(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 404 700 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
11.01.2012 Bulletin 2012/02

(21) Application number: **11169332.1**

(22) Date of filing: **09.06.2011**

(51) Int Cl.:
B24B 9/06 *(2006.01)* ***B24B 27/00*** *(2006.01)*
B24B 41/04 *(2006.01)* ***B24B 47/26*** *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **08.07.2010 IT VR20100136**

(71) Applicant: **MONTRESOR & C. S.r.l.**
37069 Villafranca (Verona) (IT)

(72) Inventor: **Montresor, Luciano**
37066 Sommacampagna VR (IT)

(74) Representative: **Modiano, Micaela Nadia**
Modiano & Partners (IT)
Via Meravigli, 16
20123 Milano (IT)

(54) Edge polishing machine

(57) An edge polishing machine (1), comprising a supporting frame (2) which has a conveyor (5) for conveying the slab (7) to be worked and supports a plurality of machining tools (3) which act on at least one edge (7a) of the slab (7) and are each actuated by a respective spindle (4). The machining tools (3) are mounted on a support (9) which can oscillate, with respect to the supporting frame (2), about a pivoting axis (10) which is substantially parallel to the advancement direction (8) of the slab (7). For at least one of the machining tools (3) a template device (11) is provided, which defines a shaping guide (12) which can be engaged slidingly, during the oscillation of the support (9) about the pivoting axis (10), by contact means (13) associated with the corresponding machining tool (3). According to the invention, automatic means for positioning the template device (11) with respect to the slab (7) are provided, as well as means for varying automatically the distance between the contact means (13) and the corresponding machining tool (3), along a direction that is substantially parallel to the axis of the corresponding spindle (4), as a function of the thickness of the slab (7) and of the shape to be given to the edge (7a).

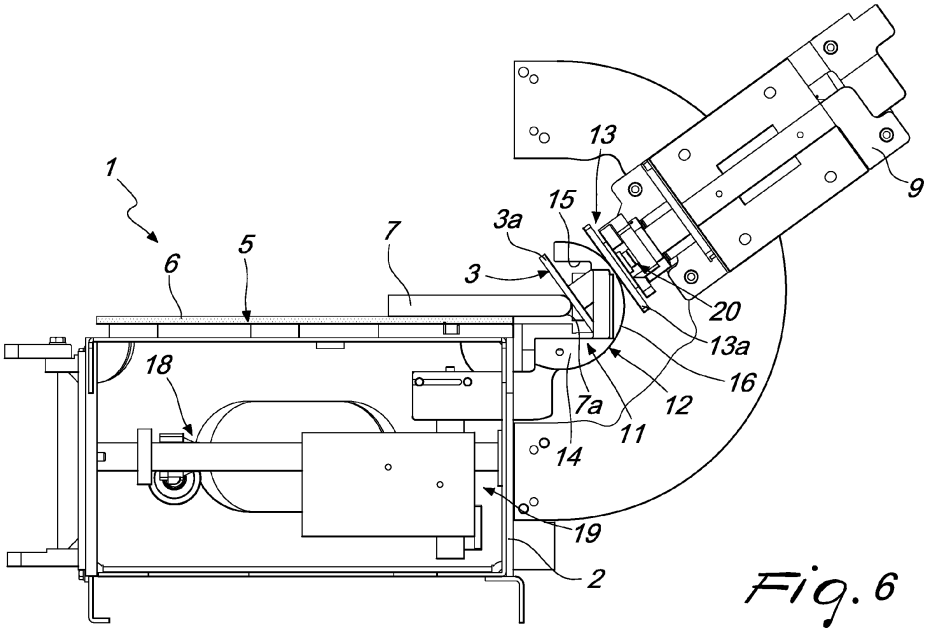

Fig. 6

EP 2 404 700 A1

Description

[0001] The present invention relates to an edge polishing machine.

[0002] Edge polishing machines are known which make it possible to shape and polish the edges of slabs made of stone-like material, such as marble, granite or the like.

[0003] Essentially, such machines have a supporting frame that supports a conveyor belt that enables the slabs to be worked to be moved along an advancement direction.

[0004] At the sides of the conveyor belt, machining assemblies are provided, which consist of a plurality of working heads, which are arranged mutually spaced apart, along the advancement direction of the conveyor belt, and which are provided with respective machining tools, which are actuated by spindles, which execute, in succession, during the advancing of the slab on the conveyor belt, the step of shaping of the edge with removal of the excess material from the edge in order to give it a preset shape, and the final finishing step with polishing of the edge itself.

[0005] In some types of edge polishing machine, the working heads are mounted on a support bar that can be moved in rotation, with respect to the supporting frame of the machine, about a pivoting axis that is substantially parallel to the advancement direction of the slab being worked, in order to enable the working heads to work on the entire thickness of the slab.

[0006] In order to enable the tools to give the edge of the slab a toroidal profile, the practice is known of associating the spindle of some working heads and, more specifically, the spindle of the working heads that carry the tools designed to execute the shaping of the edge of the slab, with a template device that makes it possible to control the movement of the tools, during the oscillation of their support bar about its pivoting axis.

[0007] Each template device is constituted, in practice, by a shaping body, which is mounted on the supporting frame of the machine, and which can be easily removed, and which defines a shaped guide edge or template profile, which can have, for example, a circular arc shape or any other shape, on which runner contact means, associated with the spindle, engage slidingly.

[0008] The sliding of the runner contact means on the shaped guide edge of the template device, during the oscillation of the working heads about the pivoting axis of their support bar, enables the tool carried by the spindle to execute the correct angular and axial movement that enables it to shape the edge of the slab according to the desired toroidal profile.

[0009] The dimensions of the template device and, in particular, the radius of the circular arc described by the shaped guide edge are determined based on the value of the thickness of the slab to be worked and of the shape of the profile which it is desired to give to the edge of the slabs, with the consequence that with the variation of the thickness of the slab to be subjected to machining or of the type of profile that it is desired to obtain, it is necessary to provide for the substitution of the template devices mounted on the machine with others having dimensions that are suitable for the slab to be worked and for the type of machining or radius of curvature to be executed, which involves a considerable manual intervention and lengthy machine downtimes.

[0010] The aim of the present invention is to solve the above mentioned problem, by providing an edge polishing machine that does not require the substitution of the template devices applied thereto, if slabs of different thicknesses need to be worked or the shape of the profile of the edge to be worked needs to be changed.

[0011] Within this aim, an object of the invention is to provide an edge polishing machine that makes it possible, in a very simple and rapid way, to adapt it both to the thickness of the slabs to be worked and to the shape of the profile of the edge that it is desired to obtain.

[0012] Another object of the invention is to provide an edge polishing machine that is capable of offering the widest guarantees of reliability and safety in use.

[0013] A further object of the present invention is to provide an edge polishing machine that can be easily implemented using elements and materials that are readily available on the market and which, furthermore, is competitive also from a purely economical viewpoint.

[0014] This aim and these objects, as well as others which will become better apparent hereinafter, are achieved by an edge polishing machine, according to the invention, which comprises a supporting frame which is provided with a conveyor for conveying the slab to be worked and supports a plurality of machining tools, which act on at least one edge of said slab and are each actuated by a respective spindle, said machining tools being mounted on a support which can oscillate, with respect to said supporting frame, about a pivoting axis which is substantially parallel to the advancement direction of said slab on said conveyor, for at least one of said machining tools there being a template device which is supported by said supporting frame and defines a shaping guide which can be engaged slidingly by contact means associated with the corresponding machining tool, during the oscillation of said support about said pivoting axis, and is characterized in that it comprises automatic means for positioning said template device with respect to said slab and means for automatically varying the distance between said contact means and the corresponding machining tool along a direction which is substantially parallel to the axis of the corresponding spindle, as a function of the thickness of said slab and of the shape to be given to said at least one edge of said slab.

[0015] Further characteristics and advantages of the invention will become better apparent from the description of a preferred, but not exclusive, embodiment of the edge polishing machine, according to the invention, illustrated by way of non-limiting example in the accompanying drawings wherein:

Figure 1 is a schematic perspective view, with parts omitted for the sake of simplicity, of the machine according to the invention;
Figure 2 is a schematic plan view from above, with parts omitted for the sake of simplicity, of the machine according to the invention;
Figure 3 is a schematic plan view from above of a portion of the machine according to the invention, with parts omitted for the sake of simplicity;
Figure 4 is an enlarged-scale plan view from above of a detail of the machine according to the invention, with some parts transparent for convenience and other parts omitted for the sake of simplicity;
Figure 5 is a schematic side view of the machine according to the invention;
Figures 6 to 11 are schematic side views of some examples of possible use of the machine according to the invention;
Figure 12 is a schematic side view, with parts shown in longitudinal cross-section and other parts in cutaway, of the machine according to the invention;
Figure 13 is a view from one side of a portion of the machine according to the invention.

[0016] With reference to the figures, the edge polishing machine, according to the invention, generally designated with the reference numeral 1, comprises a supporting frame 2 with which a plurality of machining tools 3 is associated, which can be actuated in rotation by a corresponding spindle 4.

[0017] The supporting frame 2 supports a conveyor 5, which is constituted, for example, by a conveyor belt 6, which moves the slab 7 to be worked along an advancement direction 8.

[0018] The machining tools 3 are distributed along at least one of the two opposite sides of the conveyor 5, so as to be able to act on at least one edge 7a of the slab 7.

[0019] It should be noted that at least one of the machining tools 3 and, in particular, at least one of the machining tools 3 situated upstream with respect to the direction of advancement of the slab 7, is constituted by a forming grinder 3a, that is to say by a diamond grinder designed to execute on the edge 7a of the slab 7 a removal of material, in order to obtain a determined shape of the profile of the edge 7a itself.

[0020] The number of forming grinders 3a can vary according to requirements.

[0021] The machining tools 3 located downstream of the forming grinder or grinders 3a can be constituted, as is normal, by polishing grinders, designated with 3b, which execute the finishing of the edge 7a of the slab 7.

[0022] In more detail, the machining tools 3 are mounted, in a manner that is known per se, on a support 9, which is constituted, for example, by a beam or the like, which can be oscillated on command, with respect to the supporting frame 2, about a pivoting axis 10, which is substantially parallel to the advancement direction 8 of the slab 7.

[0023] At least one of the machining tools 3 and, more preferably, at least one of the forming grinders 3a, is cooperatively associated with a template device 11, which is supported by the supporting frame 2.

[0024] In practice, the template device 11 defines, for the corresponding forming grinder 3a, a shaping guide 12, which makes it possible for the forming grinder 3a to execute the movement that enables it to achieve the desired profile on the edge 7a of the slab 7.

[0025] More specifically, during the oscillation movement of the support 9 about the pivoting axis 10, the shaping guide 12 of the template device 11 is engaged slidingly by contact means 13, which are associated with the forming grinder 3a and which are constituted, for example, by a runner element 13 a.

[0026] The sliding of the contact means 13 along the shaping guide 12 of the template device 11 is thus translated to a corresponding movement of the forming grinder 3 a.

[0027] As illustrated, the template device 11 is, for example, constituted by a shaping body 14, which has a substantially flat shape and which is arranged, with its plane of arrangement, substantially perpendicular to the plane of arrangement of the slab 7 and to the advancement direction 8 of the slab 7 on the conveyor 5.

[0028] The shaping body 14 of the template device 11 is provided, conveniently, on its side directed toward the slab 7, with a recess 15, in which the edge 7a of the slab 7 is inserted, and on its opposite side, a perimeter rim 16, which basically constitutes the shaping guide 12 and which can have a circular arc shape, as in this specific example, or other shapes corresponding to the profile that it is desired to give to the edge 7a of the slab 7.

[0029] Acting between the contact means 13 and the support 9 are thrust means 17, which are constituted, preferably, by a pneumatic assembly and which have the function of keeping the contact means 13 against the shaping guide 12 and, more specifically, of keeping the runner element 13a pushed against the perimeter edge 16 of the shaping body 14 of the template device 11.

[0030] Conveniently, the thrust means 17 make it possible, moreover, to keep the forming grinder 3a that cooperates with the template device 11 in constant contact with the edge 7a of the slab 7, for the creation of the desired profile.

[0031] The peculiarity of the edge polishing machine according to the invention consists in that it comprises automatic means for positioning the template device 11 with respect to the slab 7 to be worked and means for varying automatically the distance between the contact means 13 and the corresponding forming grinder 3a, along a direction that is substantially parallel to the axis of the corresponding spindle 4, as a function of the thickness of the slab 7 and of the profile to be provided on the edge 7a of the slab 7.

[0032] Basically, the automatic means for positioning the template device 11 and the means for varying automatically the distance between the contact means 13 and

the corresponding forming grinder 3a make it possible to automatically adapt the position of the template device 11 with respect to the slab 7 and of the forming grinder 3a with respect to the contact means 13 with the variation of the thickness of the slab 7 to be worked and of the shape of the profile that it is desired to obtain on the edge 7a, thus avoiding having to substitute, in each case, the template device 11.

[0033] Figures 6 to 11 show some examples of possible positionings of the template device 11 and of the contact means 13, with the variation of the thickness of the slab 7 and of the type of profile to be achieved on the edge 7a.

[0034] As can be seen, by modifying the position of the template device 11 itself, by way of the automatic positioning means, and by varying the distance between the contact means 13 and the forming grinder 3a, using the automatic variation means described above, different thicknesses of the slab 7 can be machined and various different shapes of the profile of the edge 7a can be obtained.

[0035] In more detail, the edge polishing machine according to the invention is, conveniently, provided with means for acquiring the data related to the thickness of the slab 7 and to the shape to be given to the edge 7a.

[0036] The acquisition means are controlled by command means, which are constituted, for example, by an electronic controller, the function of which is to drive the means of automatic adjustment of the positioning of the template device 11 and the means for varying automatically the distance between the contact means 13 and the corresponding forming grinder 3a, based on the thickness of the slab 7 to be worked and of the profile to be achieved on the edge 7a.

[0037] Advantageously, the means of automatic adjustment of the positioning of the template device 11 comprise first means 18 for the translational motion of the template device 11, with respect to the supporting frame 2, along a direction that is substantially perpendicular to the advancement direction 8 of the slab 7 and is substantially parallel to the plane of arrangement of the slab 7, and second means 19 for the translational motion of the template device 11 along a direction that is substantially at right angles to the plane of arrangement of the slab 7.

[0038] For the purposes of non-limiting example, the first translational motion means 18 can be implemented via a first motor drive assembly with a trapezoidal worm gear or a ballscrew, which can be controlled, conveniently, by a first encoder, which is functionally connected to the command means.

[0039] Similarly, the second translational motion means 19 can be constituted by a second motor drive assembly with a trapezoidal worm gear or a ballscrew, with which , advantageously, a second encoder is associated, also connected to the command means.

[0040] Conveniently, the means for varying automatically the distance between the contact means 13 and the forming grinder 3 a can be implemented with means 20 for moving the contact means 13, with respect to the corresponding forming grinder 3a, along a direction that is substantially parallel to the axis of rotation of the forming grinder 3a.

[0041] More specifically, the movement means 20 make it possible to move the contact means 13 toward or away from a supporting base 21, which supports the spindle 4 of the forming grinder 3a and which is connected to the support 9 by interposition of the thrust means 17.

[0042] Preferably, but not necessarily, the movement means 20 are constituted by a linear actuator 22 with a trapezoidal worm screw or a ballscrew.

[0043] Advantageously, the above mentioned acquisition means are provided with interface means 24 that enable the user to set the thickness of the slab 7 and/or the shape that it is desired to give to the edge 7a.

[0044] For example, the interface means 24 can be constituted by a touch screen 25, by means of which the user can select an icon corresponding to the type of profile that he or she wants to obtain and type the value of the thickness of the slab 7 to be subjected to machining.

[0045] Obviously, there is nothing to prevent the interface means 24 from being constituted by a common keyboard or any other data entry device of known type.

[0046] Once the user, by way of the interface means 24, has set the thickness of the slab 7 to be subjected to machining and has selected the type of profile that he or she wants to obtain, the command means determine the position to which the template device 11 and the contact means 13 must be brought by using a table, stored in the command means and containing a series of coordinates corresponding to the positions of the template device 11 and of the contact means 13 for different thicknesses of the slab 7 and for different selectable shapes of the profile of the edge 7a, and, optionally, by making use of the linear interpolation between the values of the table. Based on the positions thus identified for the template device 11 and the contact means 13, the command means then execute, consequently, the actuation of the automatic means for positioning the template device 11 and/or of the means for varying automatically the distance between the contact means 13 and the corresponding forming grinder 3a.

[0047] It should be noted that the command means can, optionally, also execute, during the advancement of the slab 7 to be worked, a continuous actuation of the automatic positioning means and of the means for varying the distance between the contact means 13 and the corresponding forming grinder 3a, in such a way as to make the template device 11 fulfil preset trajectories which, by combining with determined positions assumed by the contact means 13 with respect to the forming grinder 3a, make it possible to achieve a movement of the corresponding forming grinder 3a which can create, on the edge 7a of the slab 7, profiles that do not correspond to the specific shape of the shaping guide 12 of the template device 11.

[0048] In this way, the edge polishing machine, accord-

ing to the invention, is, in practice, of the digitally controlled type, i.e. it is capable of executing any type of profile on the edge 7a of the slab 7, thanks to the composition of the movements, along different directions, of the template device 11 and of the contact means 13.

[0049] For the sake of completeness, it should be noted that it is also possible for the acquisition means, optionally, to comprise, as an alternative to the interface means 24 or combination therewith, means for automatically entering or self-learning the machining parameters, such means being capable of automatically acquiring the value of the thickness of the slab 7 to be subjected to machining and/or the type of profile to be achieved on the edge 7a of the slab 7.

[0050] More specifically, such means for automatic entry can comprise means for detecting the thickness of the slab 7, not shown for the sake of simplicity, which can be located at a region upstream of the machining tools 3, according to the direction of advancement of the slab 7 on the conveyor 5.

[0051] Such means for detecting the thickness of the slab 7 can be, for example, constituted by laser sensors directed toward the conveyor 5 and the slab 7 or they can be implemented by probe means, obtainable by means of a wheel, fixed to a stem and connected to a potentiometric transducer, which is able to raise itself at the passage of the slab 7 entrained by the conveyor 5.

[0052] Advantageously, the means for automatic entry can also comprise means for automatic detection of the shape of the profile to be achieved from a suitable shape sample or copy of a sample, which can be, for example, constituted by a figure obtained on cardboard cut to size, which can be easily prepared by the machine operator or supplied by the end user of the slabs 7 according to his or her specific requirements.

[0053] In particular, such automatic means for detecting the shape of the profile are, for example, constituted by digital video cameras, which are connected to means of processing images.

[0054] Specifically, the video cameras acquire the image of the copy of the sample, suitably lit, for example, by an underlying light box.

[0055] The processing means process the image acquired by the video cameras, thus determining the shape of the profile to be achieved and supplying the command means with the coordinates of the curve that corresponds to the profile to be achieved, so that the profile to be achieved can be replicated also in different proportions, by way of the actuation of the automatic means for positioning the template device 11 and of the means for varying automatically the distance between the contact means 13 and the corresponding forming grinder 3a.

[0056] It should be noted that if there is more than one forming grinder 3 a, each one provided with its own template device 11, then the first translational motion means and the second translational motion means can be organised so as to allow a simultaneous actuation of all the template devices 11 or an independent actuation for each individual template device 11, according to requirements.

[0057] To the foregoing it should also be added that there is no reason why a template device 11 cannot be optionally provided for each polishing grinder 3b as well.

[0058] From the foregoing explanation it can be seen that the invention achieves the intended aim and objects, and in particular attention is drawn to the fact that an edge polishing machine is provided which makes it possible to automate the adjustments of the positioning of each template device present and of the respective contact means, thus avoiding having to perform the substitution of each template device at every variation of the thickness of the slabs and of the type of profile to be achieved.

[0059] All the characteristics of the invention, indicated above as advantageous, advisable or similar, may also be missing or be substituted by equivalent characteristics.

[0060] The individual characteristics set out in reference to general teachings or to specific embodiments may all be present in other embodiments or may substitute characteristics in such embodiments.

[0061] The invention, thus conceived, is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0062] In practice the materials used, provided they are compatible with the specific use, as well as the dimensions and the shapes may be any, according to requirements.

[0063] Moreover, all the details may be substituted by other, technically equivalent elements.

[0064] The disclosures in Italian Patent Application No. VR2010A000136 from which this application claims priority are incorporated herein by reference.

[0065] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. An edge polishing machine (1), comprising a supporting frame (2) which has a conveyor (5) for conveying the slab (7) to be worked and supports a plurality of machining tools (3), which act on at least one edge (7a) of said slab (7) and are each actuated by a respective spindle (4), said machining tools being mounted on a support (9) which can oscillate, with respect to said supporting frame (2), about a pivoting axis (10) which is substantially parallel to the advancement direction (8) of said slab (7) on said conveyor (5), for at least one of said machining tools (3) there being a template device (11) which is supported by said supporting frame (2) and defines a shap-

ing guide (12) which can be engaged slidingly, during the oscillation of said support (9) about said pivoting axis (10), by contact means (13) associated with the corresponding machining tool (3), **characterized in that** it comprises automatic means for positioning said template device (11) with respect to said slab (7) and means for automatically varying the distance between said contact means (13) and the corresponding machining tool (3), along a direction which is substantially parallel to the axis of the corresponding spindle (4), as a function of the thickness of said slab (7) and of the shape to be given to said at least one edge (7a) of said slab (7).

2. The edge polishing machine according to claim 1, **characterized in that** it comprises means for acquiring the data related to the thickness of said slab (7) and to the shape to be given to said at least one edge (7a) and actuation means which are controlled by said acquisition means and drive said automatic positioning means and said means for varying automatically the distance between said contact means (13) and the corresponding machining tool (3).

3. The edge polishing machine according to one or more of the preceding claims, **characterized in that** said automatic positioning means comprise first means (18) for the translational motion of said template device (11) with respect to said supporting frame (2), along a direction that is substantially perpendicular to the advancement direction of said slab (7) on said conveyor (5) and is substantially parallel to the plane of arrangement of said slab (7), and second means (19) for the translational motion of said template device (11) along a direction that is substantially perpendicular to the plane of arrangement of said slab (7).

4. The edge polishing machine according to one or more of the preceding claims, **characterized in that** said means for varying automatically the distance between said contact means (13) and the corresponding machining tool (3) comprise means (20) for moving said contact means (13) with respect to the corresponding machining tool (3) along a direction that is substantially parallel to the axis of the corresponding spindle (4).

5. The edge polishing machine according to one or more of the preceding claims, **characterized in that** said acquisition means comprise interface means (24) for the setting, on the part of the user, of the thickness of said slab (7) and/or of the shape to be given to said at least one edge (7a) of said slab (7).

6. The edge polishing machine according to one or more of the preceding claims, **characterized in that** said acquisition means comprise means for automatically entering the machining parameters, which are adapted to acquire automatically the thickness of said slab (7) and/or the type of profile to be provided on said edge (7a).

7. The edge polishing machine according to one or more of the preceding claims, **characterized in that** said first translational motion means (18) comprise a first motor drive assembly with a trapezoidal worm gear or a ballscrew, which can be controlled by a first encoder, and **in that** said second translational motion means (19) comprise a second motor drive assembly with a trapezoidal worm screw or with a ballscrew, which can be controlled by a second encoder.

8. The edge polishing machine according to one or more of the preceding claims, **characterized in that** said means (20) for moving said contact means (13) comprise a linear actuator (22) with a trapezoidal worm screw or a ballscrew.

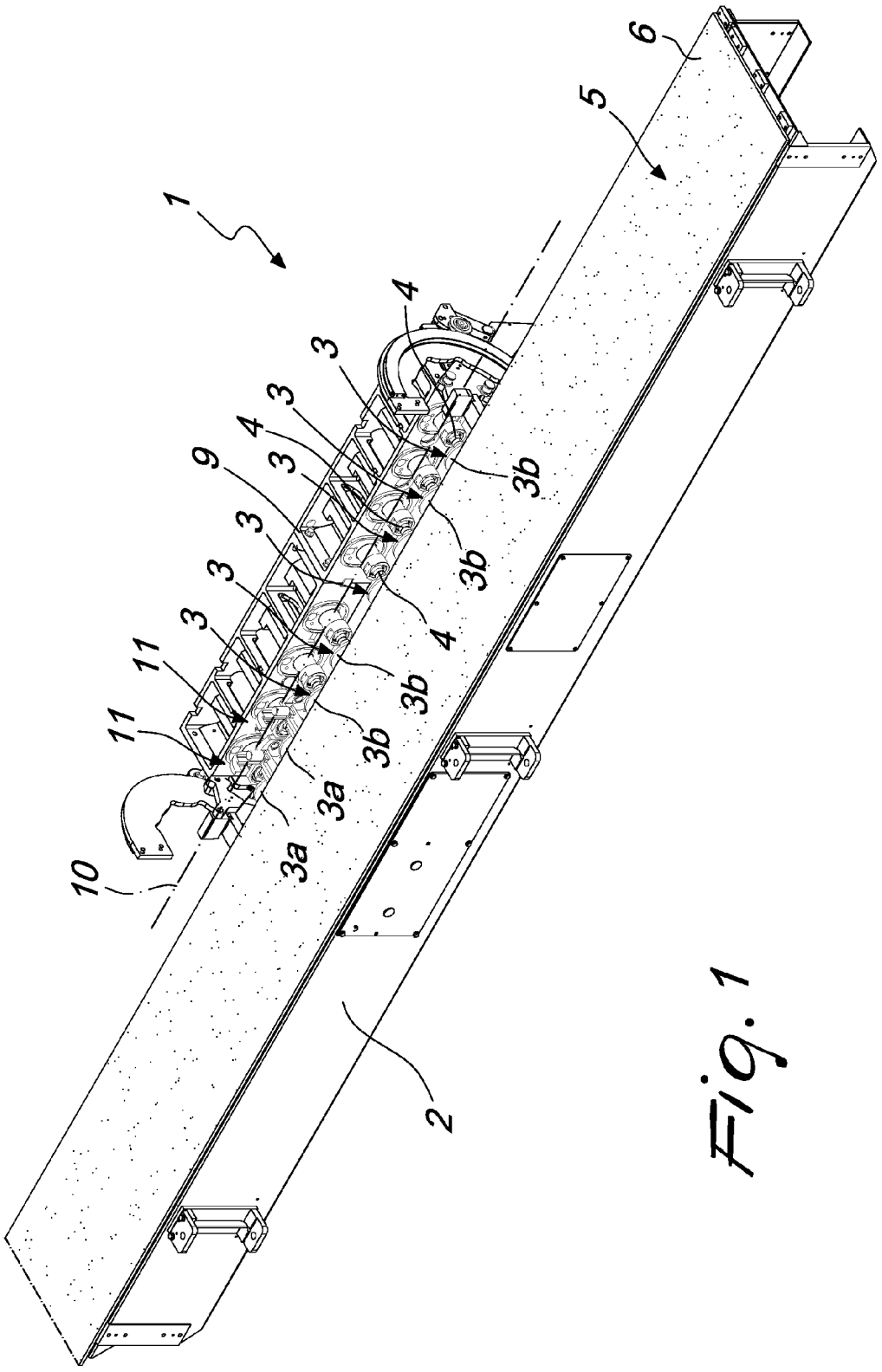

Fig. 1

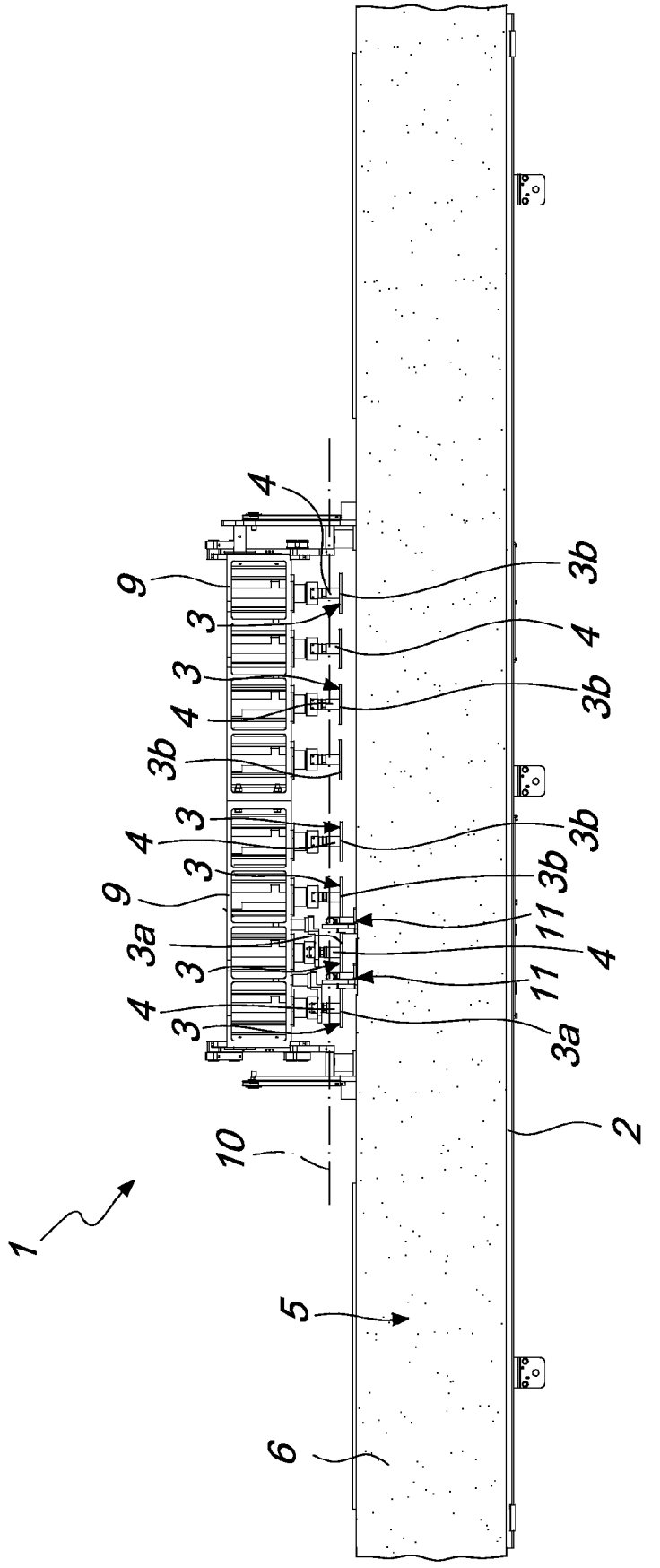

Fig. 2

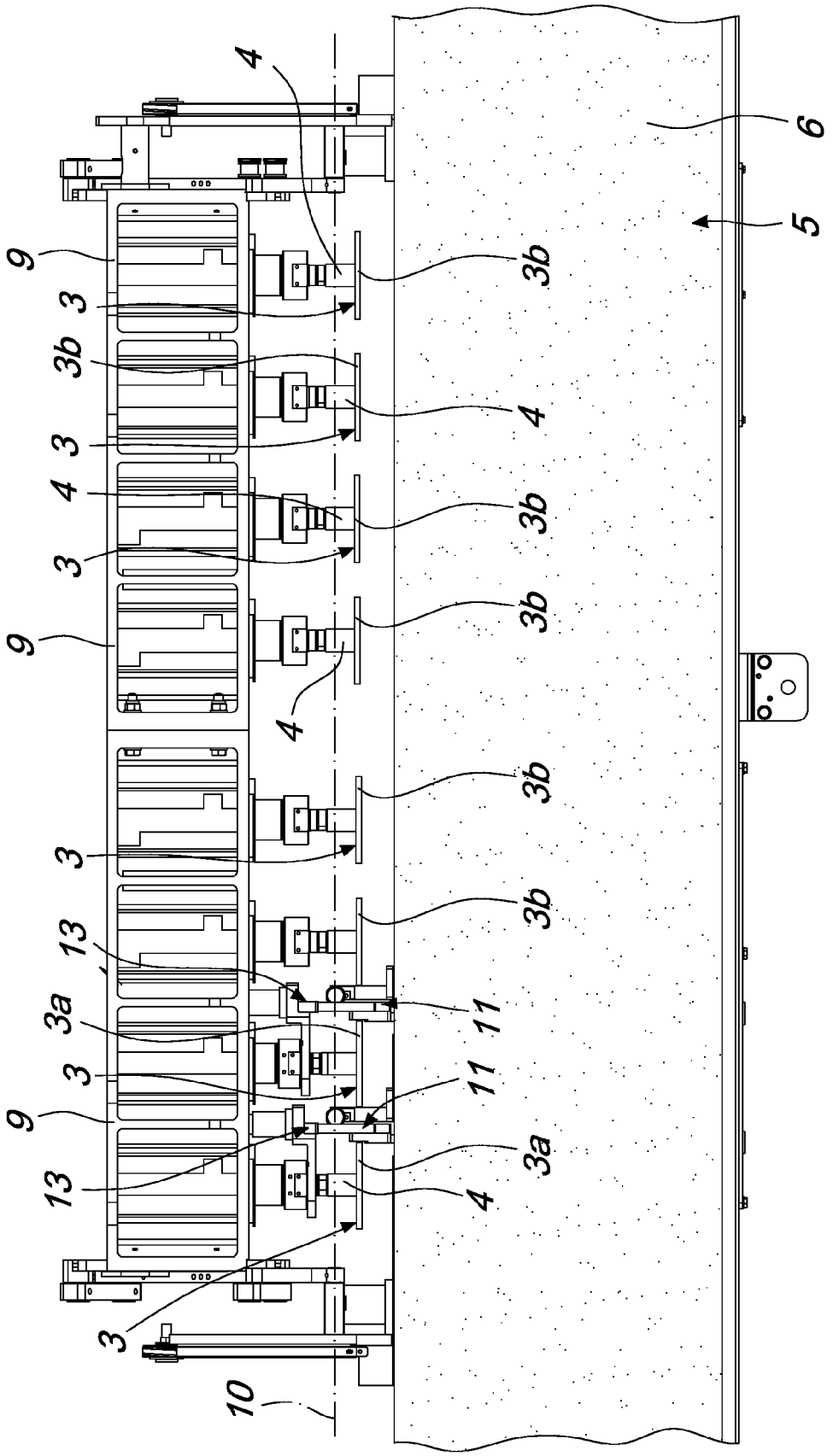

Fig. 3

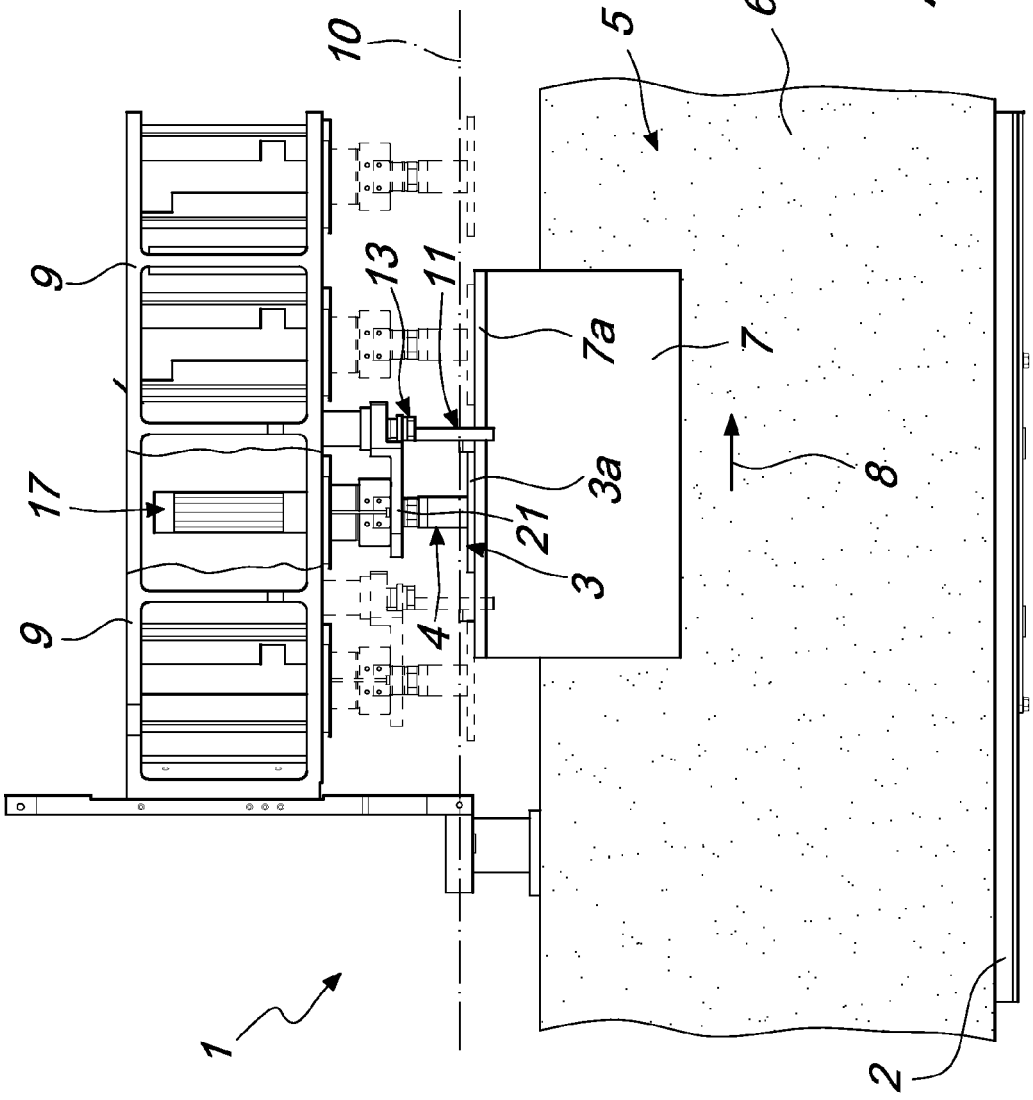

Fig. 4

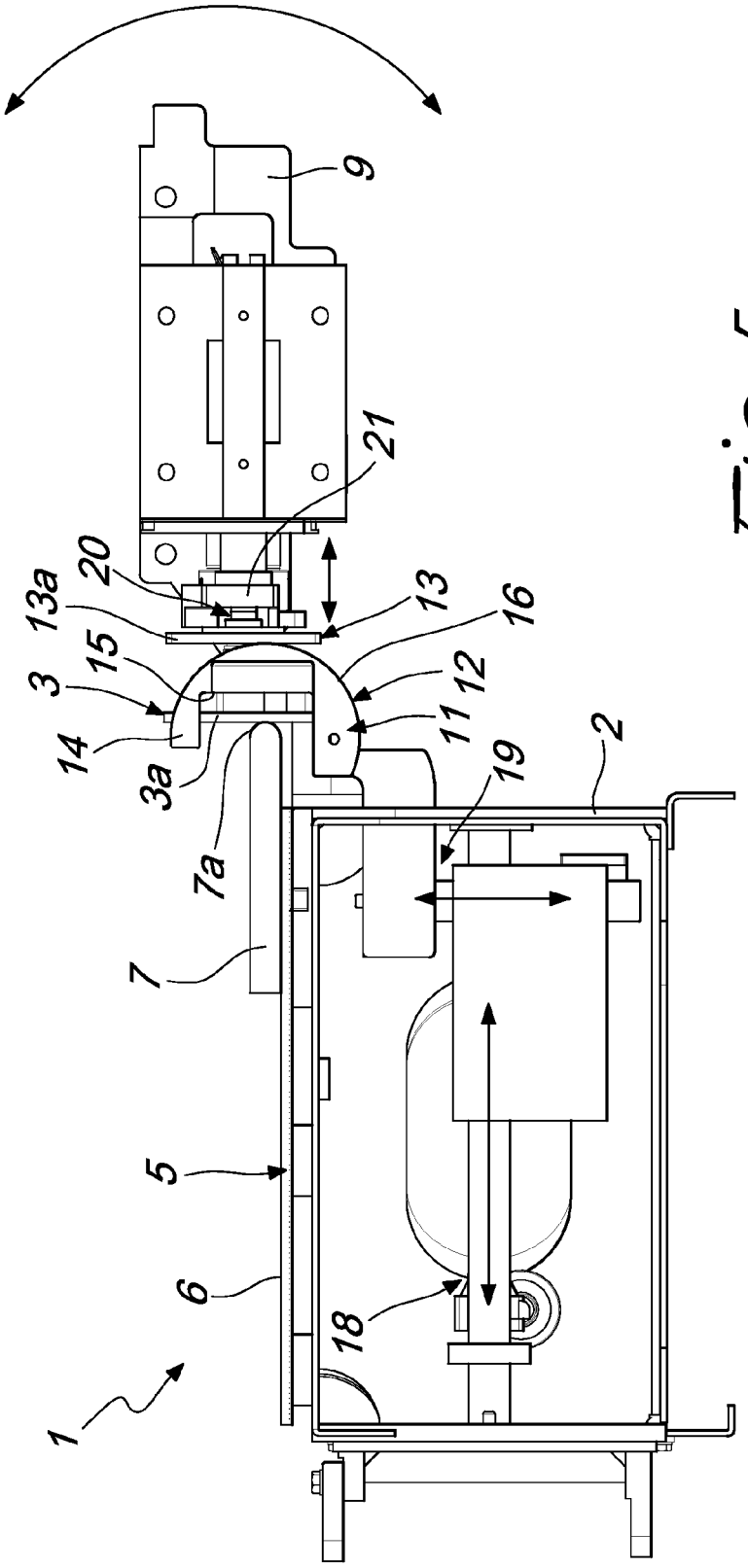

Fig. 5

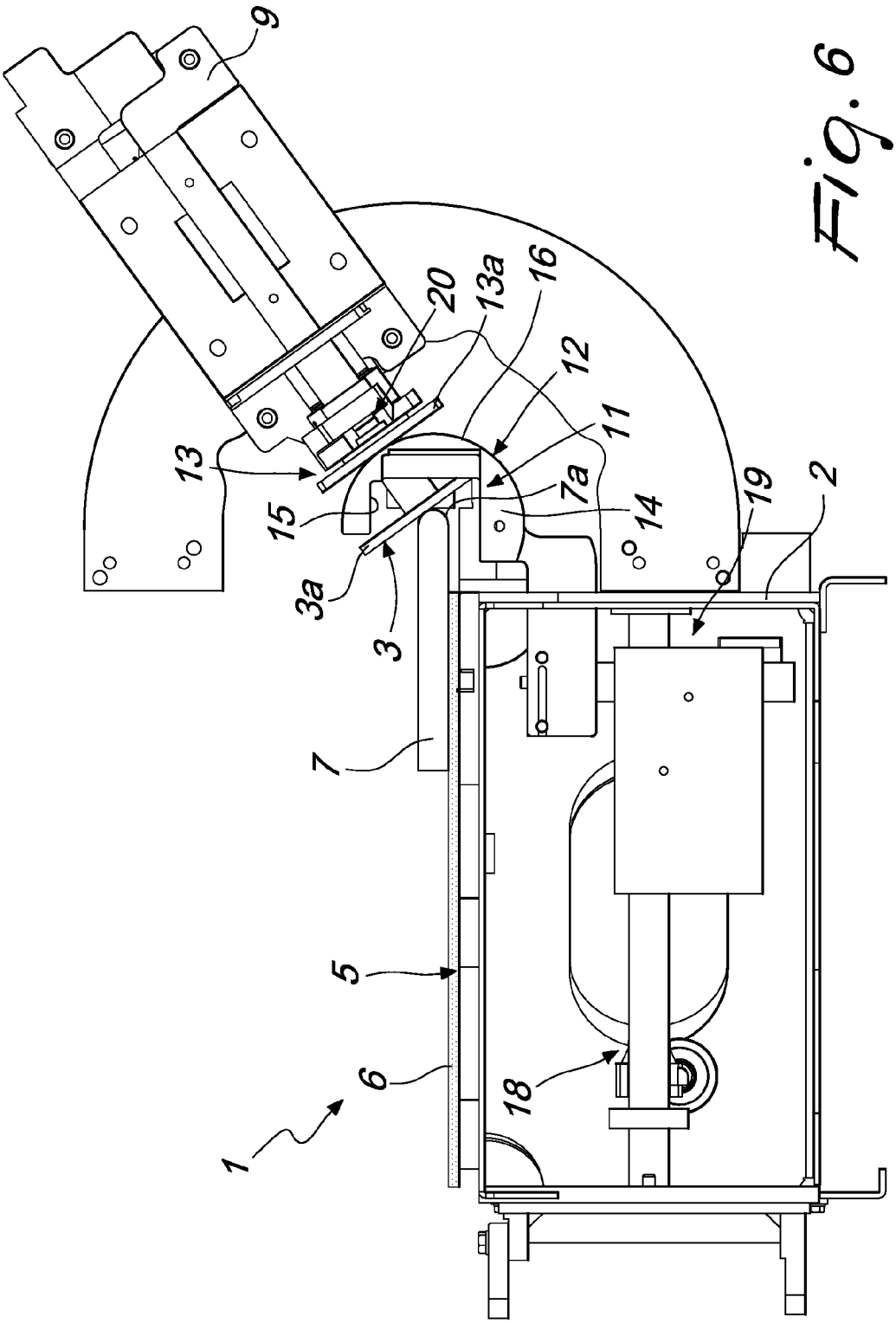

Fig. 6

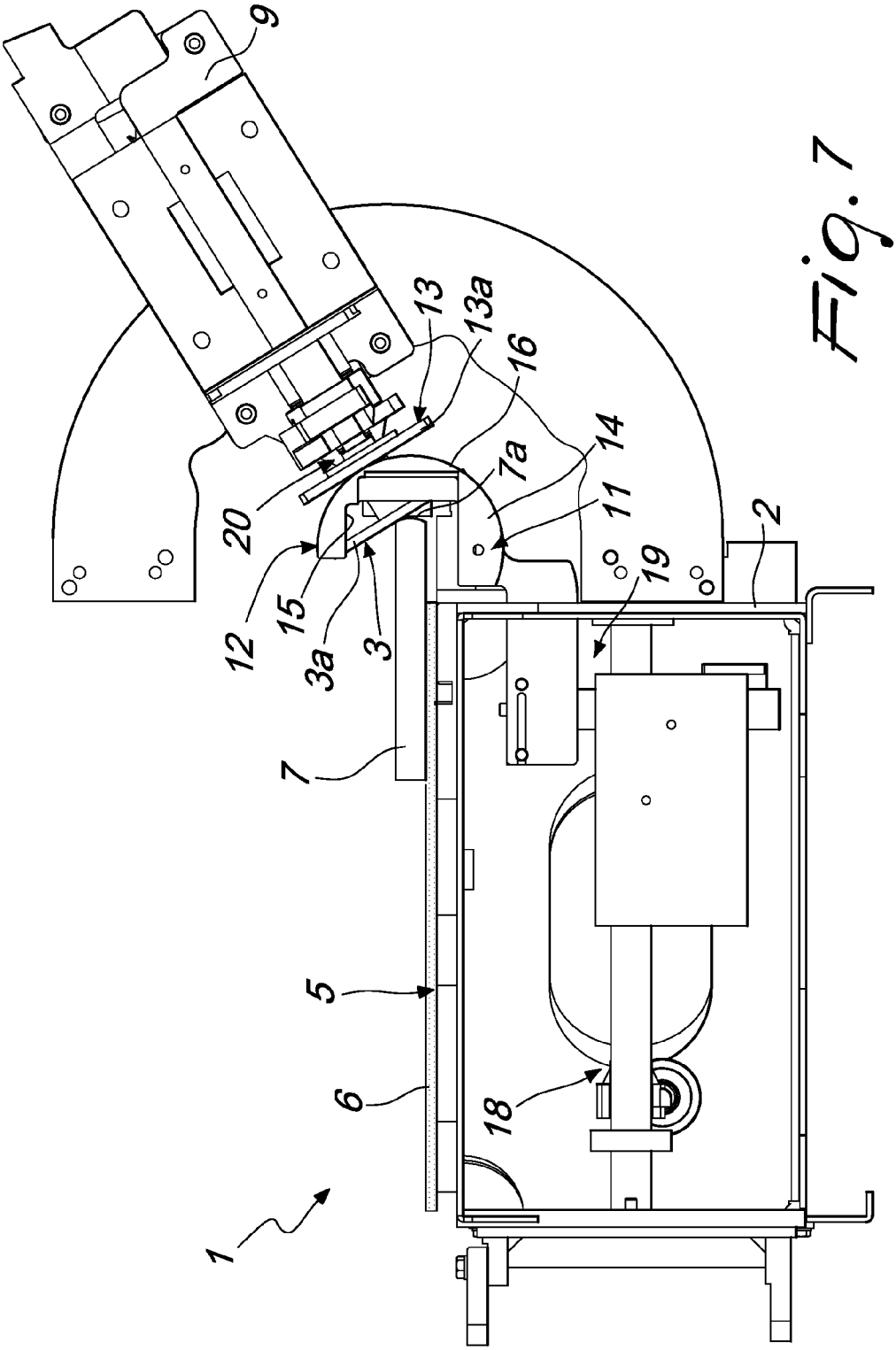

Fig. 7

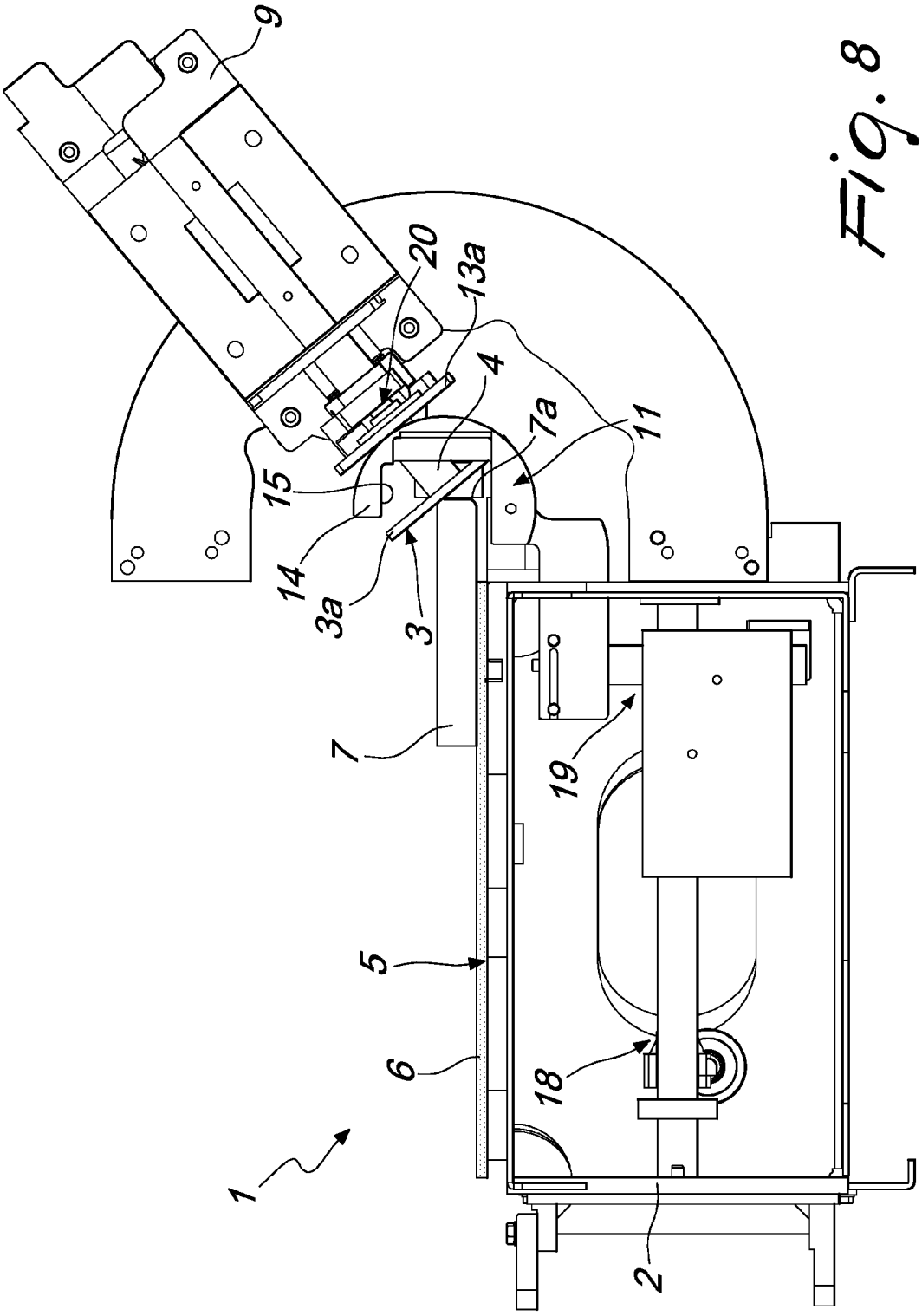

Fig. 8

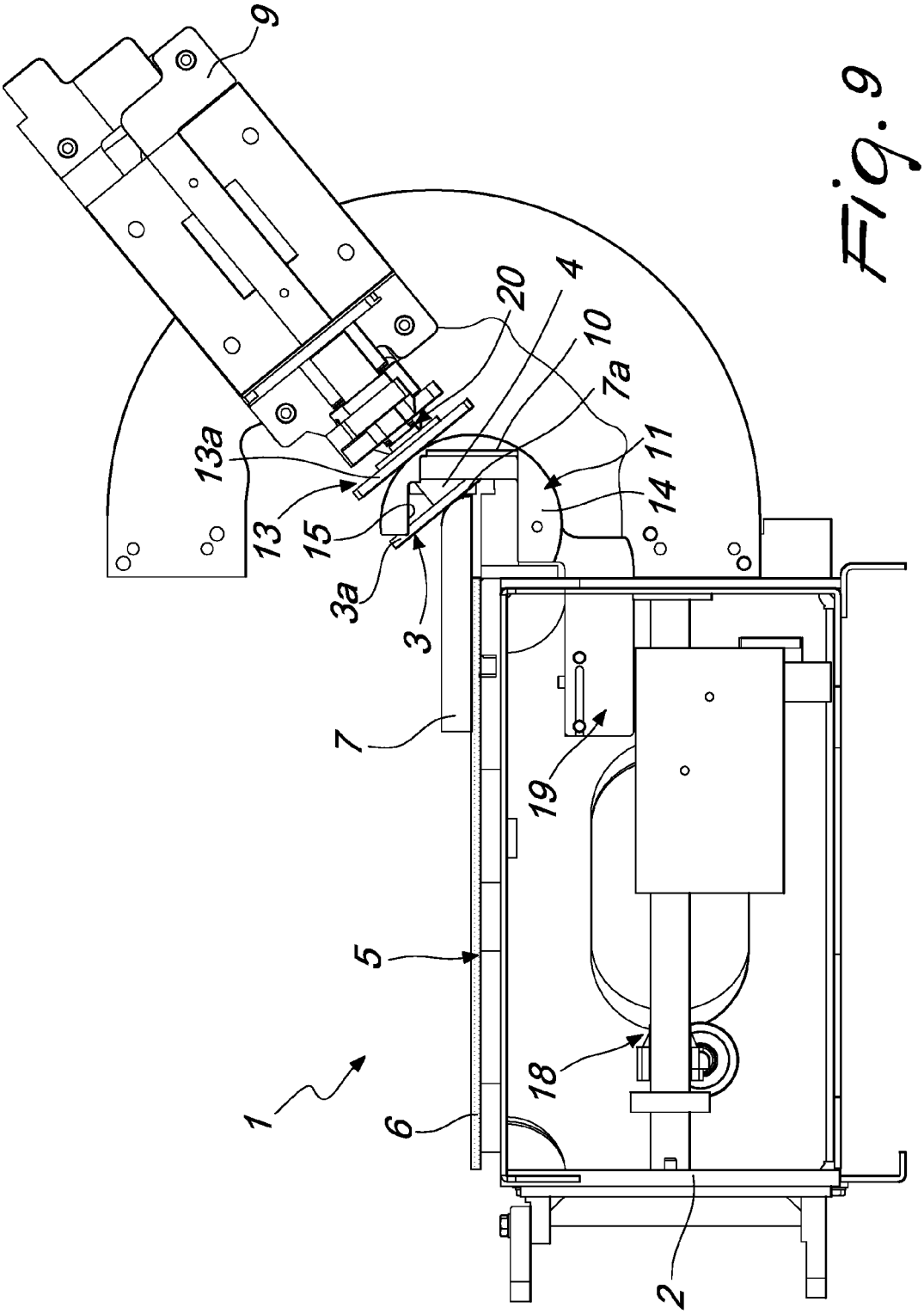

Fig. 9

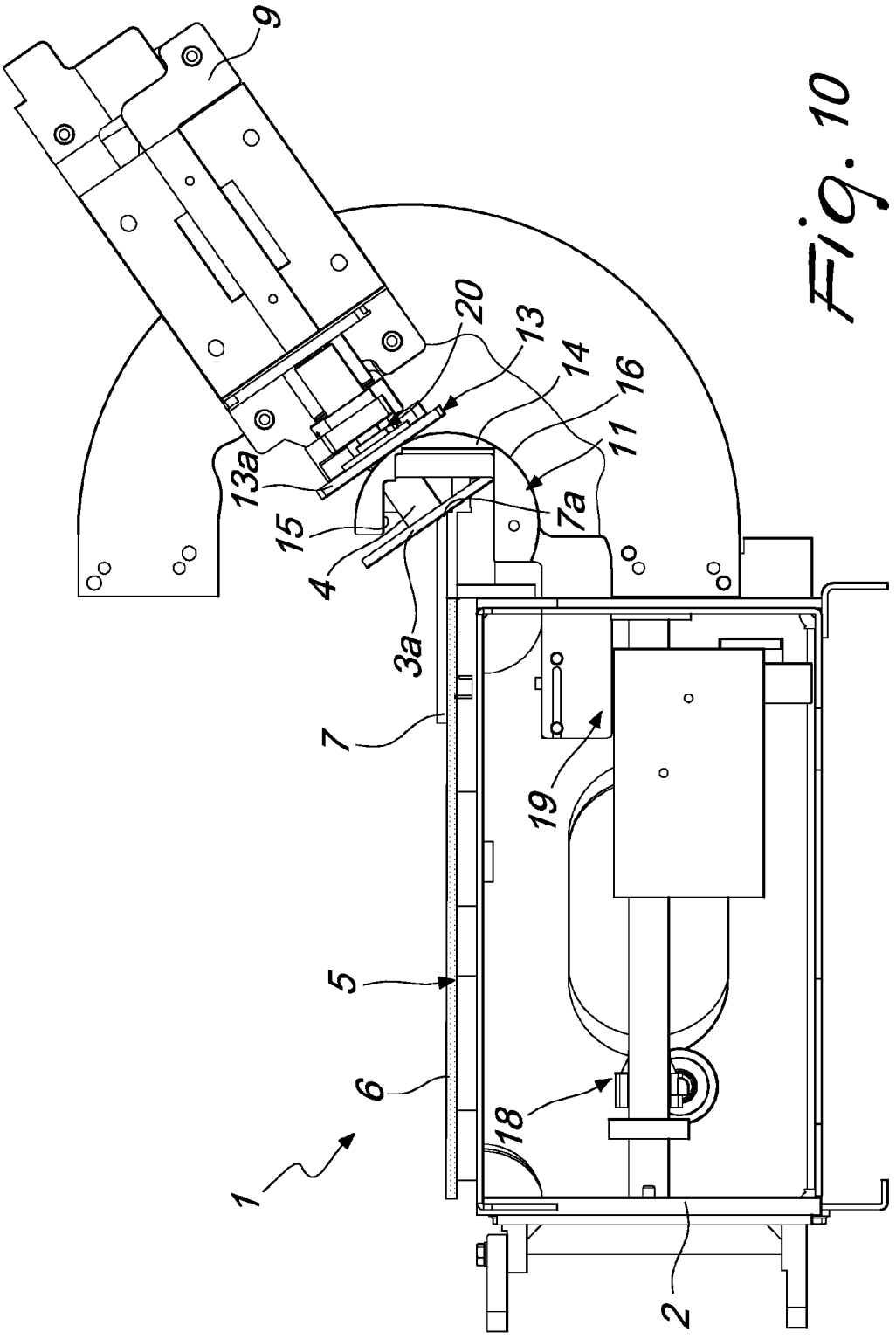

Fig. 10

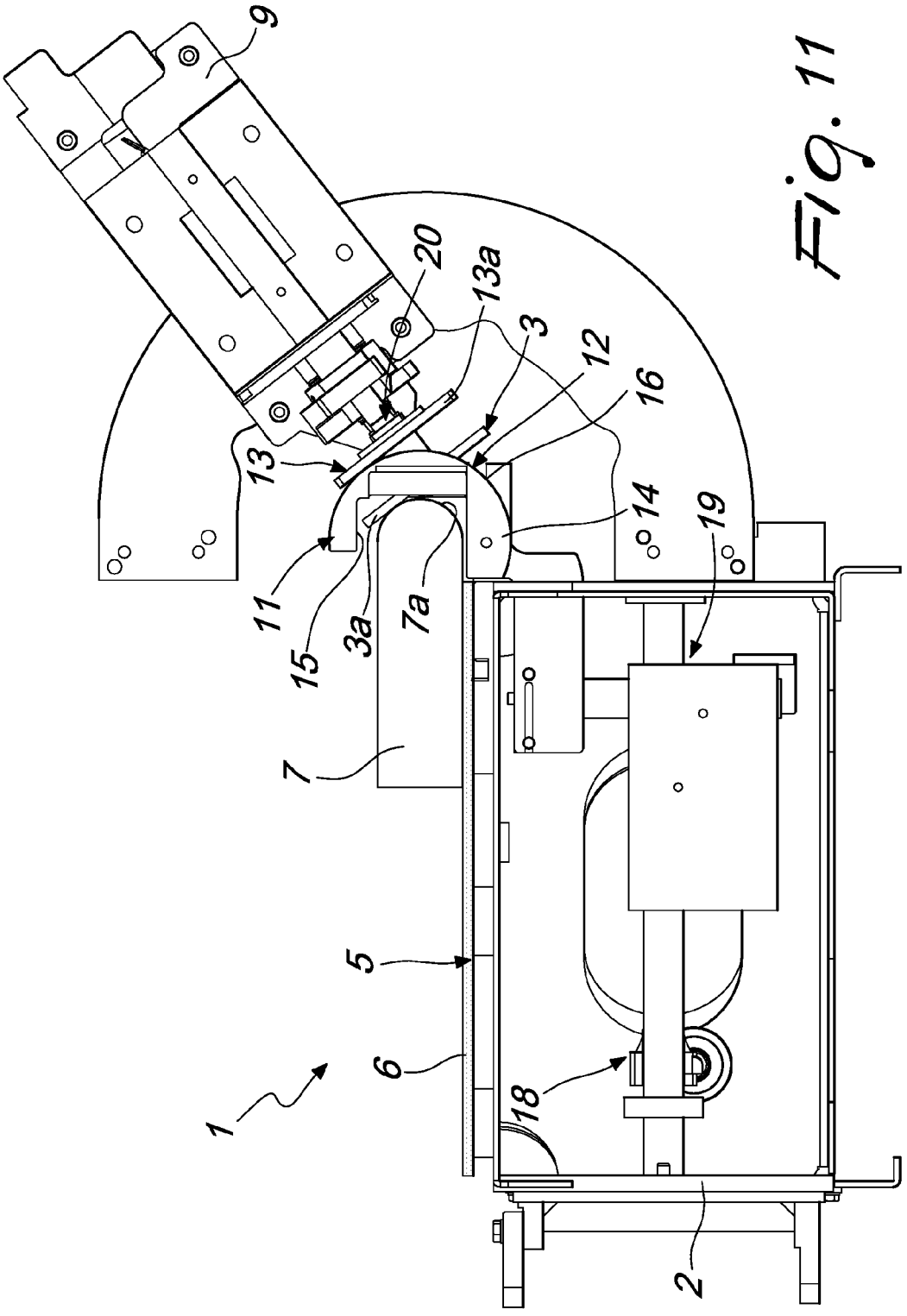

Fig. 11

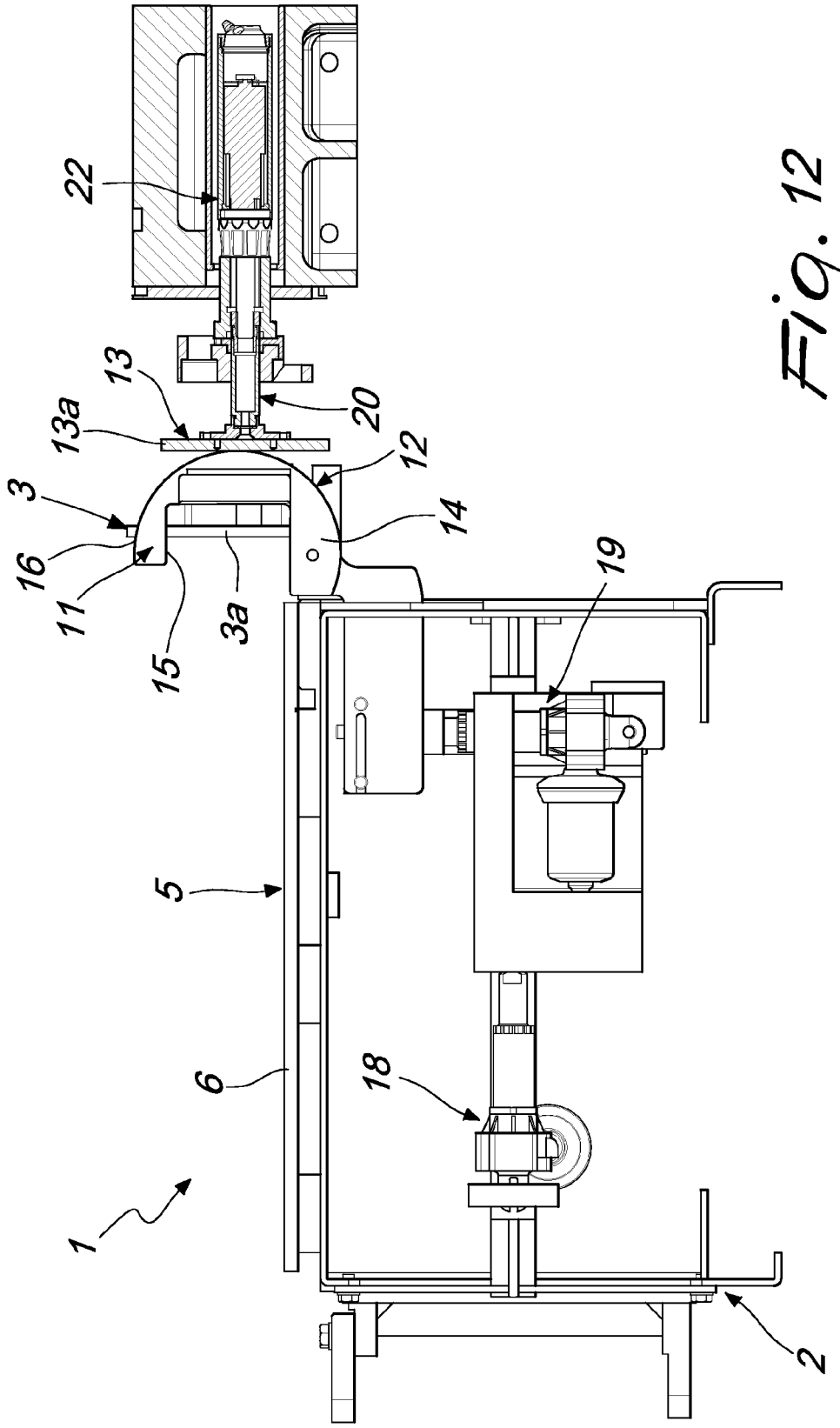

Fig. 12

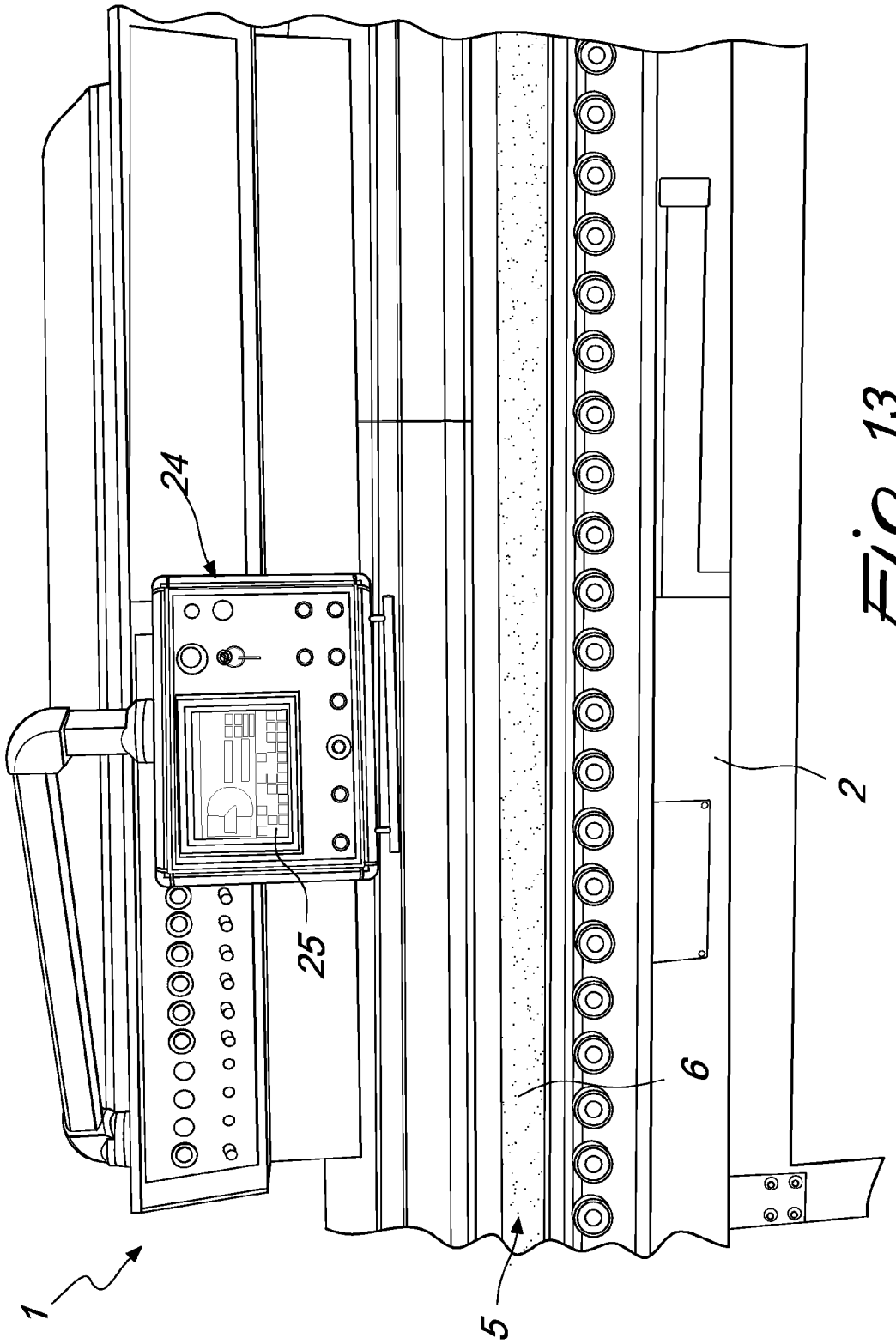

Fig. 13

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 11 16 9332

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	EP 1 520 659 A1 (MONTRESOR & C SRL [IT]) 6 April 2005 (2005-04-06) * the whole document * -----	1-8	INV. B24B9/06 B24B27/00 B24B41/04
Y	EP 1 649 975 A1 (BIESSE SPA [IT]) 26 April 2006 (2006-04-26) * paragraph [0018] - paragraph [0021]; figures 1-6 * -----	1-8	B24B47/26
A	EP 1 063 053 A2 (BAVELLONI Z SPA [IT]) 27 December 2000 (2000-12-27) * paragraphs [0007] - [0011] - paragraphs [0023] - [0030] * * paragraph [0039]; figures 1,2 * -----	1-8	

TECHNICAL FIELDS SEARCHED (IPC)

B24B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	10 October 2011	Koller, Stefan

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

2

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 16 9332

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

10-10-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1520659 A1	06-04-2005	BR PI0404174 A	24-05-2005
		CN 1603080 A	06-04-2005
		IT VR20030049 U1	02-04-2005
		US 2005074306 A1	07-04-2005
EP 1649975 A1	26-04-2006	AT 366640 T	15-08-2007
		DE 602005001597 T2	12-06-2008
		ES 2289658 T3	01-02-2008
		IT TO20040134 U1	21-01-2005
EP 1063053 A2	27-12-2000	AT 251523 T	15-10-2003
		CN 1278472 A	03-01-2001
		DE 60005749 D1	13-11-2003
		DE 60005749 T2	05-08-2004
		ES 2207440 T3	01-06-2004
		IT MI991382 A1	21-12-2000
		KR 20010007448 A	26-01-2001
		US 6416382 B1	09-07-2002

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- IT VR20100136 A **[0064]**