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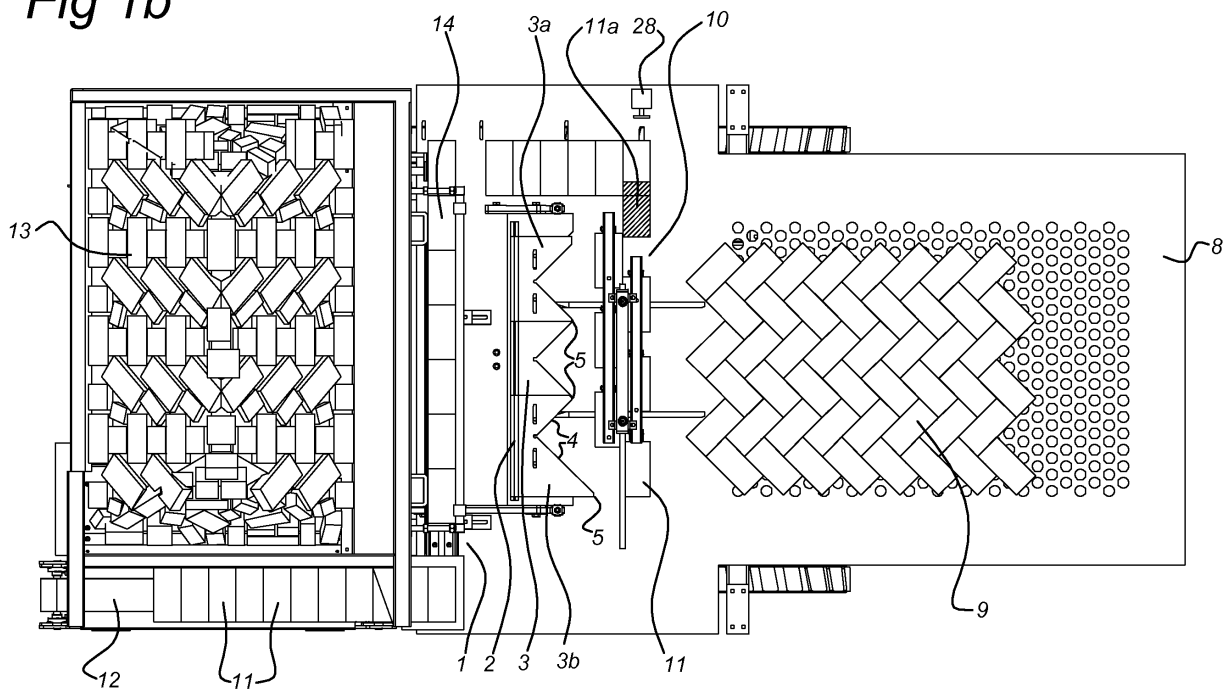
(54) **Paving device**

(57) The invention relates to a device for producing a layer portion (9) of paving stones (11) in a pattern, comprising a load-bearing surface (8) for supporting the layer portion, a fixture (2) comprising fixture parts (3) which are provided with stop edges which define a stop, in which a drive means (1) is connected to the fixture and drives the latter in a direction substantially parallel to the load-bearing surface.

Fig 1b



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Description

Background of the invention

[0001] The invention relates to a device for producing a layer portion of paving stones in a pattern.

[0002] The invention furthermore relates to a method for producing a layer portion of elongate paving stones in a herringbone pattern.

[0003] The invention furthermore relates to a device for laying paving stones.

[0004] A device of this type for producing a layer portion of elongate paving stones in a herringbone pattern is known from NL 1026269, in which a device is shown for laying a layer portion of elongate paving stones in a herringbone pattern, in which the layer is placed on an underlayer and provided with a horizontal boundary consisting at least of an end fixture having a herringbone-shaped stop edge which is adapted to the paving stones used, in which the paving stones are supplied in a supported manner on a plane of transport moving in a first direction, towards the end fixture, in consecutive sets in order to produce the layer portion, starting from the end fixture, in which the paving stones, when they touch the end fixture and/or the paving stones of the preceding set, which has already been incorporated in the layer portion, form a point of rotation and are placed in the layer portion at the desired position by engagement of the plane of transport which moves at that location, fixture only used once, variations which add up are difficult to compensate for.

[0005] One drawback of the prior art is the fact that the batch of paving stones cannot be constructed sufficiently accurately, which further complicates the handling of the batch of stones by the machine.

[0006] A device of this type for producing a layer portion of elongate paving stones with a herringbone pattern is also known from EP0256269, which discloses pressing one row of paving stones in the direction of a layer portion by means of a fixture, with the paving stones simultaneously being pushed into the desired pattern. It is not clear from the application how this desired pattern is achieved. One drawback is the complicated actuation of the fixture required in order to simultaneously push the paving stones and achieve the desired pattern. A further drawback is that for each movement cycle of the fixture, only half a row of paving stones are laid to form a herringbone pattern.

Summary of the invention

[0007] It is an object of the invention to improve the accuracy of the layer portion of paving stones, as a result of which the subsequent handling is facilitated.

[0008] It is a further object of the invention to improve the capacity of a device for producing a layer portion of paving stones in a pattern.

[0009] To this end, the invention provides a device for producing a layer portion of paving stones in a pattern, comprising a load-bearing surface for supporting the layer portion, a fixture comprising fixture parts which are provided with stop edges which define a herringbone-shaped stop for producing a layer portion of paving stones in a pattern, preferably a herringbone pattern, in which a drive means is connected to the fixture and is designed to drive the fixture in a direction substantially parallel to the load-bearing surface and substantially at right angles to the fixture, in which there is furthermore provided a positioning device designed to arrange paving stones at a mutual distance a on the load-bearing surface in their longitudinal direction in a first row which extends substantially parallel to the fixture, and a second row parallel to the first row and offset to the first row, and in which the stop edges of the fixture are designed to advance the rows in order to produce a pattern made up of a continuous row of paving stones of the layer portion.

[0010] An advantage of the device according to the invention is the fact that one movement of the fixture produces an entire continuous row of paving stones in a pattern, which is advantageous with regard to the production capacity of the device. A further advantage is the simple movement that the fixture describes when the paving stones are advanced.

[0011] The row of continuous paving stones in a pattern is preferably in a herringbone pattern or half-brick pattern.

[0012] To this end, the invention furthermore provides a device for producing a layer portion of paving stones in a pattern, comprising a load-bearing surface for supporting the layer portion, a fixture comprising fixture parts which are provided with stop edges which define a stop, in which a drive means is connected to the fixture and drives the latter in a direction substantially parallel to the load-bearing surface.

[0013] The advantage of the invention is that every paving stone, with regard to the amount of degrees of freedom, is directly positioned by the fixture, as a result of which optimum use is made of the accuracy of the fixture, dimensional variations and/or irregularities of paving stones do not accumulate, and an accurate batch of paving stones is constructed.

[0014] In one embodiment of the device, the stop edges are designed to define a herringbone-shaped stop for producing a layer portion of paving stones in a herringbone pattern.

[0015] In one embodiment of the device, the direction in which the fixture is driven is substantially at right angles to the longitudinal direction of the fixture.

[0016] In one embodiment of the device, an outer stop edge of the fixture is turned inwards through a correction angle with respect to a herringbone pattern formed by the stop edges. As a result thereof, a force is exerted on the paving stones which is directed more in the direction of the centre of the layer portion, thus improving the cohesion of the layer portion.

[0017] An outer stop edge of the fixture is a stop edge

which advances, or has advanced, an outer paving stone, or a continuous row of paving stones in a herringbone pattern, that is to say, advances the first or the last paving stone of a continuous row of paving stones in a herringbone pattern.

[0018] The correction angle is the angle through which an outer stop edge has been turned in the direction of the centre of the layer portion with respect to a herringbone pattern.

[0019] In one embodiment of the device, the correction angle is smaller than 5 degrees (< 5 °). These values produce good results in practice, improving the cohesion of the layer portion without disturbing the pattern of the paving stones.

[0020] In one embodiment of the device, means are provided so that the fixture parts can be adjusted with respect to one another in order to be able to produce different herringbone patterns using different paving stones. The fixture parts can be displaced with respect to one another and be secured again in a simple manner using nuts and bolts, quick-action clamps, etc. The fixture can thus be made suitable for processing paving stones of different formats, both elongate and square. Furthermore, the fixture can thus be adjusted to the desired pattern into which the layer portion is to be formed, such as a herringbone pattern. In addition, it is possible to attach fixture parts which can produce half-brick patterns.

[0021] In one embodiment of the device, a guide means is provided on either side of the load-bearing surface, parallel to the drive direction of the fixture, and the guide means is connected to the load-bearing surface in such a manner that when the guide means, from a starting position, is advanced in the drive direction of the fixture, the guide means likewise moves inwards. This further promotes a tight fit of the paving stones in the layer portion and improves the coherence in the batch formed.

[0022] Inwards in this context means in the direction of the centre of the layer portion, i.e. when the guide means, from a starting position, is advanced in the drive direction of the fixture and also moves inwards, the guide means moves in the direction of the centre of the layer portion.

[0023] In one embodiment of the device, a spring element is connected to the guide means in order to move the guide means in the direction of the starting position. As a result thereof, it is possible to push the guide means with the fixture and to return the guide means passively to its starting position.

[0024] In one embodiment of the device, a paving stone supplying device is furthermore provided to take paving stones to the load-bearing surface.

[0025] In one embodiment of the device, a positioning device is furthermore provided in order to arrange paving stones at a mutual distance in their longitudinal direction on the load-bearing surface in a first row which extends substantially parallel along the fixture. Preferably, the positioning device is designed to simultaneously arrange a second row of paving stones parallel to the first row and offset to the first row. Simultaneous positioning of two rows of paving stones by one positioning device is advantageous in connection with the positioning accuracy of the rows with respect to one another and the positioning accuracy of the two rows together with respect to the fixture.

[0026] In one embodiment of the device, the fixture is designed such that points of contact of the fixture act on paving stones in the first and second row, more specifically the fixture acts on the outer paving stone of the second row at an end of the paving stone in order to determine the direction in which the paving stones rotate in the direction of the stop edges. The fixture acting on the first and second row of paving stones is advantageous as this makes it possible to form a continuous row of paving stones in a herringbone pattern in a single operation, which improves the productivity of the device for producing a layer portion of paving stones in a herringbone pattern.

[0027] In one embodiment of the device, the fixture is designed such that points of contact of the fixture touch paving stones from the first row and an outer paving stone of the second row at an end of the paving stone in order to determine the direction in which the paving stones rotate in the direction of the stop edges.

[0028] In one embodiment of the device, the positioning device comprises a prepositioning means designed to preposition a paving stone in the second row and bring it within reach of a pushing means. One advantage in this case is the fact that the stroke which the positioning device itself has to perform is reduced and thus parts thereof are prevented from protruding outside the periphery of the machine. Furthermore, paving stones in the first row are prevented from ending up in undesirable positions in the row as a result of a pushing means accidentally becoming caught behind a paving stone.

[0029] In one embodiment of the device, a cleaning device is provided in order to clean the paving stones. The device is thus suitable for processing paving stones during street repaving work. In those cases, paving stones are often very dirty and cannot be processed automatically.

[0030] In one embodiment of the device, the fixture part is provided with a recess at ends of the stop edges in order to absorb dimensional variations and/or irregularities of the paving stone. This is advantageous as soiled paving stones and/or paving stones with variations in dimensions can then be processed more readily by the device.

[0031] To this end, the invention provides a device for producing a layer portion of elongate paving stones in a herringbone pattern, in which a position of each paving stone in a layer portion is determined by a fixture which is drivably connected to a drive means. The advantage of the invention is the fact that each paving stone, with regard to the amount of degrees of freedom, is directly positioned by the fixture, as a result of which optimum use is made of the accuracy of the fixture, and dimen-

sional variations and/or irregularities of paving stones do not accumulate and an accurate batch of paving stones is constructed.

[0032] To this end, the invention provides a paving device for laying paving stones comprising a device for producing a layer portion of paving stones in a pattern according to a preceding claim.

[0033] To this end, the invention furthermore provides a device for producing a layer portion of paving stones in a pattern, comprising a load-bearing surface for supporting the layer portion, a fixture comprising fixture parts which are provided with stop edges which define a stop, in which a drive means is connected to the fixture and drives the latter in a direction substantially parallel to the load-bearing surface, and in which means are provided so that the fixture parts can be adjusted with respect to one another in order to be able to produce different herringbone patterns using different paving stones. The fixture parts can be moved with respect to one another and be secured again in a simple manner using nuts and bolts, quick-action clamps, etc. The fixture can thus be made suitable for processing paving stones of different formats, both elongate and square. Furthermore, the fixture can thus be adjusted to the desired pattern into which the layer portion is to be formed, such as a herringbone pattern. In addition, it is possible to attach fixture parts which can produce half-brick patterns.

[0034] Assembly comprising a device for producing a layer portion of paving stones in a pattern and paving stones, the device comprising a load-bearing surface for supporting the layer portion, a fixture comprising fixture parts which are provided with stop edges which define a stop, in which a drive means is connected to the fixture and drives the latter in a direction substantially parallel to the load-bearing surface and in which the device arranges the paving stones at a mutual distance a on the load-bearing surface in their longitudinal direction in a first row which extends substantially parallel to the fixture, and a second row parallel to the first row and offset to the first row, and in which the rows are advanced simultaneously by the fixture in order to produce the layer portion comprising a herringbone pattern made up of a continuous row of paving stones.

[0035] To this end, the invention provides a method for producing a row of a layer portion of elongate paving stones in a herringbone pattern comprising one or more of the following steps;

- positioning paving stones at a mutual distance in two rows which are situated next to one another in their longitudinal direction,
- directly pushing a fixture against the row opposite the fixture,
- exerting a pushing force on the paving stone at an end of the paving stone in order to determine the direction in which the paving stone rotates in the direction of a stop edge,
- directly pushing the fixture against an outer paving stone of the row which is furthest from the fixture, with the distance between adjacent points of contact of the fixture being substantially equal to the length of the paving stone plus the distance,
- determining a position of each paving stone in the row of a layer portion by means of the fixture,
- following positioning of the paving stones, moving a positioning device away from the paving stones so that it comes away from the paving stones, after which the fixture pushes the paving stones against a section of the layer portion which has already been laid,
- advancing a guide means by means of the fixture.

[0036] In one embodiment of the method according to the invention, the distance between adjacent points of contact of the fixture is substantially equal to the length of the paving stone plus the distance a.

[0037] The invention furthermore relates to a handling device for a batch of paving stones for use in a device for producing a layer portion of paving stones in a pattern, in which the handling device for a batch of paving stones comprises:

- a main frame which extends along the batch of paving stones,
- a lifting means which is adjustably connected to the main frame for handling the handling device for a batch of paving stones,
- frame parts which are adjustably connected to the main frame by means of attachment means, the frame part having a herringbone pattern and extending along a continuous row of paving stones in a herringbone pattern which preferably form part of the batch of paving stones in a herringbone pattern, and frame parts being arranged at a mutual distance in such a manner that a gap is provided between frame parts in order to allow a view of the row of paving stones in a herringbone pattern,
- clamping means for clamping the paving stones, preferably vacuum clamps provided with a vacuum chamber which extends over a single paving stone.

[0038] The handling device for a batch of paving stones serves to move a batch of paving stones in a herringbone pattern from a store to the street paving, with the batch connecting to the street paving.

[0039] Since each frame part extends over a continuous row of paving stones in a herringbone pattern, it is possible to adjust the handling device to different formats of paving stones and/or to dimensional variations of a batch of paving stones. Adjusting the handling device comprises moving a frame part with respect to the main frame and preferably moving several frame parts with respect to the main frame and more preferably also moving frame parts with respect to one another.

[0040] Since each of the frame parts extends along a continuous row of paving stones in a herringbone pattern

and due to the fact that the frame parts are arranged at a distance with respect to one another, it is possible, during operation, to see the row of paving stones and the periphery of the entire batch of paving stones. This facilitates positioning of the batch of paving stones during paving and makes it easier to determine a fault, such as for example a vacuum clamp clamping a paving stone insufficiently or not at all.

[0041] If the frame part has a zigzag shape, there is an optimum overlap with a continuous row of paving stones in a herringbone pattern which forms a good starting point for providing the frame parts with vacuum clamps and for clamping the paving stones with these vacuum clamps. Incidentally, it is also possible to use other clamps, such as for example a hydraulic clamp.

[0042] As the clamps, in this case vacuum clamps with vacuum chambers which extend over a single paving stone, act on only one paving stone, the adaptability of the handling device is improved further.

[0043] The invention furthermore relates to a device provided with one or more of the characterizing features described in the attached description and/or illustrated in the attached drawings.

[0044] The invention furthermore relates to a method comprising one or more of the characterizing steps described in the associated description and/or illustrated in the associated drawings.

[0045] It will be clear that the various aspects mentioned in this patent application can be combined and may each be considered individually for a divisional patent application.

Short description of the figures

[0046] The attached diagrammatic figures illustrate various embodiments of a device according to the invention, in which:

Fig. 1a shows a paving machine in perspective;
Fig. 1b shows a paving machine in top view;
Figs. 2a-c show a diagrammatic top view of the paving machine, in which the fixture is mirror-symmetrical to Fig. 1b, in various stages of construction of the layer portion;
Fig. 3 shows a positioning device in perspective from the bottom;
Fig. 4 shows a cut-away view of the pusher plate;
Figs. 5a-c show a top view of the profiled plate and left-hand and right-hand profiled pusher plate;
Figs. 6a-b show a detail of the attachment of the guide means from Figs. 2a-c;
Fig. 7a shows a handling device for a batch of paving stones in perspective;
Fig. 7b shows the handling device for a batch of paving stones from Fig. 7a in top view;
Fig. 8a shows a perspective view of a frame of a handling device from Figs. 7a, b;
Fig. 8b shows a top view of the frame from Fig. 8a;
Fig. 9a shows a top view of a frame part of a handling device from Figs. 7a, b,
Fig. 9b shows a side view of the frame part from Fig. 9b.

Description of embodiments

[0047] Figs. 1a-b show a perspective and a top view, respectively, of a paving machine. The paving stones 11 intended to be laid as street paving are placed in bulk into a container 13. As a result thereof, the paving machine is suitable for re-using paving stones when repaving street paving. From the container 13, the paving stones are placed on a conveyor belt 12 which passes the paving stones 11 along the container, in this case in the direction of a chute 14. Via the chute 14, the paving stones are then moved to an opposite side by means of a pushing cylinder (not shown). At the chute 14, a cleaning device (not shown) is provided in order to brush and scrape off any dirt from the paving stones. This makes the machine suitable for re-using paving stones when repaving street paving. By means of a conveying means (not shown), the paving stones are finally conveyed in the direction of the positioning device 10. The positioning device 10 divides the paving stones into two parallel rows. The paving machine places the paving stones 11 onto a fixed load-bearing surface 8 in a layer portion 9, in this case in a herringbone pattern. The plate 8 is provided with holes in order to be able to dispose of any sand and grit which may be present on the paving stones 11. The plate 8 is provided with guiding beams 7 which contribute to producing the layer portion 9 and keeping the paving stones 11 together.

[0048] Figs. 2a-c show a diagrammatic top view of paving machine in different stages of construction of the layer portion 9. The fixture 2 is in this case mirror-symmetrical with respect to fixture 2 in Fig. 1b. The supply of the paving stones (not shown here) takes place from, seen in Figs. 2a-c, below and, as a result, the positioning device will also be arranged mirror-symmetrically. This is the case when processing new and clean paving stones which do not have to pass through the cleaning device at the chute 14 from Fig. 1b. The clean paving stones will be moved to positioning device 10 in line with conveyor belt 12. The paving stones 11 are placed in two rows C, D by the positioning device 10 from Figs. 1a-b. The paving stones are placed lengthwise in such a manner that they form rows C, D. Two paving stones 11 are placed a distance a apart. The two adjacent parallel rows C, D of paving stones, each row C, D in this case comprising three paving stones 11, are arranged in front of a fixture 2 which is in an inoperative position while the two parallel rows C, D of paving stones are being formed. The rows C, D are offset with respect to one another over a distance which is smaller than the length 1 of a paving stone. Each of the paving stones 11 from row D in this case adjoins two paving stones 11 from row C, except for the outer paving stone 11 in row D which adjoins only

one paving stone from row C. When the two rows C, D have been formed, the positioning device 10 moves up and away from the two rows C, D, so that the paving stones are free and can be advanced by the fixture 2. From the inoperative position, the fixture 2 is moved to the two rows of paving stones C, D by the drive means 1, with the paving stones 11 from the first row C which adjoins the fixture 2 turning about the points of contact 5 of the fixture 2. An outer paving stone from the second row D which is furthest from the fixture 2 turns about a correspondingly outermost point of contact 5 of the fixture 2. The other paving stones from the second row D turn about corners of paving stones from the first row C. The fixture 2 moves to the position in Fig. 2b where the layer portion 9 starts and forms a continuous row of paving stones 11 in a herringbone pattern. The distance between two adjacent central points of contact 5 of the fixture 2 is approximately equal to the length (1) of the paving stone plus distance a.

[0049] Distance a is preferably smaller than the length (1) of the paving stone, more preferably smaller than half the length (1) of the paving stone in order to be able to lay the paving stones in the desired pattern.

[0050] In Fig. 2c, the process of producing the layer portion 9 has progressed by one working cycle of the fixture 2 and the layer portion has grown by one continuous row of paving stones in a herringbone pattern. The two rows C, D together then form one continuous row of paving stones in a herringbone pattern in the layer portion 9.

[0051] Fig. 3 shows a positioning device 10 in perspective from the bottom. Frame portion 18 is accommodated in frame 17 in a displaceable manner. Frame portion 18 is moved to and fro by cylinder 15 between a first and second position. Frame portion 18 is provided with pushing means or stops 16. When frame portion 18 is in the first position, the stops 16 are near a side of the machine. In the second position of the frame portion 18, the stops 16 are situated in a more central position with respect to the machine. When frame portion 18 is in the first position, the paving stones 11 are pushed into the rows C, D sideways, transversely to the longitudinal axis of the positioning device 10. The frame portion 18 now moves to the second position in which the paving stones 11 are carried along by the stops 16 to a subsequent position in the row. The frame portion 18 then moves back to the first position, with the stops 16 passing the paving stones. This process is repeated until the rows C, D are full, in this case containing three paving stones 11 each. It is possible for a cylinder 28 from Fig. 1b to in each case bring a paving stone 11 within reach of the first stop 16 in the second row D, following which the frame portion 18 moves from the first to the second position. The cylinder 28 then performs a stroke of approximately three-quarters of the length of a paving stone 11 in order to move the paving stone to a paving stone position 11a. The stops 16 are pivotably attached to frame portion 18. When the frame portion 18 moves from the first to the second position, the stops 16 hit a limiting means, as a result of which the paving stones 11 can be pushed by the stops. When the frame portion 18 moves from the second to the first position, the stops 16 in this case pivot upwards, away from the paving stone 11 and in the direction of frame portion 18, with the stops dragging over the paving stones 11. It is possible that a stop 16 is slightly prestressed in the direction of the limiting means. If desired, the thickness of the stops 16 can be varied in order to influence the position of the paving stones 11 in a row C, D with respect to one another. Positioning device 10 is furthermore provided with capstans 19. The capstans 19 are connected to frame 17 by means of a height-adjustable leg. During operation of the positioning device 10, the capstans 19 rest on the steel plate 8 from Fig. 1a. By using the capstans, it is possible to move the positioning device 10 in its entirety up and away from the plate 8 by, for example, moving a wedge under the capstans 19. The capstans then rest on plate 8 by means of the wedge.

[0052] Figs. 4 and 5a-c show the fixture or fixture parts. Fig. 4 shows a cut-away view of the fixture 2. Figs. 5a-c show fixture parts and in particular a top view of a profiled plate 3, a left-hand 3a and right-hand profiled pusher plate 3b, respectively. The fixture parts 3, 3a, 3b are in this case made from steel. The profiled plate is connected to the drive means 1 by means of the securing holes 21. The left-hand and right-hand profiled pusher plate 3a, 3b are displaceably attached to the profiled plate 3. To this end, slots 20 and securing holes 22 are provided, through which a bolt (not shown) can be passed. Releasing the bolt by loosening, for example, a wing nut, makes it possible to slide the pusher plates with respect to the profiled plate. The angle profiles 23, 24 provide guidance during sliding of the pusher plates over the profiled plate 3 and secure the fixture parts 3, 3a, 3b at a good angle with respect to one another. By sliding the pusher plates 3a, 3b, it is possible to adjust the fixture 2 to the size of the paving stones. The fixture parts 3, 3a, 3b are provided with stop edges 4 which, in operation, push the paving stones 11 and define or determine a position in the plane and an angular rotation. Stop edges 4 which adjoin one another are generally at a right angle 2α to one another, except for the outer pairs of stop edges which are at a smaller angle to one another. The outer stop edges 4 are at an angle β with a line at right angles to the longitudinal direction of the fixture 2. The angle β is between 40° and 45°. As a result thereof, the outer paving stones 11 are, as it were, pushed in the direction of the centre of the layer portion 9, which ensures that the paving stones 11 in the layer portion 9 tightly adjoin one another. Points of contact 5 of fixture parts 3, 3a, 3b touch the paving stones 11 first and form a point of rotation for the paving stones from row C in Fig. 2a. An outer point of contact 5 of an outer fixture part 3b forms a point of rotation of a corresponding outer paving stone 11 in row D from Fig. 2a. To this end, this point of contact 5 of pusher plate 3b extends in row C over a distance b, as is shown in Fig. 2a. The outer stop edge 4, which adjoins the outer point

of contact 5 which extends in row C over a distance b, has a length which is greater than the length of a paving stone to be processed, preferably the length is approximately one and a half times the length of a paving stone to be processed. As a result of the length of the outer stop edge 4 being greater than the length of the paving stone, it is possible for the fixture 2 to act on both rows of paving stones C and D in Fig. 2a simultaneously. By simultaneously acting on both rows of paving stones C and D from Fig. 2a, a continuous row of paving stones in a herringbone pattern is formed by one movement of the fixture 2 and is pushed against the layer portion 9. Pusher plate 3b is situated at the end of the rows C, D, that is to say at the positions in the rows which are filled with a paving stone 11 last. Distances between adjacent points of contact 5 are approximately equal to the length 1 of a paving stone 11 plus the distance a between two paving stones in a row C, D, as illustrated in Fig. 2a. Where stop edges 4 adjoin one another at an angle profile 23, 24, a recess 27 is provided to absorb dimensional variations and/or irregularities of the corner edge of a paving stone. The shortest distance between two parallel stop edges 4 is approximately equal to the length 1 of the paving stone 11 which is processed by the machine.

[0053] Figs. 6a-b show a detail of the attachment of the guide means 7 from Figs. 2a-c. The guide means 7, in this case a u-shaped profile, is displaceably connected to plate 8. To this end, the cam 25 connected to the plate 8 engages with the cam track 26. When the guide means moves in a direction away from the fixture 2 in Fig. 2a, the cam 25, together with cam track 2, forces the guide means 7 in the direction of the centre of the layer portion 9 from Fig. 2c. Possibly, the guide means is pushed by the fixture 2 in order to simultaneously also compress the batch when the layer portion 9 grows, thus ensuring that the paving stones 11 in the layer portion 9 adjoin one another tightly. Furthermore, a spring (not shown) may be provided in order to prestress the guide means in the direction of the fixture 2 and away from the layer portion 9. If desired, several cams 25 may be used in a cam track 26 in order to prevent undesirable rotation of the guide means 7 with respect to the plate 8. The angle at which the cam track 26 is with respect to the guide means 7 can be changed in order to influence the degree to which the batch is compressed.

[0054] Figs. 7a and 7b show a handling device 29 for a batch of paving stones in perspective and top view, respectively. The handling device 29 for a batch of paving stones serves to handle a batch of paving stones which is composed of paving stones 38 in a herringbone pattern. The handling device 29 for a batch of paving stones here comprises a frame 30 which extends over the batch of paving stones. A handgrip 37 is provided at a working height. The handgrip 37 is connected to the frame and positioned at a distance therefrom. The handling device 29 for a batch of paving stones comprises frame parts 31 which extend above a continuous row 33 of paving stones 38 in a herringbone pattern. The frame parts 31 are displaceably connected to the frame 30 in such a manner that the handling device 29 for a batch of paving stones can be adjusted to the format of the paving stone 38 or can be adjusted to absorb dimensional tolerances of paving stones. In practice, the dimensional tolerances of a street paving stone can be approximately 5 mm. Here, the frame parts 31 are arranged at a distance to one another in order to form a viewing hole 35 or gap 35 which allows a view of the paving stones. Furthermore, the handling device 29 for a batch of paving stones here comprises a fluid line 36 to produce a vacuum on the vacuum clamps.

[0055] Figs. 8a and 8b show a frame 30 of a handling device according to the invention in perspective and top view, respectively. The frame 30 here consists of a central profiled section 40 and two outer profiled sections 39, 41. The central profiled section 40 and the two outer profiled sections 39, 41 are connected to one another at an end by means of a transverse profiled section 42. The central profiled section 40 is provided with a lifting means 32. The lifting means 32 is displaceably mounted on the central profiled section 40 in order to be able to align the lifting means 32 and the centre of gravity of the batch of paving stones. Here, the lifting means 32 is displaceable in the longitudinal direction of the central profiled section 40 and the wall 45 thereof adjoins the central profiled section 40. Following alignment of the lifting means 32 with the centre of gravity of the batch of paving stones, the lifting means is fixedly connected to the central profiled section 40 by means of a securing means, such as a bolt 46. The frame 30 is provided with connecting points 44, 43, in this case on the central profiled section 40 and the transverse profiled section 42, for connecting a fluid line 36. Preferably, fluid lines are incorporated in the frame 30, more preferably profiled section 40 and/or the two outer profiled sections 39, 41 and/or the transverse profiled section 42 form part of a fluid line.

[0056] Figs. 9a and 9b show a top view and a side view, respectively, of a frame part 31 of a handling device 29 according to the invention. The frame part 31 here has a zigzag shape, as a result of which the overlap with a row 33 of paving stones in a herringbone pattern is optimized. This offers a good starting point for using vacuum clamps 34 which are provided on legs 47, 48. Each leg 47, 48 is here provided with two vacuum clamps 34. Each vacuum chamber 53 of a vacuum clamp 34 here is connected to one paving stone, which provides a better starting point when adjusting the handling device 29 to the format of the paving stone. The frame part 31 is provided with a connection 52 for a fluid line 36 to pass a vacuum on to the vacuum clamps 34. Preferably, fluid lines are incorporated in a frame part 31, more preferably a frame part 31 forms part of the fluid line. The frame parts 31 are displaceably connected to the frame 30 by means of square rings 49 which in this case adjoin the central profiled section 40 and the two outer profiled sections 39, 41. After the frame parts 31 have been adjusted with respect to one another in order to adjust the handling

device to the format of the paving stone, the frame parts 31 are connected to the frame 30 by attachment means 50, 51 which are known per se, such as for example clamping using a bolt.

[0057] It will be clear that the above description is given in order to illustrate the operation of preferred embodiments of the invention and not in order to limit the scope of the invention. On the basis of the above explanation, many variations which fall within the spirit and the scope of the present invention will be obvious to those skilled in the art.

Claims

1. Device for producing a layer portion (9) of paving stones (11) in a pattern, comprising a load-bearing surface (8) for supporting the layer portion, a fixture (2) comprising fixture parts (3, 3a, 3b) which are provided with stop edges (4) which define a herringbone-shaped stop for producing a layer portion of paving stones in a pattern, preferably a herringbone pattern, in which a drive means (1) is connected to the fixture and is designed to drive the fixture in a direction substantially parallel to the load-bearing surface and substantially at right angles to the fixture (2), in which there is furthermore provided a positioning device (10) designed to arrange paving stones (11) at a mutual distance (a) on the load-bearing surface (9) in their longitudinal direction in a first row (C) which extends substantially parallel to the fixture, and a second row (D) parallel to the first row and offset to the first row, and in which the stop edges (4) of the fixture (2) are designed to advance the rows (C, D) in order to produce a pattern made up of a continuous row of paving stones of the layer portion (9) .

2. Device according to Claim 1, in which an outer stop edge of the fixture is turned inwards through a correction angle (α minus β) with respect to a herringbone pattern formed by the stop edges, and in which the correction angle (α minus β) is preferably smaller than 5 degrees (< 5 °).

3. Device according to one of the preceding claims, in which means (20, 22, 23, 24) are provided so that the fixture parts can be adjusted with respect to one another in order to be able to produce different herringbone patterns using different paving stones.

4. Device according to one of the preceding claims, in which a guide means (7) is provided on either side of the load-bearing surface, parallel to the drive direction of the fixture, and in which the guide means is connected to the load-bearing surface in such a manner that when the guide means, from a starting position, is advanced in the drive direction of the fixture, the guide means likewise moves inwards.

5. Device according to Claim 4, in which a spring element is connected to the guide means in order to move the guide means in the direction of the starting position.

6. Device according to a preceding claim, in which a paving stone supplying device (12, 14) is furthermore provided to take paving stones to the load-bearing surface.

7. Device according to a preceding claim, in which the positioning device is designed to arrange the first and second rows of paving stones simultaneously.

8. Device according to a preceding claim, in which the fixture is designed such that points of contact (5) of the fixture touch paving stones from the first row and an outer paving stone of the second row at an end of the paving stone in order to determine the direction in which the paving stones rotate in the direction of the stop edges.

9. Device according to a preceding claim, in which the positioning device comprises a prepositioning means (28) designed to preposition a paving stone and bring it within reach of a pushing means (16).

10. Device for producing a layer portion of elongate paving stones in a herringbone pattern, in which a position of each paving stone (11) in a layer portion is determined by a fixture (2) which is drivably connected to a drive means (1).

11. Paving device for laying paving stones comprising a device for producing a layer portion of paving stones in a pattern according to a preceding claim.

12. Method for producing a row of a layer portion (9) of elongate paving stones (11) in a herringbone pattern comprising one or more of the following steps:

    - positioning paving stones at a mutual distance (a) in two rows (C, D) which are situated next to one another in their longitudinal direction,
    - directly pushing a fixture (2) against the row (C) opposite the fixture,
    - exerting a pushing force on the paving stone at an end of the paving stone in order to determine the direction in which the paving stone rotates in the direction of a stop edge (4),
    - directly pushing the fixture against an outer paving stone of the row (D) which is furthest from the fixture,
    - determining a position of each paving stone in the row of a layer portion by means of the fixture,
    - following positioning of the paving stones, mov-

ing a positioning device (10) away from the paving stones so that it comes away from the paving stones, after which the fixture pushes the paving stones against a section of the layer portion which has already been laid.

13. Method according to Claim 13, in which a guide means (7) is advanced by the fixture.

14. Handling device (29) for a batch of paving stones for use with a device according to a preceding claim, in which the handling device (29) for a batch of paving stones comprises:

- a main frame (30) which extends along the batch of paving stones,
- a lifting means (32) which is adjustably connected to the main frame (30) for handling the handling device (29) for a batch of paving stones,
- frame parts (31) which are adjustably connected to the main frame (30) by means of attachment means (49, 50, 51), the frame part having a herringbone pattern and extending along a continuous row (33) of paving stones in a herringbone pattern which preferably form part of the batch of paving stones in a herringbone pattern, and frame parts being arranged at a mutual distance in such a manner that a gap (35) is provided between frame parts (33) in order to allow a view of the row (33) of paving stones in a herringbone pattern,
- clamping means (34) for clamping the paving stones, preferably vacuum clamps provided with a vacuum chamber which extends over a single paving stone.

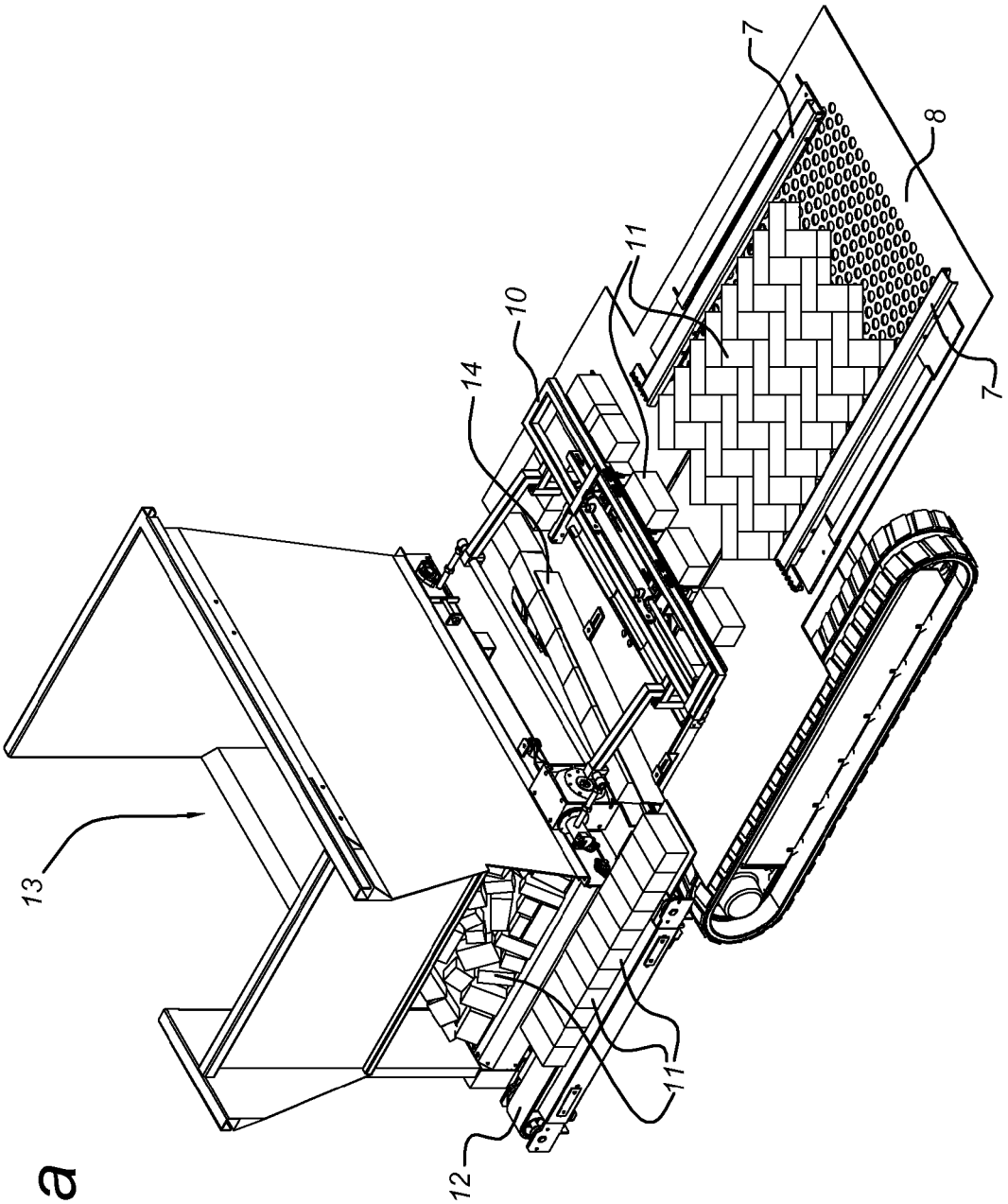

Fig 1a

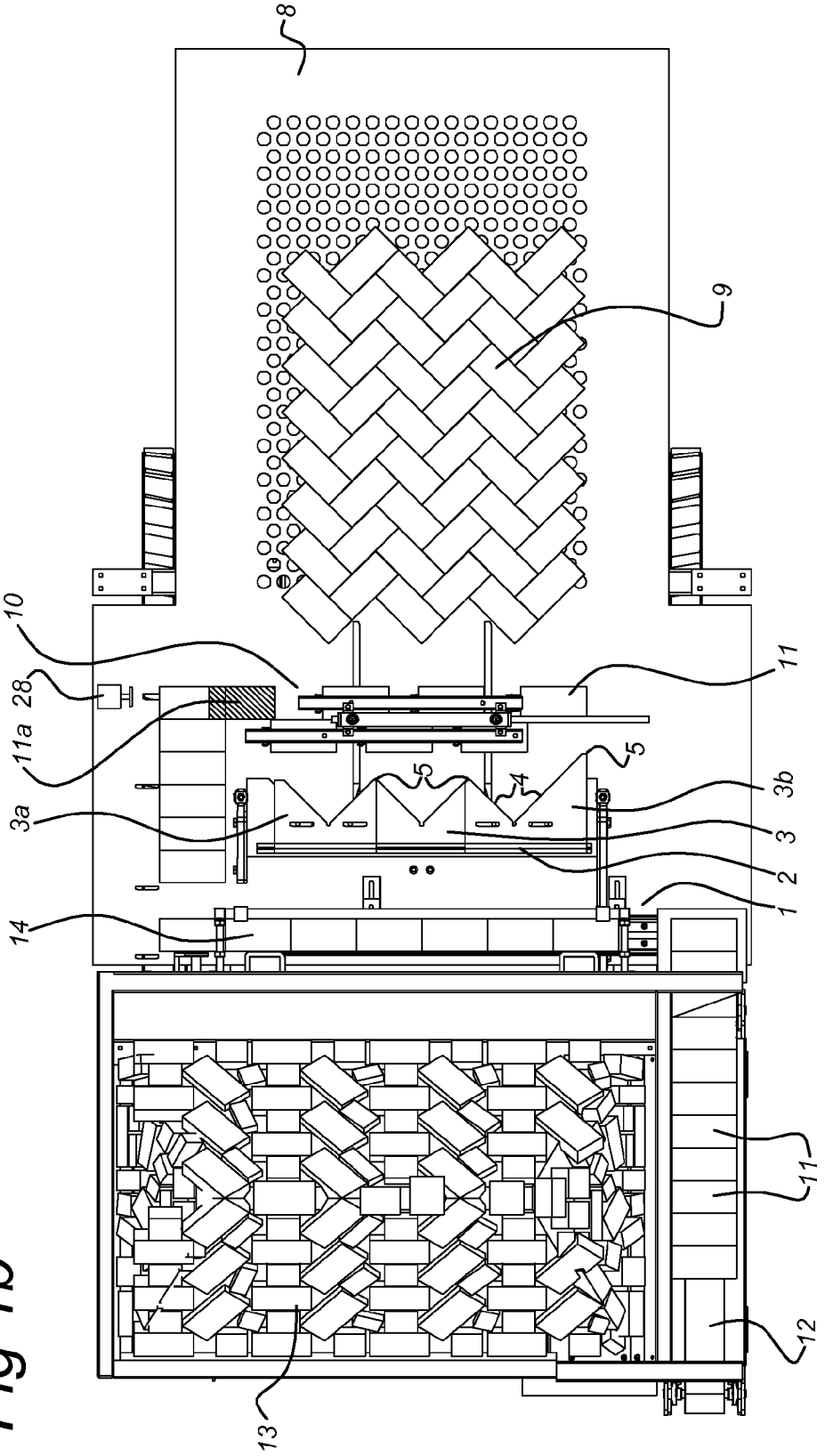

Fig 1b

Fig 2a

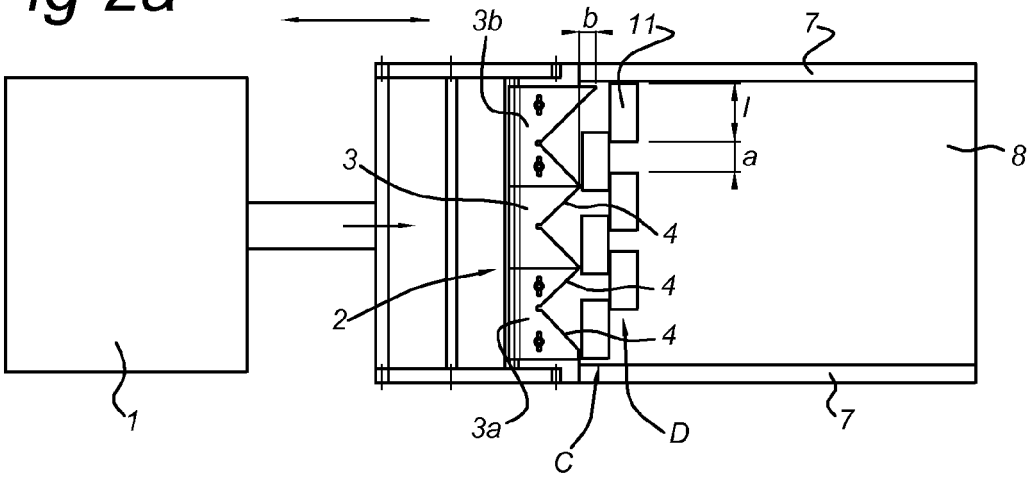

Fig 2b

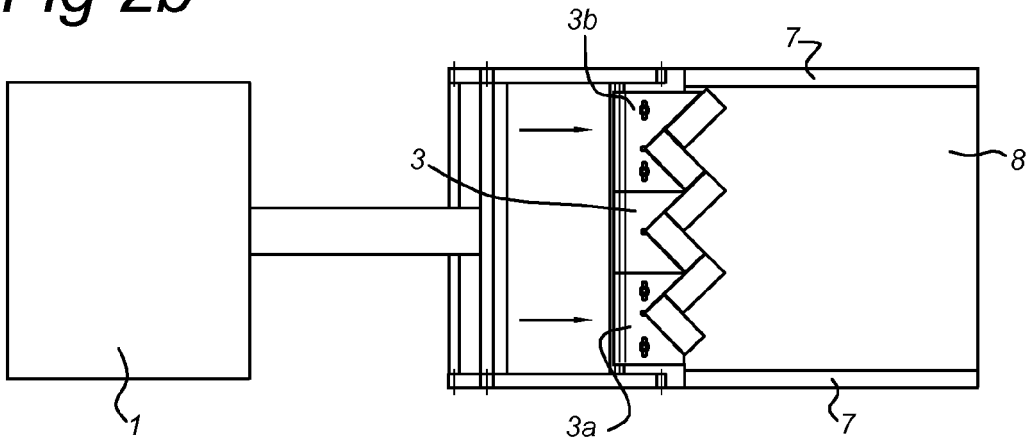

Fig 2c

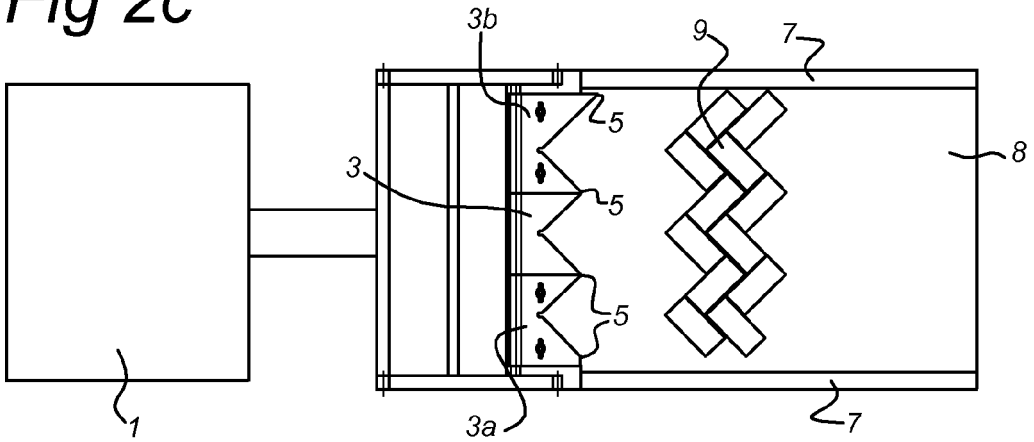

Fig 3

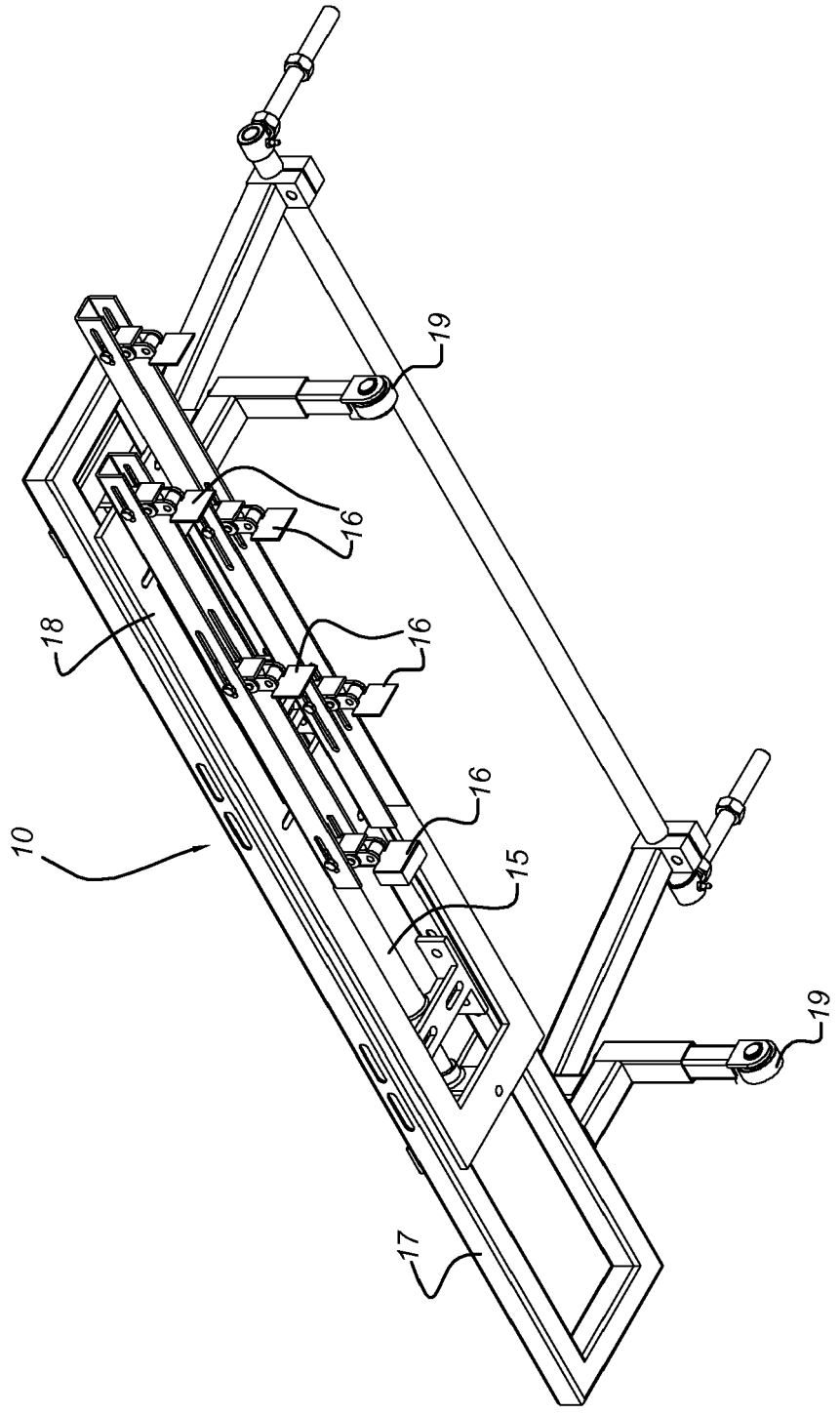

Fig 4

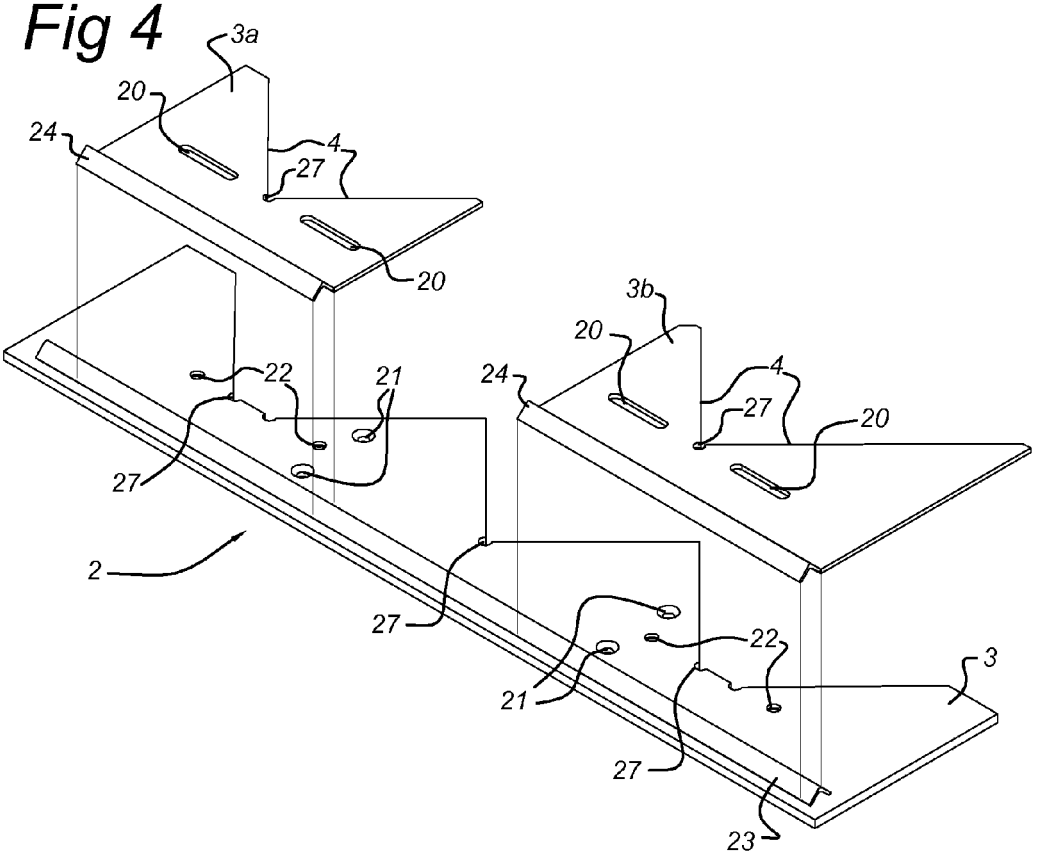
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Fig 5a

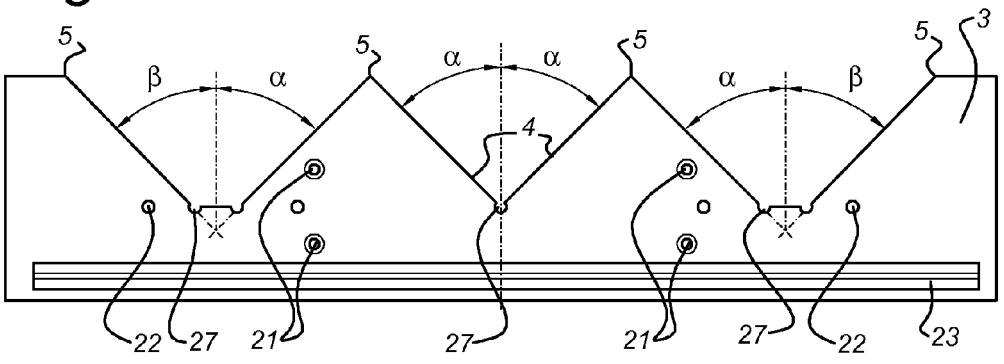
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Fig 5b

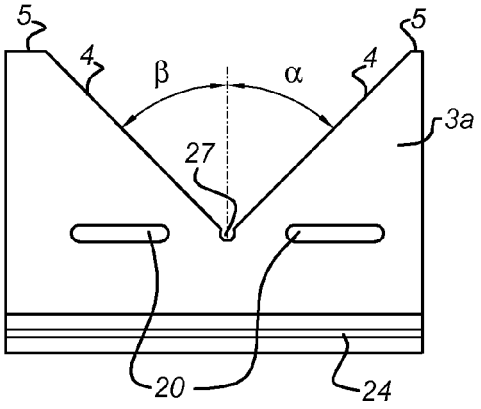


Fig 5c

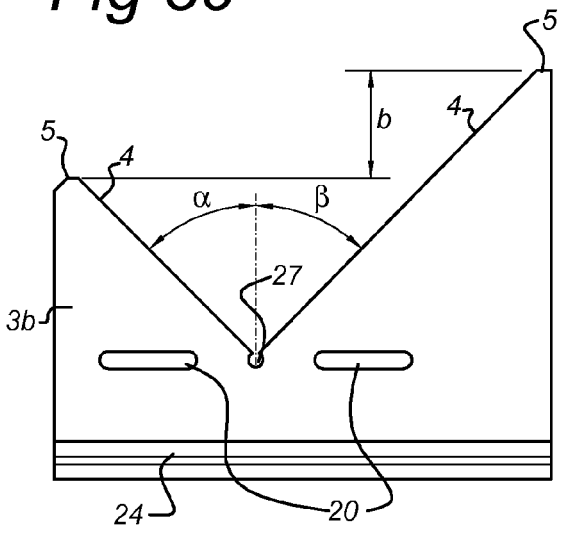


Fig 6a

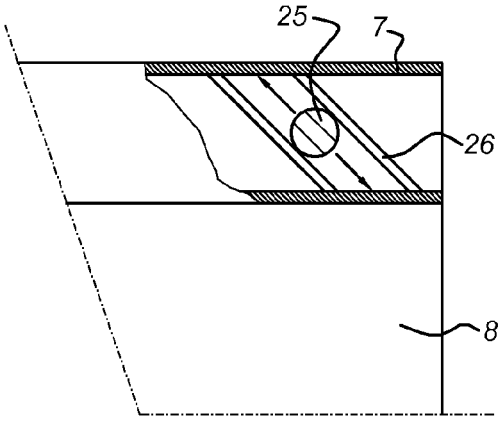


Fig 6b

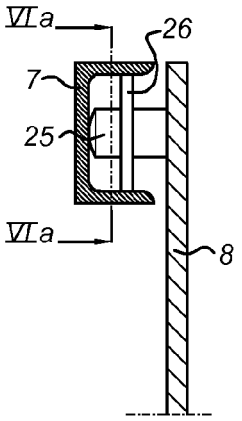


Fig 7a

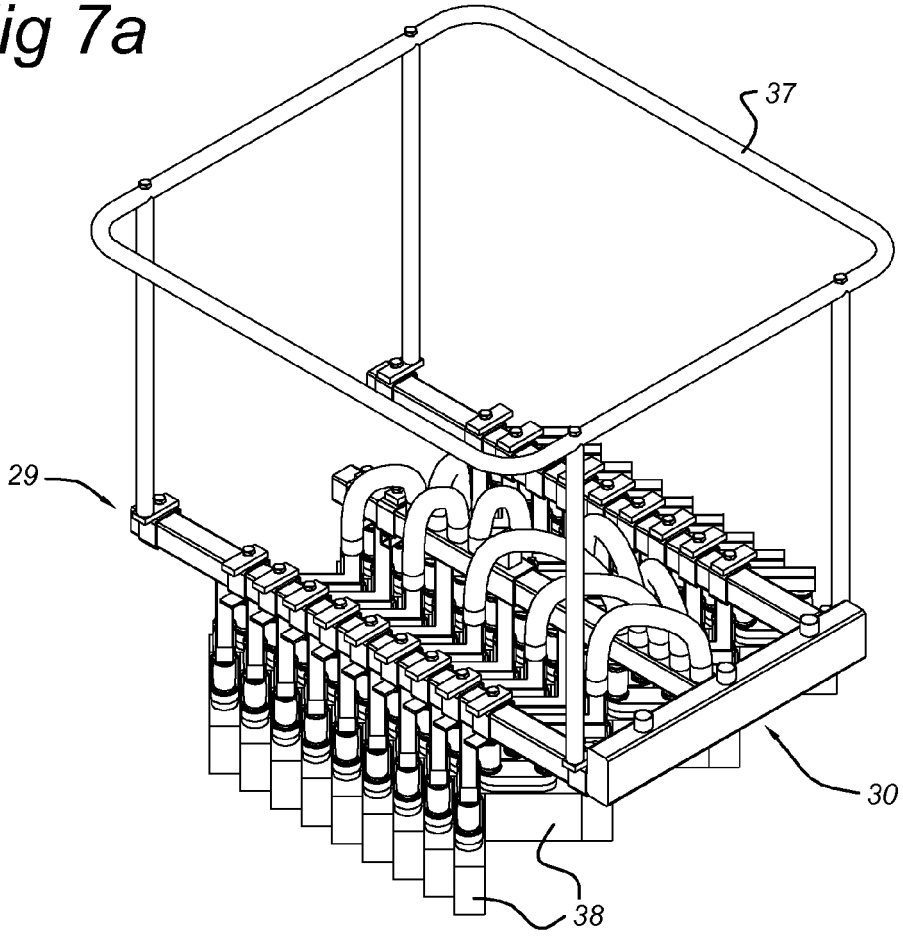


Fig 7b

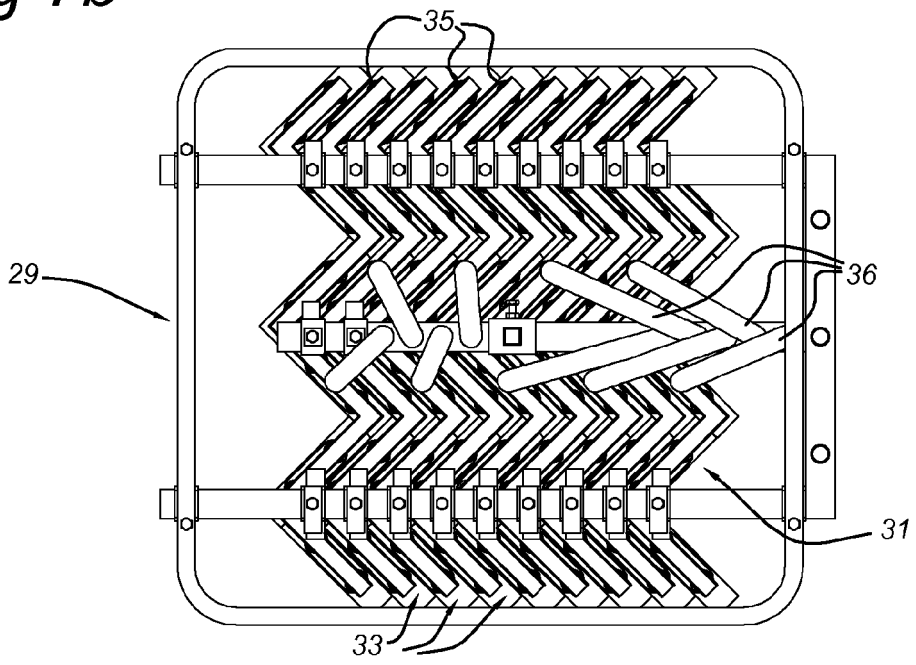


Fig 8a

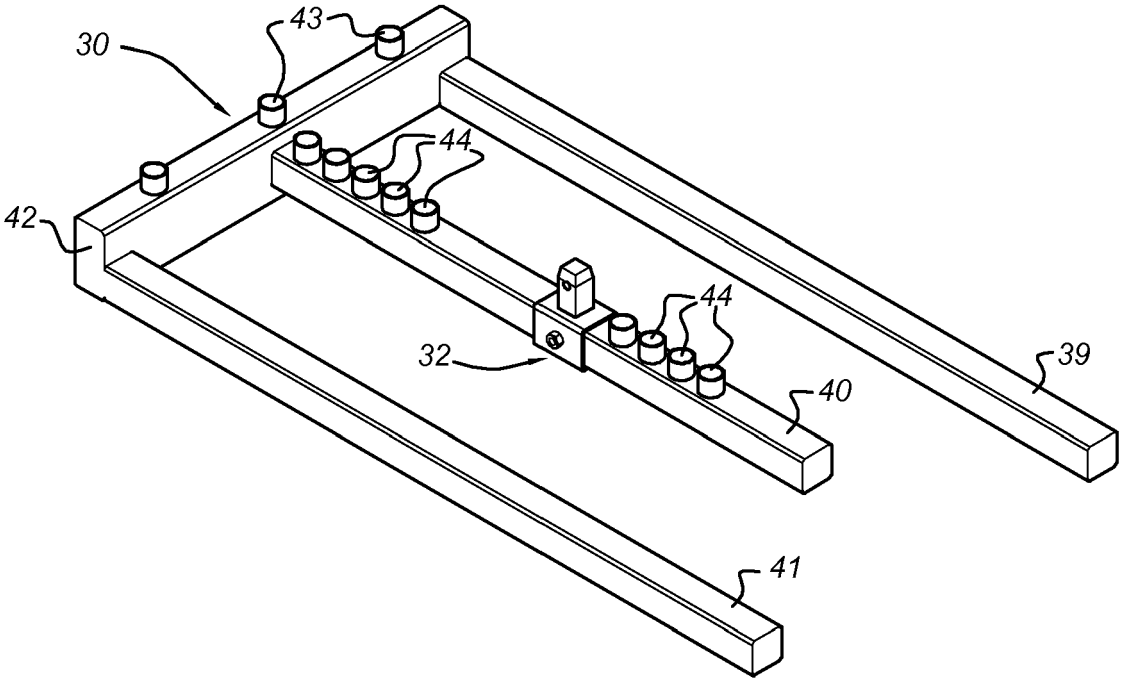
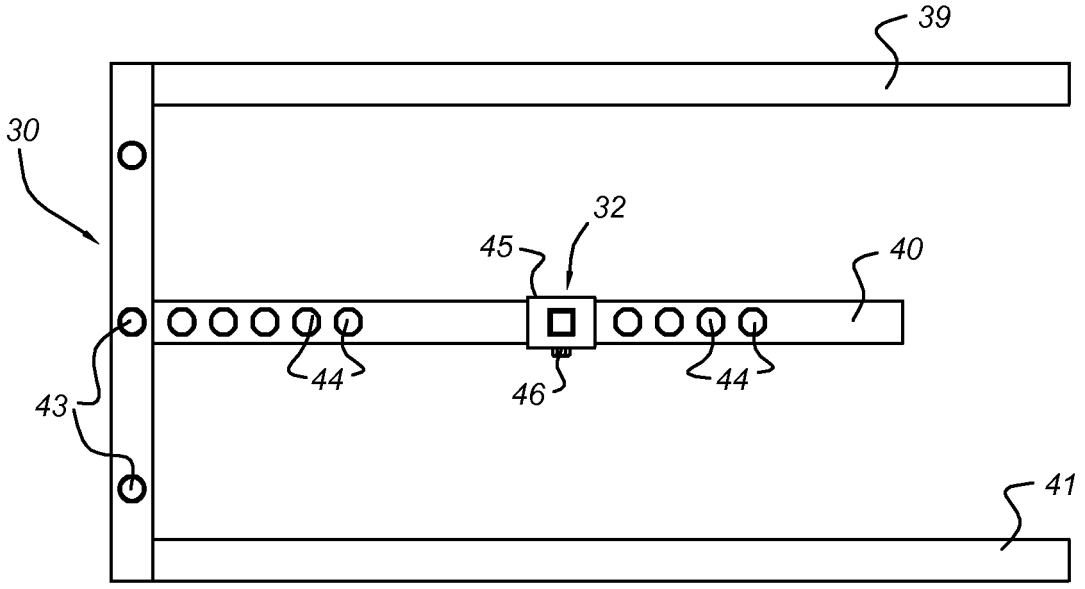


Fig 8b



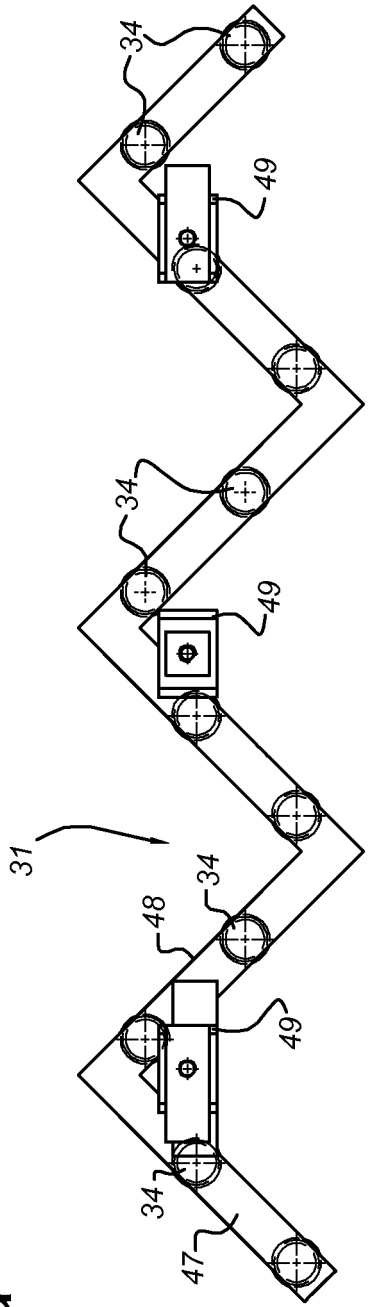

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Fig 9a

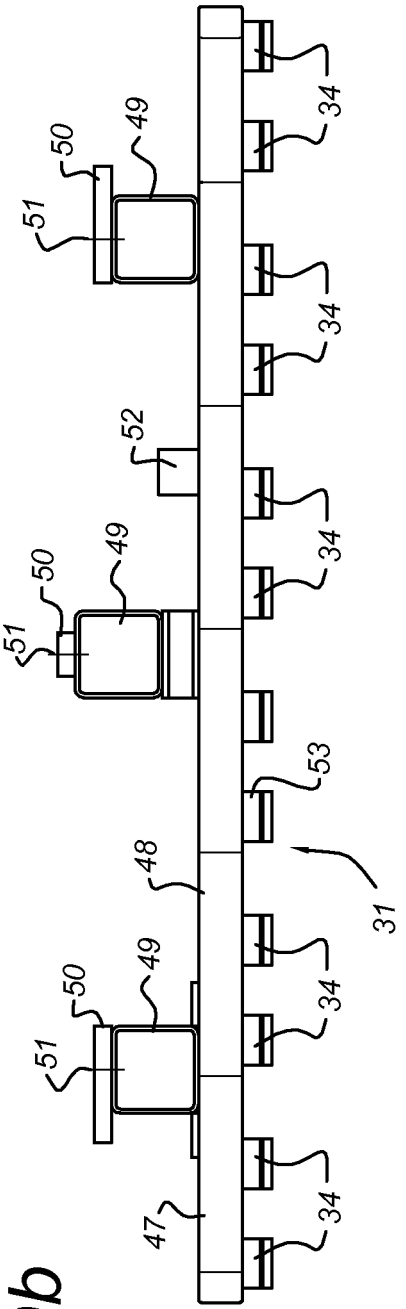
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Fig 9b

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PARTIAL EUROPEAN SEARCH REPORT

Application Number

which under Rule 63 of the European Patent Convention shall be considered, for the purposes of subsequent proceedings, as the European search report

EP 08 16 7055

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X	WO 03/104566 A (MARSHALLS MONO LTD [GB]; HALL JOHN CHRISTOPHER [GB]) 18 December 2003 (2003-12-18) * page 3, column 16 - page 5, column 8; figures 1-4 *	10-13	
D,X	NL 1 026 269 C2 (LUIJTEN AREND [NL]) 30 November 2005 (2005-11-30) * page 4, lines 1-35 * * page 8, line 15 - page 9, line 12; figures 1a,1b,1c,1g *	10-13	
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	-/--		TECHNICAL FIELDS SEARCHED (IPC) E01C

INCOMPLETE SEARCH

The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC to such an extent that a meaningful search into the state of the art cannot be carried out, or can only be carried out partially, for these claims.

Claims searched completely :

Claims searched incompletely :

Claims not searched :

Reason for the limitation of the search:

see sheet C

Place of search	Date of completion of the search	Examiner
The Hague	29 January 2009	Gallego, Adoración

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
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EPO FORM 1503 03.82 (P04E07)

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PARTIAL EUROPEAN SEARCH REPORT

Application Number
EP 08 16 7055

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INCOMPLETE SEARCH
SHEET C

Application Number
EP 08 16 7055

Claim(s) not searched:
23, 24

Reason for the limitation of the search (non-patentable invention(s)):

Subject-matter defined with reference to description and drawings

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Further limitation of the search

Claim(s) not searched:
23,24

Reason for the limitation of the search:

Subject-matter defined with reference to description and drawings

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 16 7055

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29-01-2009

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EPO FORM P0459

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- EP 0256269 A **[0006]**