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(54) **Machine for working sheets of glass and similar**

(57) Machine (1) for working sheets of glass (2) equipped with a movable work head (6) mounted on a portal (5) which, in turn, is movable over a machine bed (3); the work head (6) consisting of a mobile trolley (12) on the portal (5), a tool-holder group (13) extending from the trolley (12) towards the bed (3) according to a reference axis (A), and an orientation device (14) interposed between the trolley (12) and the tool-holder group (13) to rotate the tool-holder group with respect to the afore-

mentioned trolley (12) around a vertical axis (V) parallel to the reference axis (A), and to move the tool-holder group (13) with respect to the aforementioned trolley (12) in a direction (15) perpendicular to said vertical axis (V); the aforementioned tool-holder group (13) being subdivided into a support bracket (16) fixed to the orientation device (14), and a tool-holder yoke (17) mounted on a support bracket (16) and able to move around a rotation axis (B), perpendicular to a reference axis (A).

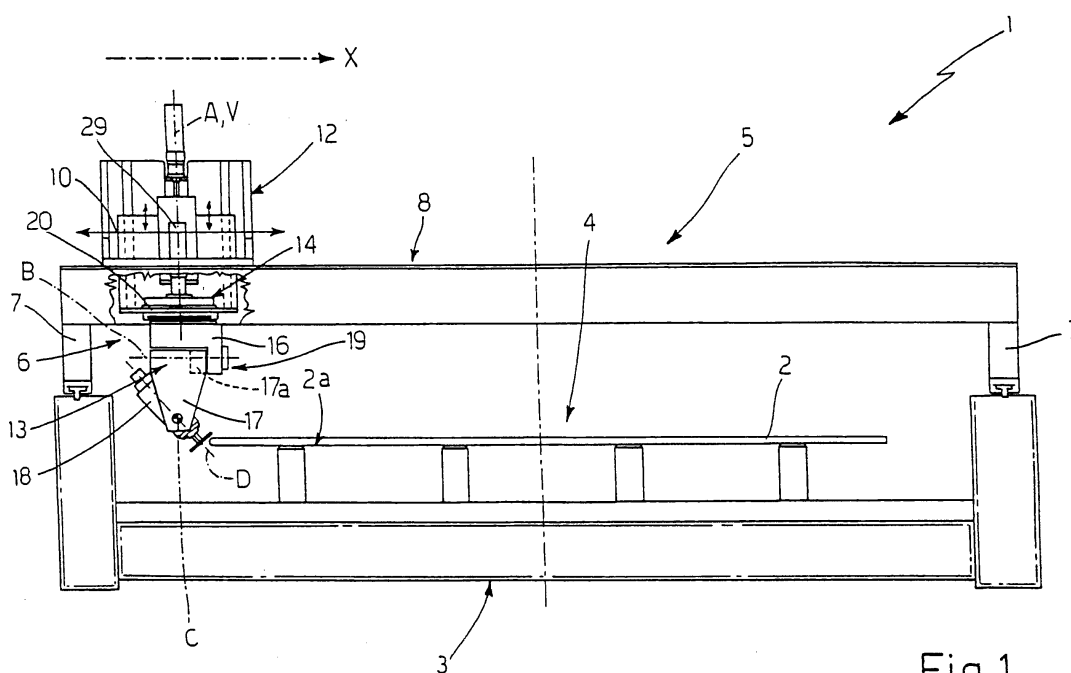


Fig.1

Description

[0001] This invention concerns a machine for working sheets of glass and similar.

[0002] In particular, this invention regards a machine suitable for bevelling the edges of glass sheets, to which the following description will refer in greater detail, but without losing its general character.

[0003] As is already well-known, the machines currently used in bevelling the edges of glass sheets include a machine bed equipped with a horizontal work plane, on which the glass sheet is placed ready for working; a movable portal mounted on the bed over the work plane; and a movable work head mounted on the portal for working the glass sheets laid on the work plane; a running slide mounted on the horizontal cross-piece of the portal; a tool-holder group extending from the slide towards the work plane coaxially to a vertical axis; and an orientation device designed to rotate the tool-holder group around the said vertical axis with respect to the slide.

[0004] At the lower end of the tool-holder group, facing the work plane, there is an adjustable chuck in which the diamond-dressed grindstone is inserted, ready for bevelling the edges of the glass sheet. Generally, the adjustable chuck is mounted on the tool-holder group so as to rotate around a horizontal axis which intersects the aforementioned vertical axis, whilst the diamond-dressed grindstone is made to rotate around an axis coplanar to the said vertical axis and perpendicular to said horizontal axis.

[0005] The machines described above have the great disadvantage of not being able to bevel rounded edges properly, thereby requiring further working, which raises the cost of the final product.

[0006] To correctly bevel the outer edge of a sheet of glass, it is necessary for the diamond-dressed grindstone to follow the profile of the outer edge in the ideal working position. This means keeping its own rotation axis at an angle determined both by the tangent to the outer edge and by the perpendicular to the work plane, in such a way as to remove the same quantity of material per unit time.

[0007] Unfortunately, the control system of the above-mentioned machines which commands the movement of the portal on the machine bed, the movement of the work head along the cross-piece of the portal, and the chuck rotations around the A and B axes, is not able to follow the profile of the rounded outer edge with enough precision to keep the diamond-dressed grindstone in the ideal position, with the result that the rounded outer edges are bevelled to varying degrees, which will require further working.

[0008] Therefore, the aim of this invention is to create a machine for working glass sheets which does not suffer from the above defects.

[0009] According to this invention, the machine for working glass sheets and similar will include a machine

bed, a movable portal mounted on the bed, and a movable work head mounted on the portal for working at least one sheet of glass, or similar, laid on the bed; the said work head includes a mobile trolley on said portal, a tool-holder group extending from the said trolley down towards the said bed according to a reference axis, and the first orientation devices of the tool-holder group placed between the trolley and the tool-holder group to rotate the tool-holder group as necessary with respect to the said trolley around a first rotation axis parallel to said reference axis; the said machine being characterised by the fact that the said tool-holder group includes a support bracket fixed to said first orientation devices and a tool-holder yoke which extends downwards from the support trolley towards the said bed; the said tool-holder yoke being mounted on said support bracket and rotating about a second rotation axis, perpendicular to said reference axis.

[0010] This invention will now be described with reference to the enclosed diagrams, which illustrate one practical, but not limitative example, where:

Fig. 1 is a front view of a machine for working glass sheets, according to the requirements of this invention, with some parts in cross-section and others removed for greater clarity;

Fig. 2 is a side view of the machine illustrated in Fig. 1, with some parts in cross-section and others removed for the sake of clarity;

Fig. 3 is a plan of the machine illustrated in Figs 1 and 2, with some parts removed for the sake of clarity;

Fig. 4 shows a detail from Fig. 2 on a larger scale, with some parts in cross-section and others removed for the sake of clarity;

Fig. 5 shows a detail from Fig. 3 on a larger scale; and

Figs 6, 7 and 8 show the machine in Fig 1 in operation.

[0011] With reference to Figs 1, 2 and 3, the number 1 indicates the whole machine for working sheets of glass 2, or similar. Such a machine can be effectively used for bevelling the outer edge 2a of a sheet of glass 2 which, in the example shown, has a rectangular shape with a curved semi-circular base.

[0012] The machine 1 includes a machine bed 3 equipped with a horizontal work plane 4 on which the sheet of glass is laid for working, a movable portal 5 mounted on the bed 3 above the work plane 4, and a sliding work head 6 mounted on the portal 5 for working the sheet of glass 2 laid on the work plane 4.

[0013] The portal 5 has a pair of vertical supports, which are mounted on the machine bed 3 and slide along it on opposite beams of the work plane 4, and a horizontal cross-piece 8 which extends above the work plane 4, parallel to a horizontal reference axis X.

[0014] In the example shown, the horizontal cross-

piece 8 is formed by two support bars 9 which connect the two vertical supports 7 and are parallel to one another and the X axis, and the movable work head 6 is mounted on both the support bars 9, and slides in the space between the two said bars.

[0015] In addition, the machine 1 includes the already known movement devices (not shown), which are designed to move the work head 6 in a direction 10 parallel to the X axis, and to move the vertical supports 7 in a direction 11 parallel to a horizontal reference axis Y, at right angles to the X axis.

[0016] With reference to Figs 1 - 4, the work head 6 includes a running slide 12 mounted on the horizontal cross-beam 8, a tool-holder group 13 extending from the slide 12 towards the work plane 4, and an orientation device 14 placed between the slide 12 and the tool-holder group 13 to check the position of the tool-holder group 13 with respect to the slide 12 itself.

[0017] In particular, the orientation device 14 is intended to rotate the tool-holder group with respect to the slide 12 around a vertical V axis, and to move the tool-holder group 13 with respect to the slide 12 in a direction 15, which is perpendicular to the said V axis.

[0018] With reference to Figs 2 and 4, the tool-holder group 13 extends according to a reference axis A, parallel to the V axis, and includes a support bracket 16 fixed to the orientation device 14; a tool-holder yoke 17 extends downwards from the support bracket 16 towards the work plane 4, with the fulcrum of its upper end on the support bracket 16 in such a way as to be able to rotate around a B axis, perpendicular to the A axis; and an adjustable chuck 18 mounted on the lower end of the tool-holder yoke 17 and rotating around a C axis, perpendicular to the B axis and coplanar with the A axis and the direction 15. In the case in point, the tool-holder yoke 17 has its fulcrum on the support bracket 16, connected with its own cross-piece 17a.

[0019] With reference to Figs 1, 6 and 8, the tool-holder group 13 also includes an orientation device 19 of the yoke, designed to rotate the tool-holder yoke 17 on command around a B axis in such a way as to incline it at an angle α , determined with respect to the A axis. Obviously, given the position of the A, B and C axes, the C axis always remains coplanar with the A axis and perpendicular to the B axis, independently of the value of the angle.

[0020] In the example shown, in particular, the orientation devices 19 of the yoke are intended to incline the tool-holder yoke 17 either clockwise or anticlockwise at an angle α , between 0° and 5° .

[0021] A tool for working the glass is to be inserted into the chuck 18, which the said chuck is designed to rotate around a D axis perpendicular to the C axis and preferably, but not necessarily, coplanar with the A axis. In the example shown, the tool for working the glass consists of a diamond-dressed grindstone intended for the bevelling of the outer edge 2a of the glass sheet 2.

[0022] Finally, the tool-holder group 13 includes

means of activation (already well-known and not illustrated), intended to rotate the chuck 18 around the C axis, and to keep the tool housed in the said chuck rotating around the D axis.

[0023] With reference to Figs 2, 4 and 5, the slide 12 includes a horizontal support plate 20, which runs parallel to the V axis on the slide 12 between the support bars 9 of the horizontal cross-beam 8, and activation means of the type already known that regulate the distance between the plate 20 and the work plane 4 opposite.

[0024] On the other hand, the orientation device 14 includes a circular rotating platform 21 which rotates around the V axis within the housing passing through the plate 20, and a running slide 22 mounted on the platform 21 in the direction 15. The slide 22 is fixed to the support bracket 16 of the tool-holder group 13, and the orientation device 14 includes means of activation 23 intended to rotate the platform 21 around the V axis, and means of activation 24 intended to move the slide 22 on the platform 21 in the direction 15, in such a way as to be able to vary the distance between the V axis of rotation of the platform 21 and the A axis of the tool-holder group 13.

[0025] The means of activation 24 can position the tool-holder group in one of various possible positions, so that the A axis coincides with the V axis.

[0026] In the example shown, the platform 21 is equipped with an aperture 25, which extends in direction 15 along the diameter of the said platform 21, and the slide 22 is shaped in such a way as to run along said aperture 25.

[0027] With reference to Fig. 4, the means of activation 23 include a ring belt mounted around a couple of pulleys, the first of which, indicated with number 27, is fitted to the edge of the platform 21, the second of which, indicated with the number 28, is fitted on the output shaft of an electric motor 29, fixed to the support plate 20 of the slide 12.

[0028] Meanwhile, the means of activation 24, include a couple of linear actuators 30, which are already well-known and each of which has a screw-lead screw group, where the lead screw is fastened to the platform 21, while the screw is held by the slide 22 and extends in direction 15 so as to move the lead screw in direction 15 when it rotates around its own axis.

[0029] The above description makes the operation of the machine 1 clear enough not to require further explanations.

[0030] The main advantage of the machine 1 described above is to carry out bevelling on the curved outer edges 2a of a similar quality to the bevelling along the straight edges 2a, thereby eliminating the need for further working.

[0031] With reference to Figs 6, 7 and 8, testing has shown that the possibility of moving the tool-holder group in direction 15 in order to off-set the A and V axes, together with the possibility of rotating the tool-holder

group 13 around the V axis, inclining the tool-holder yoke 16 by an angle α with respect to the A axis and inclining the chuck around the C axis, means that the tool can be orientated continuously, so that, during the working of the glass sheet 2, its working point Ω remains on a reference plane Π which passes through the V axis and is perpendicular to the tangent at the outer edge 2a in the work point Ω (in Fig. 6 the reference plane Π is parallel to the plane of the paper). This solution dramatically simplifies the movement of the work head 6 on the work plane 4, enabling the tool for working the glass to follow the profile of the outer edge 2a with great precision, maintaining the optimal work position even during the bevelling of the curved outer edges 2a.

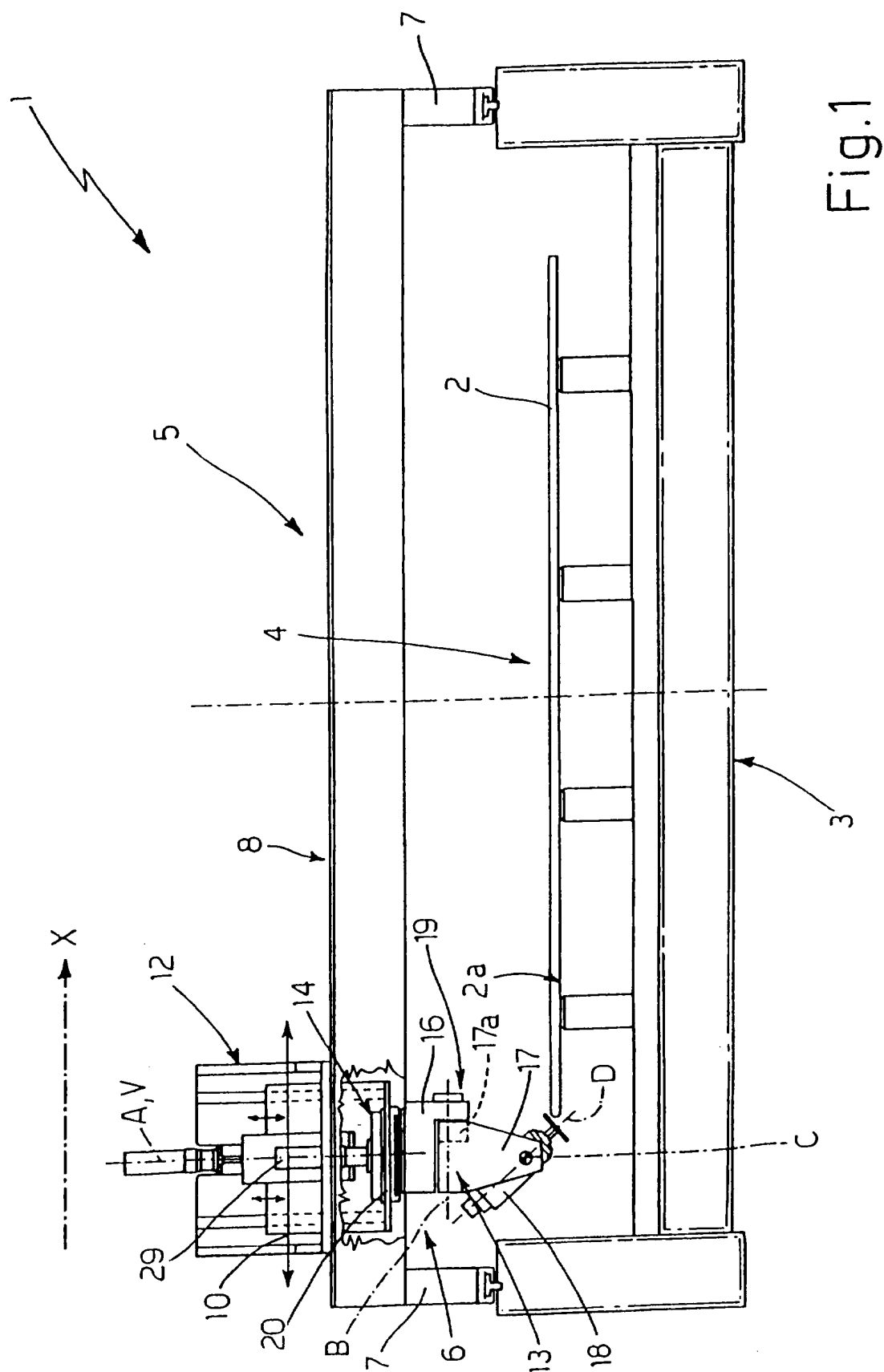
[0032] Finally, it is evident that the machine 1, described and illustrated, here can be modified or varied without changing the substance of this invention.

Claims

1. Machine (1) for working sheets of glass (2) or similar including a machine bed (3), a movable portal (5) mounted on the bed, and a mobile work head (6) mounted on the portal (5) for the working of at least one glass sheet (2) or similar laid on the bed (3); the said work head (6) including a mobile trolley (12) on said portal (5), a tool-holder group (13) extending downwards from said trolley (12) towards said bed (3) according to a reference axis (A), and the first means of orientation (14) of the tool-holder group (13) interposed between the trolley (12) and the tool-holder group (13) in order to rotate the tool-holder group (13) on command around a first rotation axis (V) parallel to said reference axis (A), the said machine (1) being characterised by the fact that the said tool-holder group (13) includes a support bracket (16) fixed to said first means of orientation (14) and a tool-holder yoke (17) extending from the support bracket (16) towards the said bed (3); the said tool-holder yoke (17) being mounted on said support bracket (16) and rotating around a second rotation axis (B), perpendicular to the said reference axis (A).
2. Machine according to revendication 1, characterised by the fact that the said tool-holder group (13) includes second means of orientation (19) intended to rotate the tool-holder yoke (17) on command around said second rotation axis (B) in such a way as to incline it at an angle (α) with respect to said reference axis (A).
3. Machine according to revendication 2, characterised by the fact that said angle (α) is between 0° and 5° .
4. Machine according to revendication 2 or 3, charac-

terised by the fact that said tool-holder group (13) includes an adjustable chuck (18) mounted on said tool-holder yoke (17) and rotating around a third rotation axis (C), perpendicular to said second rotation axis (B) and coplanar with said reference axis (A).

5. Machine according to any of the preceding revendications, characterised by the fact that the said first means of orientation (14) are selectively intended to move the said tool-holder group (13), with respect to said trolley (12), in a chosen direction (15) which is substantially perpendicular to said first rotation axis (V) and said reference axis (A); the said third rotation axis (C) being coplanar with said first rotation axis (V) and with said reference axis (A).
6. Machine according to any of the preceding revendications, characterised by the fact that the said machine bed (3) has a horizontal work plane (4) and the said first rotation axis (V) is substantially perpendicular to said work plane (4).
7. Machine according to any of the preceding revendications, characterised by the fact that the said first means of orientation (14) include a platform (21) mounted on said trolley (12) and rotating around said first rotation axis (V), and a slide (22) running along said platform (21) in said chosen direction (15); the support bracket (16) of said tool-holder group (13) being mounted firmly on said slide (22).
8. Machine according to revendication 7, characterised by the fact that said platform (21) is circular in shape and equipped with an aperture (25), extending along the diameter of the said platform (21) in the said chosen direction (15); the said slide (22) running along said aperture (25).
9. Machine according to revendication 7 or 8, characterised by the fact that the said first means of orientation (14) include the first means of activation (23) designed selectively to rotate the said platform (21) around said first rotation axis (V), and second means of activation (24) designed selectively to move the said slide (22) in the said chosen direction (15).



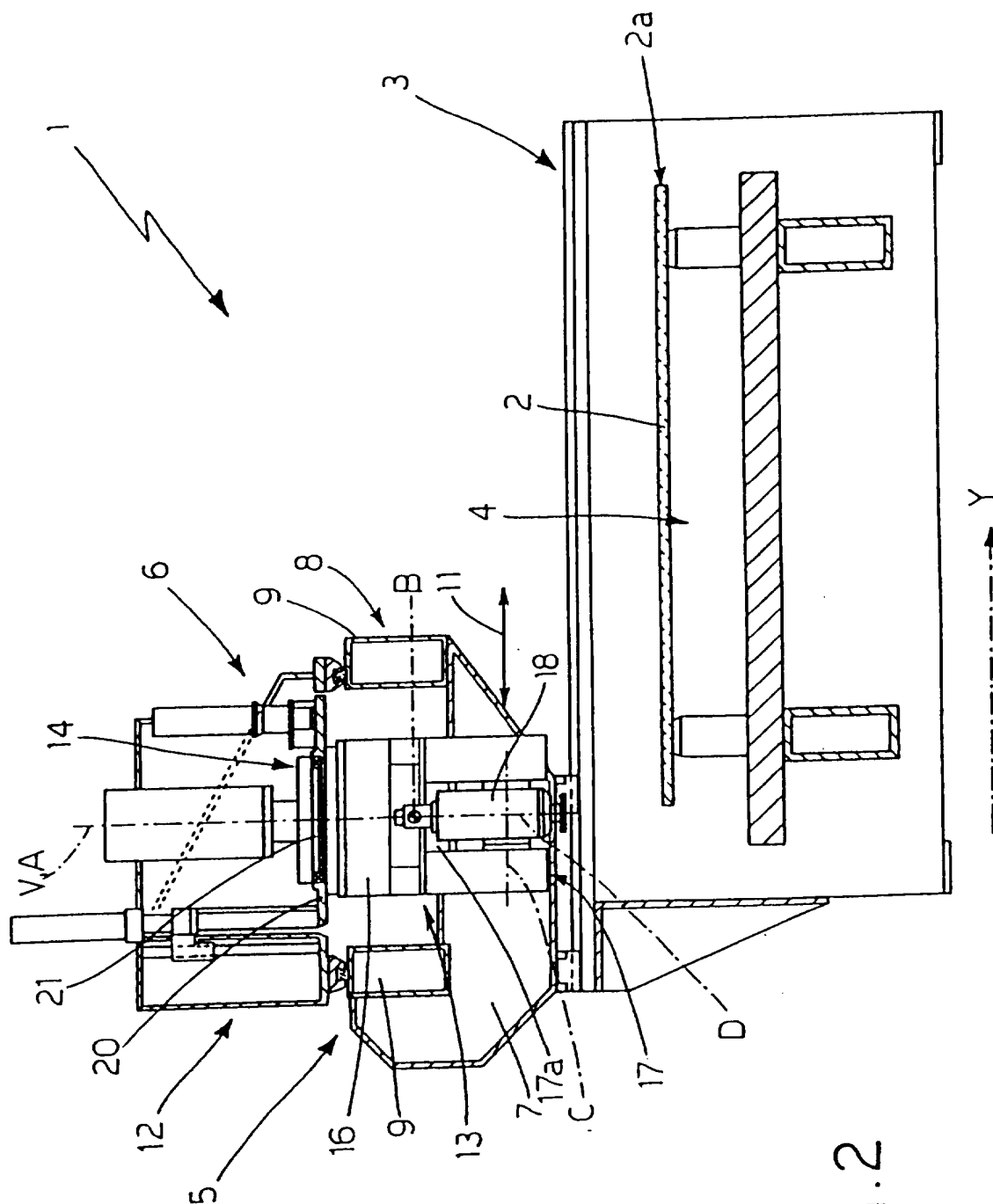


Fig. 2

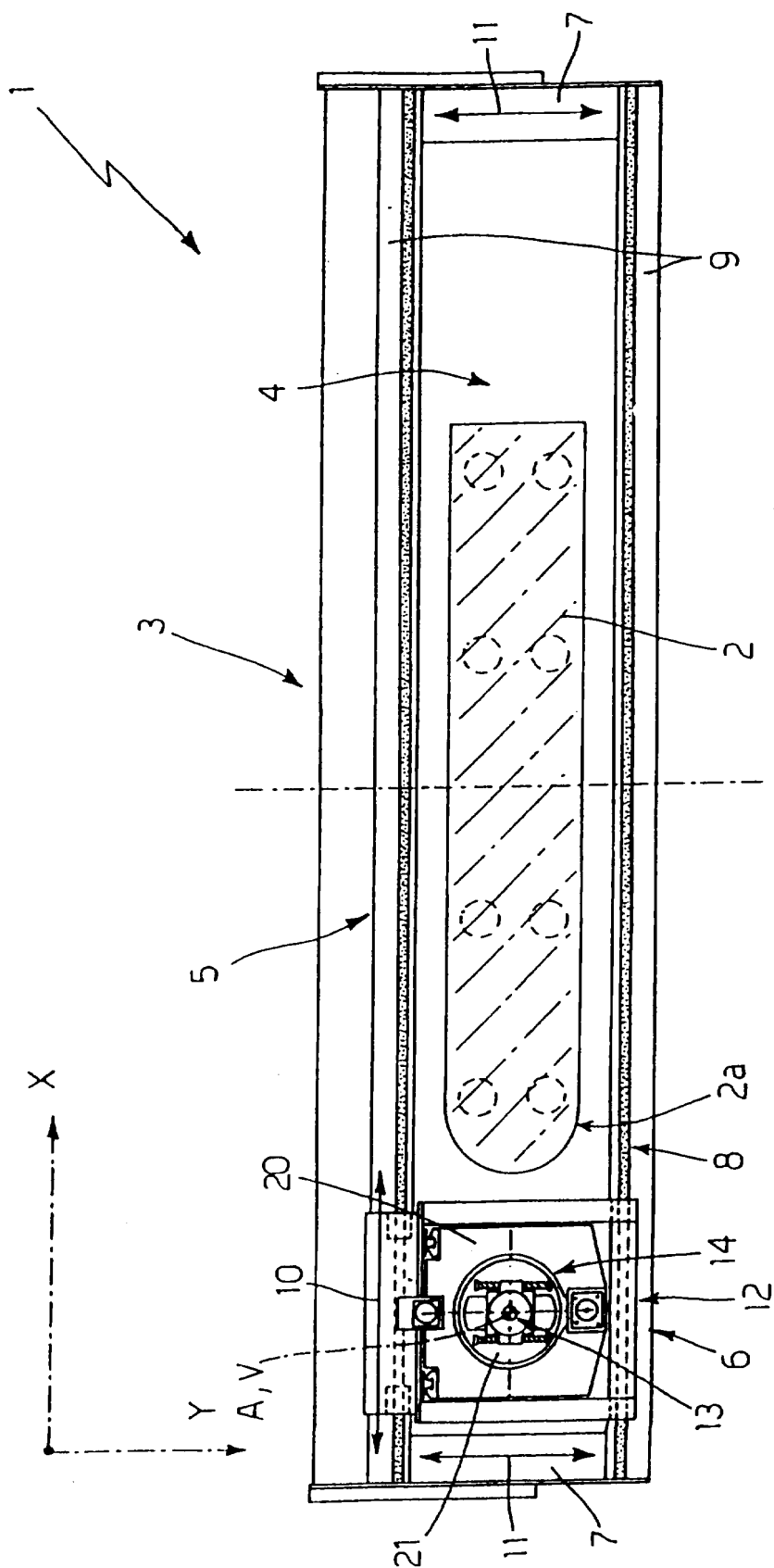
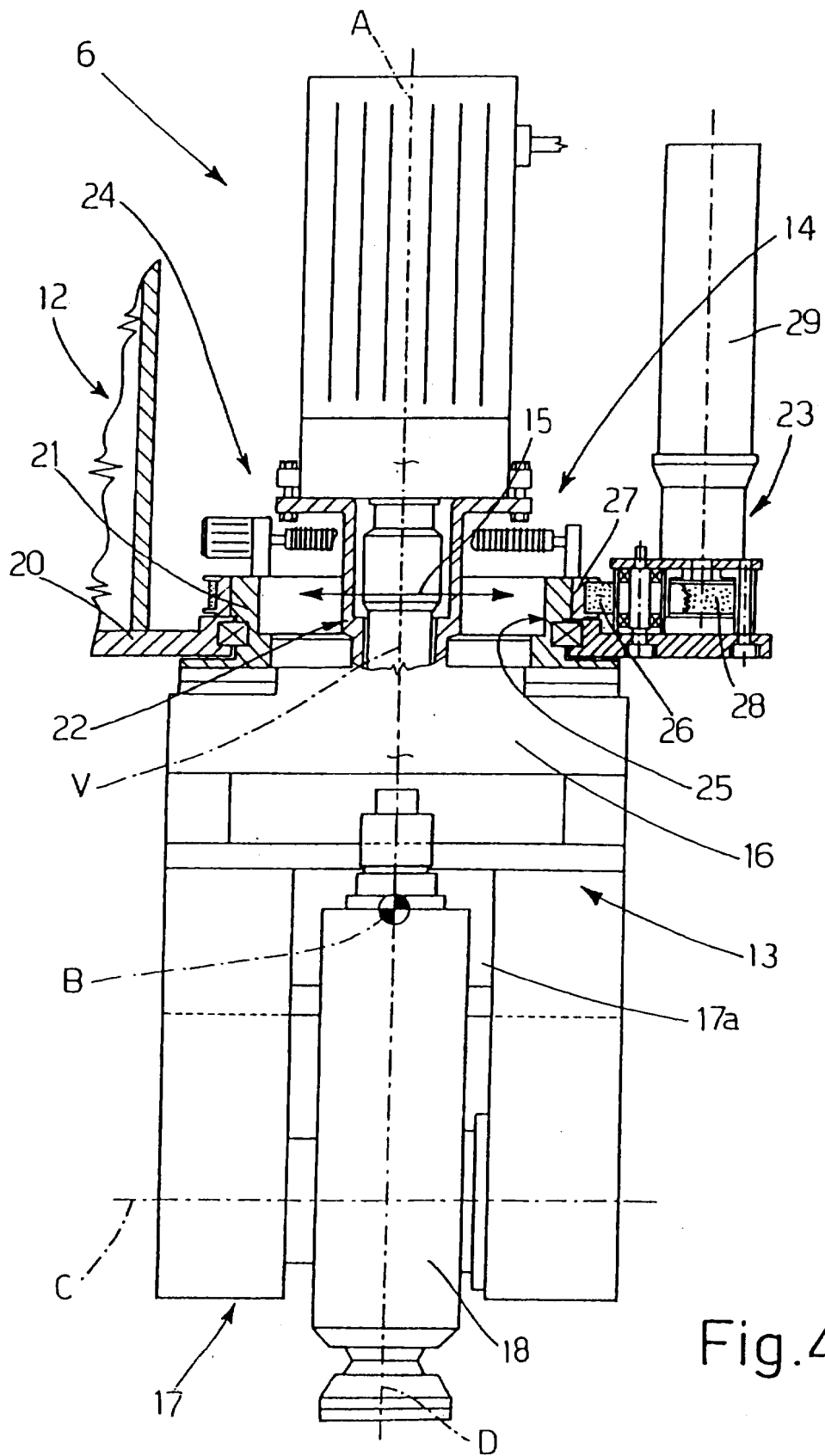
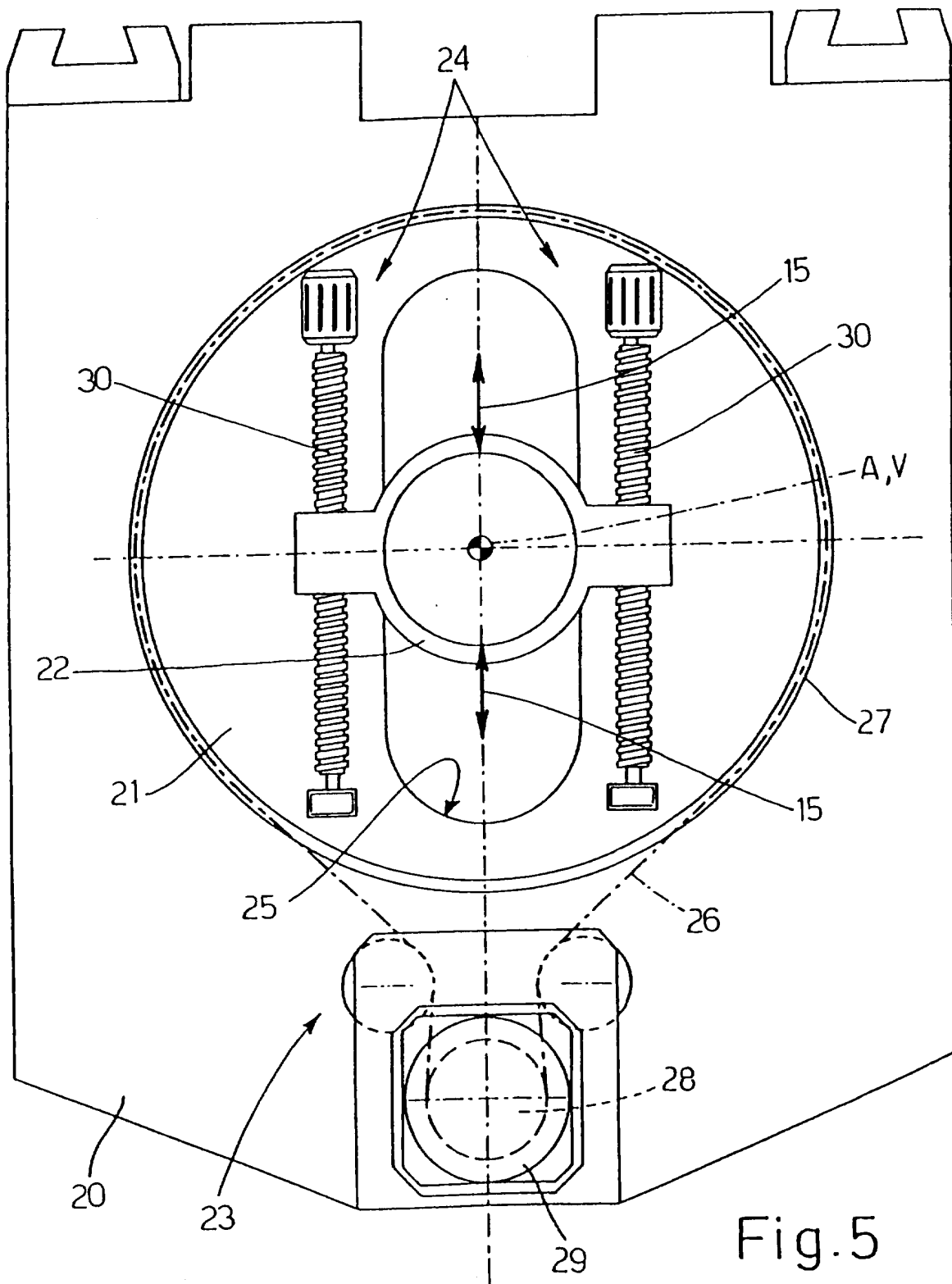


Fig. 3





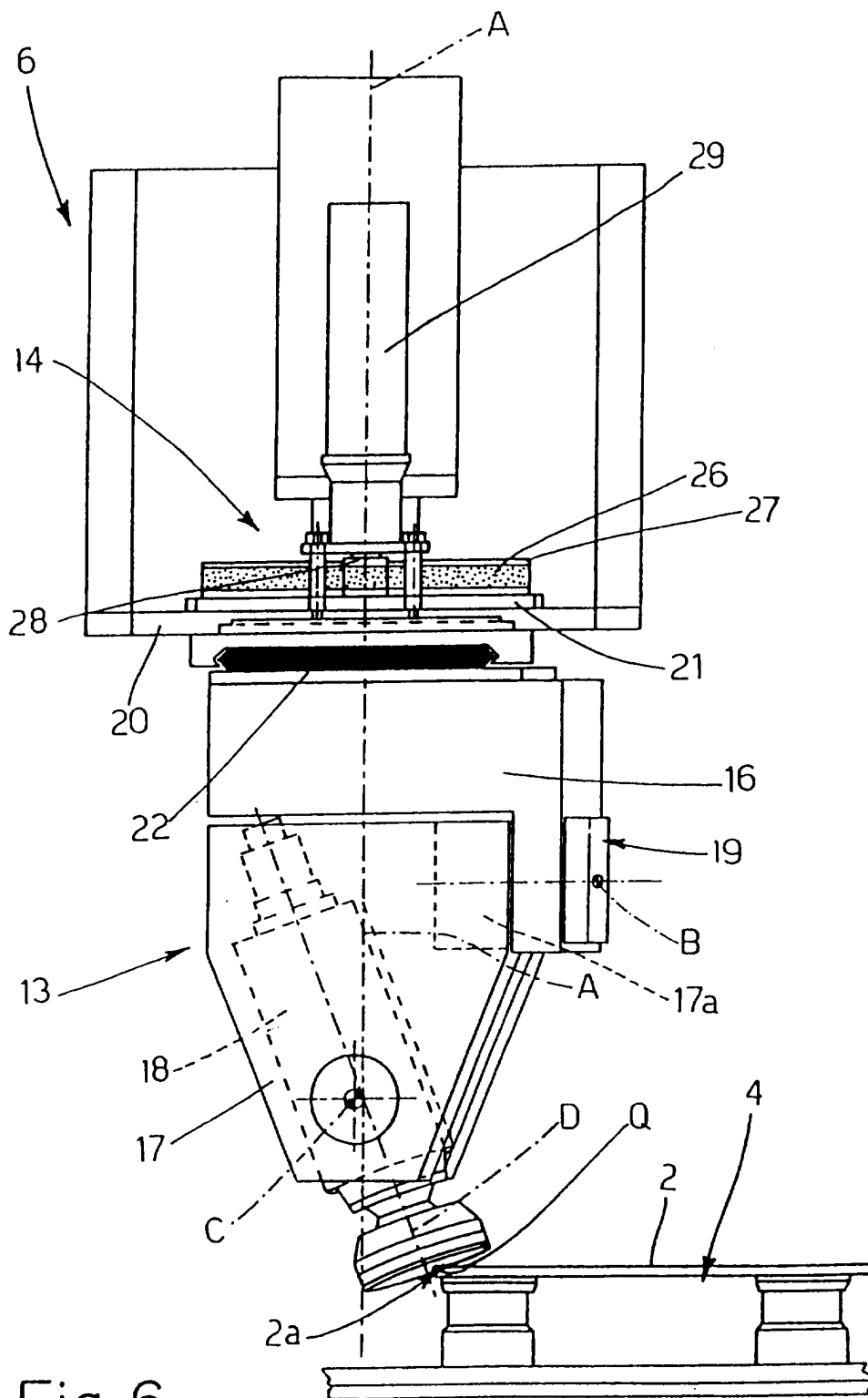


Fig.6

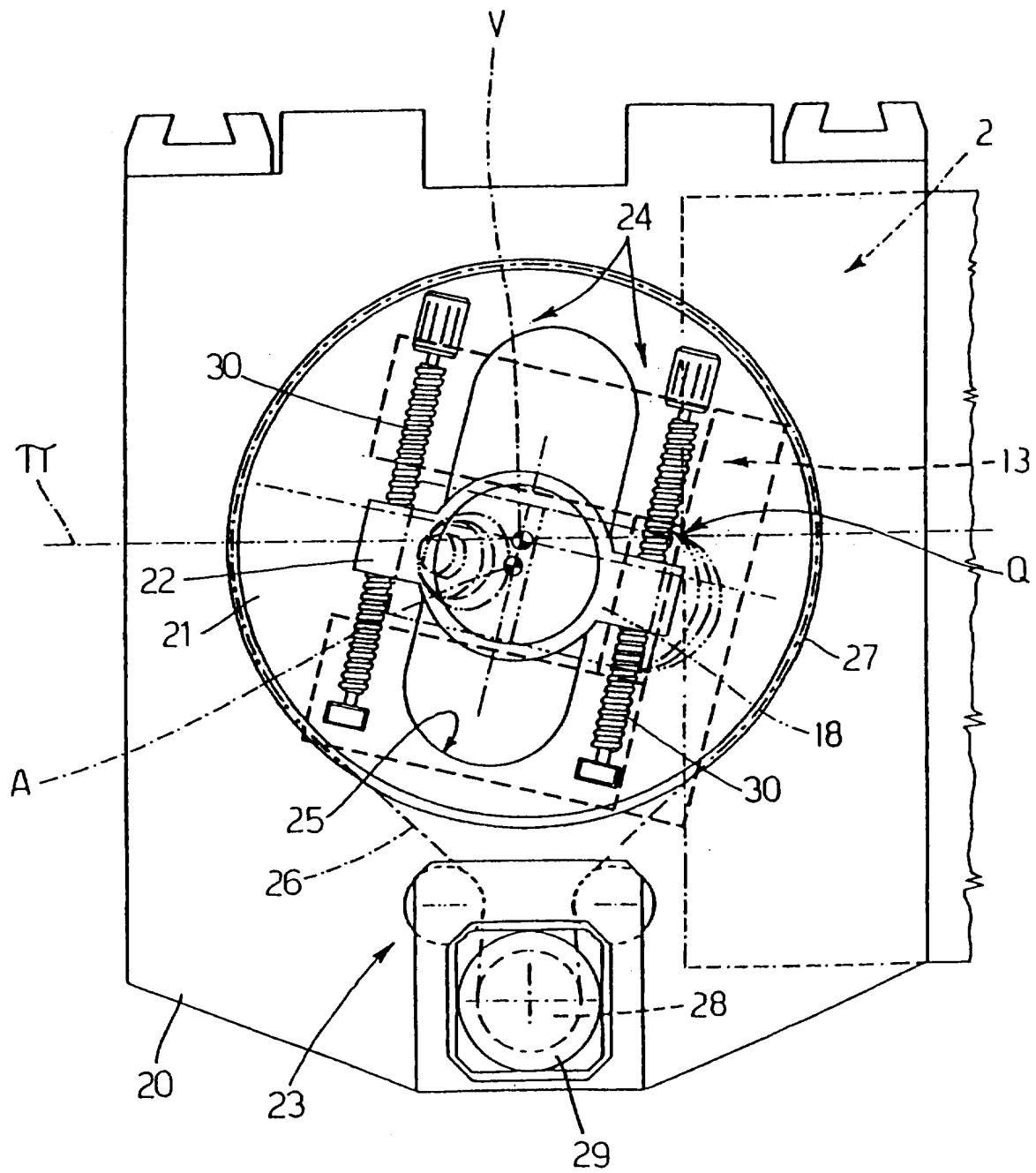


Fig.7

