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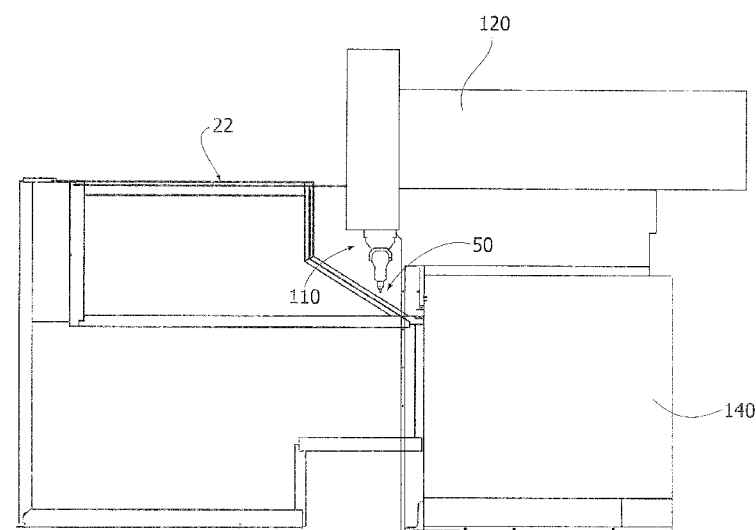
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- (54) **Title:** WORK CELL AND LASER-MACHINING CENTRE EQUIPPED WITH SUCH CELL

FIG. 5



- (57) **Abstract:** Described herein is a work cell for machining operations carried out via a laser head, the work cell including: - at least one working area (20, 40) designed to receive the pieces on which to carry out laser machining; and - a lateral covering (60) and a top covering configured for separating at least partially said working area from the outside. 10 The work cell is characterized in that: - it comprises an internal divider (18) that defines, together with said lateral covering, a first working area (20) and a second working area (40) separated from one another by said divider; and 15 - said top covering (22) is selectively mobile between a first position over said first working area (20) and a second position over said second working area (40).



"Work cell and laser-machining centre equipped with such cell"

Field of the invention

5 The present invention relates to a work cell and to a laser-machining centre equipped with such cell.

Prior art

10 As is known, machining centres equipped with laser heads require an appropriate shielding for protecting, from rays of laser beams directed and/or reflected towards the outside, the areas surrounding the working area in which the staff responsible for control and operation of the centre are operating.

15 Currently used work cells normally have a structure fixed to the floor, mounted on which are a series of shielding panels designed to define a lateral covering and a top covering of the working area. The lateral covering provides a total cover on four sides, and envisages mobile gates designed to enable access to
20 the working area by the operators or the machinery that serves the work cell.

Object of the invention

25 The object of the present invention is to provide a cell that will define two distinct working areas and will be characterized in that it is constituted by a structure that is simple and easy to install.

30 In the general framework of industrial machining operations, there is then the constant requirement to be able to use work centres that are as flexible and versatile as possible.

35 As regards this general problem, in the specific context of machining centres equipped with laser heads, the present applicant again proposes providing a cell that can be converted from a configuration with two working areas to a configuration with just one working

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area.

Summary of the invention

One or more of the objects referred to above are achieved by a work cell having the characteristics
5 specified in Claim 1.

The present invention also regards a work centre having the characteristics specified in Claim 12.

The characteristics specified in the claims form an integral part of the teaching provided herein.

10 The work cell described herein is characterized in that it provides an internal divider that defines, together with the outer lateral covering of the work cell, a first working area and a second working area separated from one another by the divider and in that
15 the top covering of the work cell is selectively mobile between a first position over the first working area and a second position over the second working area.

As will be seen in detail in what follows, thanks to the characteristics in question, the work cell
20 described herein can be associated to a single laser head that operates on both of the working areas in an alternating way, at the same time enabling, while the laser head is operating within one area, the other area to be accessible in all safety by an operator, for
25 example so that it can be prepared for machining a new workpiece.

According to a further important characteristic of the work cell described herein, the top mobile covering of the work cell is moreover constituted by a
30 series of panels assembled together in a telescopic way so as to be able to assume selectively an extended configuration, for carrying out the function of covering of the working areas, and a compact configuration, where the covering can instead be
35 withdrawn into a position of non-use. At the same time,

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the internal divider referred to above can be pre-arranged mobile on wheels so that it can be easily transported into and out of the work cell.

The above characteristics enable conversion of
5 the work cell from a configuration with two working areas to a configuration with a single area, in a simple and fast way.

Detailed description of some embodiments

Further characteristics and advantages of the
10 present invention will emerge clearly from the ensuing description with reference to the annexed drawings, which are provided purely by way of non-limiting example and in which:

- Figure 1 is a perspective view of an embodiment
15 of the work centre described herein;

- Figure 2 is a perspective view of an embodiment of the work cell described herein, in a configuration with two working areas;

- Figures 3 and 4 are a front view of the work
20 cell of Figure 2, respectively in a first operating condition and in a second operating condition;

- Figure 5 is a side view of the work cell of Figure 2;

- Figure 6 illustrates the work cell of Figure 2
25 in a configuration with a single working area.

In the ensuing description, various specific details are illustrated aimed at enabling an in-depth understanding of the embodiments. The embodiments may be provided without one or more of the specific
30 details, or with other methods, components, or materials, etc. In other known cases, structures, materials, or operations are not shown or described in detail to prevent various aspects of the embodiment from being obscured.

35 The references used herein are only provided for

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convenience and hence do not define the sphere of protection or the scope of the embodiments.

As anticipated above, the work cell described herein has been specifically provided for use in work
5 centres in which the laser heads operate.

With reference to the figures, designated by the reference number 100 is a work centre in which a machine is installed, equipped with a laser head 110 for carrying out machining via laser beam, for example
10 operations of welding, cutting, drilling, etc. The laser head 110 is carried by an overhead carriage 120, for example an overhead travelling crane, which is supported by a load-bearing structure 140 - illustrated in the figures in an altogether schematic way - and is
15 mobile in a main direction X of the work centre. The head 110 is mobile with respect to the carriage 120 in the further two main directions Y and Z, which are orthogonal to one another and to the direction X.

As mentioned at the start, in the applications in
20 which a laser head operates, there exists the problem of having to shield the area where the machining head is working so as to protect, from possible reflected rays of the laser beam, the surrounding areas in which the staff responsible for control and/or operation of
25 the work centre may be operating.

In this connection, in a way in itself known in the art, the work centre 100 comprises an outer protective structure having side walls 111 and a roof 113. As will be seen in greater detail in what follows,
30 mobile doors 115 are provided on the front side of the centre to enable access into the centre.

The work cell described herein, which in the figures is designated as a whole by the reference number 10, has the function of defining itself a
35 shielded working area inside the work centre.

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The work cell described herein has the peculiarity of defining two distinct working areas in which the head 110 operates alternately, and of providing a shielding such as to enable an operator to
5 access in total safety, during the machining in one of the two areas, the working area set alongside in which the laser head is not operating. In the example illustrated in the figures, the two working areas in question are designated by the reference numbers 20 and
10 40, respectively.

In various embodiments, as in the one illustrated, the work cell 10 comprises a framework that is constituted by two lateral uprights 12, 14, fixed to the floor, for example via screws or bolts,
15 and by a pair of cross members - of which only the cross member 16 is visible in the figures - oriented in the main direction Y and supported by the uprights 12 and 14. Carried on each upright is a shielding panel 60.

20 The work cell 10 further comprises an intermediate divider 18, which also bears a shielding panel 60, which is set between the two uprights 12, 14 in a pre-set position, preferably in a position at the same distance from each of them, thus dividing the work
25 cell 10 into the two working areas 20, 40 referred to above.

Furthermore, the work cell 10 comprises a top covering 22, which is mounted mobile on the cross members of the framework in a direction parallel to the
30 main direction X. In particular, the covering 22 is carried, on its side closer to the structure 140, by at least one carriage (not illustrated) that is moved along the corresponding cross member of the framework via a belt transmission system driven by a motor,
35 carried by the cross member itself. Preferably, set

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between the carriage and the frame of the covering 22 is a guide with washers designed to enable relative movement between the frame and the carriage in the event of impact so as to prevent, in this circumstance, major damage to the structure of the covering. On the opposite side, the covering 22 rests, instead, on bearings, which are mobile on rails provided on the corresponding cross member of the framework.

As illustrated in Figures 3 and 4, the covering 22 is rendered mobile with respect to the framework of the work cell so that it can be selectively positioned in two distinct positions, specifically, over the working area 20, in a first position, and over the working area 40, in the second position. In the first position, the covering 22 carries out a function of protection in regard to the underlying working area 20, and renders, instead, accessible to the laser head 110 the working area 40 set alongside. Likewise, in the second position, the covering 22 carries out a function of protection in regard to the working area 40, while it renders the working area 20 accessible to the laser head 110.

As regards the shielding function performed by the structure described, it may be noted that, when the head 110 operates in one of the two working areas, the other area is shielded, from the possible reflections of the laser beam emitted by the head 110, mainly by the intermediate divider 18 and by the top covering 22. As has been said, thanks to these shielding elements the operator can access the shielded area in total safety. On the other hand, the panels 60 arranged on the lateral uprights 12, 14 perform, instead, a shielding function to protect the areas outside the work cell. The variation of position of the covering 22 must clearly be co-ordinated with control of the laser

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head 110 so that the latter will not come to interfere with the movement of translation of the covering. In this connection, before the covering 22 is moved, the head 110 must be brought back out of the work cell 10
5 via a movement along the axes Y and Z, to be set in a condition of non-interference.

In regard to this technical problem, it should be noted that in various preferred embodiments, as in the one illustrated, the covering 22 advantageously has a
10 transverse profile, which in the proximity of the structure 140 identifies a sudden lowering, set before the end edge of the covering itself, so as to define on the outside a recess 50 within which the laser head 110 can be received during movement of the covering. This
15 enables the work cell 10 to be brought immediately adjacent to the load-bearing structure 140 of the laser head, thus reducing the overall dimensions of the work centre and, at the same time, optimizing the space available for the two areas 20, 40.

20 As mentioned previously, the work centre 100 has at the front a passage for access that is closed by mobile doors 115 having, like the walls 111, a function of protection towards the external environment. It should now be noted that the doors 115 are two in
25 number (in Figure 1 only the left-hand one is visible that is in a closed position) and close the two passages to the working areas 20 and 40; preferably, these doors are slidable and are set on the opposite sides of the work centre in their respective open
30 position. Each of these doors is designed to remain closed during machining within the respective working area for carrying out a shielding action to protect the external environment, and is instead designed to move into the open position during machining in the adjacent
35 working area to allow free access for the operator. The

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positioning of these doors is hence synchronised with movement of the head 110 exactly as in the case of the covering 22. It is to be noted that the doors 115 can also form part of the structure of the work cell 10 and
5 hence be constrained to the load-bearing structure of said work cell, instead of being constrained to the structure, outside the work cell, of the work centre. It should moreover be noted that, when these doors are both in the closed position, they close completely the
10 passage for access to the work centre 100, even in the absence of the intermediate divider, and are hence also able to operate in the same way as a sliding door of a conventional work centre.

From what has been said above, it hence clearly
15 emerges how the work cell described herein makes it possible to set up the work centre 100 for operation with two distinct working areas via a simple structure perfectly integrated in the work centre. This configuration with two areas, as has been seen, enables
20 the laser head to operate in the two working areas in an alternating way and moreover with elimination of any dead time for preparation and/or loading thanks to the fact that, while the head is carrying out a machining operation inside one area, the operator can access the
25 area alongside in conditions of total safety.

Clearly, a control unit, preferably the control unit of the work centre itself, will be pre-arranged for controlling the covering 22 and the doors 115. Control of the covering and of the doors will
30 necessarily be co-ordinated with control of the laser head 110 - or vice versa - for the reasons outlined above. In preferred embodiments, the work centre can provide in each working area a control station, via which the operator can start up, through one and the
35 same command, machining within the working area and the

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synchronised movements seen above of the covering 22 and of the doors 115. In alternative embodiments, a single control station for both of the working areas is instead envisaged.

5 Now, as regards the possibility of conversion of the work cell 10 from the configuration with two working areas to a configuration with a single working area, the covering 22 may, for this purpose, be constituted by a series of panels 22 assembled
10 together in a telescopic way so as to be able to assume selectively the extended configuration illustrated in Figures 1, 2, and 3, for the covering function discussed above, and a compact configuration, illustrated in Figure 5, with which the covering can
15 instead be withdrawn into a position of non-use within the work cell. As may be seen in Figure 6, this position of non-use is preferably provided close up to one of the two lateral uprights of the work cell. Furthermore, in various preferred embodiments, as in
20 the one illustrated, the divider 18 is mounted on a trolley so that it can be easily transported into and out of the work cell 10; it is positioned inside the work cell 10, in the pre-set position, via reference guides 17 fixed to the floor inside the work cell.

25 Thanks to the characteristics referred to, the work cell 10 can hence be converted from its configuration with two working areas illustrated in Figure 1 into the configuration with a single working area illustrated in Figure 5, in an extremely simple
30 and fast way, simply by setting the covering 22 in the position of non-use discussed above, and removing the intermediate divider 18 from the work cell, this being an operation that can be carried out also by just one operator since the divider is mobile on wheels. From
35 the foregoing, in this operating mode, the doors 115

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can operate for closing the passage for access to the work centre completely.

It is also to be noted that in various embodiments, as in the one illustrated, in each of the two working areas the work cell can present a fixed panel 23 set at the margin of the corresponding area, on the side further away from the other working area, which has the function of constituting a prolongation of the covering 22 when this is in the corresponding position over the working area itself. This fixed panel co-operates with the covering to protect the corresponding area from above, and hence enables provision of a covering that in itself has dimensions smaller than in the case where the covering has to cover by itself the entire area, with evident advantages both from the constructional standpoint and from the functional standpoint, in particular as regards the condition of non-use of the covering itself, where this may in fact present even smaller overall dimensions.

The fixed panel 23 can be mounted on the corresponding lateral upright or else on the cross members of the framework of the work cell. As may be seen in Figure 5, in its position of non-use the covering 22 is set above the aforesaid panel.

In order to guarantee proper operation of the work cell, and more in general of the work centre, the work cell 10 can be equipped with position sensors designed to detect proper positioning of the intermediate divider 18 and of the covering 22 in their respective operating positions for the shielding function referred to above. In this case, the control unit of the centre is configured for activating operation of the laser head only if it receives, from the aforesaid sensors, confirmation of proper

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positioning of the elements controlled thereby.

Furthermore, the intermediate divider 18 can be equipped with a top hinged portion, designed to collapse in the event of impact, for example in the case where the head 110 comes to bang against the divider, and a sensor may be associated to this portion to verify the position thereof. At the same time, the control unit is connected to the sensor in question for interrupting the operations of the laser head in the case where tipping-over of this portion of the divider is detected.

The sensors in question may, for example, be constituted by proximity sensors of a magnetic type.

Of course, without prejudice to the principle of the invention, the details of construction and the embodiments may vary, even significantly, with respect to what has been illustrated herein purely by way of non-limiting example, without thereby departing from the scope of the invention, as defined in the annexed claims. It should be noted, in particular, that the lateral covering of the work cell 10 does not necessarily have to be provided via accessory structures that need to be added to the work centre but may also be defined, either totally or in part, by structures already forming part of the work centre.

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CLAIMS

1. A work cell for machining operations carried out via a laser head, comprising:

5 - at least one working area (20, 40) designed to receive the pieces on which to carry out laser machining; and

- a lateral covering (60) and a top covering configured for separating at least partially said working area from the outside,

10 characterized in that:

- said work cell comprises an internal divider (18) that defines, together with said lateral covering, a first working area (20) and a second working area (40) separated from one another by said divider; and

15 - said top covering (22) is mobile selectively between a first position over said first working area (20) and a second position over said second working area (40).

2. The work cell according to Claim 1, wherein
20 said top covering (22) is controlled by an actuator in its movement between said first and second positions.

3. The work cell according to Claim 1 or Claim 2, wherein said top covering (22) is constituted by a series of panels (22') assembled together in a
25 telescopic way so as to be able to assume selectively an extended configuration, for covering said first and second areas, and a compact configuration for withdrawing said covering into a position of non-use.

4. The work cell according to any one of the
30 preceding claims, wherein said top covering (22) is operated via a belt transmission system driven by an electric motor.

5. The work cell according to any one of the
35 preceding claims, wherein said internal divider (18) is mounted on a trolley.

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6. The work cell according to Claim 5, comprising, fixed to the floor, a reference guide (17) for the trolley of said divider, designed to define a proper positioning of the divider within said work cell.

7. The work cell according to any one of the preceding claims, wherein said top covering (22) has a transverse profile that identifies, on one side, a lowering that is set before the corresponding end edge of the covering, so as to define on the outside a recess (50), above said covering, where said laser head (110) can be received during movement of said top covering.

8. The work cell according to any one of the preceding claims, comprising sensors for detection of proper positioning of said top covering in said first and second positions, which are designed to transmit a signal indicating said positioning to a control unit.

9. The work cell according to any one of the preceding claims, comprising a sensor for detection of proper positioning of said divider within said work cell, which is designed to transmit a signal indicating said positioning to a control unit.

10. The work cell according to any one of the preceding claims, wherein said divider comprises a part that can be tipped over in the event of impact, said work cell comprising a sensor for detecting tipping-over of said part, which is designed to transmit a signal indicating said tipping-over to a control unit.

11. The work cell according to any one of the preceding claims, comprising two sliding doors (115) that close the respective passages, through said lateral covering, to said first and second working areas (20, 40).

12. A work centre, of the type including:

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- a machine tool comprising a laser head (110);
and

- a work cell (10) according to any one of the
preceding claims,

5 wherein said laser head is itself mobile between
a first position in said first working area (20) and a
second position in said second working area (40);

wherein said work centre further comprises:

10 - a control unit configured for controlling the
top covering (22) of said work cell and said laser head
(110) in such a way that, when said laser head is in
its first position, said covering is in its second
position and, when said laser head is in its second
position, said top covering is in its first position.

15 **13.** The work centre according to Claim 12,
wherein:

said work cell comprises sensors for detecting
proper positioning of said top covering in said first
and second positions; and/or

20 said work cell comprises a sensor for detecting
proper positioning of said divider within said work
cell,

wherein said control unit is configured for
preventing or blocking movement and/or operation of
25 said laser head if one of said sensors does not detect
said proper positioning.

30 **14.** The work centre according to Claim 11 or
Claim 12, comprising outer side walls (111), a roof
(113), and at least one mobile door (115), which define
a closed space enclosed in which are said machine tool
and said work cell.

35 **15.** The work centre according to Claim 14,
comprising two sliding doors (115) that close the
respective passages to said first and second working
areas (20, 40),

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wherein said control unit is configured for controlling said doors in such a way that, when said laser head is in its first position, the door of said first working area is in its closed position, whereas
5 the door of said second working area is in its open position, and, when said laser head is in its second position, the door of said first working area is in its open position, whereas the door of said second working area is in its closed position.

10

FIG. 1

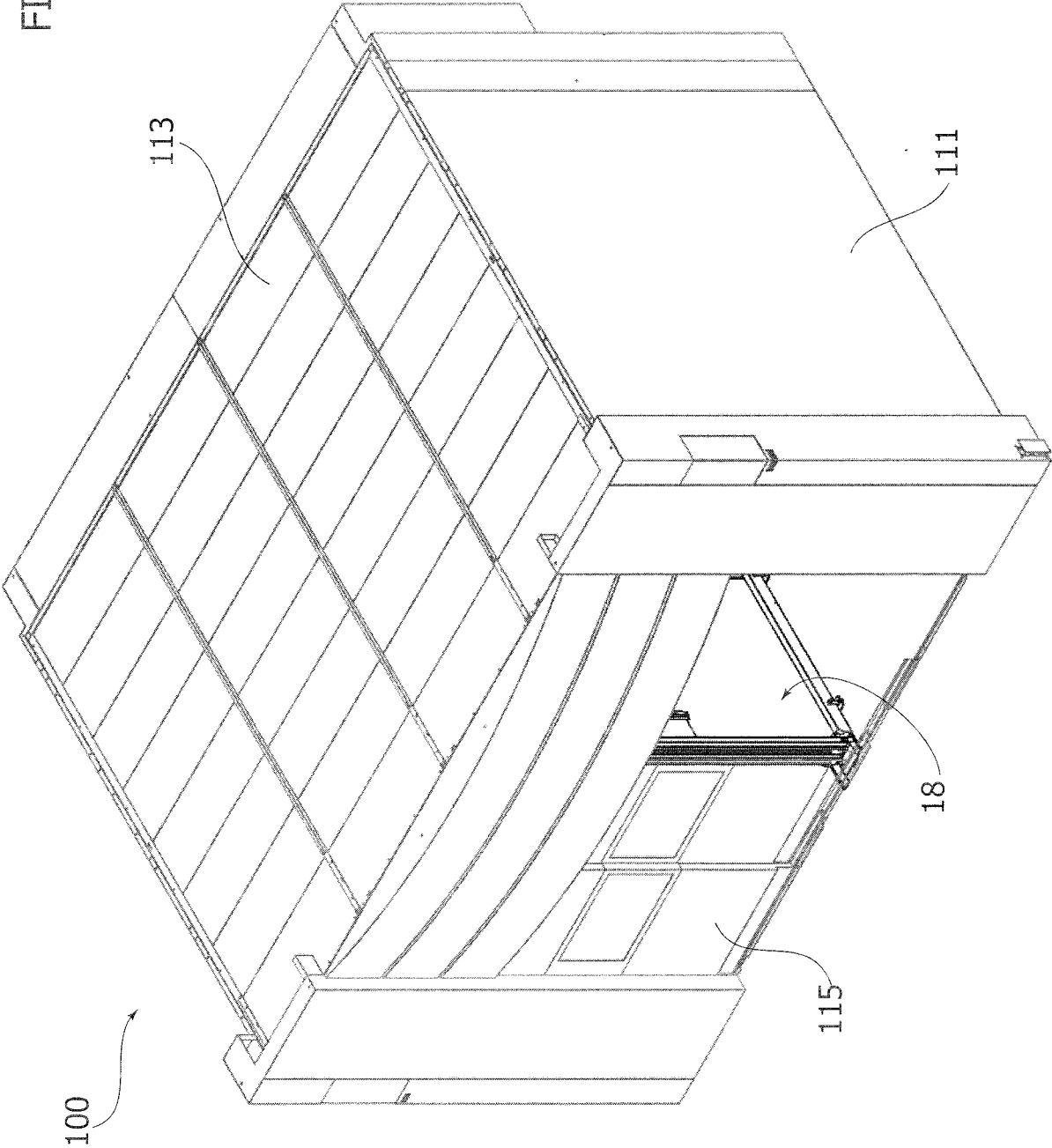


FIG. 2

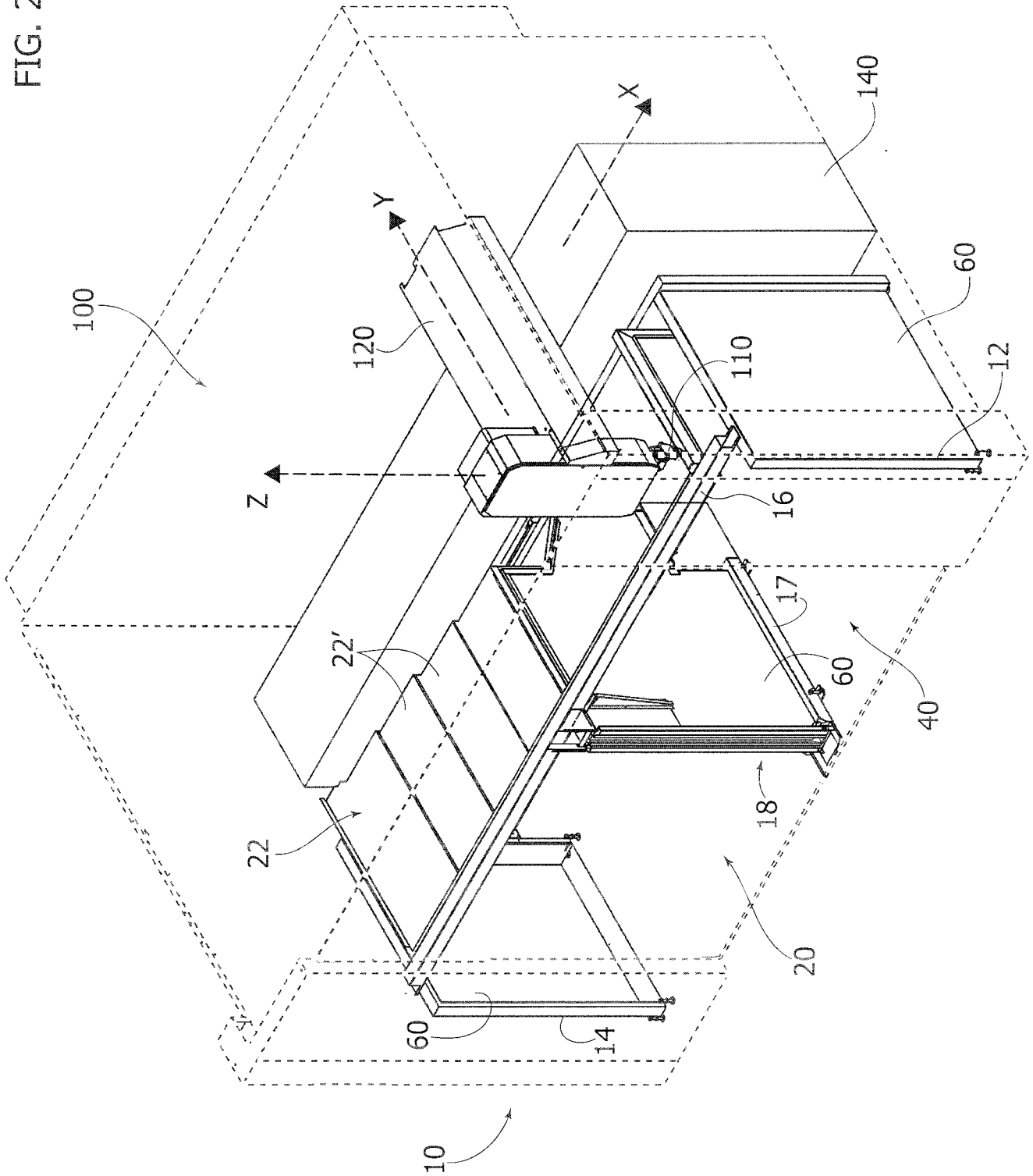


FIG. 3

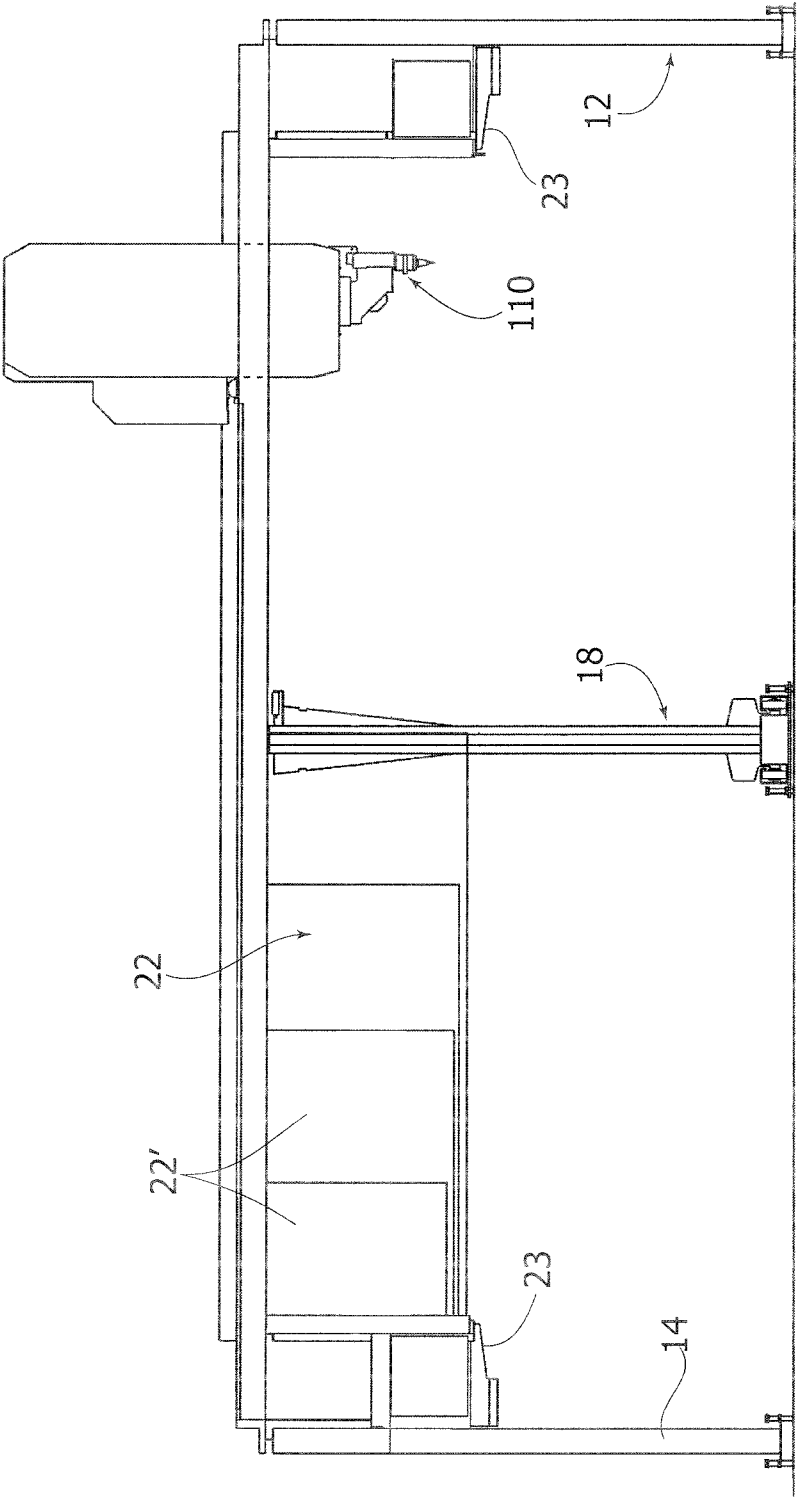


FIG. 4

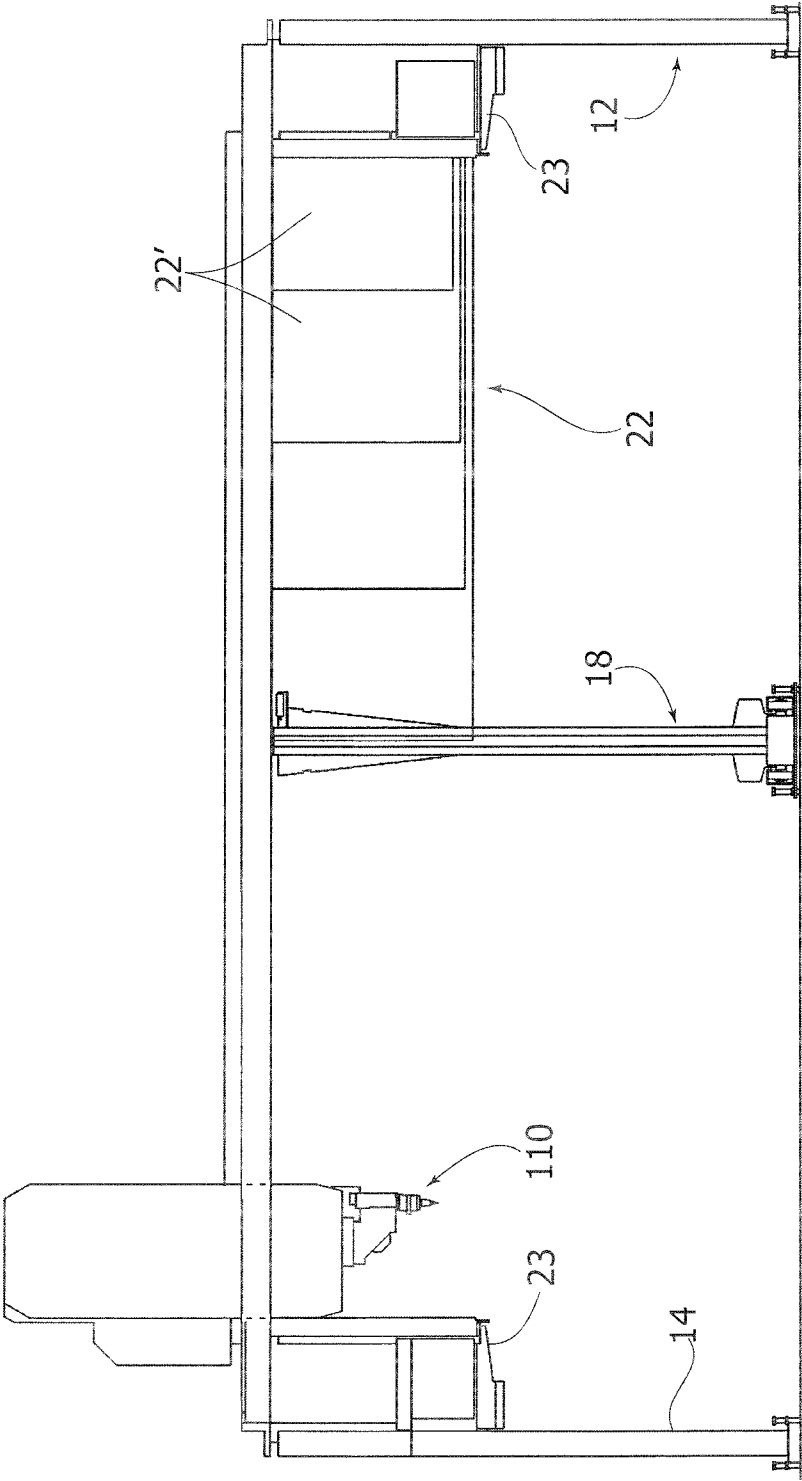


FIG. 5

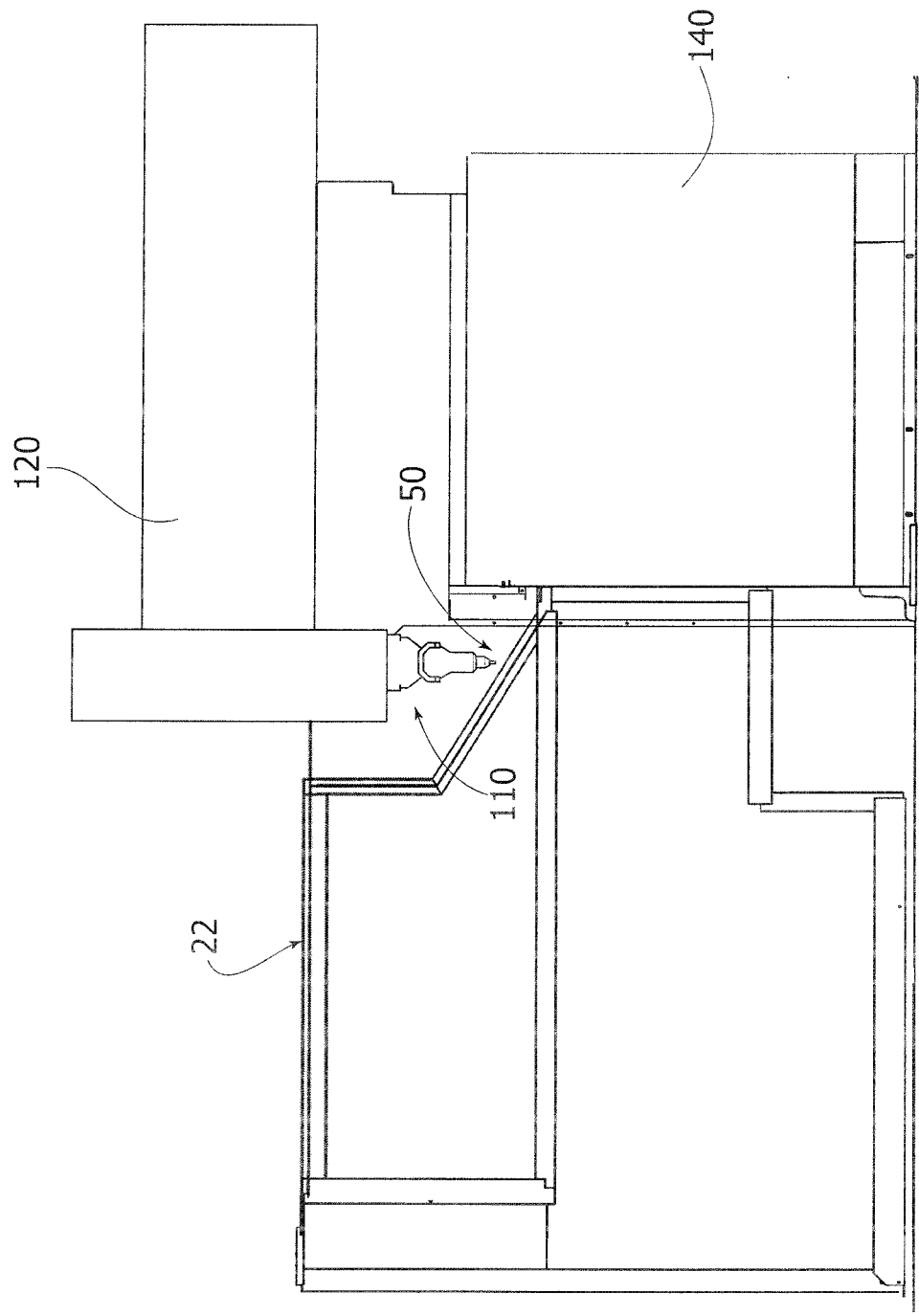
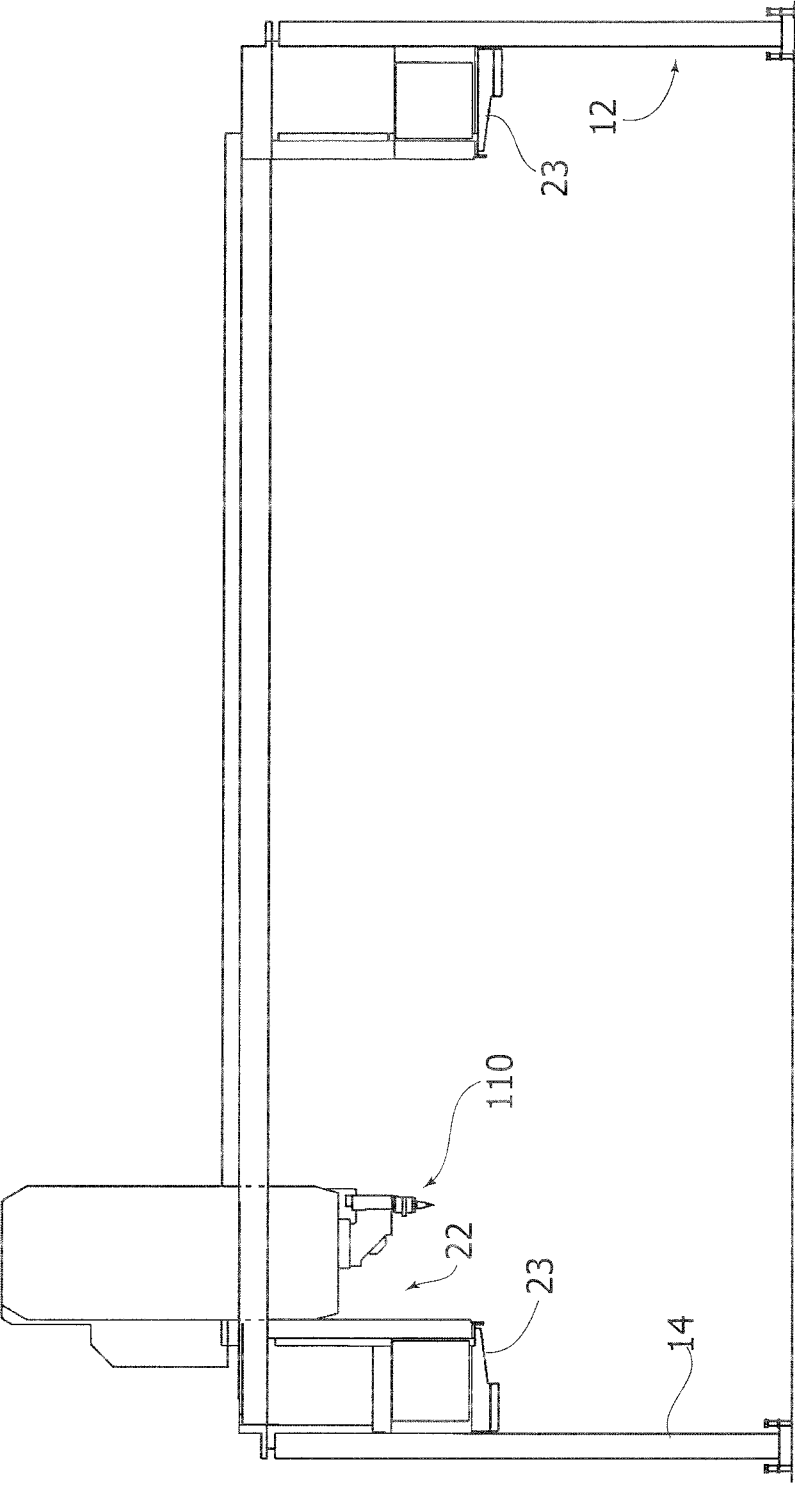


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2016/057570

A. CLASSIFICATION OF SUBJECT MATTER
INV. B23Q11/08 B23K37/00
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)
B23Q B23K

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)

EP0-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 199 29 695 A1 (BERLINER WERKZEUGMASCH [DE]) 8 March 2001 (2001-03-08)	1-6,8-11
A	figures 1, 2	7,12-15

A	EP 1 985 412 A1 (SCM GROUP SPA [IT]) 29 October 2008 (2008-10-29) abstract; figure 1	1-15

☐

Further documents are listed in the continuation of Box C.

☒

See patent family annex.

* Special categories of cited documents :

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

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Date of the actual completion of the international search

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20/03/2017

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2016/057570

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19929695	A1	08-03-2001	NONE

EP 1985412	A1	29-10-2008	NONE
