick-up position (shown in Figures 10 to 12) in which it is intended to pick up at least one retention element 13b from a pick-up region 50, and a replacement position (shown in Figures 5 and 2) in which it is intended to couple the (or each) retention element 13b, taken from the pick-up region 50, with a respective grip chuck 11.

According to a preferred embodiment, which is shown in the figures, the loading device 20 and the unloading device 30 are constituted by a single replacement element 10a.

Preferably, in order to reduce the time for the removal of retention elements 13a from the grip chucks 11, the unloading device 20, in the working position, is adapted to remove, substantially simultaneously, respective retention elements 13a associated with at least two grip chucks 11.

For example, as shown in the figures, the unloading device 20 is adapted to remove, simultaneously, respective retention elements 13a associated with two grip chucks 11.

It is possible for the unloading device 20 to be able to move between at least two distinct working positions.

In particular, in each one of the two or more working positions the unloading device 20 is adapted to remove at least one retention element 13a from at least one respective grip chuck 11.

In the embodiment shown in the figures, in each one of the two working positions the unloading device 20 is adapted to remove the retention elements 13a associated with two grip chucks 11.

In particular, such solution is advantageous if the retention elements 13a to be replaced are constituted, respectively, by a supporting body 14a and an abutment body 15a.

As shown in the figures in fact, in the first working position the

unloading device 20 will proceed to remove one or more abutment bodies 15a whereas, in the second working position, it will proceed to remove one or more supporting bodies 14a.

In the replacement position, the loading device 30 is adapted to couple, substantially simultaneously, respective retention elements 13b with at least two grip chucks 11.

For example, as shown in the figures, the loading device 30 is adapted to couple, simultaneously, respective retention elements 13b with two grip chucks 11.

Preferably, as shown in the figures, the loading device 30 can assume at least two replacement positions.

In particular, in each one of the at least two replacement positions the loading device 30 is adapted to couple at least one retention element 13b with at least one respective grip chuck 11.

In the embodiment shown in the figures, in each one of the two replacement positions the loading device 30 is adapted to couple the retention elements 13b with two grip chucks 11.

In particular, such solution is advantageous if the retention elements 13b to be coupled are constituted, respectively, by a supporting body 14b and an abutment body 15b.

As shown in the figures in fact, in the first replacement position the loading device 30 will proceed to couple a respective supporting body 14b with one or more grip chucks whereas, in the second replacement position, it will proceed to couple a respective abutment body 15b with the same.

There is no reason why, obviously, such storage regions 40 and pick-up regions 50 could not be defined on surfaces that are not flat but, for example, cylindrical.

The storage region 40 and the pick-up region 50 are, advantageously, defined on a sheet-like supporting body 70.

In order to speed up the operations of changing the retention elements

13a, 13b, it is possible to arrange the storage region 40 proximate to the pick-up region 50.

Such storage regions 40 and pick-up region 50 comprise, for example, receptacles intended to contain the retention elements 13a, 13b.

Conveniently, the loading device 20 and/or the unloading device 30 are actuated by at least one articulated movement arm 60.

The replacement element 10a can be constituted, for example, by a supporting element 61 that is kinematically connected to the articulated arm 60.

The supporting element 61 supports one or more grip elements 62, which provide the unloading device 20 and the loading device 30.

Merely for the purpose of example, the supporting element 61 can be associated with two pairs of grip elements 62.

Each grip element 62 has at least one engagement element intended to remove and act on the retention elements 13a to be removed and on the retention elements 13b to be coupled to the grip chucks 11.

Merely for the purpose of example, at least one engagement element comprises first jaws 63 that can move on command in order to operate on a respective supporting body 14a, 14b.

A second engagement element supports second jaws 64 that can move on command in order to operate on a respective abutment body 15a, 15b.

Advantageously, the first pair of grip elements 62 is associated with the first jaws 63 while the second pair of grip elements 62 is associated with the second jaws 63.

Since the angular position of the supporting bodies 14a, 14b about the longitudinal axis 100 is variable, the grip element 62, and specifically the second jaws 64, are rotatable about an axis 103 that is parallel to the longitudinal axis 100.

The coupling between the end of the grip chucks 11 which defines the retention head 11a and the retention elements 13a, 13b can be varied.

By way of example, the retention elements 13a, 13b can be provided with one or more engagement pins 65 which can be inserted in a respective sliding guide 66 defined at a respective grip chuck 11.

The sliding guide 66 has a guiding portion 66a and an end accommodation portion.

In this regard, the grip elements 62 can move in order to insert and disconnect the engagement pin or pins 65 into and from the respective sliding guide 66 so as to enable the picking up from and the coupling of the retention elements 13a, 13b with the respective grip chuck 11.

To this end, each grip element 62 is advantageously associated with an actuation motor that is adapted to enable the rotation thereof about the axis 102.

The axial movement of the grip element 62 and the opening or closing of the first jaws 63 and of the second jaws 64 can be commanded by the same actuation motor or by different motor means.

The apparatus 1 comprises, furthermore, means for the relative movement of the grip chucks 11, in which the retention elements 13a are yet to be replaced, with respect to the automated means 10.

Advantageously, such relative movement means comprise control means adapted to actuate the movement of the grip chucks 11 along the movement circuit 12 in order to make the grip chucks 11, which are associated with retention elements 13a to be replaced, approach the automated means 10 in each instance.

Such movement is performed, conveniently, when the unloading device 20 of the automated means 10 is in the storage position and/or the loading device 30 is in the pick-up position.

According to a further aspect, the present invention relates to a method for replacing retention elements 13a from grip chucks 11.

Such grip chucks 11 can be moved along a movement circuit 12 and are intended to carry a respective preform picked up by a feeding device 2 to

heating means 3 in order to transport it, in heated condition, to a device 4 for transferring the heated preforms and from there to a blow-molding device 5 that is adapted to form the preforms into respective containers by blow-molding.

According to the present invention, the method comprises:

a step of removal, by automated means 10, of the retention elements 13a to be replaced;_

a step of storing, by the automated means 10, the retention elements 13a which have been removed;

a step of picking up, by the automated means 10, retention elements 13b that are different from the retention elements 13a removed;

a step of coupling, by the automated means 10, the different retention elements 13b with a respective grip chuck 11.

The automated means 10 comprise an unloading device 20 and a loading device 30.

The unloading device 20 can be moved, on command, between a working position, in which it is intended to remove at least one retention element 13a from a respective grip chuck 11, and an unloading position, in which it stores, at a storage region 40, the (or each) one retention element 13a which has been removed from the respective grip chuck 11.

The loading device 30 can be moved, on command, between a pick-up position, in which it is intended to pick up at least one retention element 13b from a pick-up region 50, and a replacement position, in which it is intended to couple the (or each) retention element 13b taken from the pick-up region 50 with a respective grip chuck 11 from which, previously, the retention element 13a had been removed.

Advantageously, the removal step and the storage step provide for the removal and storage, substantially simultaneously, of respective retention elements 13a associated with at least two grip chucks 11.

Conveniently, the unloading step provides for at least two distinct

working positions for the unloading device 20.

In each one of the at least two working positions, the unloading device 20 is adapted to remove at least one retention element 13a from at least one respective grip chuck 11.

Preferably, the pick-up step and the coupling step provide, substantially simultaneously, for the pick-up and coupling of respective retention elements 13b from and with at least two grip chucks 11, respectively.

Delving deeper into the details, the coupling step provides for at least two replacement positions of the loading device 30; in each one of the two replacement positions the loading device 30 is adapted to couple at least one retention element 13b with at least one respective grip chuck 11.

Advantageously, the method provides for a step of relative movement of the grip chucks 11 with respect to the automated means 10.

Preferably, such movement step comprises the movement of the grip chucks 11 along the movement circuit 12 in order to bring, in each instance, the grip chucks 11 associated with retention elements 13a to be replaced to the region of action of the automated means 10.

Such movement step is performed, conveniently, when the unloading device 20 of the automated means 10 is in the storage position and/or the loading device 30 is in the pick-up position.

All the characteristics of the invention, indicated above as advantageous, convenient or similar, may also be missing or be substituted by equivalent characteristics.

The individual characteristics set out with reference to general teachings or to specific embodiments may all be present in other embodiments or may substitute characteristics in such embodiments.

The invention, thus conceived, is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

In practice the materials employed, provided they are compatible with the specific use, and the dimensions and shapes, may be any according to requirements.

Moreover, all the details may be substituted by other, technically equivalent elements.

The content of Italian patent application no. VR2013A000070, the priority of which is claimed in the present application, is incorporated as a reference.

Where the technical features mentioned in any claim are followed by reference numerals and/or signs, those reference numerals and/or signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference numerals and/or signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference numerals and/or signs.

CLAIMS

1. An apparatus (1) for obtaining plastic containers which comprises a device (2) for feeding preforms, a device (3) for heating the preforms picked up by said feeding device (2), a device (4) for transferring the preforms heated by said heating device (3) to a blow-molding device (5) that is adapted to form said preforms into respective containers by blow-molding, said apparatus (1) comprising a supporting framework (9) for a plurality of grip chucks (11) that can be moved along a movement circuit (12) and are intended to carry a respective preform picked up by said feeding device (2) to said heating means (3) in order to transport it, when heated, to said transfer device (4), said grip chucks (11) having a respective retention head (11a) that comprises at least one retention element (13a, 13b) designed to lock the neck of a respective preform into place, characterized in that it comprises, along the extension (101) of said movement circuit (12), automated means (10) for changing said retention elements (13a, 13b), said automated means (20) being adapted to remove and store said retention elements (13a) to be replaced and to pick up, and couple with a respective grip chuck (11), retention elements (13b) that are different from said retention elements (13a) to be replaced.

2. The apparatus (1) according to claim 1, characterized in that said at least one retention element (13a, 13b) comprises a body (14a, 14b) for supporting the neck of a respective preform and an abutment body (15a, 15b) for unloading said heated preform onto said transfer device (4), said automated means (10) being adapted to change said supporting body (14a) or said abutment body (15a).

3. The apparatus (1) according to claim 1, characterized in that said at least one retention element (13a, 13b) comprises a supporting body (14a, 14b) for the neck of a respective preform and an abutment body (15a, 15b) for unloading said heated preform onto said transfer device (4), said automated means (10) being adapted to change said supporting body (14a)

and said abutment body (15a).

4. The apparatus according to one or more of the preceding claims, characterized in that said grip chuck (11) is connected kinematically to first motor means adapted to actuate the angular rotation, about the longitudinal axis (100) of said grip chuck (11), of at least one portion of said retention element (13a, 13b).

5. The apparatus (1) according to one or more of the preceding claims, characterized in that said first motor means are adapted to actuate the angular rotation, about the longitudinal axis (100) of said grip chuck (11), of said supporting body (14a, 14b).

6. The apparatus (1) according to one or more of the preceding claims, characterized in that said automated means (10) comprise an unloading device (20) that can be moved on command between a working position, in which it is adapted to remove at least one retention element (13a) from a respective grip chuck (11), and an unloading position, in which it stores, at a storage region (40), said at least one retention element (13a) removed from the respective grip chuck (11).

7. The apparatus (1) according to one or more of the preceding claims, characterized in that said automated means (10) comprise a loading device (30) that can be moved on command between a pick-up position, in which it is adapted to pick up at least one retention element (13b) from a pick-up region (50), and a replacement position, in which it is adapted to couple said at least one retention element (13b) picked up from said pick-up region (50) with a respective grip chuck (11).

8. The apparatus (1) according to one or more of the preceding claims, characterized in that said loading device (20) and said unloading device (30) are constituted by a single replacement element (10a).

9. The apparatus (1) according to one or more of the preceding claims, characterized in that said unloading device (20), in said working position, is adapted to remove, substantially simultaneously, respective retention

elements (13a) associated with at least two grip chucks (11).

10. The apparatus (1) according to one or more of the preceding claims, characterized in that said unloading device (20) can move between at least two distinct working positions, in each one of said at least two working positions said unloading device (20) being adapted to remove at least one retention element (13a) from at least one respective grip chuck (11).

11. The apparatus (1) according to one or more of the preceding claims, characterized in that said loading device (30), in said replacement position, is adapted to couple, substantially simultaneously, respective retention elements (13b) with at least two grip chucks (11).

12. The apparatus (1) according to one or more of the preceding claims, characterized in that said loading device (30) provides for at least two replacement positions and, in each one of said two replacement positions, is adapted to couple at least one retention element (13b) with at least one respective grip chuck (11).

13. The apparatus (1) according to one or more of the preceding claims, characterized in that said loading device (20) and/or said unloading device (30) are actuated by at least one articulated movement arm (60).

14. The apparatus (1) according to one or more of the preceding claims, characterized in that it comprises means for the relative movement of said grip chucks (11) with respect to said automated means (10).

15. The apparatus (1) according to one or more of the preceding claims, characterized in that said relative movement means comprise control means adapted to actuate the movement of said grip chucks (11) along said movement circuit (12) in order to make the grip chucks (11) associated with retention elements (13a) to be replaced approach said automated means (10) in each instance.

16. A method for replacing retention elements (13a) from grip chucks (11) that can be moved along a movement circuit (101) and are intended to

carry a respective preform picked up by a feeding device (2) to heating means (3) in order to transport it, when heated, to a device (4) for transferring the heated preforms to a blow-molding device (5) that is adapted to form said preforms into respective containers by blow-molding, said method comprising:

- a step of removal, by automated means (10), of said retention elements (13a) to be replaced;

- a step of storing, by said automated means (10), said retention elements (13a) removed;

- a step of picking up, by said automated means (10), retention elements (13b) that are different from said retention elements (13a) removed;

- a step of coupling, by said automated means (10), said different retention elements (13b) with a respective grip chuck (11).

17. The method according to claim 16, characterized in that said automated means (10) comprise an unloading device (20) that can be moved on command between a working position, in which it is intended to remove at least one retention element (13a) from a respective grip chuck (11), and an unloading position, in which it stores, at a storage region (40), said at least one retention element (13a) removed from the respective grip chuck (11).

18. The method according to one or more of claims 16 to 17, characterized in that said automated means (10) comprise a loading device (30) that can be moved on command between a pick-up position, in which it is intended to pick up at least one retention element (13b) from a pick-up region (50), and a replacement position, in which it is intended to couple said at least one retention element (13b) picked up from said pick-up region (50) with a respective grip chuck (11).

19. The method according to one or more of claims 16 to 18, characterized in that said removal step and said storage step provide for the

removal and storage, substantially simultaneously, of respective retention elements (13a) associated with at least two grip chucks (11).

20. The method according to one or more of claims 16 to 19, characterized in that said unloading step provides for at least two distinct working positions for said unloading device (20), in each one of said at least two working positions said unloading device (20) being adapted to remove at least one retention element (13a) from at least one respective grip chuck (11).

21. The method according to one or more of claims 16 to 20, characterized in that said pick-up step and said coupling step provide, substantially simultaneously, for the pick-up and couplingof respective retention elements (13b) from and with at least two grip chucks (11), respectively.

22. The method according to one or more of claims 16 to 21, characterized in that said coupling step provides for at least two replacement positions of said loading device (30), in each one of said two replacement positions said loading device (30) being adapted to couple at least one retention element (13b) with at least one respective grip chuck (11).

23. The method according to one or more of claims 16 to 22, characterized in that it comprises a step of relative movement of said grip chucks (11) with respect to said automated means (10).

24. The method according to one or more of claims 16 to 23, characterized in that said movement step comprises the movement of said grip chucks (11) along said movement circuit (12) in order to bring, in each instance, the grip chucks (11) associated with retention elements (13a) to be replaced to the region of action of said automated means (10), said movement step being performed when said automated means (10) are in the storage step and/or in the pick-up step.

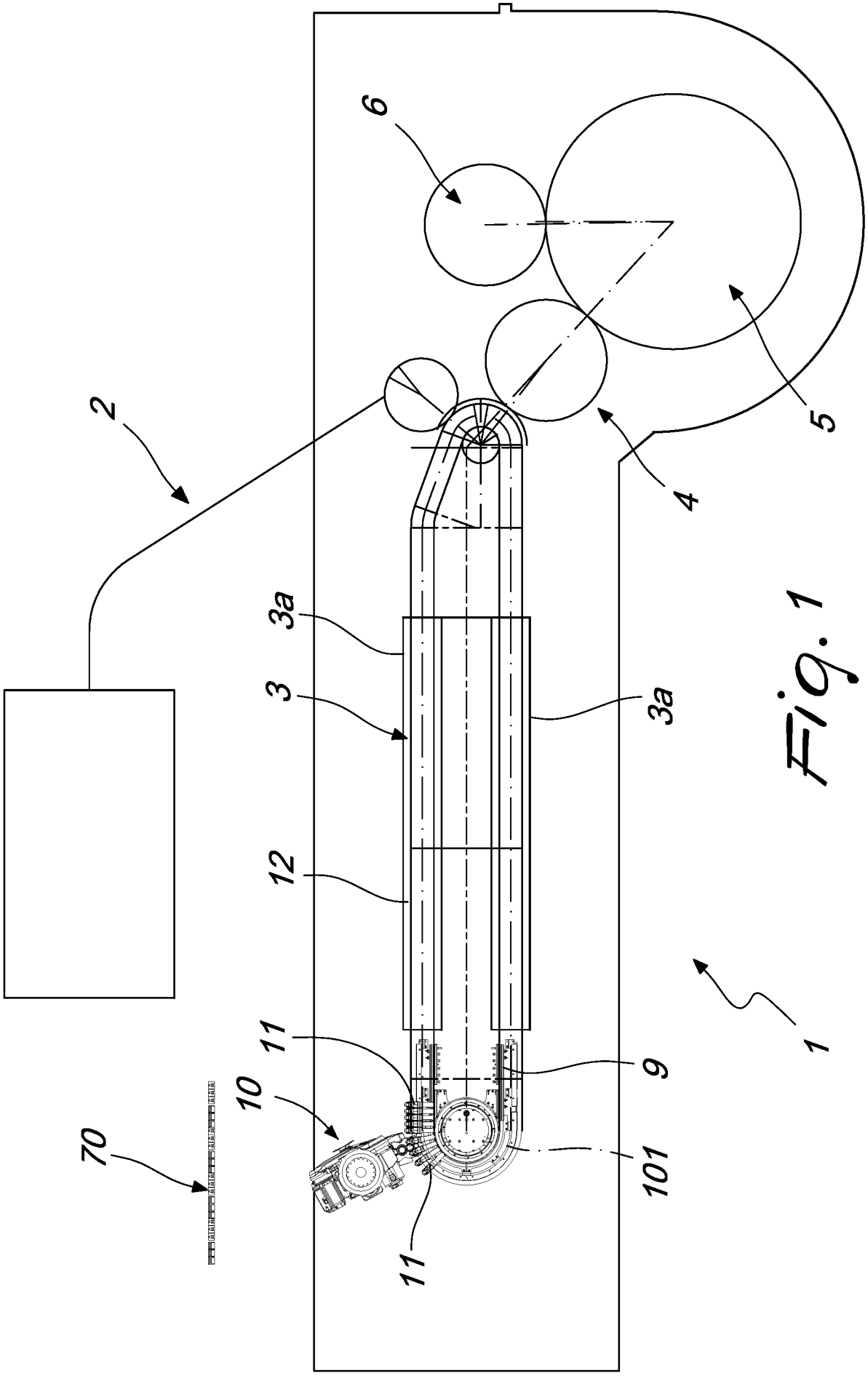

Fig. 1

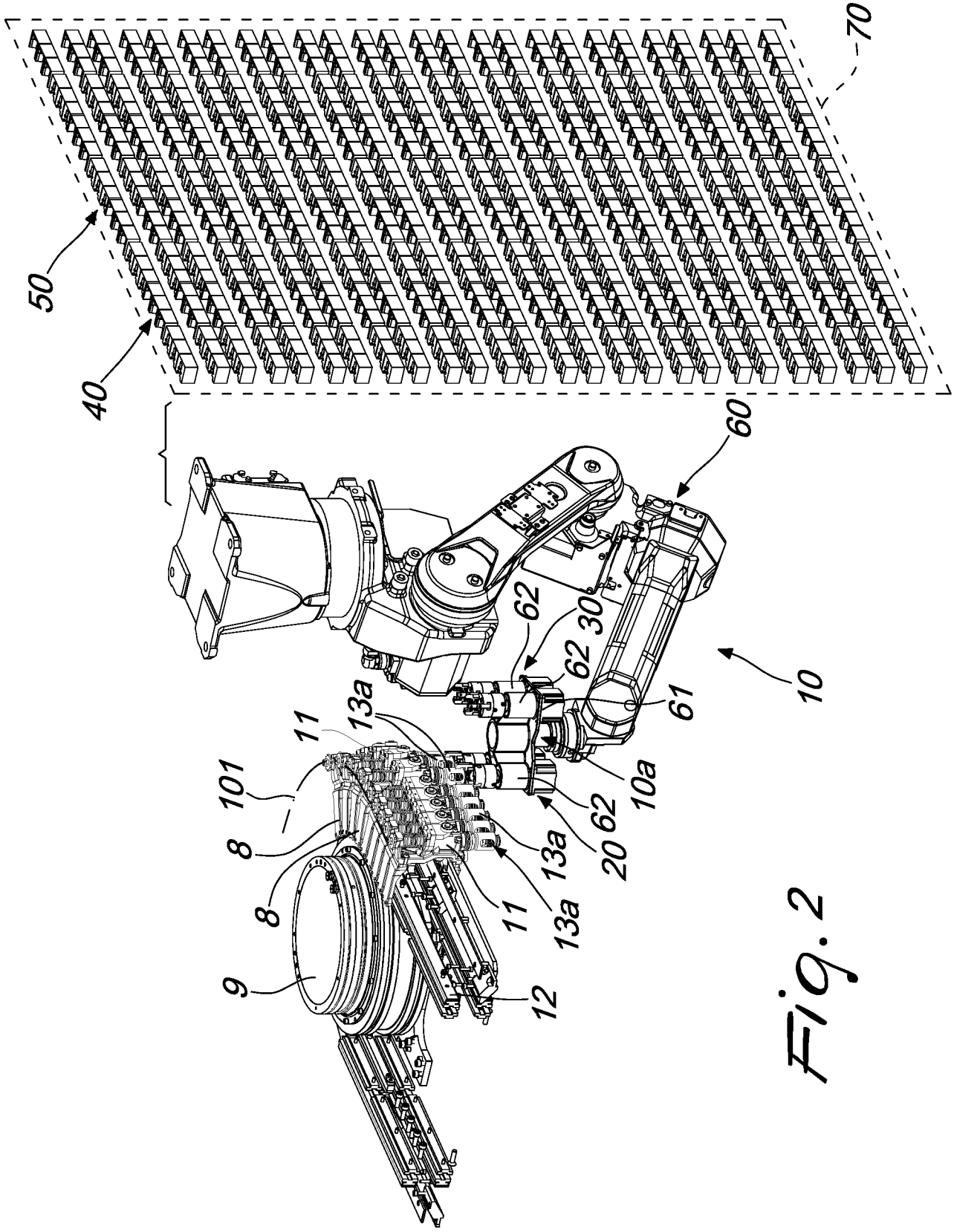

Fig. 2

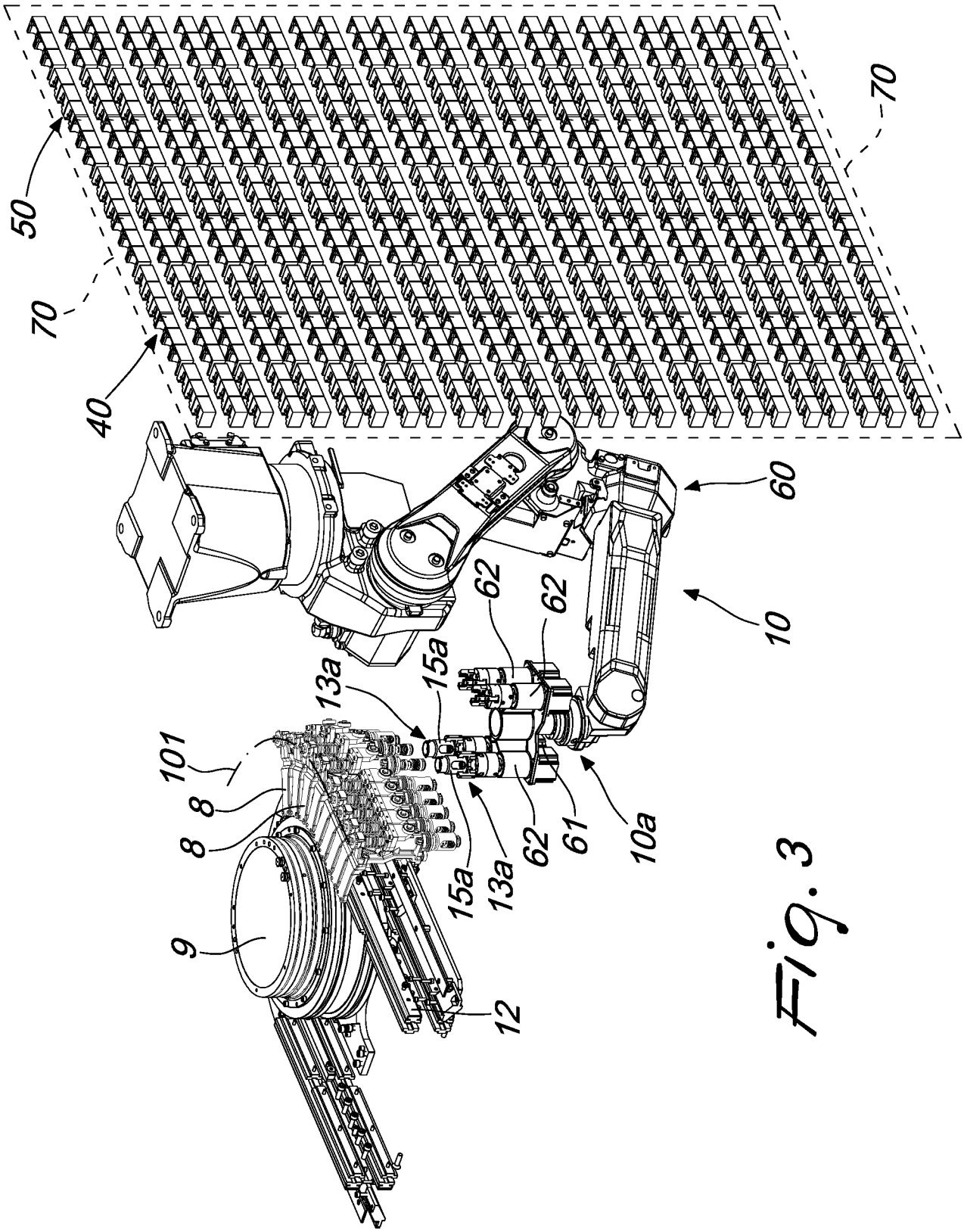

Fig. 3

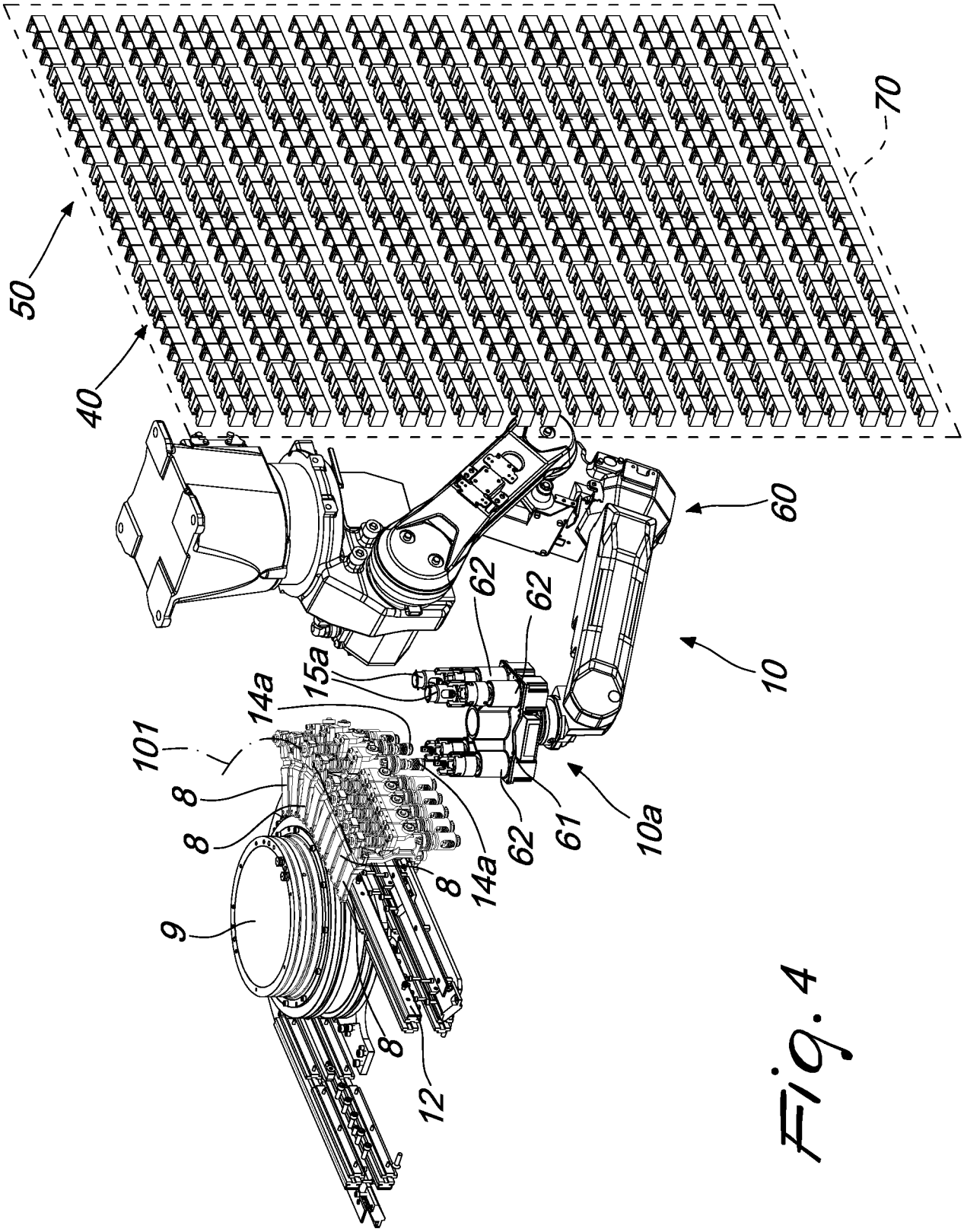

Fig. 4

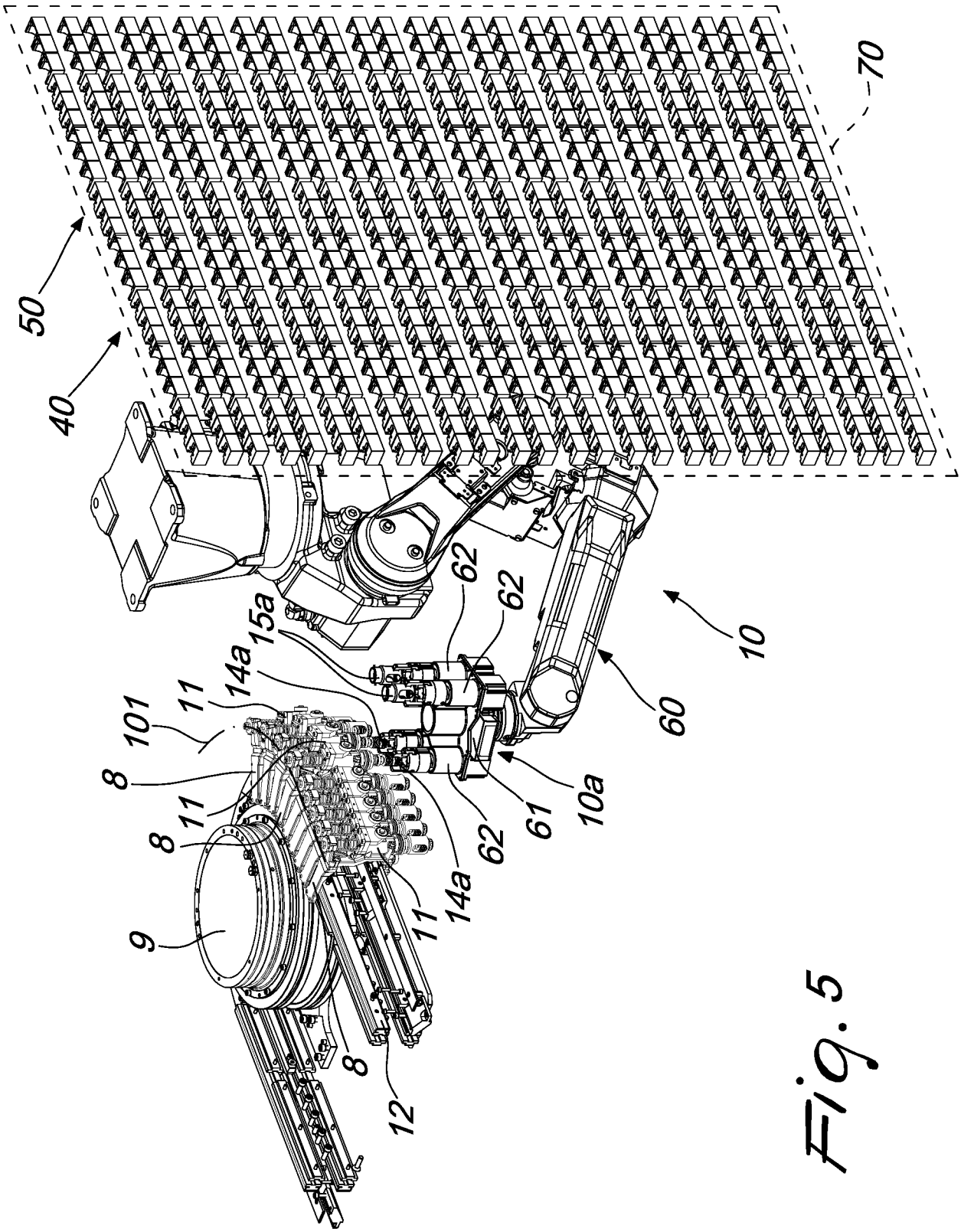

Fig. 5

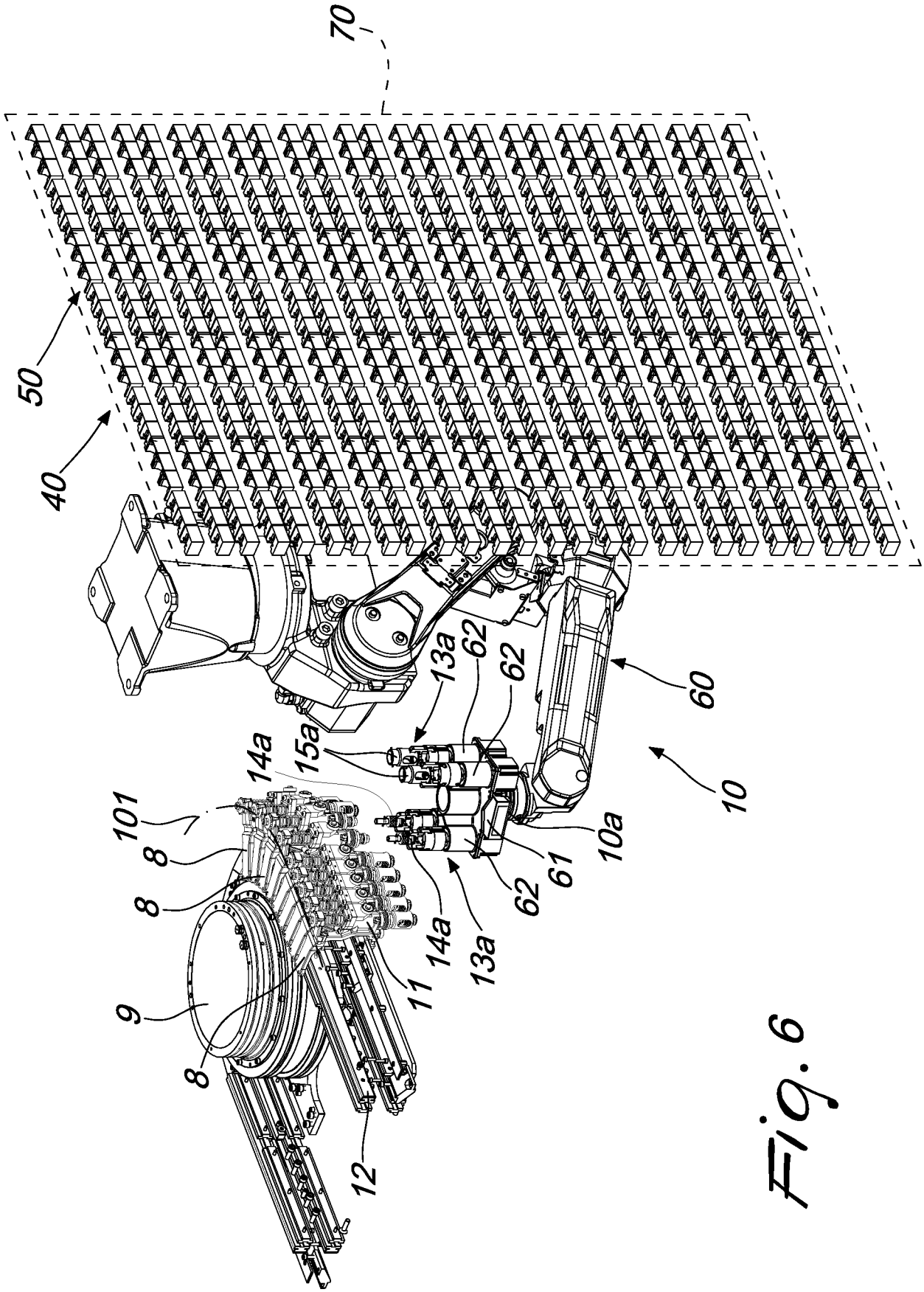

Fig. 6

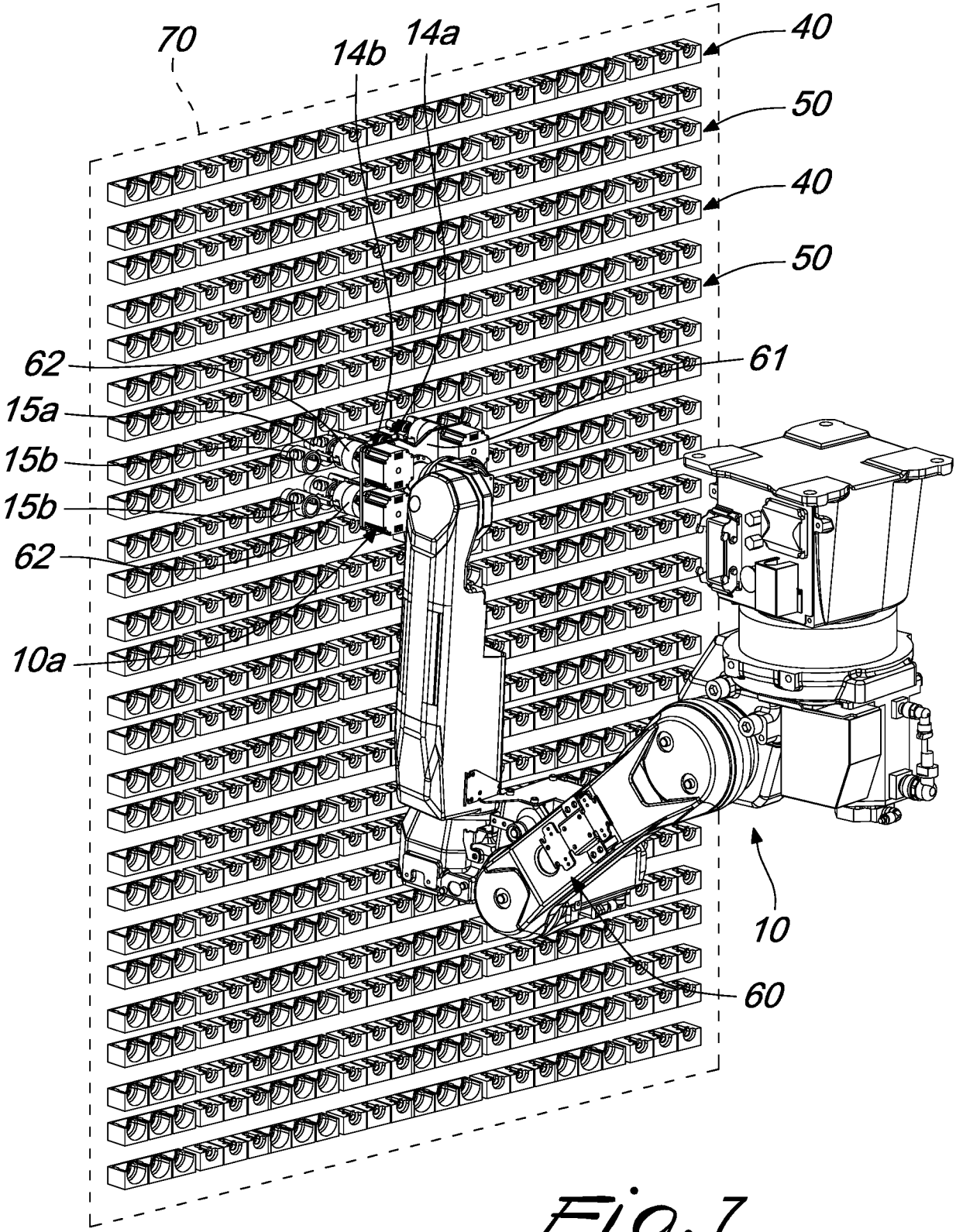

Fig. 7

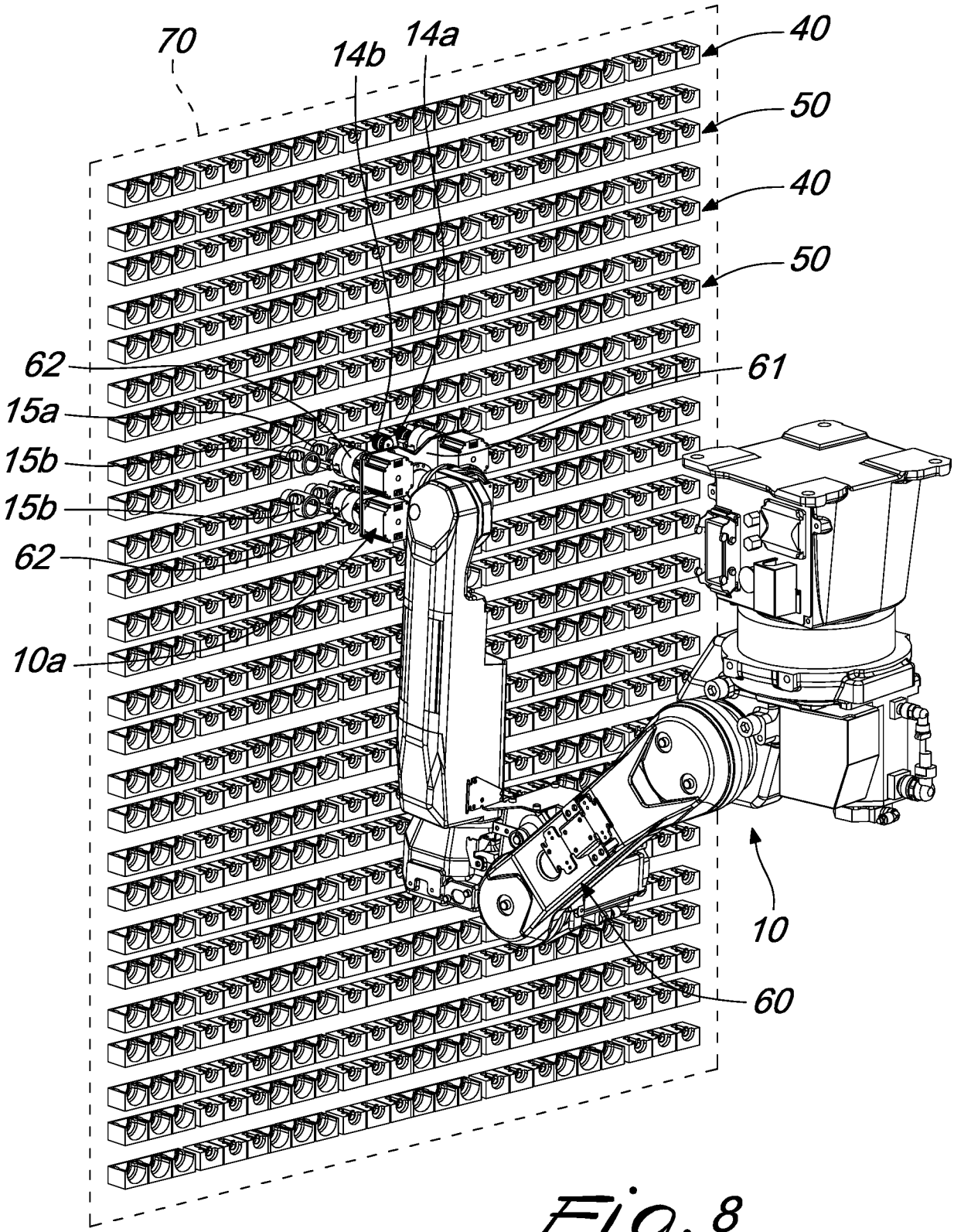

Fig. 8

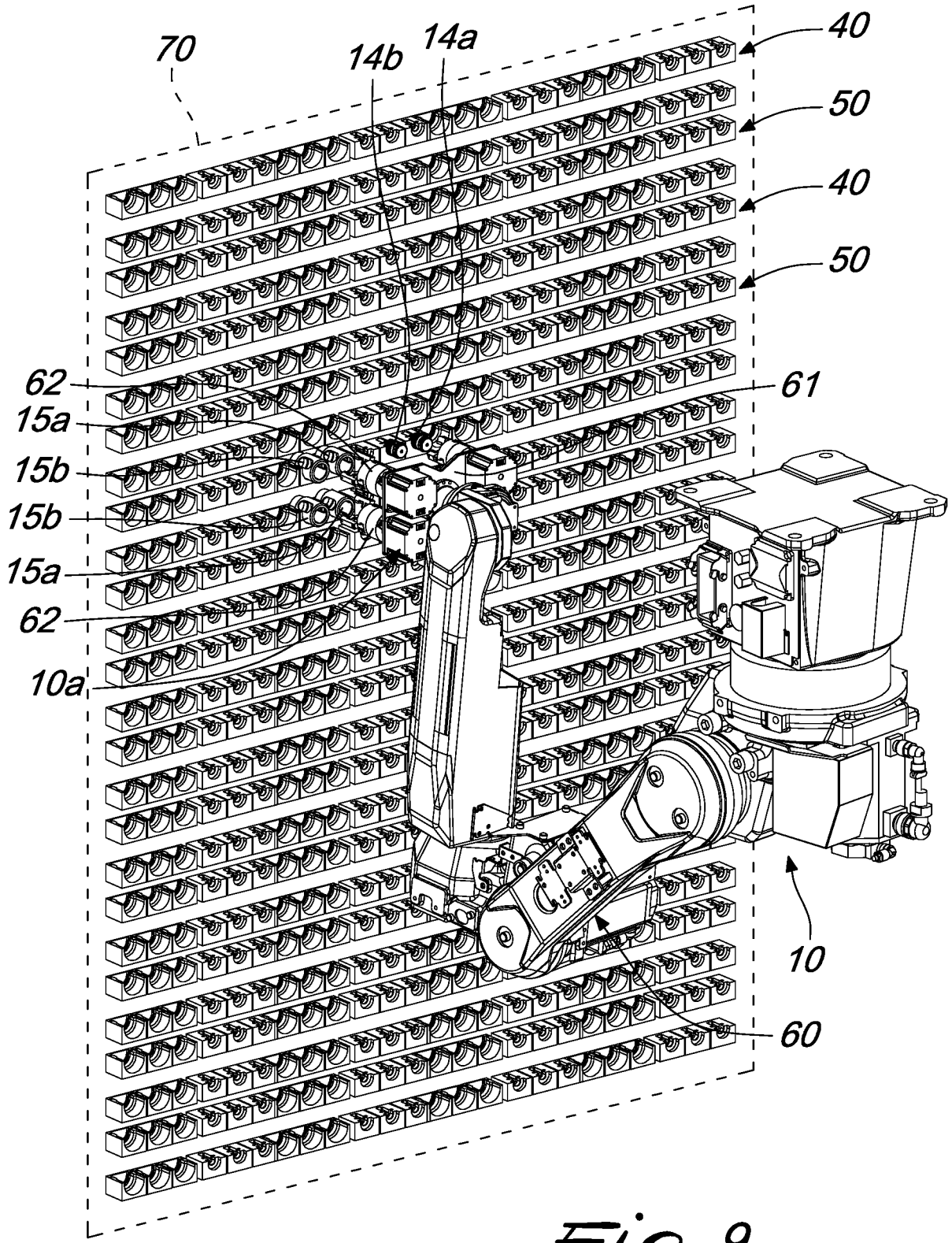

Fig. 9

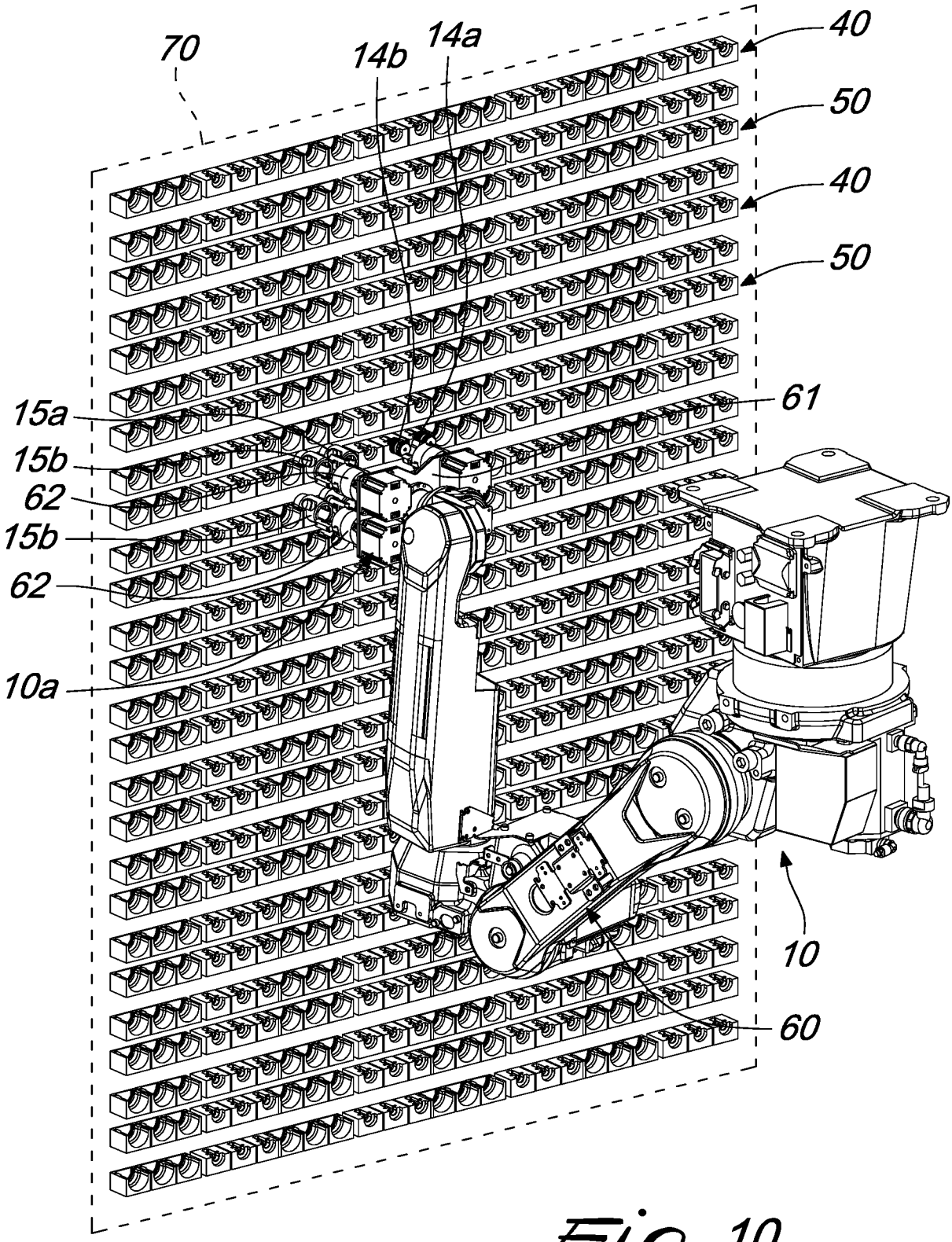

Fig. 10

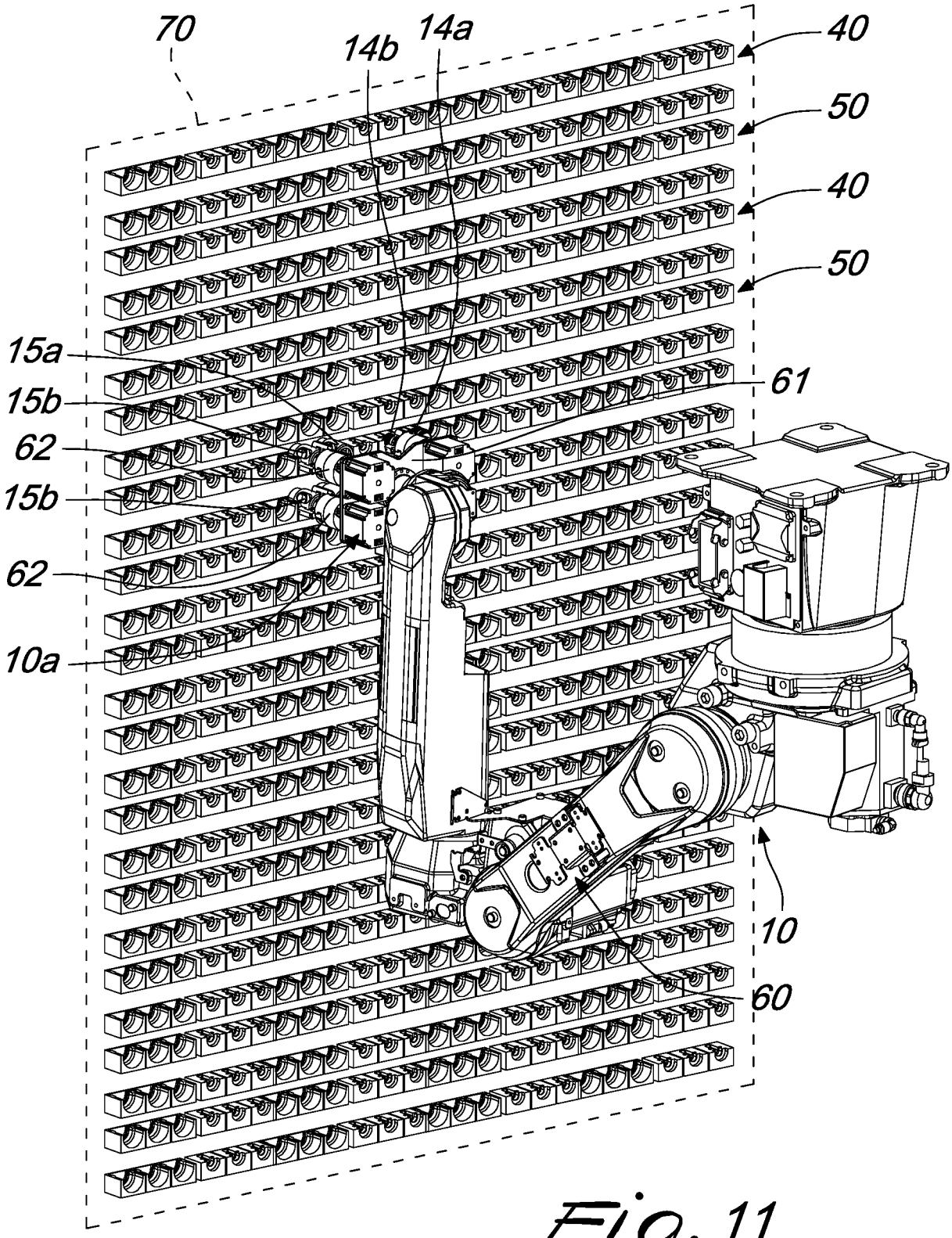

Fig. 11

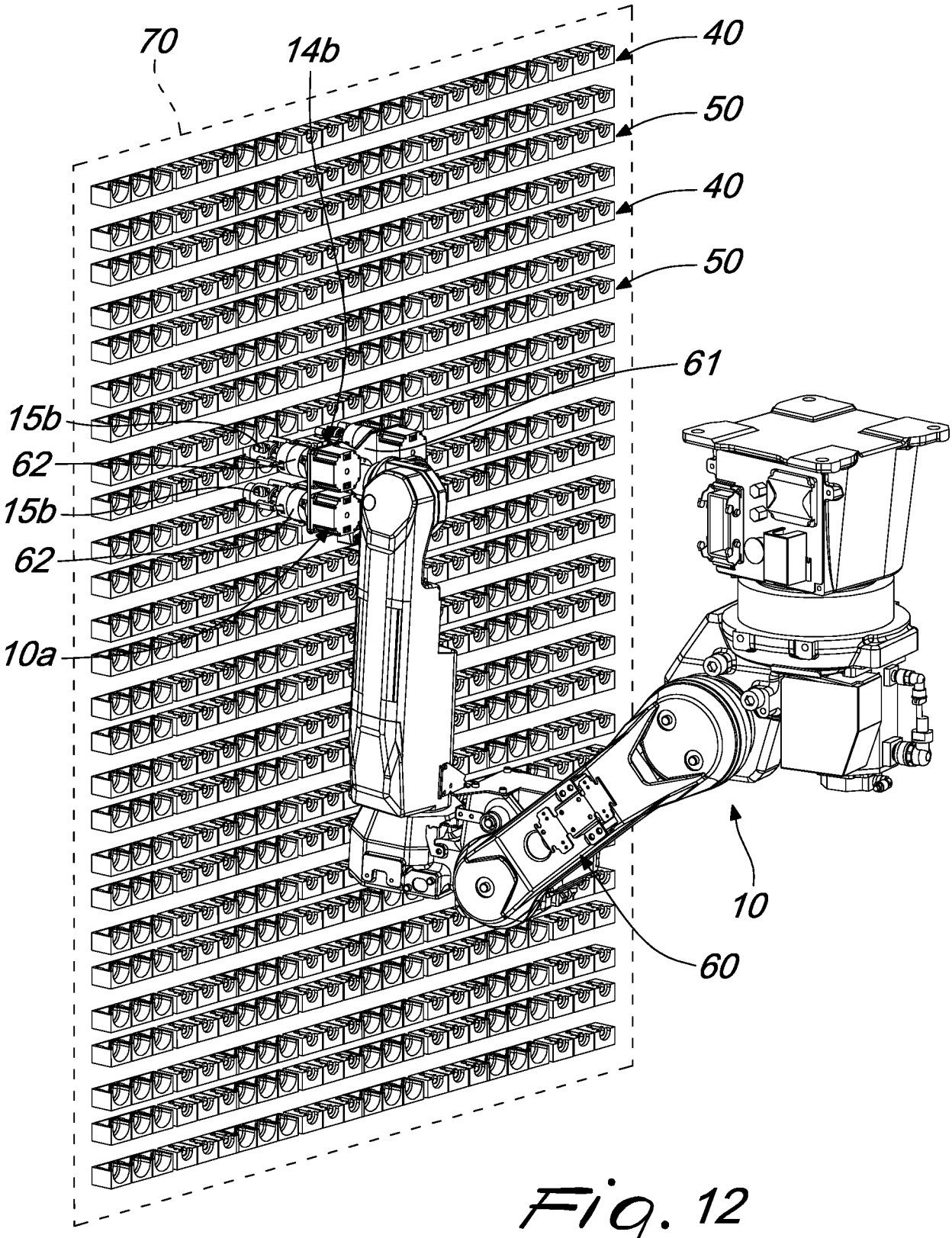

Fig. 12

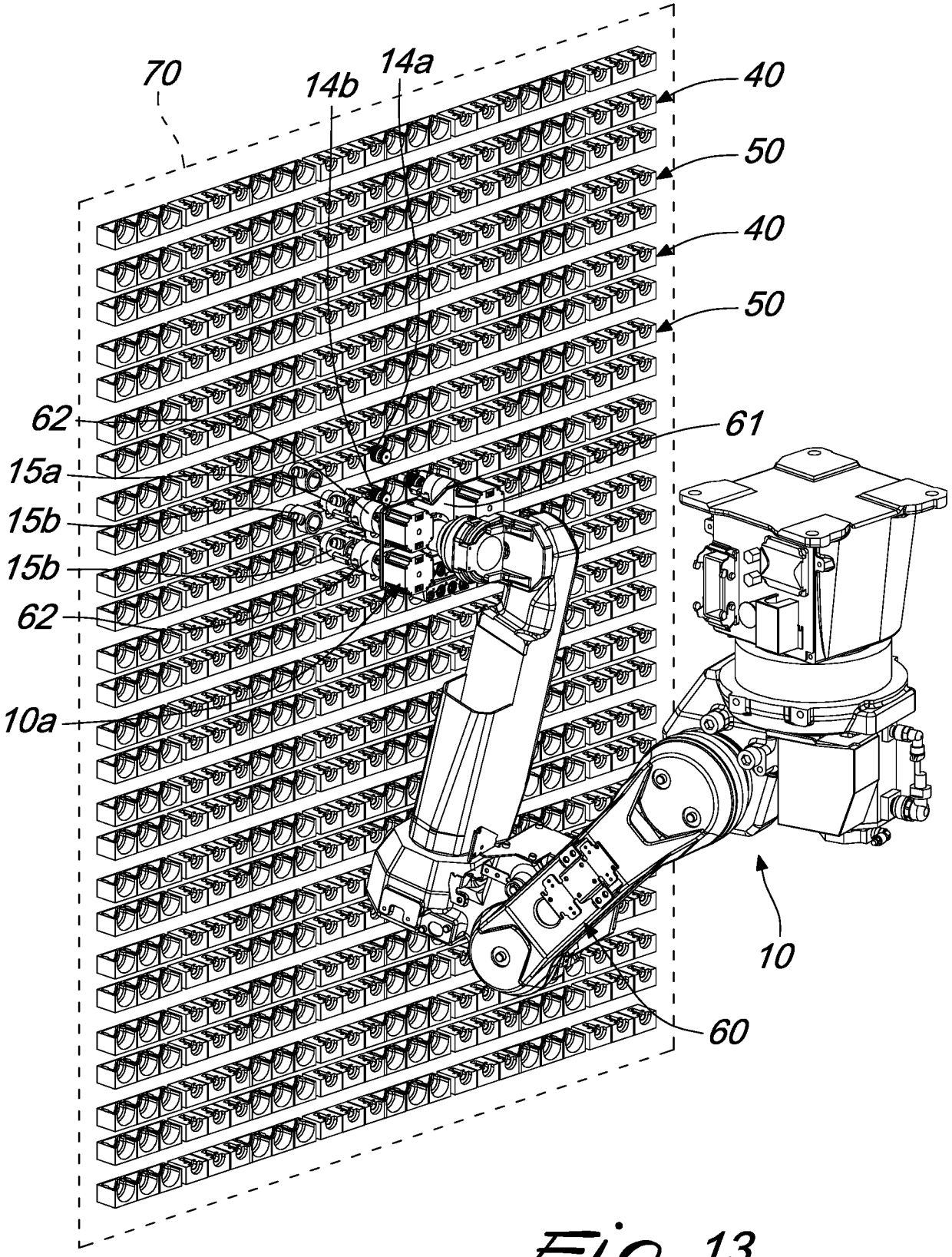

Fig. 13

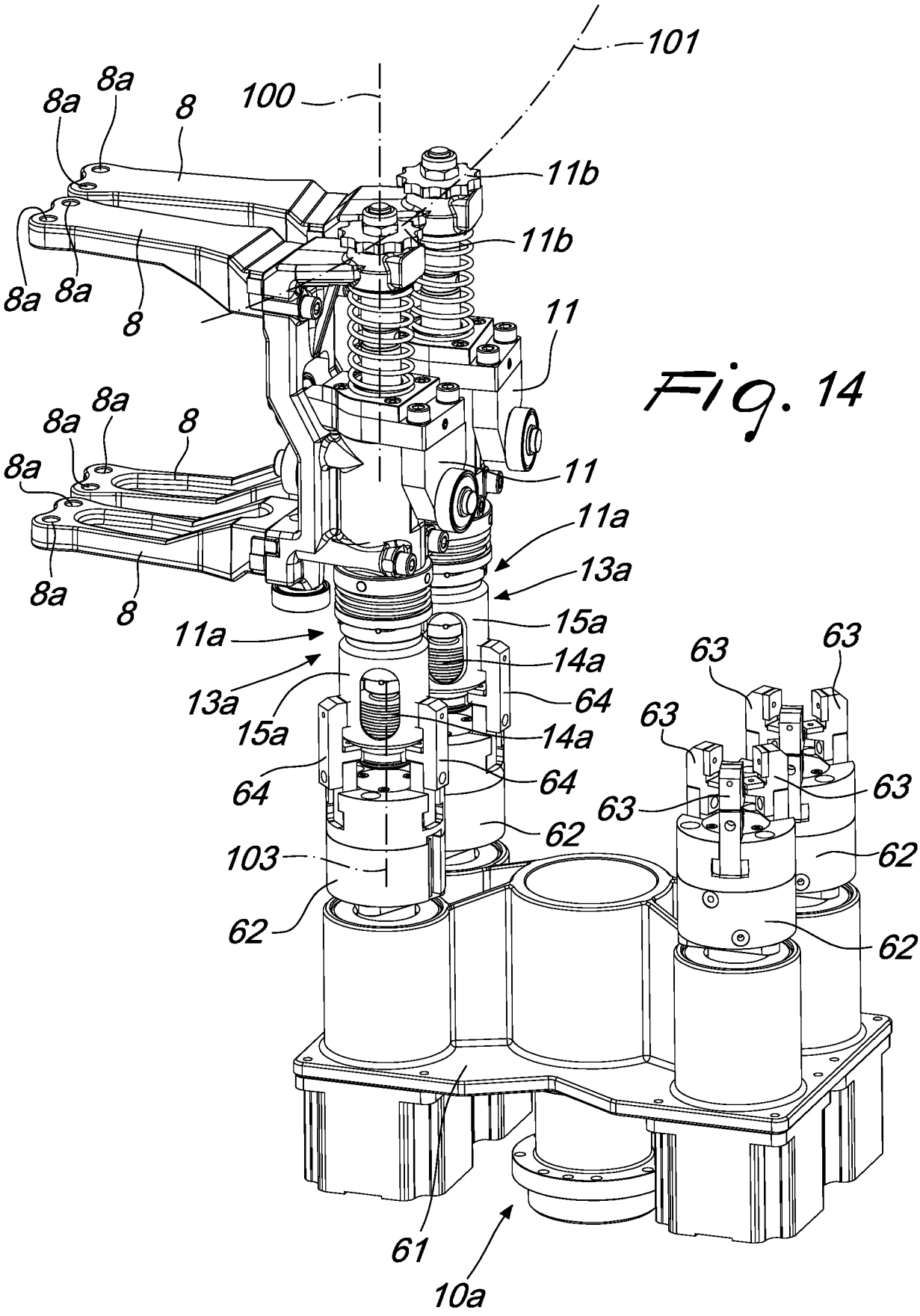
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Fig. 14

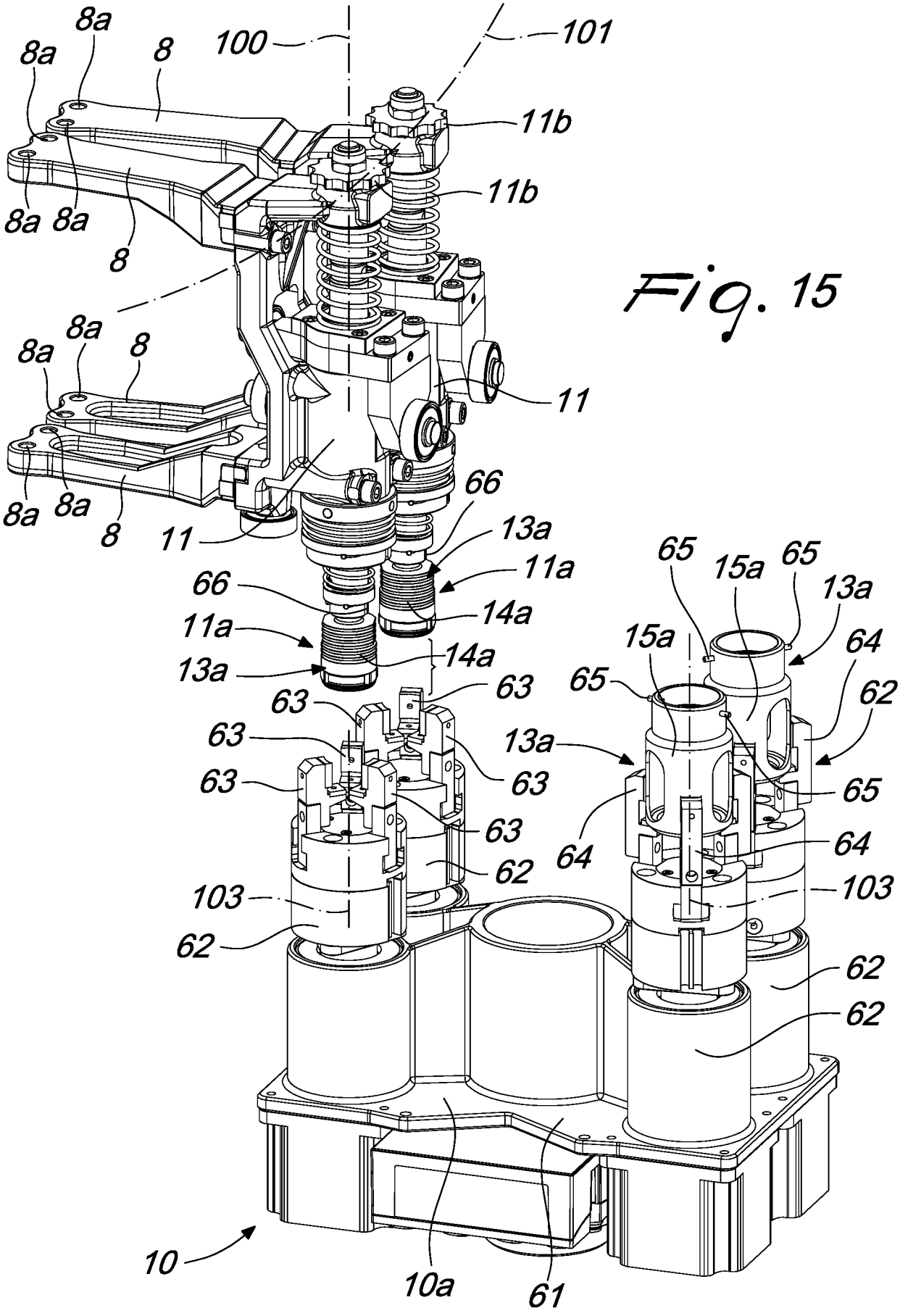
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Fig. 15

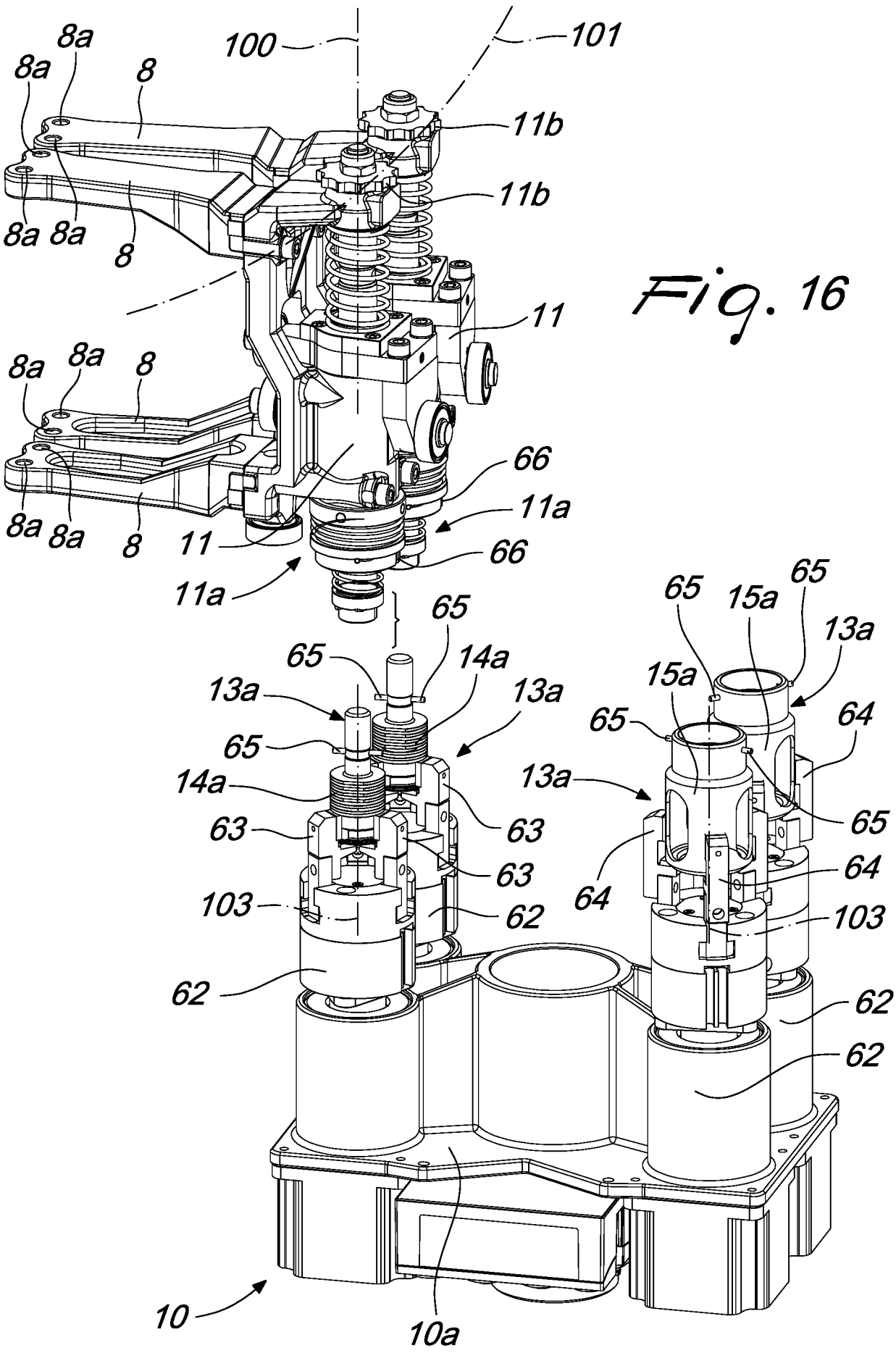

Fig. 16

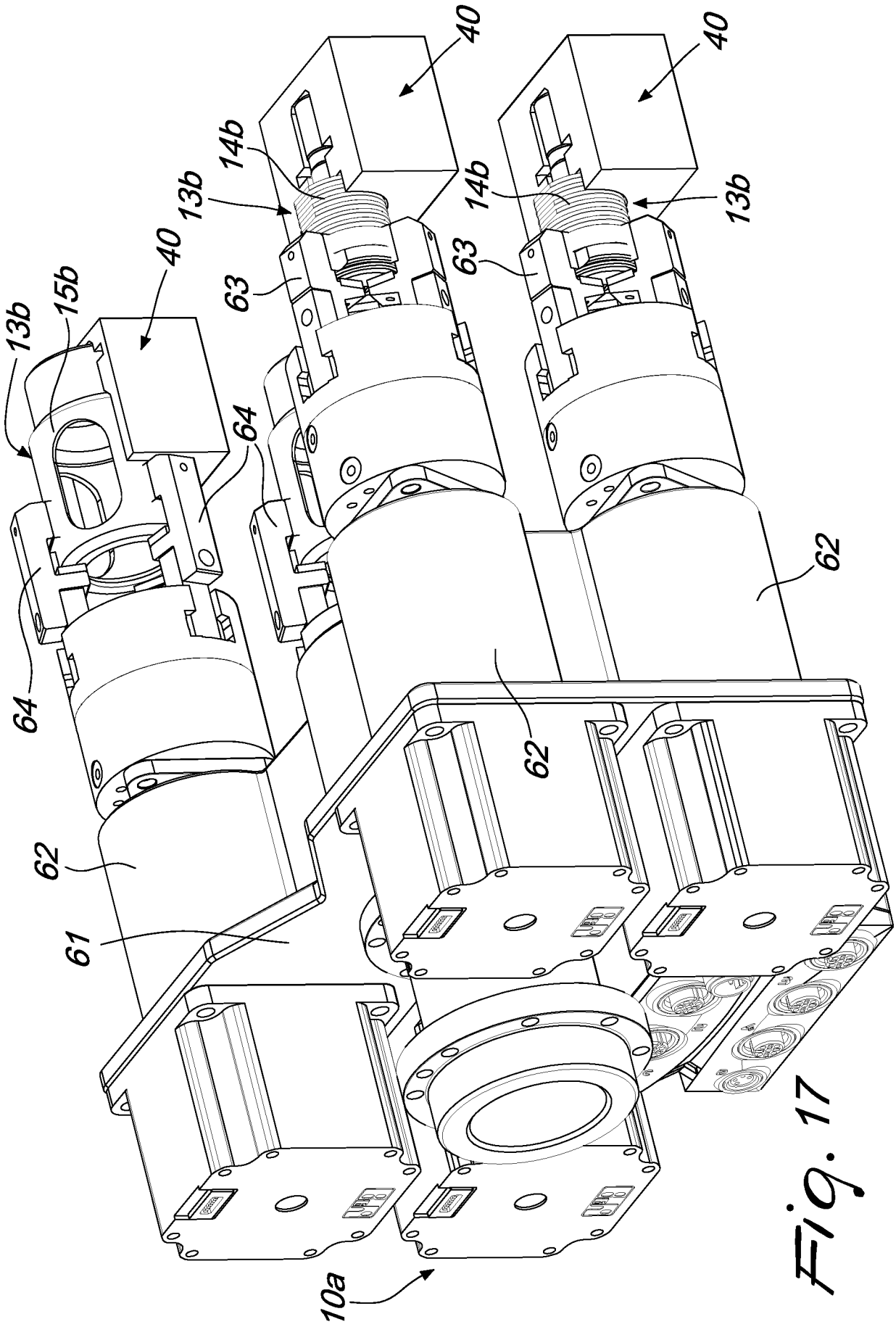

Fig. 17

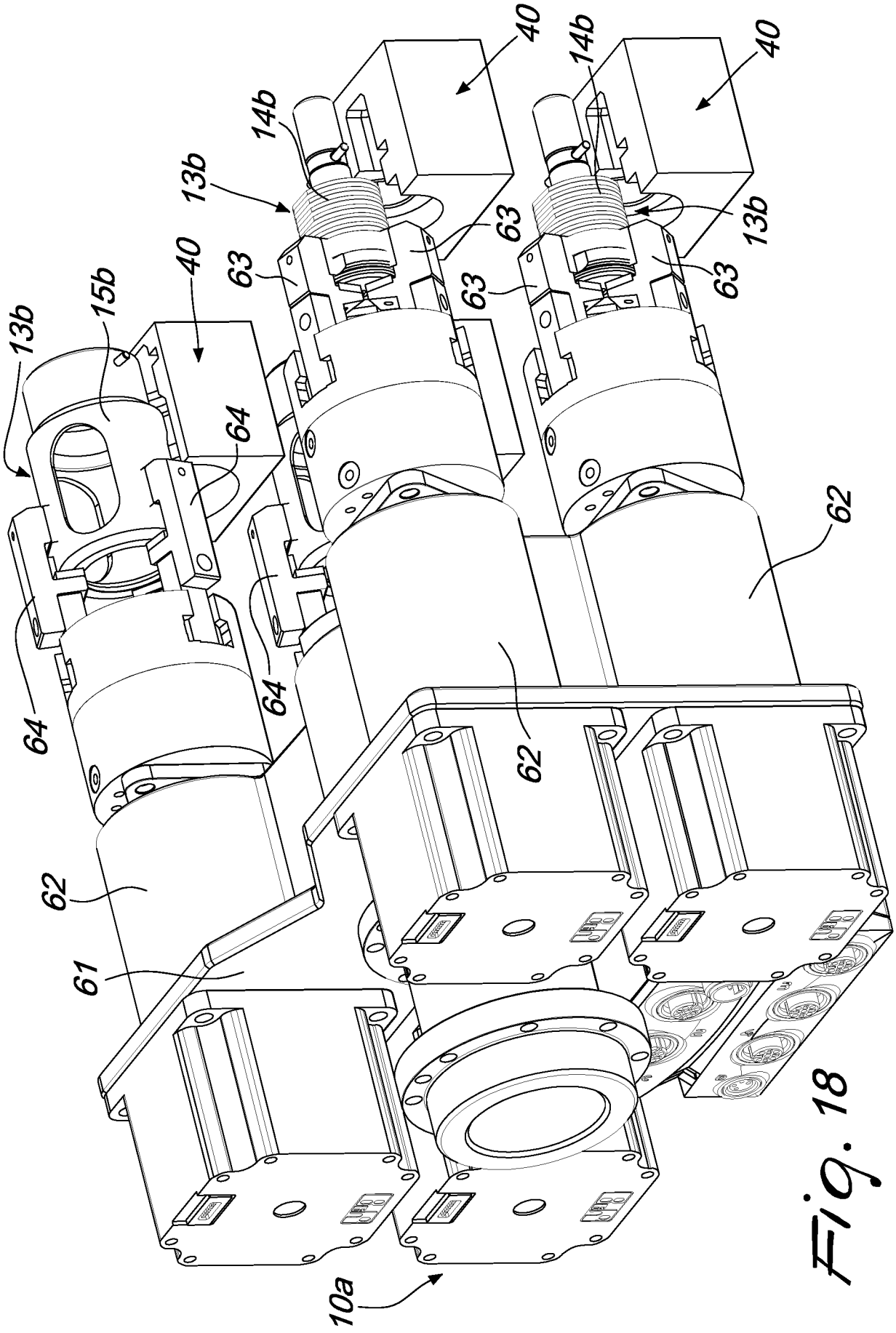

Fig. 18

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2014/060026

A. CLASSIFICATION OF SUBJECT MATTER
INV. B29C49/42
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 10 2007 037400 A1 (KRONES AG [DE]) 12 February 2009 (2009-02-12) paragraph [0021] - paragraph [0023]; figure 4 paragraph [0042] - paragraph [0045]; figure 4 -----	1-24
X	EP 2 258 534 A1 (KRONES AG [DE]) 8 December 2010 (2010-12-08) abstract; figures 1-4 -----	1-24
X	EP 2 030 759 A1 (KRONES AG [DE]) 4 March 2009 (2009-03-04) paragraph [0015] - paragraph [0030]; figures 1-5 -----	1-24
X	DE 10 2010 022126 A1 (KRONES AG [DE]) 24 November 2011 (2011-11-24) paragraph [0042]; figures 1-15 -----	1-24

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"E" earlier application or patent but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 June 2014	17/06/2014

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Muller, Gérard

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2014/060026

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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