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(54) **Paving machine**

(57) Device for creating a bond of paving elements, comprising a frame having a storage container for the paving elements, a laying surface for supporting the bond and means for transporting the paving elements in a main direction of the device from the storage container to the laying surface, wherein the storage container has a dis-

charge side where the paving elements can be discharged to the transporting means, **characterised in that** the storage container is placed over the transporting means and the discharge side of the storage container is situated at a side thereof that faces away from the laying surface.

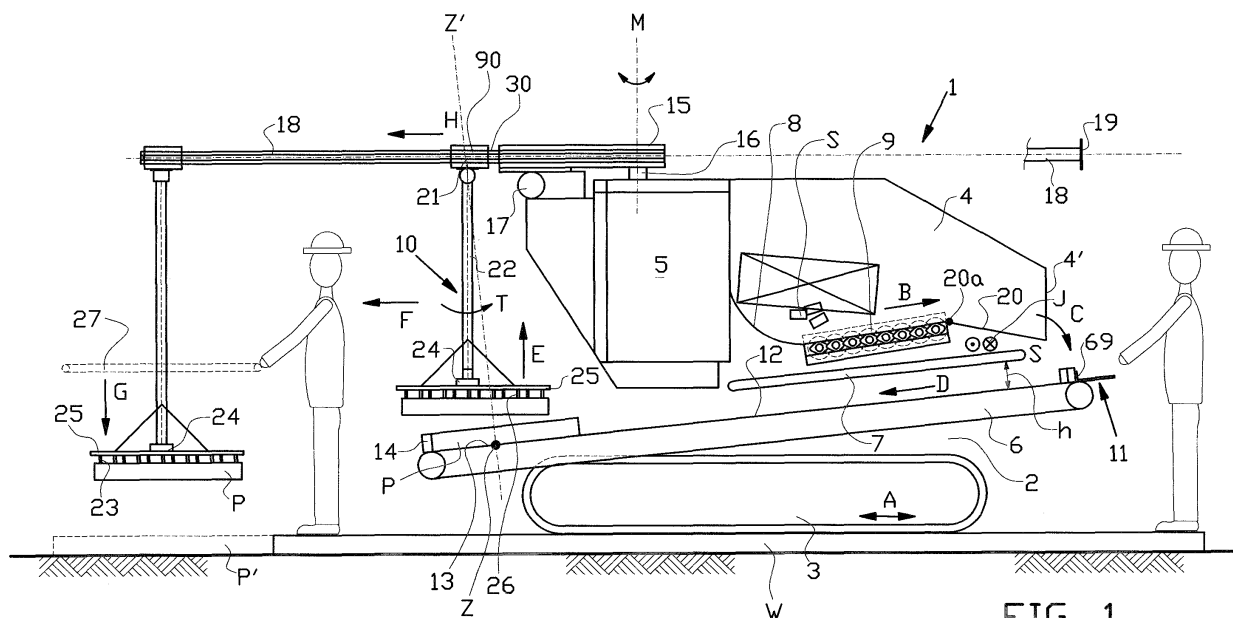


FIG. 1

Description

BACKGROUND OF THE INVENTION

[0001] The invention relates to a device for creating a paving from elements and to a method for creating a paving from elements. Paving elements are being used, coming from a stacked or randomly oriented stock of paving elements, such as paving stones or paving bricks of concrete or clay and tiles or slabs.

[0002] Such a device is known for, on a laying surface, creating a herringbone bond from paving bricks coming from a stock, and subsequently picking up said bond from the laying surface and placing said bond in a work, connecting to previously laid bonds.

[0003] Examples of such devices can be found in Dutch patent applications 84.01469, 86.00820, 86.02633 and 93.01484 and European patent applications 0.256.169, 0.164.146 and 0.640.721.

[0004] Recent devices, operating in simple manner, are described in Dutch patent 1026269 and European patent application 1.600.556. With the device shown therein the bricks are taken from a stock, placed on a longitudinal conveyor situated aside of the storage container and then turned in transverse direction and placed on a main conveyor in order to be passed to the laying surface in the transverse orientation thus obtained. Due to abutment against an end jig or a previously placed series of bricks, the bricks are turned into the slanted orientation desired for the herringbone bond, during incorporation in the bond.

[0005] Although said known device proved to function well there is a need for further simplification of the device and the method, considering the often limited room available near a work.

[0006] Furthermore there is a need for a device and method of the type mentioned in the preamble, with which several types and dimensions of paving elements can be processed.

[0007] Furthermore there is a need for a device and method of the type mentioned in the preamble with which different types of bonds of paving elements can be formed.

[0008] There is also a need for a device and method of the type mentioned in the preamble that is easy to operate/carry out.

SUMMARY OF THE INVENTION

[0009] It is an object of the invention to provide in at least one of these needs.

[0010] According to one aspect the invention provides a device for creating a bond of paving elements, comprising a frame having a storage container for the paving elements, a laying surface for supporting the bond and means for transporting the paving elements in a main direction of the device from the storage container to the laying surface, wherein the storage container has a dis-

charge side where the paving elements can be discharged to the transporting means, characterised in that the storage container is placed over the transporting means and the discharge side of the storage container is situated at a side thereof that faces away from the laying surface.

[0011] The device according to the invention can be compact in horizontal (process) direction, as the paving elements are transported below past the storage container to the laying surface. The vertical space over the transporting means is utilised for the stock. Furthermore when bringing the paving elements on the transporting means use is made of the potential energy, as a result of which when the paving elements are manually placed on or near the transporting means the burden on the workman is low.

[0012] The device can also be kept compact in the vertical sense when between the storage container and the transporting means a passage space for the paving elements is left open, which has a smallest height which at the most is a few times the height of the treated paving elements. Preferably said smallest height is 1.5 to twice the height of the treated paving elements. This increases the safety.

[0013] In an additional or alternative embodiment a passage space for the paving elements is left open between the storage container and the transporting means, which passage space can be adjusted as regards height, so that the optimal height for the paving elements in question can at all times be realised.

[0014] Treating the paving elements in the transition from the stock to the transporting means is enhanced when the transporting means extend in a direction opposite the main direction beyond the discharge side of the storage container. The workman then has room for guiding the bricks and the like downwards and is able to place the bricks with an overview on or near the transporting means.

[0015] In one embodiment at the upstream end of the transporting means one or more positioning surfaces are provided for one or more paving elements coming from the storage container. The positioning surface may be single or multiple and then be formed by a number of support surfaces, which considered in transverse direction, are spaced apart from each other. The positioning surface may offer a support to one or several series of paving elements that are transverse to the main direction. In one embodiment the positioning surface can be moved, particularly can be pulled away, for discharge of said series to the transporting means. Thus a workman is able to organize the paving elements with an overview and in a controlled manner. In another embodiment sliders are provided which push the bricks placed on the positioning surface from the positioning surface onto the transporting means.

[0016] In one embodiment the device is provided with means for detecting the presence of a brick on its support surface in question and giving a signal for it to a control

unit, wherein the control unit, depending on the signal received from the detecting means activates means for discharging the brick in question from the positioning surface. The control unit may be provided with a memory for storing the fact of discharging the brick in question, and be adapted for activating the discharge means again depending on receiving signals regarding the brick discharge from other support surfaces, in one embodiment not until said signals have been received for all other support surfaces.

[0017] Over the positioning surface a number of magazines can be placed for forming a number of accommodation spaces, each for a series of bricks supporting on each other, wherein the accommodation spaces are open at an upper side for receiving bricks coming from the storage container and are open at a bottom side for discharging bricks to the positioning surface, wherein the magazines preferably are placed to let the bricks therein support on a brick situated on the positioning surface, wherein the accommodation spaces preferably are separated from each other by separation means, such as walls, and/or wherein, preferably, the magazines, as regards location, can be adjusted in transverse direction and/or the magazines can be replaced. The magazines can be detached from each other or formed as one unity

[0018] In one embodiment at the discharge side of the storage container and the beginning of the transporting means at least at one side, preferably on either side, a side stop is present for a series of paving elements that are coming from the storage container and that are transverse to the main direction, which side stop preferably can be adjusted in transverse direction. In this way the workman is able to realise the exact desired position of the paving elements coming from the storage container, adjusted to the further process, particularly the bond formation on the laying surface.

[0019] In one embodiment at the discharge side of the storage container and the beginning of the transporting means one or more side stops are present for positioning the bricks coming from the storage container in transverse direction. Preferably, they can be moved in transverse direction between two positions corresponding with the desired paths of movement of the discharged bricks, should this be necessary particularly when forming a herringbone bond (see for instance figure 6 of EP 1.600.556). Said embodiment can advantageously be combined with the embodiment described two paragraphs above, wherein the side stops are not moved by the control unit until the control unit has detected that a brick has been discharged from all support surfaces.

[0020] In a compact embodiment the storage container, in the main direction, leaves the laying surface exposed, so that the laying surface remains properly reachable for equipment for placing the formed bond towards/in the work.

[0021] In a manner known per se the device may be provided with an end stop for the bond in the making on the laying surface. In one embodiment the end stop is

profiled in transverse direction and the profile is adjustable in that direction, so that adjustment to the dimensions of the paving elements is possible, particularly when forming a herringbone bond.

[0022] Preferably the position of the end stop is also adjustable in the main direction, so that the geometric centre of gravity of the formed bond can be adjusted, particularly to the pick-up equipment used.

[0023] The deployability of the device is increased when the end stop is replaceable by an end stop having a different shape and/or different dimensions, so that adjustment to the desired type and size of paving element, such as paving brick, tile or slab, and their dimensions, and the desired bond, such as herringbone, half-brick or stretcher, can take place at all times.

[0024] Creating the bond can further be enhanced when the device is provided with a side stop for the bond in the making on the laying surface, preferably on either side. Adjustment to the used paving elements and the desired bond can be facilitated when the position of at least one of the side stops is adjustable in a direction transverse to the main direction and/or in main direction.

[0025] In a simple and compact embodiment of the device according to the invention the transporting means also form the laying surface. The paving elements are then touched as little as possible in the entire process.

[0026] The laying surface may be sloping in the main direction.

[0027] According to a further aspect the device is provided with a pick-up device for picking up a completed bond from the laying surface and transferring it into the work, wherein the pick-up device comprises a framework provided with pick-up means for the paving elements in the completed bond, wherein the framework is suspended with a suspension from a substantially horizontal outrigger, wherein the suspension is movable along the outrigger, wherein the outrigger is connected to a support on the frame and can be moved along it in substantially horizontal direction between a retracted position situated above the storage container and a position that is extended from the storage container. The drive for the outrigger can as a result be kept simple.

[0028] In one embodiment thereof the suspension itself is provided with means for driving the suspension along the outrigger. Operation means can in that case be provided on the framework for operating the drive means of the suspension. When the workman operates the pick-up device for transferring the bond to the work, he is able to carry out all operational actions at the framework.

[0029] In one embodiment, wherein the device is provided with means for securing the suspension at the support or the immediate vicinity thereof of the frame, after securing the suspension the outrigger can be retracted by operating the drive at the suspension.

[0030] In one simple embodiment the outrigger is provided with a rack and the suspension is provided with a pinion cooperating therewith.

[0031] The support can be rotatable on the frame about a substantially vertical centre line, preferably by means of a motor on the device.

[0032] Further adjustment to the size and/or shape of the paving elements to be used can take place when the pick-up device present for picking up a completed bond from the laying surface and transferring it into the work, comprises a framework that is provided with pick-up means, such as suction cups, for the paving elements in the completed bond and furthermore is provided with means for adjusting the mutual distance of the pick-up means.

[0033] In one embodiment of the device according to the invention the storage container is provided with means for supplying the elements to the discharge side, wherein the supply means are active in a direction opposite the main direction.

[0034] According to a further aspect the invention provides a device for creating bonds of paving elements, comprising a frame having a laying surface for forming the bond, and means provided on said same frame for moving the elements to the laying surface, in a main direction, wherein the frame, over and spaced apart from the moving means, supports a storage container for the elements for forming a passage for the elements coming from the storage container.

[0035] According to a further aspect the invention provides a method for creating a bond of paving elements, wherein the elements are placed in a storage container that is positioned over a conveyor, spaced apart therefrom, wherein the elements are taken out of the storage container and placed on the conveyor in a given orientation, are transported in said orientation by the conveyor below past the storage container to a laying surface, and are included in the bond on the laying surface.

[0036] In one embodiment thereof the elements when being included in the bond, are altered in orientation and/or position in transverse direction, such as for creating a herringbone bond.

[0037] In another embodiment the elements when being included in the bond retain their orientation and/or position in transverse direction, such as when creating a half-brick or stretcher bond, (for paving bricks or tiles) or a basketweave bond.

[0038] The aspects and measures described in this description and the claims of the application and/or shown in the drawings of this application may where possible also be used individually. Said individual aspects, such as the end stop, the side stops, the pick-up device and its suspension and other aspects may be the subject of divisional patent applications relating thereto. This particularly applies to the measures and aspects that are described per se in the sub claims.

SHORT DESCRIPTION OF THE DRAWINGS

[0039] The invention will be elucidated on the basis of a number of exemplary embodiments shown in the at-

tached drawings, in which:

Figure 1 shows a schematic side view of an exemplary embodiment of a device according to the invention;

Figure 2 shows an isometric view of a further elaborated embodiment of a device according to the invention;

Figure 3 shows a top view of the device of figure 2;

Figure 4 shows a top view of the positioning area of the device of figures 2 and 3;

Figures 5, 5A and 5B-D show a top view of the end of the device of figures 2-4 where the bond is formed, without and with a pick-up unit, respectively, and a detail in a number of views;

Figures 6A-D show a number of schematic illustrations of bonds of paving elements to be created with a device;

Figures 7A and 7B show a side view and a top view of an alternative arrangement for the positioning area;

Figures 8A-C are side views of an alternative arrangement for the positioning area; and

Figure 9 shows a schematic view of two consecutive steps, in top view, in an example of the process of discharging bricks to a conveyor in a device according to the invention.

DETAILED DESCRIPTION OF THE DRAWINGS

[0040] The paving machine 1 shown in figure 1 is automobile in directions A and comprises a frame 2 borne by caterpillar tracks 3. The frame 2 bears chamber 5 for motors and their power supplies that are not further shown, for activating the various drives of the machine 1. For the machine 1 the feed side, on the right-hand side of the drawing, and the exit side, on the left-hand side of the drawing, can be discerned. At the feed side of the chamber 5 the frame 2 supports a hopper 4, which has a wall 8 and a bottom 9, which is built up from series of star wheels placed on parallel, driven shafts in order to move bricks S in the hopper 4 in the direction B. A sloping, open bottom 20 of parallel bars connects to the bottom 9, which open bottom discharges the bricks S through an opening forming the discharge side 4' of the hopper 4. Below the bottom 9 and the slope 20 a belt conveyor 7 is positioned, which collects sand coming from the bricks S and discharges it in transverse direction J to a side of the machine. The angle of the slope 20 can be adjusted, wherein the slope at the location of 20a hinges

with the hopper 4.

[0041] Below, in front of the discharge side 4', there is a positioning area 11 further to be discussed on the basis of figure 4, where a workman is able to grab the bricks S presented at the discharge side 4' and move them in the direction C in order to position them for further treatment. The height of the positioning area 11, particularly the positioning surface 69 to be further discussed, in this case corresponds with the workman's hip or belly, for instance 1 m, but can be adjusted using means that are not further shown.

[0042] At the positioning area 11 a conveyor 6 starts, extending slightly downwardly inclined over the full length of the machine 1 and running with the belt 12 from the positioning area 11 in the direction D below past the hopper 4 and the chamber 5 in order to merge into a laying surface 13, which in this case is formed by the belt 12 itself. The bricks S transported thereto by the belt 12 are stopped by a jig system 14, also see figure 5. The smallest height h of the passage as defined by the belt 12 and the belt 7 is 1.5 to twice the height of the bricks or tiles to be treated and can be adjusted by altering the angle of the slope of the conveyor 6.

[0043] Above the laying surface 13 there is a pick-up unit 10, comprising a framework 25 having suction cup holders 26 that are provided with one or more suction cups 23. At the location of 24 the framework 25 is substantially rigidly attached to a vertical bar 22, that is telescopically operable to lift or lower the framework. The bar 22 is provided with a cross-bar 27, extending over the width of the machine 1. At the upper end the bar 22 is suspended from a tube 30 by means of a universal connection or a ball hinge 21. The tube 30 bears a motor 90 for, by driving a worm or pinion cooperating with a rack on rod 18, being moved along an outrigger rod 18 extending through the tube. The outrigger rod 18 also extends through a sleeve 15 supporting the rod 18 and can be moved therethrough. In figures 1 and 2 both ultimate positions of the rod 18 can be seen. The ultimate extended position shown in figure 1 by full lines is limited by stop plate 19, which is depicted on the right for the retracted position of figure 2. The rod 18 can be secured to the sleeve 15 in both ultimate positions. The sleeve 15 may be provided with longitudinal guides that snugly engage onto longitudinal guides cooperating therewith and positioned on the outrigger rod 18.

[0044] In figure 4 the positioning area 11 is further shown. A positioning surface 69, forming support surfaces for bricks, snugly connects to the belt 12, at the upstream end of the upper course thereof. A cross-bar 60 having a square cross-section is placed on the frame 2 at supports 60a, b at a short distance above and in front of the positioning surface. On the bar 60 a number of brick orienting means 61 are attached so as to be adjustable in longitudinal direction of the bar, which orienting means each comprise two side stops 64 and a rear stop 65. The rear stops 65 are attached to an end of a piston rod 68 of cylinder 67 and can be moved from a retracted

position (bottom two positions in figure 4), in which the positioning surface 69 can be reached by a brick S, to a discharge position (upper position of figure 4) to transfer a brick S (direction L) to belt 12. A cylinder 62 with piston rod 63 is provided for shifting the bar 60, when this is desirable for the bond to be created, in transverse directions N, so that the paths of bricks in consecutive transverse series of bricks do not coincide, which may be desirable when forming a herringbone bond. Instead of a cross-bar with a number of individually operable brick dischargers (such as 61/64/65) a cross-bar having permanent brick dischargers thereon can be provided, wherein the cross-bar can be moved as one unity with the brick dischargers using for instance a number of cylinders for in one go discharging a number of bricks that are adjacently positioned on the positioning surface to the belt 12.

[0045] It can be seen in figure 5 that the laying surface 13 is surrounded on three sides by a jig system 14, which comprises a cross-bar 41 and two side bars 42, fixedly attached to each other. In this example three jig members 40 are provided on the cross-bar 41, which jig members have the shape of bishop's mitres. By means of screw handles 44 extending through slots 45, the jig members 40 are attached to the cross-bar 41 so as to be movable/adjustable (O) in transverse direction. On the side bars 42 straight side jigs 43 are provided which, by means of screw handles 46 extending through slots 47, are attached to the side bar 42 in question so as to be movable/adjustable (P) in transverse direction. By means of screw handles 48 extending through slots 49, the jig system 14 as a whole is attached to the frame 2 so as to be movable/adjustable (Q) in longitudinal direction.

[0046] On either side of the laying surface 13 two upright supports/guides 50 are arranged on the frame 2, which supports/guides, see the detail of figures 5B-D, define a diagonally oriented feed 51 with a support surface 52 and upper surface 56, which merges into an inclined passage 53, which passage merges into a more vertically oriented passage 54 having bottom 55. As shown in figure 5B the passage 54 is perpendicular to the laying surface 13, so when the laying surface 13 is sloping, such as in the embodiment of figure 1, the passage 54 will also be slightly inclined with respect to the vertical. The bottom support surfaces 54 are positioned so as to be able to support the ends of the cross-bar 27, wherein the centre of the line between both support surfaces 54 is diagonally above the geometric centre of gravity Z of the bond to be formed, so that as a result the centre of the cross-bar 27 and thus the centre of the framework 25 are in line (Z' in figure 1, considered perpendicular to the laying surface 13) with Z.

[0047] The tube 30, see figure 5A, is provided with rollers 81 at both ends at the top. Between the facing ends of the tube 30 and the sleeve 15 rollers 82 are supported on the rod 18, for roller support of vacuum lines for the suction cups. The tube 30 can temporarily be secured to the sleeve 15 with means that are not shown. The sleeve

15 is arranged on the axle 16 so as to be rotatable about vertical centre line M by a motor in the engine room, and is then guided and supported by a nearly semi-circular guide 17.

[0048] In operation the machine 1 is positioned on a basis, in figure 1 a bond W already laid. In the hopper 4 a collection of used paving bricks S is placed in a random manner. The star wheels in the hopper bottom 9 urge the bricks in the direction B, and they slide over slope 20 to the discharge side 4'. A workman is positioned there, who takes one or two bricks S by hand, fully grabs them or only directs them at one or two sides during falling, in order to get the bricks at the correct location on the positioning surface 69. Please note that alternatively a stacked package of paving bricks that may or may not be new, can be placed in the hopper 4. The star wheels are able to untie said package in order to discharge the paving bricks to the slope 20.

[0049] The workman places the bricks each in a brick orienting means 61, and subsequently has the cylinders 67 activated, as a result of which the, in this example three, bricks are discharged to the belt 12. When being moved by the belt 12, below past the hopper 4 and chamber 5, the bricks retain their position in transverse direction and their orientation. The end jig members 40 have been adjusted beforehand at the correct mutual distance for creating a herringbone bond. Due to the correct mutual alignment, considered in transverse direction, of the brick orienting means 61 and the (tips of the) bishop's mitres it is ensured in accordance with the teachings of European patent application 1.600.556 that the bricks when abutting said tips turn and move into the right direction as if of their own accord. The side jigs 43 are also adjusted beforehand into transverse position. Furthermore the jig system 14 as a whole is adjusted such on the frame 2, that the geometric centre of gravity Z of the bond to be made vertically coincides with the centre between the two support surfaces 54 for the bar 27 of the pick-up unit 10, according to said line perpendicular to the laying surface 13.

[0050] The bricks of the consecutive transverse series rotate about the tips of the first series of bricks, yet in opposite direction, in accordance with said patent document. Continuing in that way a herringbone bond is realised on the laying surface 13, see figure 6A.

[0051] During formation of the bond the ends of the bar 27 rest on the support surfaces 52 situated higher. The tube 30 is secured to the sleeve 15. When the bond on laying surface 13 is finished the bar 22 is telescopically extended, as a result of which the ends of the bar 27 slide over the support surfaces 52 and end up in the passages 53, in which they snugly fit. When extending the bar 22 further, the ends of the bar 27 pass through the passages, subsequently the passages 54 and finally come to rest on the bottoms 55. Because the tube 30 remains in its place and the bar 22 rotates about ball hinge 21 (arrow T), and moreover the ball hinge 21 is in line (considered perpendicular to the laying surface 13) with Z, and the

framework 25 is substantially rigidly connected to the bar 22, the framework 25 will be urged to a position parallel to the laying surface 13. Then the suction cups are activated and the bricks are sucked vacuum. The bar 22 is subsequently retracted, so that the package P, consisting of the bond created, is lifted in direction E. Then the motor 90 is operated to move the tube 30 in the direction H along the outrigger rod 18 in order to move the package P in direction F, until over the desired location in the work, over a sand bed, see figure 1, left-hand side, optionally while rotating the outrigger rod 18 about pin 16. By manipulating an end of the cross-bar 27, the workman then aligns the package P' on the work, and lowers (G) the framework 25 in a controlled manner until the bricks S of the package P' rest on the sand bed and the suction cups can be deactivated. All functions can be operated by the workman while he stands by the pick-up unit 10, using a remote control.

[0052] Meanwhile the workman at the other end of the machine 1 has continued taking out, leading and having bricks discharged to the belt 12 and a next package P is almost finished. The bar 22 is retracted again and the motor 90 is operated to move the tube 30 back again to have the pick-up unit 10 pick up the next package P.

[0053] When a half-brick or stretcher bond has to be created, see figure 6C, the jig members 40 are removed and a straight end stop 40b can be attached against the cross-bar 41. The side bars 43 are adjusted at the correct position, and the same goes for the jig system 14 as a whole. At the location of the positioning surface 69 the bricks are placed in a first row against a right stop 99 and in a second row against a left stop 99, shifted over half a brick size t, so that the alternating transverse series shown in figure 6C are created. Two transverse series at a time can be discharged to the belt 12 where, while retaining their mutual position, they are transported to the laying surface 13. By rotating the suction cup holders 26 at 45 degrees beforehand, they are adjusted to this bond as regards orientation and location. The distance between two side stops 99 is set at $n.L + \frac{1}{2} L$, in which n is the number of bricks in a transverse series and L the brick length.

[0054] For creating a basketweave bond, see figure 6D, the bar 60 can be removed and side stops 99 are attached on the frame 2, adjusted to the brick size. The workman now forms a complete transverse formation of bricks on the positioning surface, which subsequently are discharged together to the belt 12, on which, while retaining their mutual position, they are transported to the laying surface 13. The suction cup holders 26 have been adjusted beforehand to said bond as regards orientation and location.

[0055] Instead of paving stones or bricks the machine 1 can be used for creating bonds with tiles or slabs, see figure 6B. To that end the mutual distance between the brick orienting means 61 is adjusted, as well as the distance between related side stops 64. Just like in creating a half-brick bond the one transverse series is laid from

the one side stop 99 and the next against the other side stop 99. However, now each transverse series is separately discharged to the belt 12. The suction cup holders 26 have been adjusted beforehand to said bond as regards orientation and location, including height, taking the larger weight of the elements into account.

[0056] When the work needs to be stopped for a longer period of time or has been finished, the tube 30 is moved against the sleeve 15 and both are coupled to each other, or the tube 30 is coupled to another relatively fixed part of the device, such as the chamber 5. Subsequently the motor 90 is operated in opposite direction, as a result of which the outrigger rod 18 is urged to the right, into the sleeve 15, until the retracted position schematically shown in figure 1, right-hand side, is achieved and the outrigger rod 18 no longer projects from the machine 1 or hardly so. When the machine 1 has to be used again the motor 90 is operated again in the other direction, as a result of which the outrigger rod 18 is extended again. When a first package P has to be picked up from the laying surface 13, the tube 30 is uncoupled again from the sleeve 15.

[0057] In figures 7A and 7B an alternative arrangement of the positioning area, in this case 111, is schematically shown. The bottom 109 consisting of star wheels, of the hopper is depicted, which discharges bricks to a grid 104. Below the grid 104 and the bottom 109 a sand collection and discharge belt 107 is placed. The grid 104 slopes downwards to the discharge side and at the end offers an opportunity to a workman to manipulate the bricks. Immediately below/adjacent to the grid end -in this example three- magazines 170 are disposed on the frame of the machine, which each define a tubular accommodation space 171 in which a stack of bricks can be accommodated and of which the dimensions are adjusted to the bricks to be processed so that they remain properly oriented. Optionally filler strips 172 can be arranged in the accommodation spaces. The lower end of each accommodation space 171 sits over a related support surface 169, on which the lowermost brick supports. The downstream wall 171 a of the accommodation space 171 ends at slightly over a brick's height distance from the conveyor belt 112 so that the lowermost brick is able to move along there. The upstream wall 171 b leaves an opening free for a pusher beam 165, which can be reciprocally moved in the directions L by two cylinders 167 and piston rods 168 positioned on either side of the belt 112. The rear wall 171b is furthermore interrupted, see figure 7B, so that the workman can easily see whether bricks are still present.

[0058] The magazines 170 are replaceably attached to two cross-bars 160 (figure 7B), which together are slidable in the directions O by means of a fixedly positioned cylinder 162 and piston rod 163, in order to adjust the position of the magazines 170 in transverse direction.

[0059] In use the workman guides the bricks from the grid 104 in the correct orientation in the accommodation spaces 171. By operating the pusher beam 165 the low-

ermost brick is slid from the support surface 169, below past the wall 171 a, onto the belt 112. When the beam 165 has returned below the wall 171 b the lowermost brick is able to be lowered onto the support surface 169.

The bricks situated on top of it are lowered along with it.

[0060] When an undesired accumulation of bricks takes place on the grid 104, this is detected by means of a sensor 174, which gives a signal to a control unit which stops the drive of the star wheels, until the sensor 174 no longer detects bricks, optionally with a delay.

[0061] When a sensor 175, active in the accommodation space 171, does not detect a brick, the control unit on the basis of said signal will not actuate the cylinders 167, until the sensor 175 does detect a brick again. All this can be designed such that the pusher beam will not be operated until all sensors 175 detect bricks, or when a sufficient number of said sensors 175 detect a brick, when this is accepted.

[0062] When one workman is used, only two bricks (each brick by one hand) can each time be guided. In case of more than two support surfaces, in a next movement the brick/bricks for the other support surfaces have to be guided. The workman, when the first two bricks are immediately discharged to the belt, may be mistaken when placing the next bricks. In that way the formation of the bond can get disrupted. As according to the invention a vertical stock of bricks is made over each support surface, the discharge of bricks has become largely independent from the workman's ability to pay attention.

[0063] Another advantage of the arrangement depicted here as example is that the workman does not have to pick up the bricks, which eases his work.

[0064] A further advantage is that the risk of not discharging a brick in a discharge stroke is reduced. The pusher beam is only operated when there are (sufficient) bricks. Please note that instead of one pusher beam individual pushers, individually operable, can also be used as illustrated before.

[0065] Another arrangement of the positioning area, here 211, is schematically shown in figures 8A-C and 9. The positioning surface is formed here by a number of L-shaped plates 269, of which the one leg 269a forms the support surface and the other leg 269b is upright and offers a positioning aid. The plates 269 are rotatably attached on a cross-bar 260 and biased to an inclined upright position, shown in figure 8A, by a spring that is not shown. The upright legs 269b are provided with a passage or window 269c for a pusher 265. The pushers 265 have each been attached on operation arms 261, that are able to hinge about hinges 262. The rotation of the arms 261 about their hinges is effected by exerting a force Q by activating cylinders 267.

[0066] When a brick S is placed on a support surface 269a the L-plate 269 will tilt, counter spring pressure, to the position shown in figure 8B. The upright leg 269b gets within reach of a proximity sensor 275, which gives a signal to a control unit of the device. The control unit is able to activate the cylinder 267 of the related pusher

arrangement, as a result of which the arm 261 rotates and the pusher 265 moves through window 269c and pushes the brick S from support surface 269a in the direction L, until on the belt 212 (figure 8C).

[0067] In figure 9 (for the sake of illustration) two positions of the cross-bar 260 are shown. The one position is the position indicated by B1, B2 and B3 and the other position, alternating therewith, by A1, A2, A3. On the left-hand sides of the plates 269 the side stops 264 are arranged on the bar 260. When the brick that was initially positioned on support surface B1 is discharged to the belt 212 the plate 269 springs back to the position of figure 8A. That occasion, or the occasion prior to that of operating the cylinder 267, can be established by the control unit, for instance by storing the fact that the cylinder 267 was operated in a memory. When the workman now places a brick on B1 again the control unit, that is programmed to that end, will not operate the related pusher 265, but first the pushers for the bricks on the surfaces B2 and B3, unless they have already been operated in this stroke. After the control unit has detected that bricks have been discharged from each of B1, B2, B3, the bar 260 will be moved in direction P to the left, to bring the centres of gravity of the bricks S in line with I1 instead of I2. Not until then does the control unit operate the cylinder 267 for the surface that initially was B1, now A1. In this way it is prevented that bricks are discharged twice or several times after one another according to the same line I1 or I2. Moreover the workman always has an empty space for a brick and he is able to continue working.

[0068] The same principle can also be followed when the bricks are indeed discharged in the same line, that means without movements O, P taking place.

[0069] The above description is included to illustrate the operation of preferred embodiments of the invention and not to limit the scope of the invention. Starting from the above explanation many variations that fall within the spirit and scope of the present invention will be evident to an expert.

Claims

1. Device for creating a bond of paving elements, comprising a frame having a storage container for the paving elements, a laying surface for supporting the bond and means for transporting the paving elements in a main direction of the device from the storage container to the laying surface, wherein the storage container has a discharge side where the paving elements can be discharged to the transporting means, **characterised in that** the storage container is placed over the transporting means and the discharge side of the storage container is situated at a side thereof that faces away from the laying surface.

2. Device according to claim 1, wherein between the

storage container and the transporting means a passage space for the paving elements is left open, which preferably can be adjusted as regards height, wherein the passage space preferably has a smallest height which at the most is a few times the height of the treated paving elements, wherein, preferably, the smallest height is at the most twice the height of the treated paving elements.

3. Device according to any one of the preceding claims, wherein the transporting means extend in a direction opposite the main direction beyond the discharge side of the storage container.

4. Device according to the preamble of claim 1 or according to any one of the preceding claims, wherein at the upstream end of the transporting means a positioning surface is provided having one or more support surfaces for paving elements coming from the storage container, wherein, preferably, the positioning surface offers support to one or several series of paving elements that are transverse to the main direction, and/or wherein, preferably, a) the positioning surface can be moved, particularly can be pulled away, for discharge of said series to the transporting means, or b) the device is provided with means for pushing the paving elements from the positioning surface onto the transporting means.

5. Device according to claim 4, wherein over the positioning surface a number of magazines are placed for forming a number of accommodation spaces, each for a series of bricks supporting on each other, wherein the accommodation spaces are open at an upper side for receiving bricks coming from the storage container and are open at a bottom side for discharging bricks to the positioning surface, wherein the magazines preferably are placed to let the bricks therein support on a brick situated on the positioning surface, wherein the accommodation spaces preferably are separated from each other by separation means, such as walls, and/or wherein, preferably, the magazines, as regards location, can be adjusted in transverse direction and/or the magazines can be replaced.

6. Device according to the preamble of claim 1 or according to any one of the preceding claims, wherein at the discharge side of the storage container and the beginning of the transporting means at least at one side a side stop is present for a series of paving elements that are coming from the storage container and that are transverse to the main direction, wherein, preferably, such a side stop is present on either side, and/or wherein, preferably, the position of the side stop can be adjusted in transverse direction.

7. Device according to the preamble of claim 1 or ac-

cording to any one of the preceding claims, wherein the discharge side of the storage container and the beginning of the transporting means are provided with one or more side stops for positioning the bricks coming from the storage container in transverse direction, wherein, preferably, the side stops can be moved in transverse direction between two positions corresponding with the desired paths of movement of the discharged bricks.

8. Device according to the preamble of claim 1 or according to any one of the preceding claims, provided with an end stop for the bond in the making on the laying surface, wherein, preferably, the end stop is profiled in transverse direction and the profile is adjustable in that direction, and/or the position of the end stop is adjustable in the main direction, and/or the end stop is replaceable by an end stop having a different shape and/or different dimensions.
9. Device according to the preamble of claim 1 or according to any one of the preceding claims, provided with a side stop for the bond in the making on the laying surface, wherein, preferably, the device is provided with a side stop on either side for the bond in the making on the laying surface, and/or wherein the position of at least one of the side stops is adjustable in a direction transverse to the main direction and/or in the main direction.
10. Device according to any one of the preceding claims, wherein the transporting means also form the laying surface.
11. Device according to any one of the preceding claims, wherein the laying surface is sloping in the main direction.
12. Device according to the preamble of claim 1 or according to any one of the preceding claims, furthermore provided with a pick-up device for picking up a completed bond from the laying surface and transferring it into the work, wherein the pick-up device comprises a framework provided with pick-up means, such as suction cups, for the paving elements in the completed bond, furthermore provided with means for adjusting the mutual distance of the pick-up means.
13. Device according to any one of the preceding claims, wherein the storage container is provided with means for supplying the elements to the discharge side, wherein the supply means are active in a direction opposite the main direction.
14. Method for creating a bond of paving elements, wherein the elements are placed in a storage container that is positioned over a conveyor, spaced

apart therefrom, wherein the elements are taken out of the storage container and placed on the conveyor in a given orientation, are transported in said orientation by the conveyor below past the storage container to a laying surface, and are included in the bond on the laying surface.

15. Method according to claim 14, wherein the elements when being included in the bond, are altered in orientation and/or position in transverse direction, particularly for creating a herringbone bond, or wherein the elements when being included in the bond retain their orientation and/or position in transverse direction.
16. Device for creating bonds of paving elements, comprising a frame having a laying surface for forming the bond, and means provided on said same frame for moving the elements to the laying surface, in a main direction, wherein the frame, over and spaced apart from the moving means, supports a storage container for the elements for forming a passage for the elements coming from the storage container.

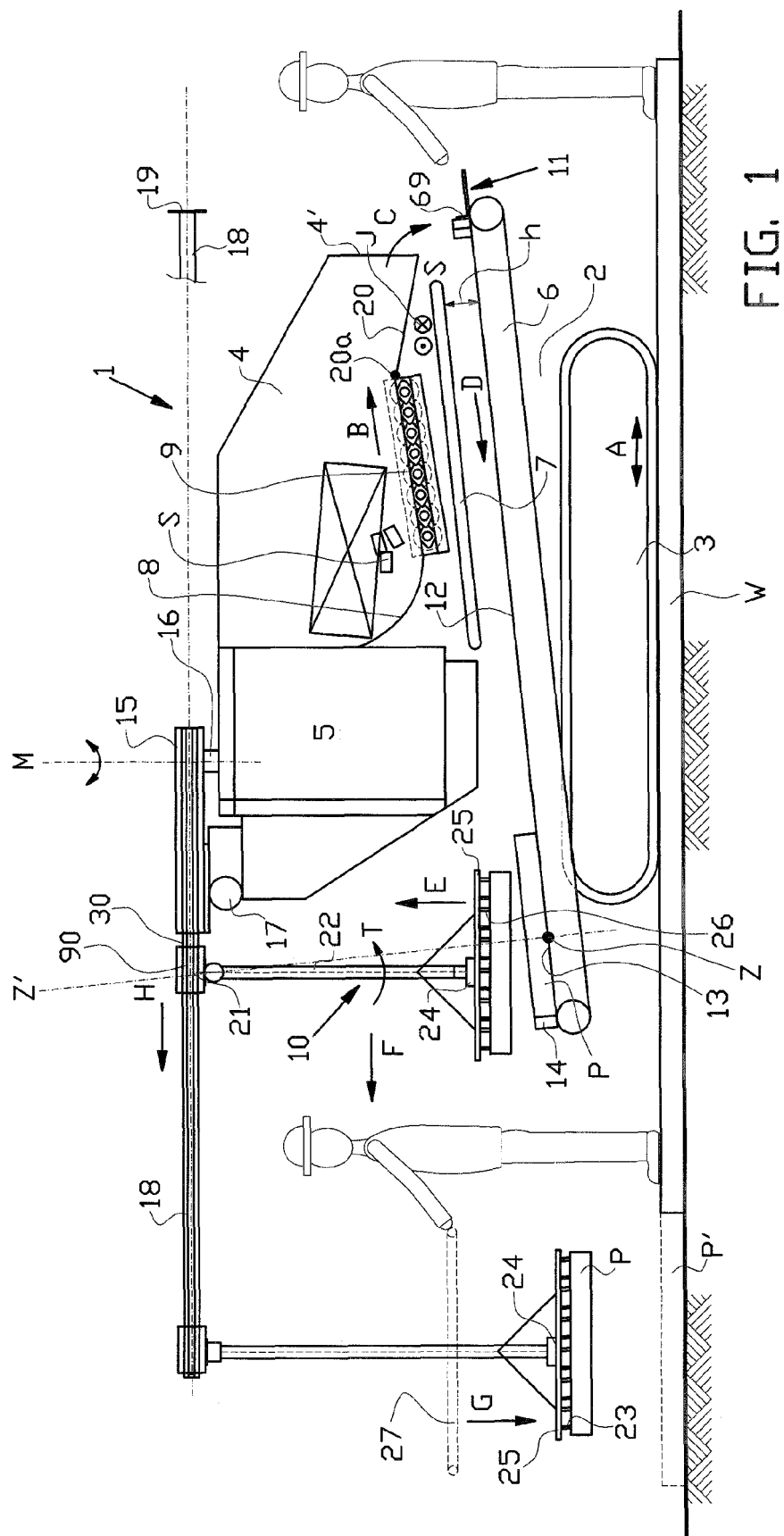


FIG. 1

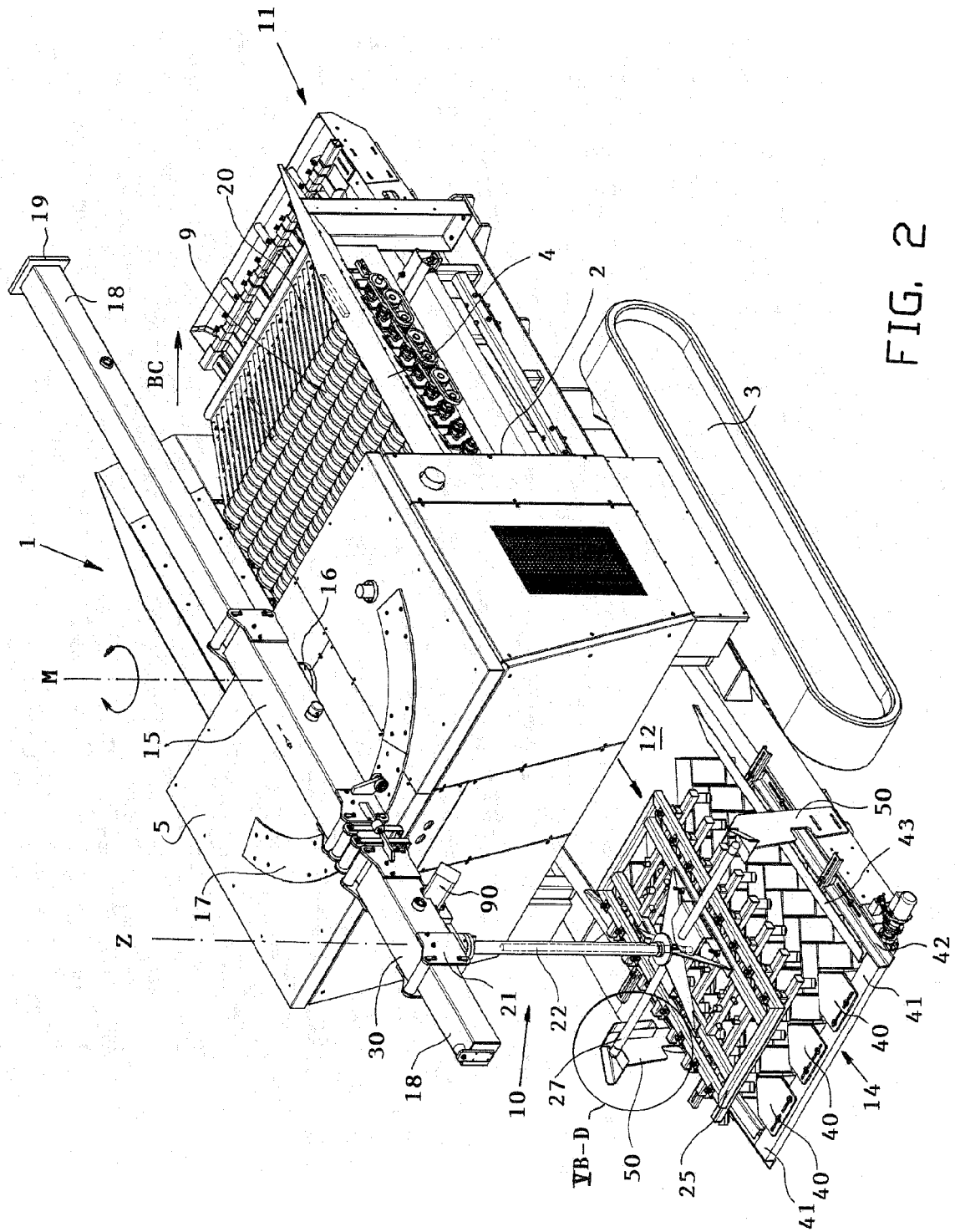
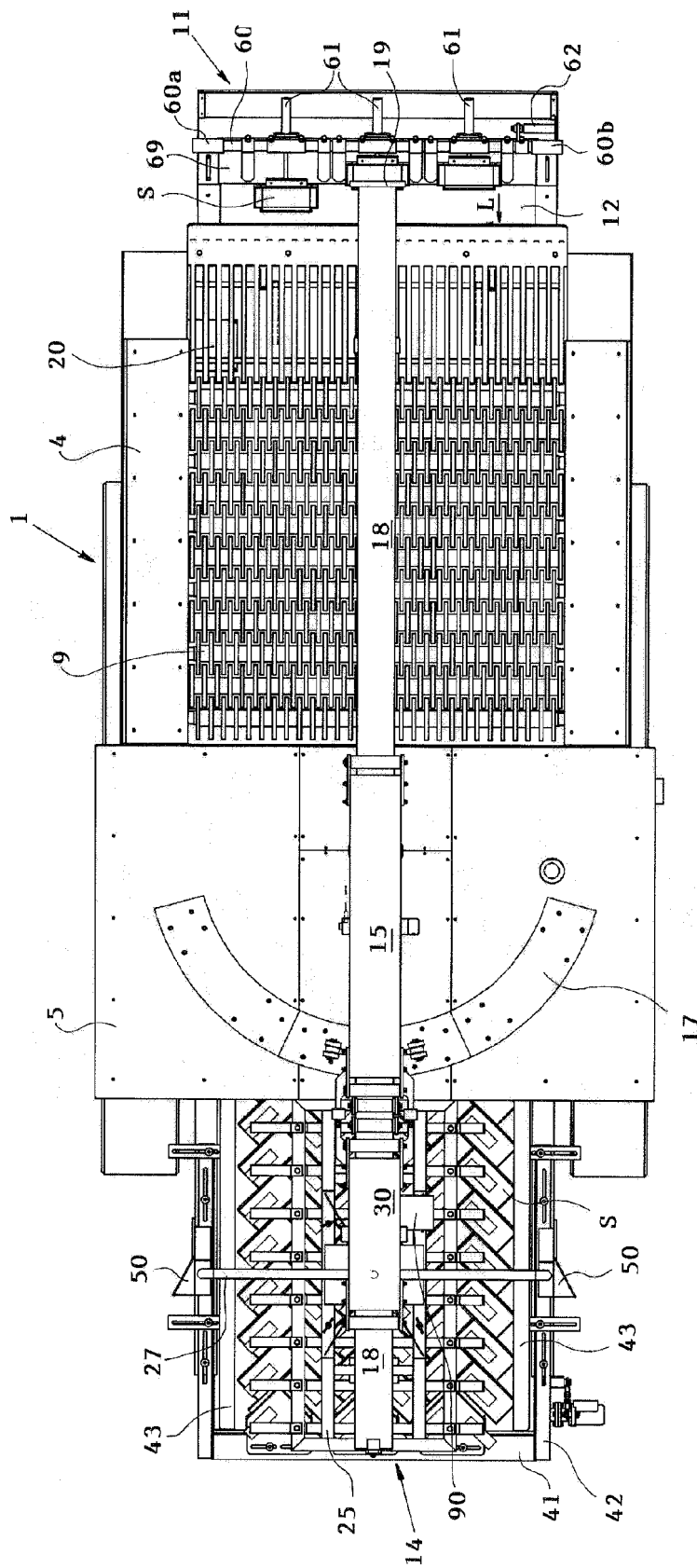


FIG. 2



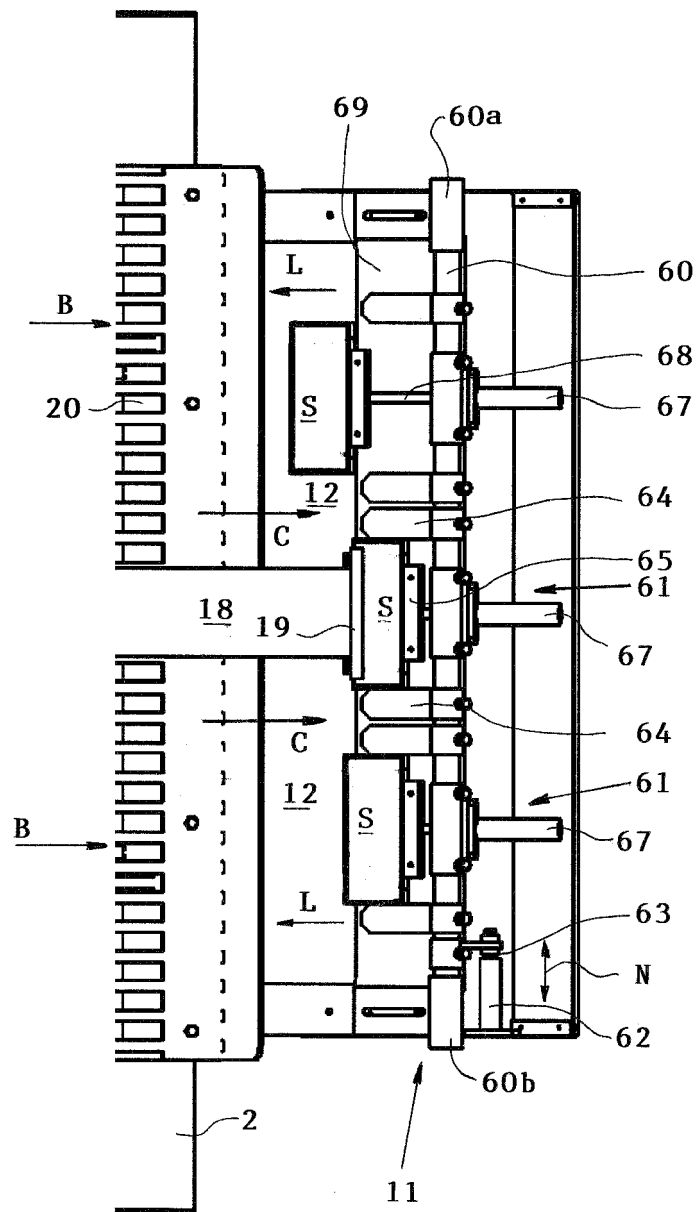


FIG. 4

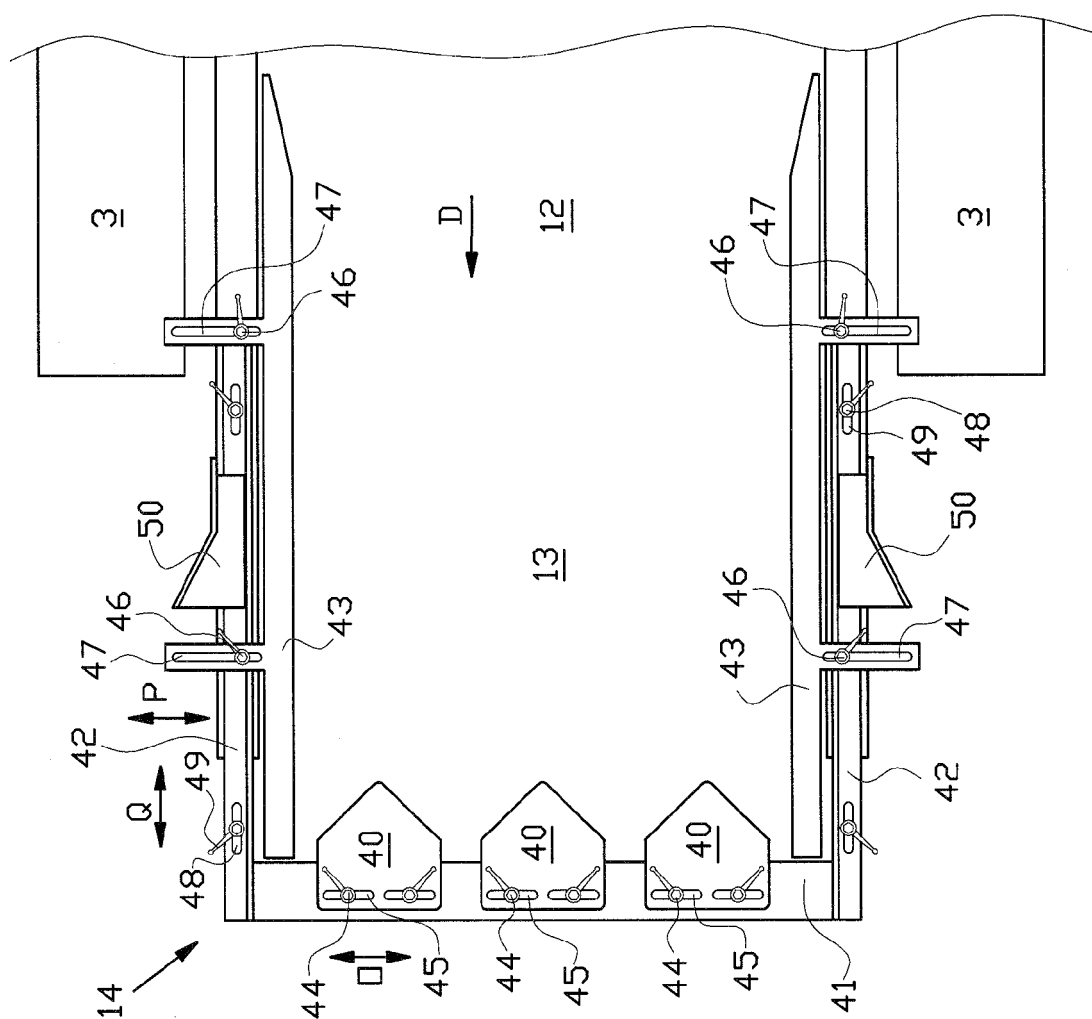


FIG. 5

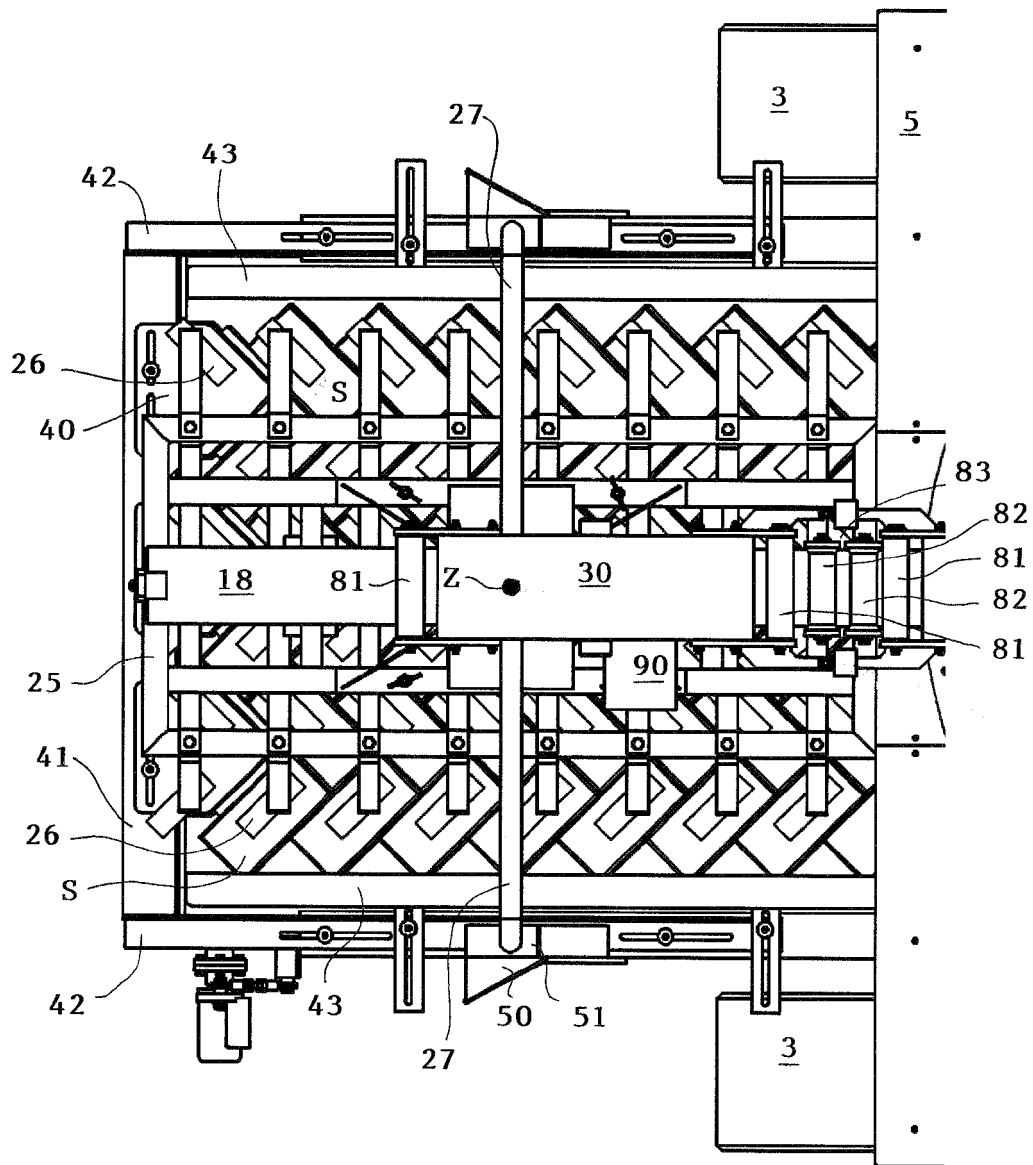


FIG. 5A

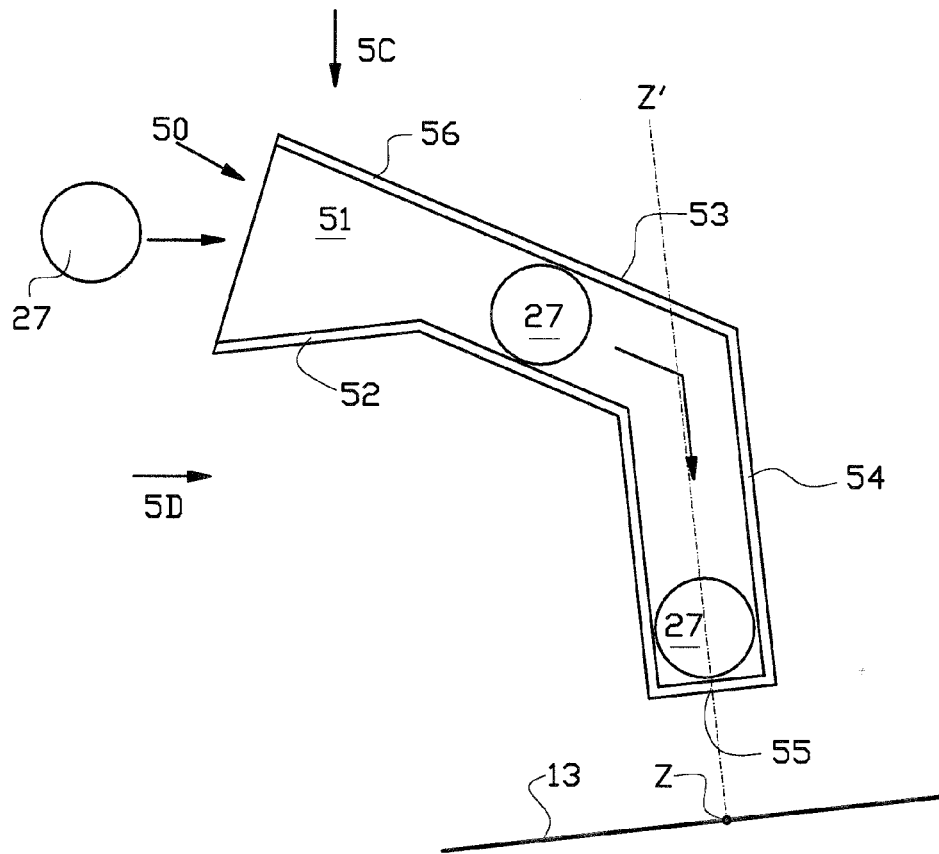


FIG. 5B

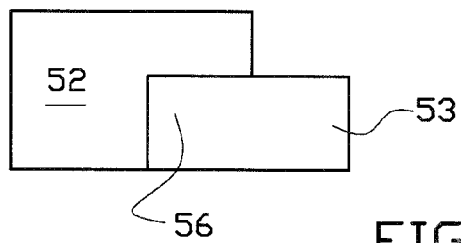


FIG. 5C

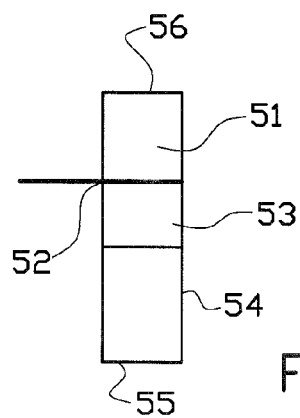
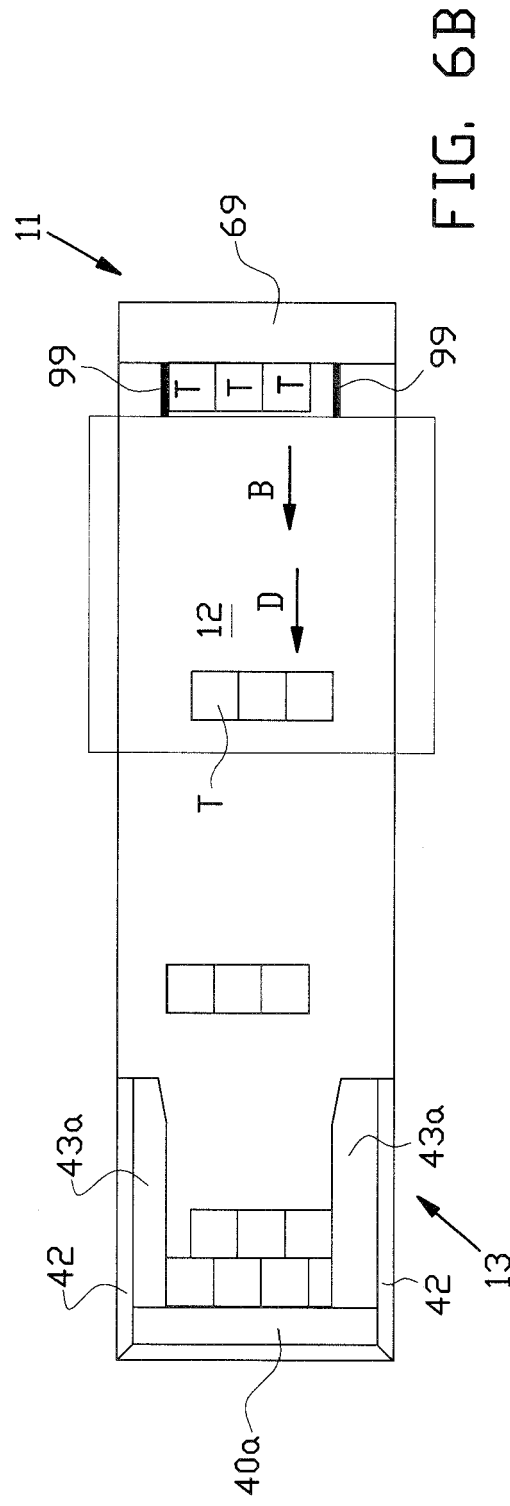
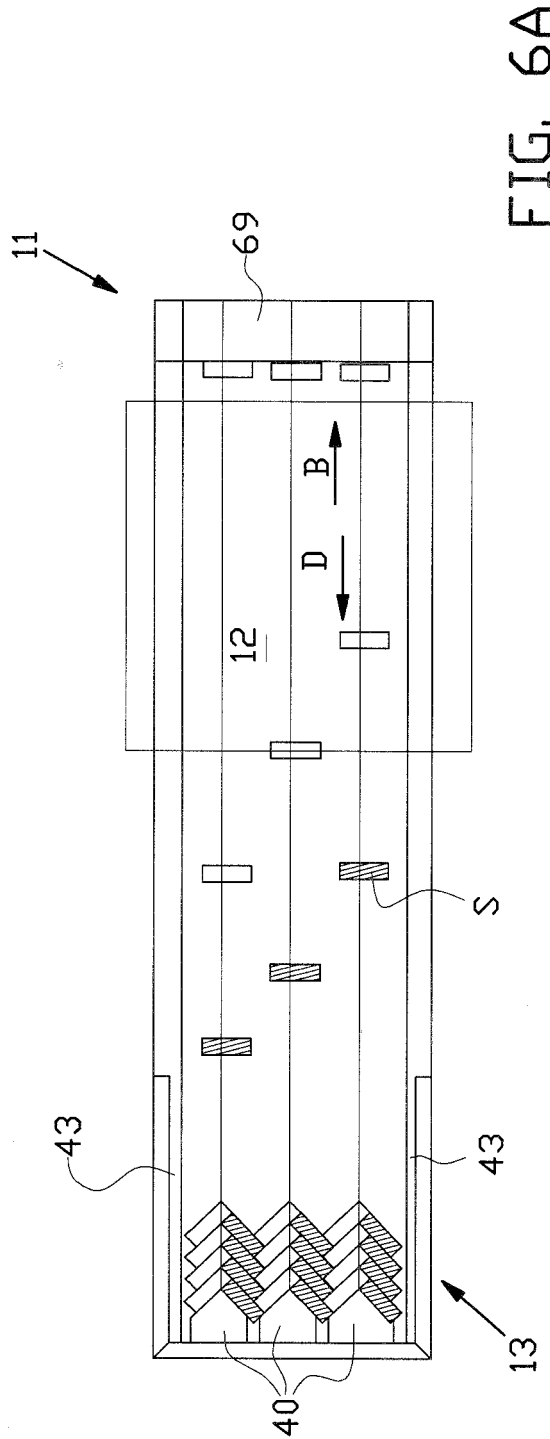
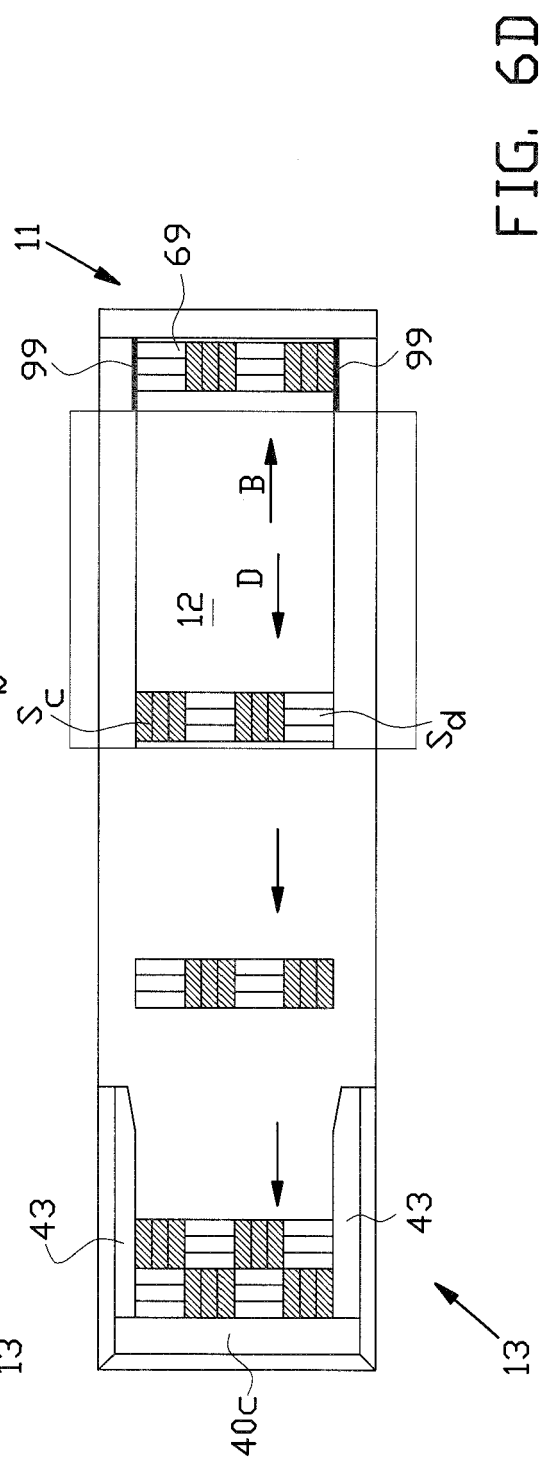
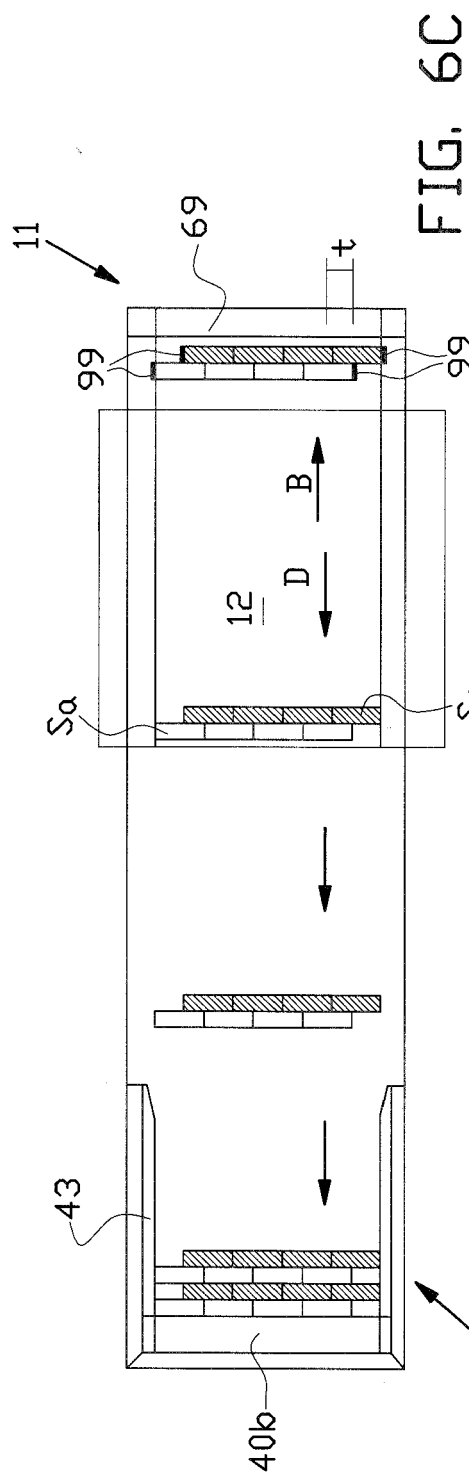


FIG. 5D





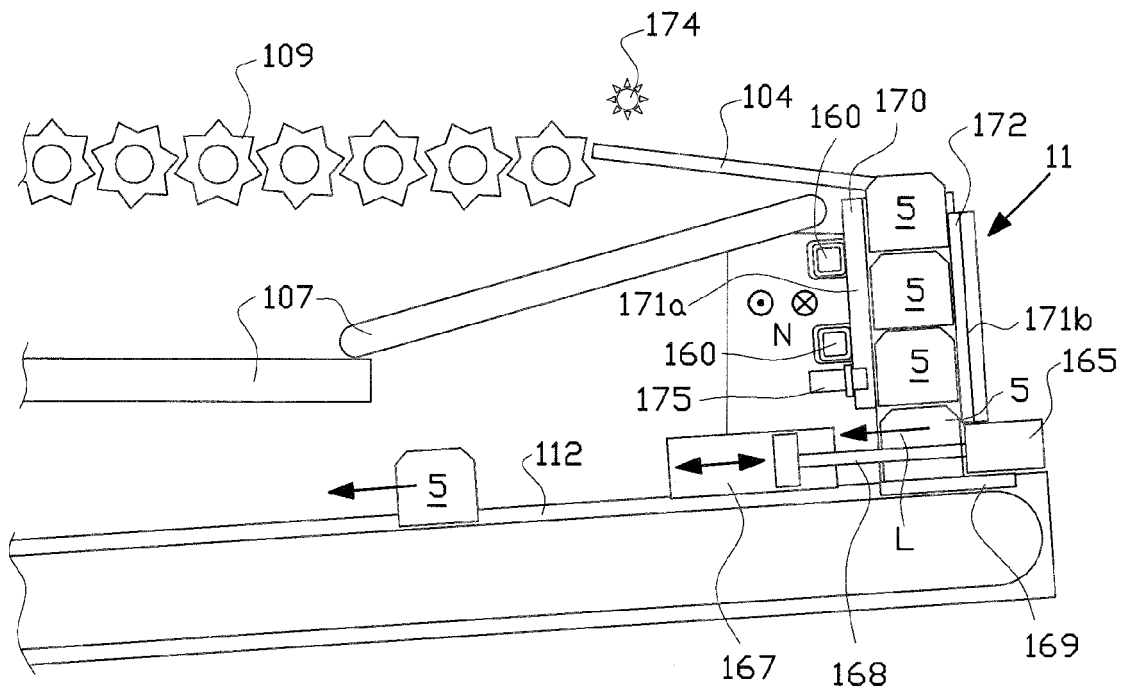


FIG. 7A

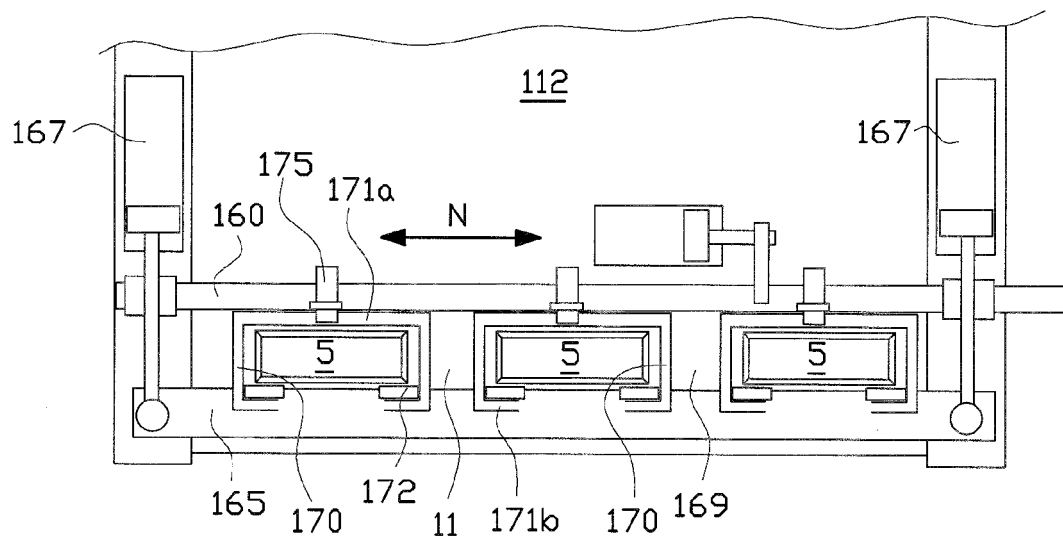


FIG. 7B

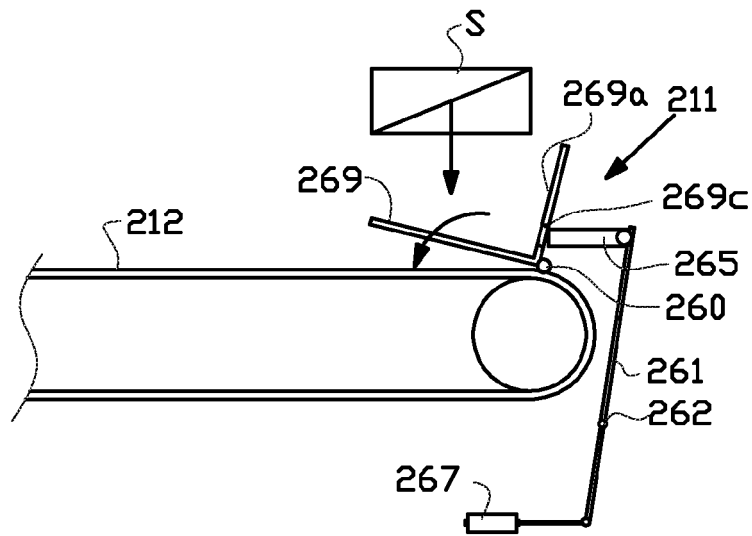


FIG. 8A

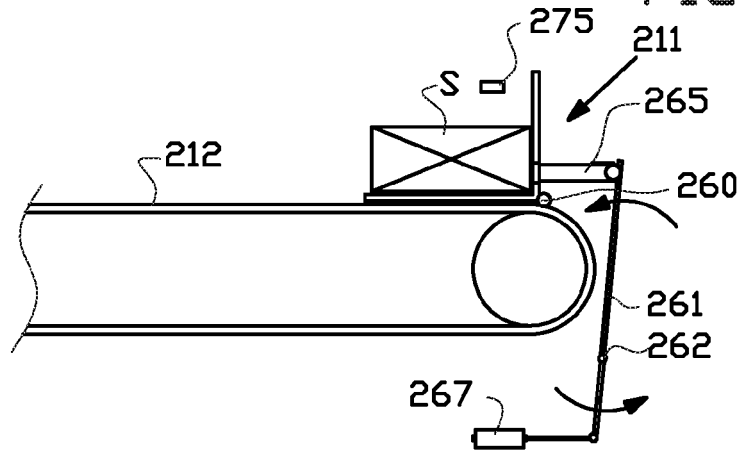


FIG. 8B

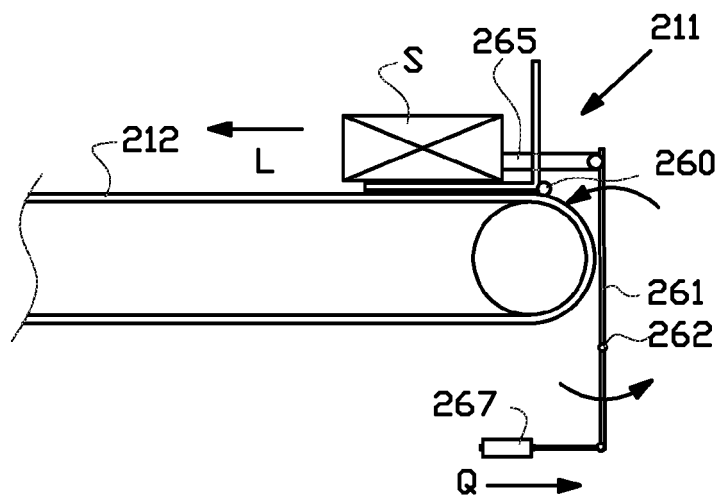


FIG. 8C

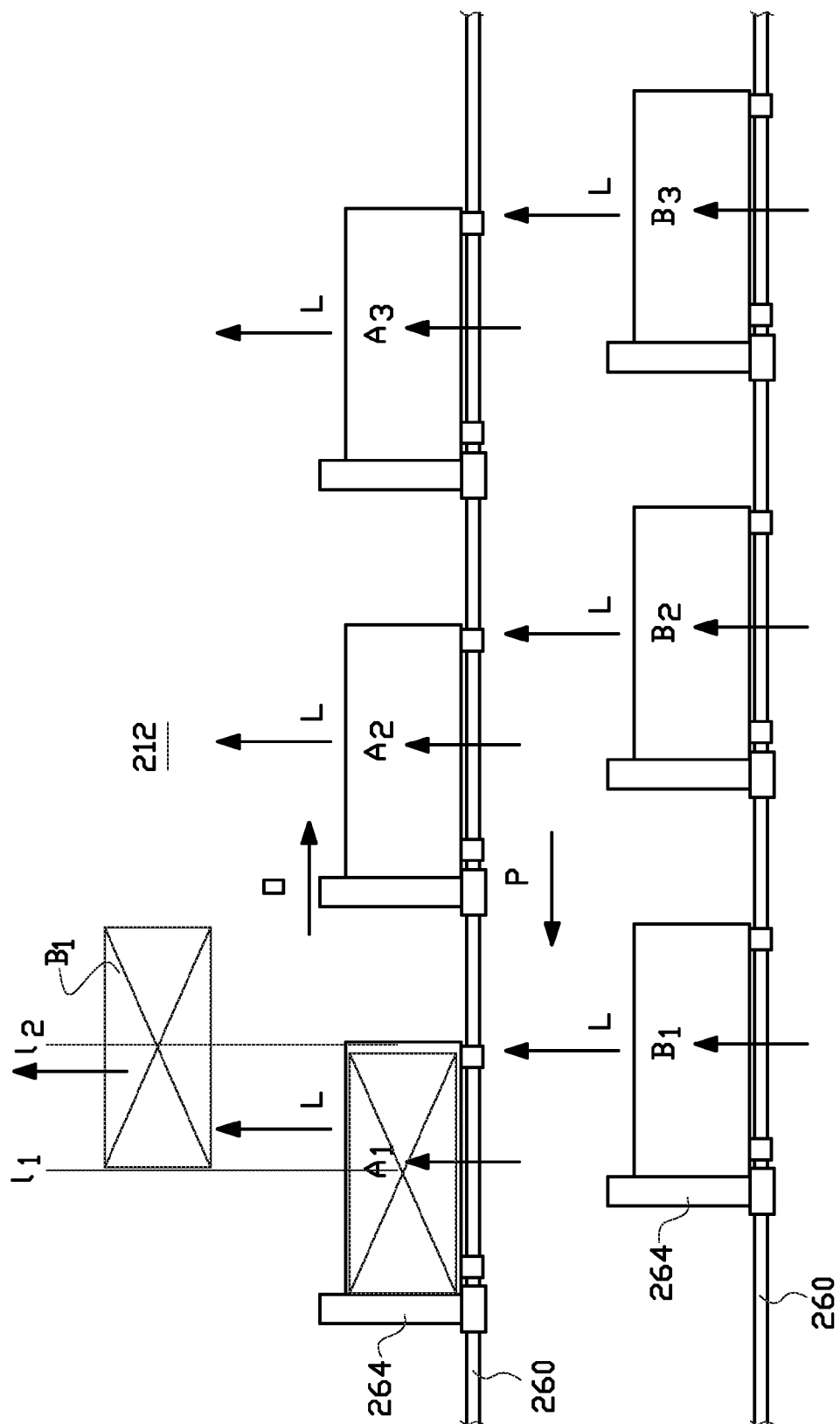


FIG. 9



EUROPEAN SEARCH REPORT

Application Number
EP 08 17 1324

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	* figures 1,2 *		

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	* figures 1-4 *		

The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 10 March 2009	Examiner 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 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	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 08 17 1324

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The members are as contained in the European Patent Office EDP file on
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