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(54) A machine for making grooves in edges of slabs or tiles

(57) The machine is characterised in that it comprises: a work plane on which the slabs or tiles (2) rest during the work operation; at least one conveyor (3) for transporting the slabs or tiles (2) to the work plane before the work operation is begun, and for removing the slabs or tiles (2) from the work plane after the work operation has been completed; means for blocking, which on command fasten the slabs or tiles (2) on the work plane in order that the work operation can be carried out; at least one tool for making grooves, which tool is supported on a motor head (40) and which is predisposed on command to cut into an edge of the slabs or tiles (2); the means for blocking and the at least one tool being capable of adjustment in order to receive various slab or tile formats.

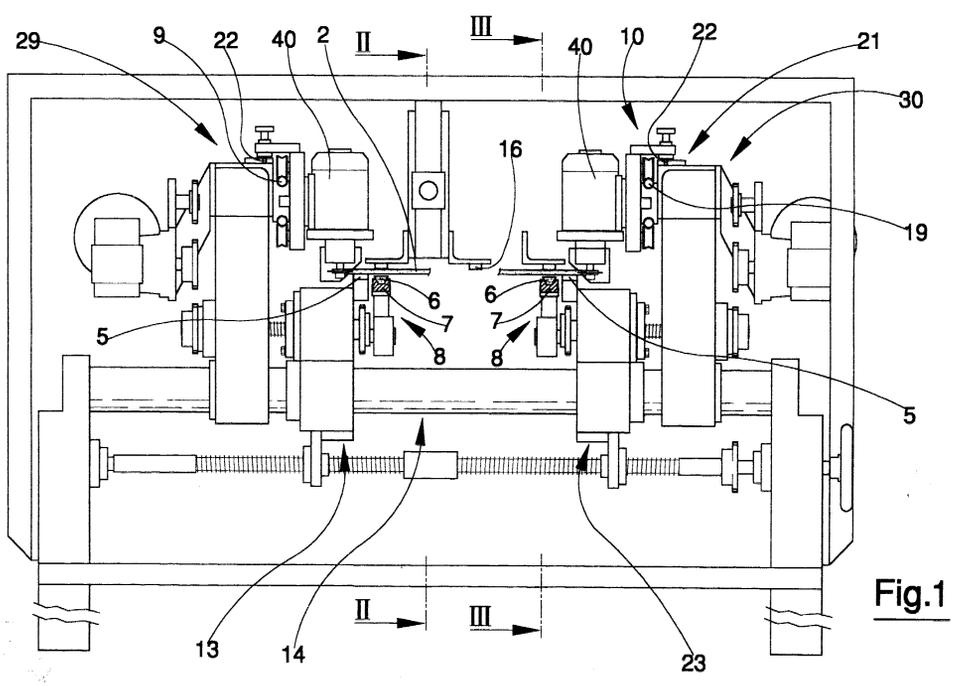

Fig.1

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Description

[0001] Specifically, though not exclusively, the invention is usefully applied in making grooves in the edges of slabs or tiles, the resulting grooves being able to receive tabs, which tabs are inserted into the grooves of facing edges of slabs or tiles so that the slabs or tiles can be mounted in such a way as to present a single flat and self-levelling surface.

[0002] An essential prerequisite of the grooves is that they must be made at a predetermined distance from the face of the slabs. In other words, the grooves have to exhibit their upper surface at a predetermined distance from the upper surface (the surface in view when the slabs are mounted) of the slabs.

[0003] Also, the grooves have to be made on all of the edges of the slabs, with an equal distribution for all of the slabs or tiles of a same format.

[0004] The exact positioning of the grooves on the various edges of the slabs has to take into account the different requirements imposed by the envisaged overall composition or pattern of the slabs when mounted.

[0005] Any machine capable of adequately responding to the above-mentioned needs has to have the characteristics of precision and versatility (for example, it has to be able to cope with slab format changes).

[0006] It also has to be easily insertable into a normal slab or ceramic tile production line.

[0007] The present invention provides a machine for making grooves on edges of slabs or tiles which can guarantee not only high precision but also a very considerable versatility, which enables easy and rapid adaptability to a change of format.

[0008] The invention has the advantages of being simply constructed and functional. These aims and advantages and others besides are all attained by the present invention, as it is characterised in the appended claims.

[0009] Further characteristics and advantages of the present invention will better emerge from the detailed description that follows of a preferred but non-exclusive embodiment of the invention, illustrated purely by way of a nonlimiting example in the accompanying figures of the drawings, in which:

figure 1 is a schematic section made according to line I-I of figure 3 below;
figure 2 is an enlarged-scale representation of a part of figure 1;
figure 3 is a reduced-scale schematic section made according to line III-III of figure 1;
figure 4 shows a part of a section made according to line IV-IV of figure 1;
figures 5 and 6 are enlarged-scale representations of two different operational configurations of a detail of a section made according to line I-I, concerning the slab-centring technique employed by the machine and the placing of the slabs on the rests.

[0010] With reference to the figures of the drawings, 1 denotes in its entirety a frame provided with a conveyor 3 for slabs and/or ceramic tiles along which the slabs are transported in a consecutive line. In particular the conveyor 3 is a chain conveyor, although it could have been a belt conveyor, the upper branch of which is constituted by two parallel chains 6 running on seatings 7 supported by cam devices 8 able to produce, on command, a vertical displacement of the seatings and thus of the chains 6.

[0011] These vertical displacements of the upper branch constituted by the two parallel chains 6 are predisposed to rise from an inactive lower position below a rest plane for the slabs 2, constituted by rests 5, to an upper position above the rest plane and vice versa.

[0012] The rest plane, also a work plane, identified by the rests 5 has the precise task of functioning as a rest and location reference plane for the slabs 2 during the work phase, with a removal of material as the grooves 20 are made in the edges of the slabs 2.

[0013] The upper branch of the conveyor 3, on the other hand, has the task of conveying the slabs 2 to the rest plane for execution of the work phase, and of removing the slabs 2 there-from at the end thereof. For this purpose the chains 6, constituting the upper branch, are wound and stretched between pulleys 26 positioned in such a way as to keep the upper branch "naturally" below the rest plane identified by the rests 5, i.e. in the lower inactive position. The passage into the upper active position is achieved by means of the cam devices 8, which simply raise the chains.

[0014] The machine is provided with means for blocking above the rests 5, which on command blocks the slabs 2 on the rests 5 so that the work phase can be carried out. The means for blocking basically comprise two pressers 16 located parallel to the rests 3 which are commanded to press the slabs 2 already on the rests 5 down against them.

[0015] In the illustrated embodiment the pressers 16 are commanded by a four-bar hinge link wherein two crank members 17, to which the pressers 16 are hinged, are made to oscillate with respect to the fixed member 18 which functions as a frame. Jacks 25 actuate the link.

[0016] The pressers 16 are positioned to operate opposite to and facing the rests 5. In order to enable adjustment for various formats at least one of the two pressers 16 is constrained to the two crank members 17 with a transversally-sliding couple which enables the one of the two pressers 16 to be located at a predetermined distance from the other.

[0017] The rests 5 can also be adjusted according to slab format; they can be distanced in relation to the transversal dimensions of the slabs 2.

[0018] The guides 7 with the relative cam devices 8, commanded through chain transmissions 28, are supported on oppositely-located frames 13 and 23, on which the rests 5 are also supported.

[0019] The frames 13 and 23 are in turn constrained

to transversal guides 14 solidly constrained to the frame 1 and are caused to displace along the guides themselves, which displacements are symmetrical with respect to a vertical median plane parallel to the rests 5, by a self-centering screw adjustment device 15.

[0020] Fixed reference locating means 24 are included to take account of the transversal dimensions of the slabs 2, in a perpendicular direction to the direction identified by the rests 5. The locating means 24 interact directly with the edges of the slabs 2 during the stage in which the slabs 2 are placed on the rests 5, which occurs following the lowering of the chains 6 the slabs 2 are conveyed upon.

[0021] Each single groove 20 is cut by a disc cutter 4 supported on a motorhead 40 and on command cuts into an edge of a slab 2 placed on the rests 5 and blocked down thereon by the pressers 16.

[0022] A plurality of cutters 4 is provided, sufficient to cut at least two grooves into a same edge of each slab 2.

[0023] The cutting operation is normally done contemporaneously on same and aligned edges of more than one slab 2. For this purpose a plurality of aligned cutters 4 is provided, appropriately distanced.

[0024] The cutters 4 can be arranged along one edge alone of the workpiece slabs and can be supported on single independent motor heads 40.

[0025] In the illustrated embodiment, where grooves are to be cut in rectangular or square slabs, or in any case slabs having opposite and parallel edges, a first plurality of cutters 4 is provided on relative motor heads 40, which first plurality of cutters 4 will operate on one edge of a slab, and a second plurality of cutters 4 is also provided (with relative motor heads 40), which second plurality will operate on an opposite edge of the slab.

[0026] In particular, the second plurality of cutters 4 is arranged symmetrically to the first plurality with respect to a vertical median plane arranged lying parallel to the two rests 5.

[0027] The heads 40 of the first plurality are constrained to guides 9 predisposed to enable the single heads 40 to displace in a parallel direction to the direction identified by the rests 5. These displacements serve to position the heads 40 and the relative cutters 4 so as to take account of the various slab formats.

[0028] Similarly, the heads 40 of the second plurality are constrained to guides 19 predisposed to enable the single heads 40 to displace in a parallel direction to the direction of the rests 5.

[0029] The guides 9 and 19 are fixed on elements 29 and 30 which in turn are coupled on transversal guides 14 and are solidly connected to the frames 13 and 23 through connections allowing adjustment of the relative positions in a parallel direction to the guides 14.

[0030] The heads 40 of the first plurality of cutters 4 are individually provided with locating organs 10 which couple with other, fixed locating organs 11 removably constrained to the element 30 and therefore to the guides 9.

[0031] Similarly the heads 40 are singly provided with locating organs 10 predisposed to couple with other locating organs 21 which are removably constrained to the element 29 and therefore to the guides 19.

[0032] In the illustrated embodiment the locating organs 10 are constituted by mechanical obturators predisposed to insert in holes 12, 22, specially distanced on the locating organs 11, 21, which locating organs 11, 21 are flat and elongate and removably constrainable to screw in predetermined positions on the elements 29 and 30.

[0033] Each type of format corresponds to a pair of locating organs 11 and 21 which, once fixed on the elements 29 and 30, enable a rapid longitudinal positioning of the motor heads 40 to be carried out, by engaging the locating organs 10 provided on each head with the locating organs, or holes 11 and 21.

[0034] During normal operation of the machine a predetermined number of slabs 2 lying on the chains 6 is deposited, following a lowering of the chains 6, on the rests 5 which, in the illustrated embodiment, constitute the reference plane with respect to which the distance of the grooves to be made on the opposite edges of the slabs 2 from the "top" side of the slab 2 lying on the rests 5 is calculated. At the same time as the slab 2 is placed on the rests 5 the slab 2 is centred or aligned by the reference locating means 24.

[0035] The pressers 16, operated by the pistons 25, then block the slab 2 in the work position.

[0036] Once the slab 2 is properly blocked, the two pluralities of cutters 4 are commanded to close up to the edges of the slabs 2, with the subsequent contemporaneous advance of the cutters 4 in a transversal direction parallel to the transversal guides 14 up to completion of the programmed run.

[0037] Once the work run is completed, a return run is commanded to bring the cutters 4 back into the start position.

[0038] The runs are obtained by moving in synchrony the elements 29 and 30, to which the two opposite pluralities of motor heads 40 are solidly constrained.

[0039] When the cutters 4 are distanced and the pressers 16 raised, the seatings 7, through actuation of the cam devices 8, raise the branches of the chains 6 above the rest plane identified by the rests 5 in order to load the slabs 2 onto the chains 6 in order to remove them.

[0040] The machine can be inserted directly into a line, perhaps coupled in parallel with an identical machine with which an alternating function is set up, able to maintain the line flow constant.

Claims

1. A machine for making grooves in edges of slabs or tiles, characterised in that it comprises:

a work plane on which the slabs or tiles (2) rest during a work operation;
at least one conveyor (3) for transporting the slabs or tiles (2) to the work plane before the work operation is begun, and for removing the slabs or tiles (2) from the work plane after the work operation has been completed;
means for blocking, which on command fasten the slabs or tiles (2) on the work plane in order that the work operation can be carried out;
at least one tool for making grooves, which tool is supported on a motor head (40) and which is predisposed on command to cut into an edge of the slabs or tiles (2);
the means for blocking and the at least one tool being capable of adjustment in order to receive various slab or tile formats.

2. The machine of claim 1, characterised in that the work plane comprises at least two parallel rests (5) situated at a reciprocal distance which is adjustable according to dimensions of the slabs or tiles.

3. The machine of claim 1 or 2, characterised in that the at least one conveyor (3) comprises a chain conveyor of which at least the upper branch is comprised between the two rests (5) and can displace, on command, from a lower position in which it is below the work plane to an upper position in which it is above the work plane, and vice versa.

4. The machine of claim 3, characterised in that the chains (6) constituting the upper branch of the conveyor (3) run on seatings (7) which are supported by cam devices (8) which cam devices (8) are able, on command, of raising the chains (6) constituting the upper branch from a lower inactive position in which the upper branch is below the plane described by the rests (5), into a position located above the plane described by the rests (5), and vice versa.

5. The machine of claim 4, characterised in that it comprises means for reference, for locating the slabs or tiles (2) in a direction which is perpendicular to a direction described by the rests (5).

6. The machine of claim 5, characterised in that it comprises at least a first plurality of the tools (4) for making grooves, which tools are supported on independent motor heads (40) which are constrained to guides (9) which enable the motor heads (40) to displace in a parallel direction to a direction described by the rests (5); the tools (4) and the heads (40) being aligned at a same side of the rests (5); the heads (40) being individually provided with locating organs (10) which are predisposed to couple with fixed locating organs (11) removably constrained to the guides (9).

7. The machine of claim 6, characterised in that the rests (5) are predisposed to receive a plurality of the slabs or tiles (2) located consecutively in a line, and that the tools (4) and the corresponding heads (40) are predisposed to operate contemporaneously on same sides of all the aligned plurality of slabs or tiles (2).

8. The machine of claim 7, characterised in that it comprises a second plurality of the tools (4) with relative motor heads (40), which tools (4) are symmetrically arranged with regard to the first plurality of tools with respect to a vertical median plane arranged parallel to the two rests (5); the heads (40) of the second plurality being independent and constrained to guides (19) predisposed to enable single heads (40) of the heads (40) to displace in a parallel direction to a direction identified by the rests (5); the heads (40) being also singly provided with locating organs (10) which can couple with locating organs (21) solidly and removably constrained to the guides (19).

9. The machine of claim 8, characterised in that the locating organs (10) are constituted by mechanical obturators predisposed to insert into holes (12, 22) specially afforded and distanced on the locating organs (11, 21); the locating organs (11, 21) being flat and elongate and removably constrainable due to screws positioned at predetermined positions on the locating organs (11, 21).

10. The machine of claim 9, characterised in that the guides (9, 19) are mounted on frames (13, 23) on which the rests (5) are supported; the frames (13, 23) being coupled on transversal guides (14) which enable adjustment positioning in a perpendicular direction to the rests (5).

11. The machine of claim 10, characterised in that it comprises a screw adjustment device (15) for adjusting a position of the frames (13,23) in a perpendicular direction to the rests (5) which screw adjustment device (15) causes the two opposite frames (13, 23) to displace symmetrically with respect to a vertical median plane parallel to the rests (5).

12. The machine of claim 11, characterised in that the means for blocking for commandably fastening the slabs or tiles (2) on the work plane comprise two pressers (16) which are parallel to the rests (5) and which are commanded to press the slabs or tiles (2) against the rests (5).

13. The machine of claim 12, characterised in that the pressers (16) are commanded by a hinge link mech-

anism in which two crank members (17), to which the pressers (16) are hinged, are commanded to oscillate with respect to a fixed member (18) of the hinge link mechanism, which functions as a frame.

14. The machine of claim 13, characterised in that at least one of the two pressers (16) is constrained to the two crank members (17) by means of a sliding couple in a transversal direction which enables the one of the two pressers (16) to be located at a predetermined distance with respect to another of the two pressers.

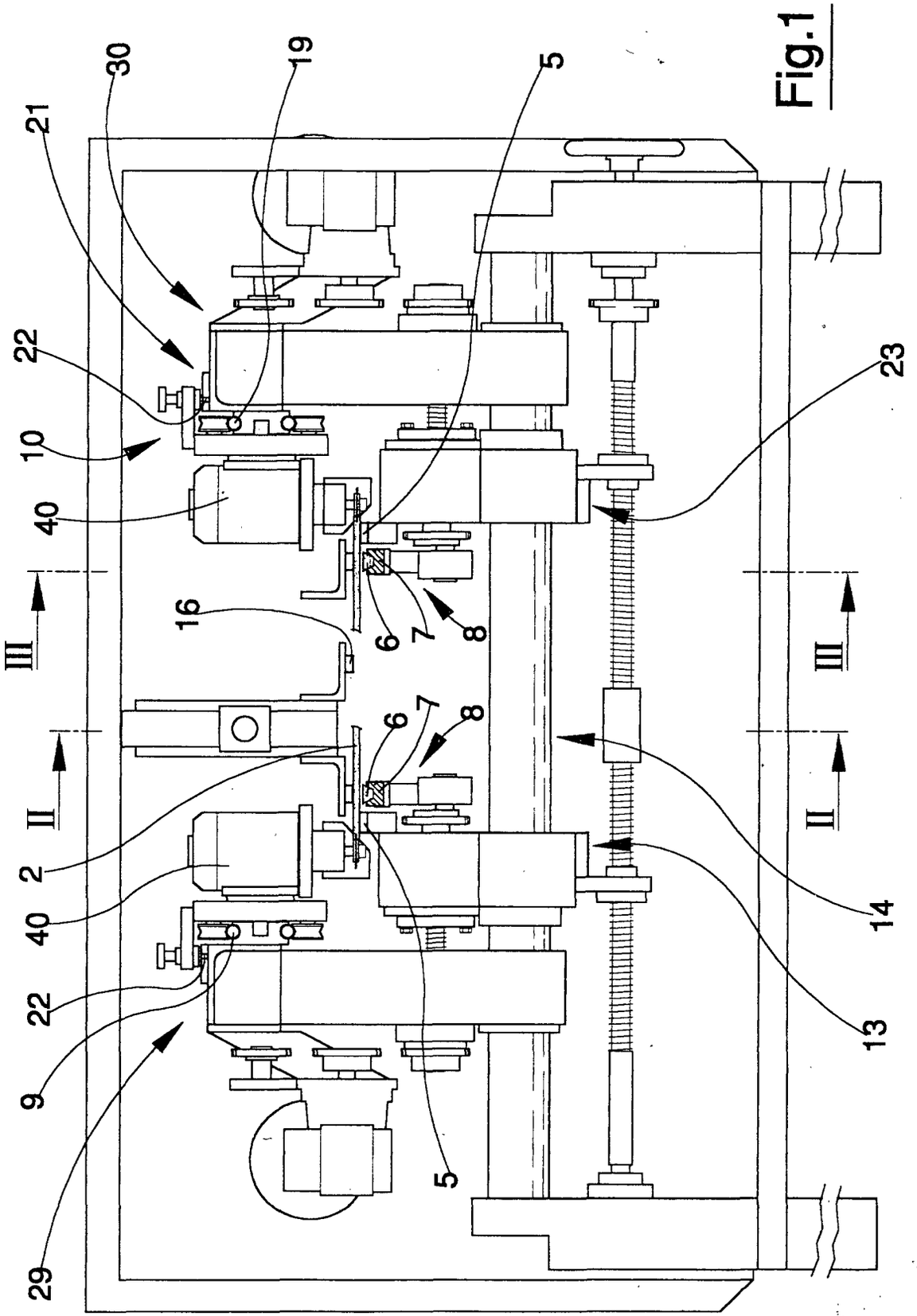


Fig.1

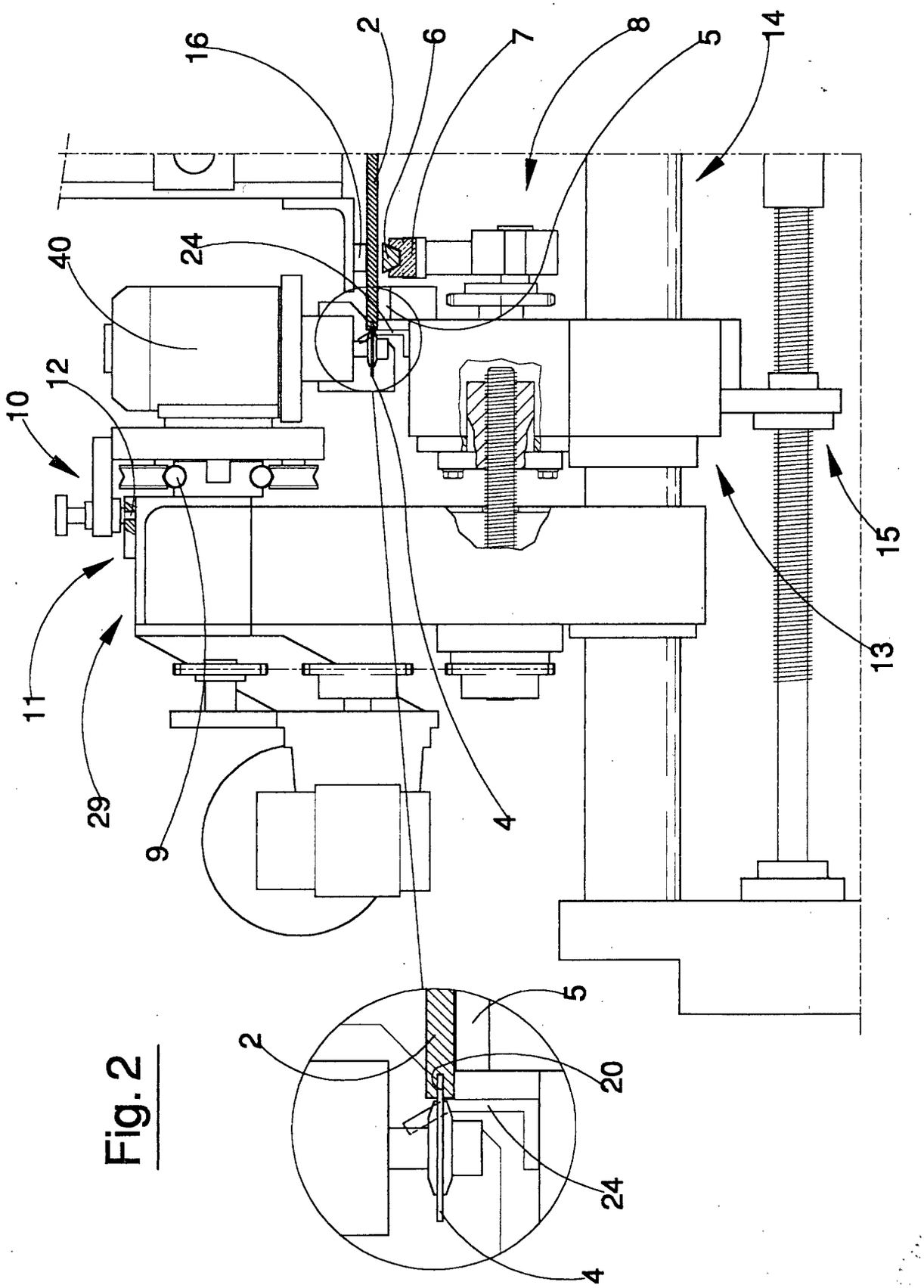


Fig. 2

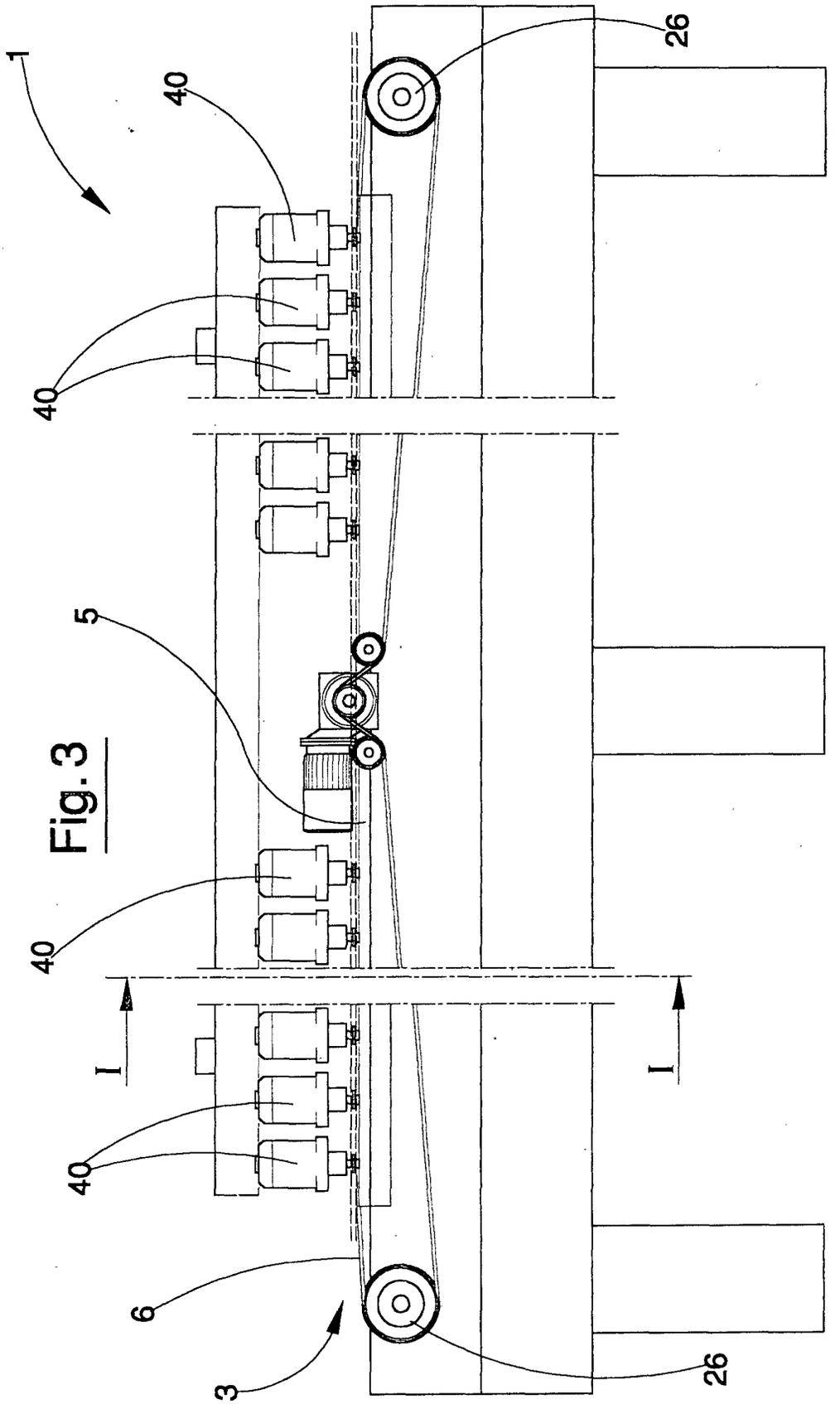
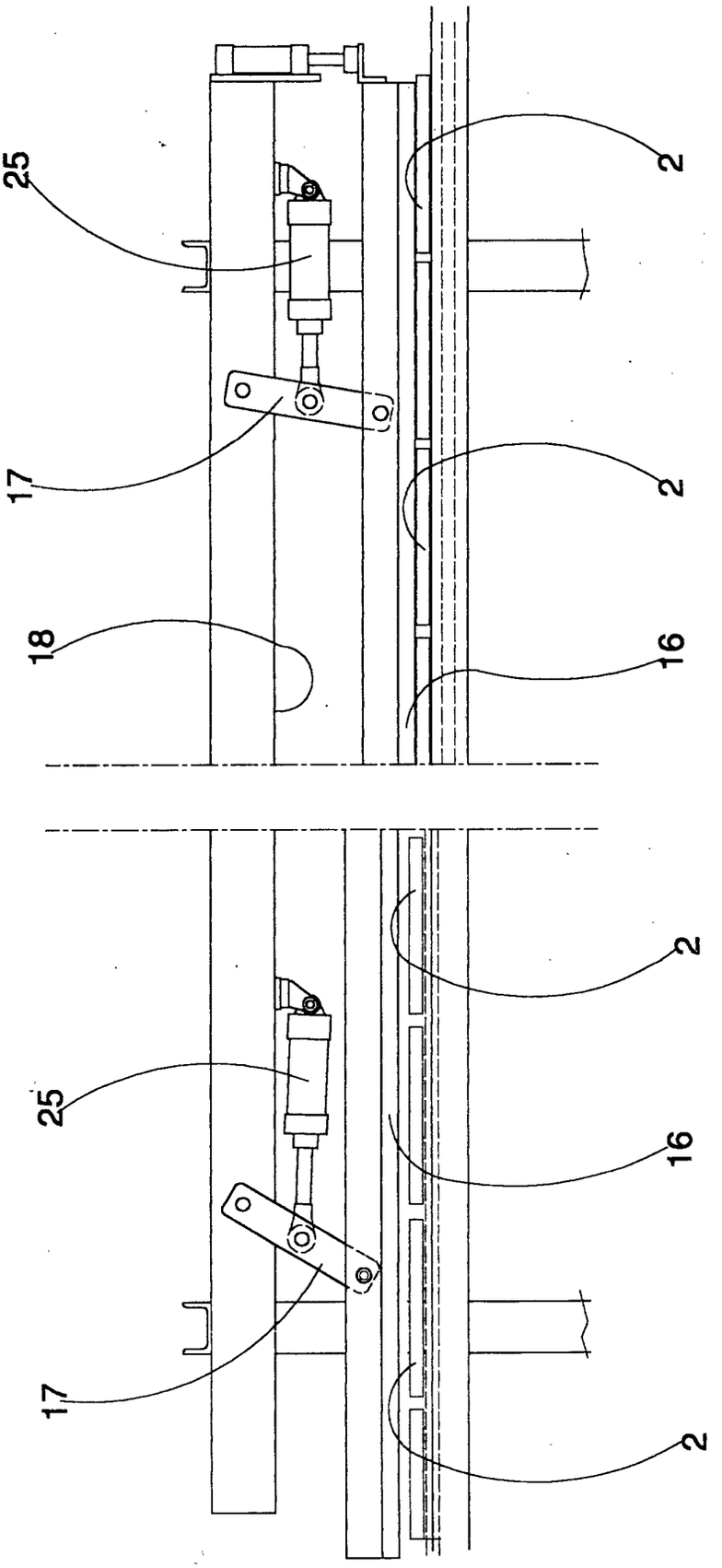


Fig. 3

Fig. 4



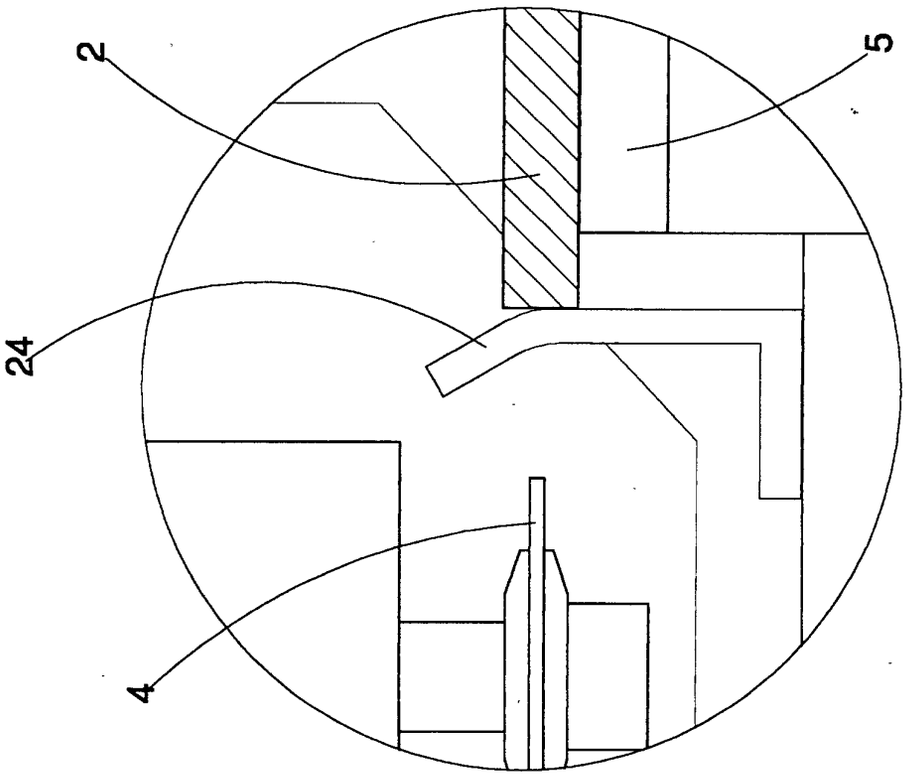


Fig.6

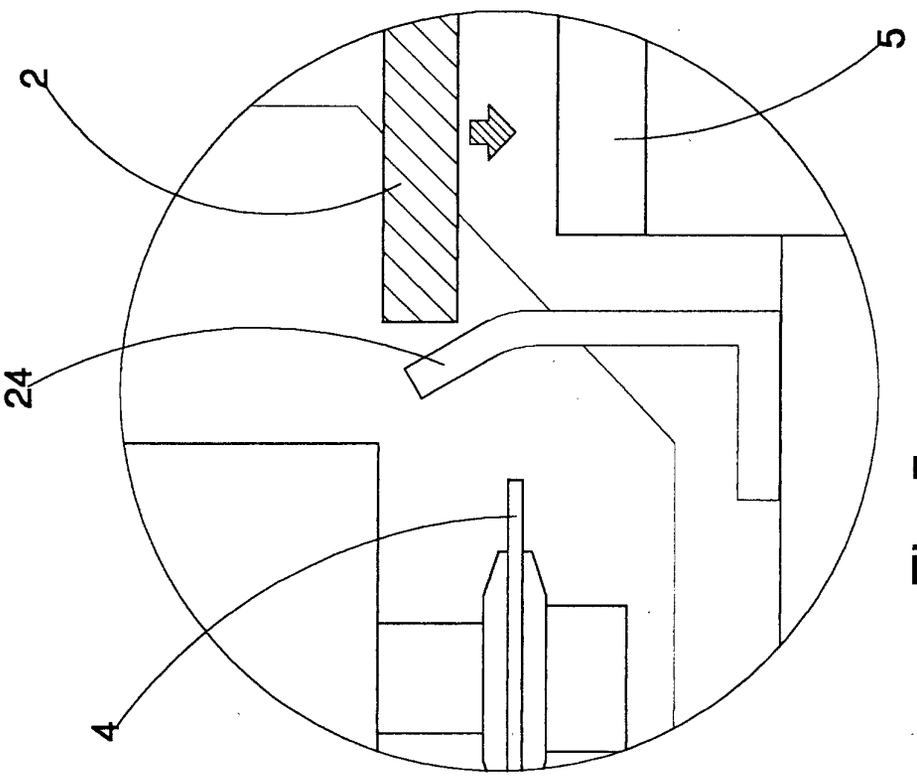


Fig.5