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(54) **Method and apparatus for transforming layers of paving bricks from a uniformly oriented initial pattern to a herringbone laying pattern**

Verfahren und Vorrichtung zum Umformen von Pflastersteinschichten aus einem gleichmässigorientierten Originalmuster in ein Fischgrätenmuster

Procédé et dispositif pour transformer des couches de pierres à paver orientées uniformément dans un stade initial dans un dessin à chevrons

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WO-A-83/03270 **NL-A- 8 600 820**
NL-A- 8 602 633

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Description

[0001] The invention relates to a method and apparatus for transferring layers of paving bricks from a uniformly oriented initial pattern to a herringbone laying pattern.

[0002] A method and apparatus as described in the preamble of claims 1 and 5, respectively, are known from EP-A-0.164.146, in which the bricks are offered in a pattern, in which the one half of the bricks lies approximately half a length in front of the second row of intermediate bricks, to a so-called lazy-tongs (Neurenberger link or mechanism) operating from above which is provided with suction cups which are lowered on the bricks. The two rows of bricks are then brought on different levels vis-à-vis one another and subsequently converted by the action of the tongs, the one row of bricks, as seen in the horizontal plane, being turned clockwise and the other row of bricks being turned anti-clockwise. Then the bricks are brought back to the same level and lowered again, to be subsequently removed to the placing layer to be formed. A drawback of this construction is that it is rather complicated.

[0003] Another device for arranging bricks in a herringbone pattern and transferring these bricks to a substrate while maintaining this pattern is known from WO-A-83 03270. Here the herringbone pattern is realized by arranging the bricks in an initial side by side relationship, spacing the bricks in lateral directions, turning the bricks over 45° and bringing them back together.

[0004] Another method and apparatus for transforming layers of paving bricks from a uniformly oriented initial pattern to a herringbone laying pattern are known from the Dutch patent application NL-A-86 00820. Here rows of bricks are fed, by layer and by transverse row, from a stack of a number of layers of bricks positioned on the upstream side of the apparatus across a vibrating and slanting transport plane, whilst enlarging their mutual transverse distance, to a converting apparatus, where they are converted by means of sliding chutes to a slanting position of 45° with regard to the feed direction. Subsequently the bricks are transported further up to a transversely placed framing which can be adjusted to a mean herringbone size of the brick pattern. It has been appeared that the converted bricks, particularly the first rows of the module of bricks in herringbone pattern which is to be formed, can lose their orientation during displacement from the converting means to abutment against the stationary framing or against the last row of bricks placed up against it, and this in such a way that corrections have to be carried out manually. During this, the converting process has to be stopped temporarily, which means loss of efficiency.

[0005] An object of the invention is to improve this, which is achieved with the help of the measures indicated in claim 1 (method) and claim 5 (apparatus).

[0006] With the end jig moving along in the working direction, it is attained that the bricks only have to bridge a minimal distance after they have been converted to a

herringbone position. The period in which they could possibly change their position can be thus kept short to very short. The end jig is driven at such a speed that, for a series of converted bricks, the rear faces of the series of bricks which have been previously converted will, as seen in working direction, at least substantially lie at the same location as the contact faces of the end jig during the receipt of the first series of bricks. In order to control the process of making the placing layer even further, it is advantageous if according to the invention guide jig means or confining means are provided, which laterally check the bricks which are in a herringbone pattern. These guide jig means, which can at the same time serve as guide for the end jig during the displacement thereof, are also adjustable to the processed bricks, that is to a distance of $(n_1 \cdot L + B) \cdot \frac{1}{2}\sqrt{2}$, in which n_1 is the number of bricks per row in transverse direction, L the length of the brick, including leeway/tolerance for smoothing out irregularities such as small loose stones, and B the width of the brick, including aforesaid margin. These L and B are indicated below as the practical length and width. The guide jigs are adjusted at sight, for example whilst making the first module. Then it is ensured that the adjustment is also correct for the brick actually treated. Within a determined circumference, which thus can be adjusted per situation, on average and on balance each brick will be laid in a allotted rectangular surface area, which corresponds to the practical brick size. Each produced module therefore has an equal circumference size (width, length) with a same number of bricks. Thus it is achieved that the formed placing layer is offered exactly in the way it should lie in situ in a paving work. The formed module placing layer can be made from rectangular bricks of any size, whether the bricks have already been used or are new. This is a considerable advantage over an existing method according to which multi-layered packs of bricks in herringbone pattern are delivered. Only bricks of which the length is twice the width are suited for packs of that kind.

[0007] For laying purposes the placing layer can then also be held to be concentrated in the centre of gravity surface, onto which centre the take-up means can be controlled. After the placing layer has been taken up with the help of the take-up means, the latter can be guided to the correct place with the help of suitable orientation means which indicate the centre of gravity in the paving work. The orientation or positioning means can comprise laser apparatuses, but can in their simplest form be realized in the form of a jig to be placed on the work.

[0008] Preferably the take-up means are provided with one or more suction cups, for each brick at least one. In the previously mentioned Dutch patent application an exemplary embodiment of a suction cup of that kind is described. For heavier bricks it will be necessary to apply two suction cups per brick. In such a case, however, according to a preferred embodiment of the apparatus according to the invention one suction cup will suffice, the suction cup then being provided with a rubber

casing, which is oval of elliptical in cross section. By doing so the brick in question can be taken up in a more reliable way, with a lower suction force.

[0009] Converting the bricks which are still uniformly oriented in series of slantingly directed bricks in particular oriented alternately at an angle of 45°, can take place in a variety of ways. According to the Dutch patent application NL-A-86 00820 this can be achieved with the help of sliding chutes which are alternately set in opposite directions at an angle of 45° vis-à-vis the supply line, or by supplying the bricks from two packs of bricks arranged laterally at an angle of 45° vis-à-vis the laying jig.

[0010] A method for mechanically laying bricks in a herringbone pattern and an apparatus for that purpose are known from the Dutch patent application NL-A-86 02633, where use is made of a herringbone jig for converting rows of bricks of which the longitudinal sides are placed adjacent one another to a herringbone pattern, which herringbone jig can take on a transverse receiving position in which the oncoming row of bricks can be received in a way shifted in transport direction vis-à-vis one another and which jig can then be turned alternately to the one side and to the other side to turn the bricks to a position in which they form a row which is again perpendicular to the direction of advance and are adapted for connecting to an already formed herringbone pattern.

[0011] With some further developments of the apparatus according to the invention an improvement is made herein.

[0012] The converting means are adapted to engage the bricks for turning them to a herringbone orientation whilst at least substantially maintaining the mutual centre-to-centre distance in transverse direction of the bricks. According to a first further development the converting means comprise drive means for drivingly engaging the bricks in direction of transport at a location situated on a first longitudinal half of these bricks in order to accelerate that first longitudinal half with regard to the second longitudinal half and furthermore bearing means for creating a point of rotation for the second longitudinal half of those bricks by engagement of a location on said second half. The bricks are thus converted to a herringbone orientation by the drive means, about the turning point located on the other side of the brick concerned.

[0013] The invention thus also relates to a method for converting a row of parallel paving bricks arranged next to one another to a row of bricks arranged next to one another in herringbone fashion, wherein the bricks are turned with their longitudinal axis through an angle of 45° by engaging the bricks during the advancement of these bricks across a supporting transport plane in order to accelerate their corresponding first longitudinal half of these bricks with regard to the adjacent second longitudinal half thereof, whilst having those bricks turn through an angle of 45° about a contact point between

the second longitudinal half and a stationary bearing point. The resultant of the forces in transport direction exerted on the first longitudinal half is greater than the resultant for the second longitudinal half (which resultant can even be zero), so that a brick turning moment is created.

[0014] Preferably the drive means comprise driven rollers which are arranged to engage the underside of the bricks. The drive means are thus arranged at a place without forming an obstacle and engage the underside of the first longitudinal half of the bricks to accelerate the latter in relation to the other longitudinal half.

[0015] The drive rollers are preferably placed so as to project in a recess in the support plane in order to engage the first longitudinal half of the bricks, while the second longitudinal half is supported by the supporting plane.

[0016] According to an alternative embodiment the drive rollers have a first portion which is provided with a rough surface and a second portion which is provided with a smooth surface, wherein the first portion and the second portion are placed in axial direction next to one another to engage the first and the second longitudinal half of the brick, respectively. According to another alternative embodiment likewise two portions are provided in the drive rollers, but the first portion which engages the first longitudinal half of the bricks has a larger diameter than the second portion, which remains at a clear distance from at least a part of the underside of the second longitudinal half.

[0017] The bearing means are preferably formed by extended longitudinal guides extending in transport direction to beyond the drive rollers, which are interspaced in transverse directions at distances of approximately two rows of bricks and alternate in transverse direction with shorter longitudinal guides, which are interspaced in transverse direction at distances of approximately two rows of bricks, wherein the drive rollers, as seen in transport direction, are arranged downstream from the ends of the short longitudinal guides and substantially upstream from the end of the extended longitudinal guides, wherein the first transport means comprise means for alternately offering the converting means transverse series of bricks which, as seen in transverse direction, are located on 2n and 2n-1 positions, respectively. Thus transverse series of bricks are offered in turn to the drive rollers, the alternately offered transverse series respectively finding their rotational points at the end of the extended longitudinal guides.

[0018] The invention concerned can be simplified by allowing the drive rollers to be arranged in two adjacent brick transport paths each time. These drive rollers can be in line in transverse direction, and then be rotated by one single drive shaft.

[0019] According to a first further development the converting means comprise turning means which are placed so as to engage the side of the bricks at a distance from the horizontal middle thereof, the drive

means for the converting means displacing them in transverse direction to turn the bricks in their horizontal plane after engagement thereof. A preferred embodiment of this apparatus is described in claim 15.

[0020] With an apparatus constructed in that way conversion of the bricks is achieved in a very easy way. In the embodiment with turning means executed as pusher rods the same pusher rod can the one time convert a brick present on the right hand side thereof to allow it to be turned in an anti-clockwise direction and then be pressed against a following brick situated on the left hand side thereof, to convert it whilst turning it in a clockwise direction. Advantageously the end jig or the last laid herringbone row, respectively, is held at such a distance in working direction from the pusher rods that the brick to be converted arrives with one front vertical corner rib against the end jig or that row of bricks already laid, to form a point of rotation during turning of the brick. The end jig thus attains an additional function.

[0021] According to an alternative further embodiment of the invention the lazy tongs structure is in principal retained, but instead of suction cups which retain the bricks in a vertical sense, use is made of preferably U-shaped brick receiving openings such as described in claim 16.

[0022] These brick receiving openings engage the bricks in the horizontal plane and by operation the tong structure see to the conversion of the bricks in a direct way, without them having to be lifted out of their plane. The energy necessary for converting is thus kept low. After the bricks have been converted the tongs structure itself can be easily lifted to allow the bricks to be transported further.

[0023] The invention will now be explained in more detail on the basis of a number of merely exemplary embodiments shown in the accompanying drawings, in which:

figure 1 shows a preferred embodiment of the apparatus according to the invention;

figure 2A-2E is a schematic representation of the converting process as it takes place in the apparatus according to figure 1;

figure 3 is a schematic representation of the end result, i.e. the placing layer, achieved with the apparatus according to figure 1;

figure 4 is a schematic view in working direction of the converting means in the apparatus of figure 1;

figure 5A and 5B is an alternative embodiment of the converting means, represented in bottom view, in respective end positions;

figure 6 is a bottom view of a suction cup according to the invention;

figure 7 is a top view of a paving work;

figures 8A, 8B and 8C are a schematic representation of a part of the converting process, which corresponds to that of the figures 2D and 2E, however with another converting apparatus; and

figures 9A, 9B and 9C show an alternative embodiment of the converting apparatus of the figures 8A-C.

[0024] The integrated and movable apparatus according to figure 1 comprises a frame 2, which is movable by means of wheels 3 and can be hooked with a coupling part 4 to a lorry, for example. On the right hand or supply side of the apparatus 1 there is a platform 5, on which a stack of bricks S is put. The platform 5 can be moved up and down along a guide 6. This takes place with the help of a motor, not shown, which can be operated with the help of an operable and adjustable control apparatus 21. An outrigger 7 attached to the frame 2 extends, as seen in the drawing, to the right and above the stack S. On the right end of the outrigger 7 a slide 8 is arranged, which is movable back and forth in a driven manner along the outrigger 7 in the directions of the arrow B. Alternatively the vibrating plate 10' can be extended on the upstream side for defining a supply table while the pack of bricks S is placed ahead of that on a jack-up platform. With a separate gripping tool comprising a front clamping strip of a rear clamping strip, the upper layer of bricks is then, whilst being clamped, slid onto the supply table, until all the bricks are supported by it. A fixed lateral guide and a lateral guide which is transversely adjustable ensure that the supplied layer of bricks is placed exactly in front of the entrances to the guide paths which are to be discussed below. Then the front clamping strip, which also ensured that the preceding group of bricks moved up, is lifted up and the layer of bricks is then pushed along to some extent with the rear clamping strip.

[0025] In the drawing on the left of the stack S there is the upstream end of faintly sloping vibrating plate 10' which is made to vibrate with the help of drive means not shown. Just above the vibrating plate 10' there are a number of mutually transversely placed guide plates 9, which extend to the left in the direction of the slope of the vibration plate 10, are adjusted at their upstream end to a mutual transverse distance of a brick width, and recede in downstream direction from one another in transverse direction in a smooth way so as to arrive at their downstream end at a distance of $\frac{1}{2}\sqrt{2}$ the practical brick length. These guide plates 9 define between them brick supply paths in the direction C. The vibrating plate 10' also terminates at the downstream end of the guide plates 9 and a few centimetres (for example 2 cm) above that there is the upstream end of the following vibration plate 10", which forms the support surface at the converting and laying parts of the apparatus 1. The up-

stream end of vibrating plate 10" and the downstream end of vibrating plate 10' preferably engage in a finger or tooth fashion into one another as seen in vertical projection, whilst leaving intermediate small vertical passages clear for pusher rods 12 which are arranged just beneath the vibrating plate 10' (see figure 1A) and which are movable up and down (directions D). Because of the difference in height of both previously mentioned ends, the upstream end of the vibrating plate 10" forms a shoulder 11, against which the bricks delivered by brick supplied through brick paths come to rest, to then, on command, be tipped up by the upward movement of selected pusher rods, so as to arrive with the lower front edge on the vibrating plate 10" and to be subsequently transported further on it under the influence of the vibrations.

[0026] Downstream from the shoulder 11 a converting device is arranged, which is attached by means of posts 15 to the frame 1. This converting device will be discussed below in detail.

[0027] Downstream from the converting apparatus 14 is the place where the herringbone brick module is finally formed. The base there is formed by the vibrating plate 10, while an end jig 23 is arranged transversely on the left hand end side. This end jig 23 is movable in the direction F and is then guided by two lateral guides 22, which moreover serve for laterally confining the bricks included in the module. After having had the apparatus operative for some time, the end jig 23 and the lateral guides 22 are selected and/or adjusted to the practical brick size and the dimensions of the desired module.

[0028] A taking-up apparatus 24 is arranged on the discharge end of the apparatus 1. The latter is attached by means of posts 28 to the frame 2 and provided with an articulated working arm 27, at the end of which a frame 25 is attached, to which a series of suction cups 26 is attached. The frame 25 and thus the suction cups 26 are movable up and down in the directions G, to be brought into engagement with the bricks. In addition, the working arm 27 is swivellable in the horizontal to displace the frame 25 with suction cups 26 and bricks sucked firmly by it to the left in the direction H in order to deliver the bricks into the paving work (not shown).

[0029] In operation first of all stack S of bricks is delivered to the platform 5 by a fork-lift truck. The platform 5 is then adjusted along guide 6 to such a height that the bottom side of the upper layer of bricks is at level with the surface of the vibrating plane 10'. Then the vibrating plane 10' is made to vibrate and the slide 8 is moved to the left, in the course of which the slide 8 moves the upper layer of bricks to the left onto the vibrating plane 10'. During this the bricks are kept separate from one another in transverse direction by the guide plates 9 and thus go in distinct rows which are separate from one another in transverse direction along the sloping vibration plane 10' in direction C to the left until they arrive at the shoulder 11, having been meanwhile brought to a larger mutual transverse distance

from one another ($\frac{1}{2}\sqrt{2} \times L$) by the guide plates 9 diverging from each other. This situation is shown schematically in figure 2A. Here the shoulder 11 is linear (see figure 3), which should be understood such that the upstream end edge of the vibrating plate 10" is situated at such a (small) distance from the downstream end edge of the vibrating plate 10', that the pusher rods 12 are lifted and lowered therethrough. When the rows or tracks of bricks are counted from below, as seen in the figure, the pusher rods for the uneven rows will then be coupled with each other and the pusher rods for the even rows will be coupled with each other. In figure 2B the pusher rods 12 for the even rows b, d etc. have been lifted for a while. For each even row a brick has been let through. These bricks are received by the end jig 23 provided with a zigzag shaped end plane. This end jig 23 is adjustable or is selected for the size of the brick to be handled. The end jig 23 is held at a place such that for a moment the bricks b, d, etc. are restrained with their vertical left front rib. Behind the middle of the bricks b, c, etc., but still at the position of those bricks, there are pusher bars 18 of the converting apparatus 14, which is shown in more detail in figure 4. By operating the motor 20 by means of operating unit 21, the double-acting cylinder 16 is activated so that it will move in the direction E1 vis-à-vis the piston rods 17. By this the pusher bars 18 are brought into engagement with the right hand side, as seen in downstream direction, of the bricks b, d, etc. and continuing movement of these pusher bars 18 then ensures that they turn about a vertical axis. The line of contact between the bricks b, d, etc. and the contact plane of the end jig 23 provide a point of rotation (or line of rotation), which during the turning is displaced somewhat to the left, along the contact plane as a result of the influence of the vibrations of vibrating plane 10. As a consequence of this the bricks b, d are brought in a smooth way up against the contact plane of the end jig 23. Thus the first part of the first transverse series of bricks is arranged in herringbone pattern. Subsequently, the lock 11 is again operated, but now to allow the bricks of the uneven tracks (a, c, e, etc.) to pass through. In the meantime in order to give these bricks space, the end jig is displaced along a distance of $\frac{1}{2}\sqrt{2}$ the (practical) width, across the vibrating plane and guided by the guides 22. The bricks a, c, e etc. then come in a position which is comparable to that of the bricks b, d, etc., in figure 2B, but now rest with their right hand front rib against a head face of those bricks b, d, etc. instead of against the contact plane of the end jig 23. Now the converting apparatus 14 is operated once more, but now in such a way that the cylinder 16 is moved vis-à-vis the piston rods 17 in the direction E2. The pusher bars 18 are then pressed against the left side faces of the bricks a, c, e etc. as a result of which said bricks, as seen on paper, are turned to the left, during which movement the right hand front rib which makes contact will slide along the head face of the bricks b, d etc. and then along the contact plane of the end jig 23. When the head faces of

the bricks a, c, e, etc. have arrived at the contact plane of the end jig 23, the first herringbone patterned row is completely ready. The lock 11 is then operated to allow the next row of bricks b, d etc. through, while the end jig is again moved over a distance of $\frac{1}{2}\sqrt{2}$ the (practical) width of the brick. Now the bricks b, d, etc. however, do not abut with their left hand front rib against the contact plane of the end jig 23, but instead the head face of the bricks a, c, e, etc. which have just been arranged. Actually, the contact plane of the end jig 23 is now replaced by a contact plane which is formed by the free faces of the bricks which face the upstream direction of the first row just arranged.

[0030] In the figures 2D and 2E the laying of the second herringbone row is shown, which is carried out in the same way as is shown in figures 2A and 2B. With each complete row the end jig 23 is moved over a distance of $\sqrt{2}$ the (practical) B, that is in two steps. After laying nine herringbone rows, the end jig is will have been moved over a distance of 9 times $\sqrt{2}$ the (practical) stone width, as is indicated in figure 3. In this example there are twelve tracks of bricks, i.e. the uneven tracks a, c, e, g, i, k and the even tracks b, d, f, h, j and l. During turning the bricks remain with their centre of gravity on the extension of the centre line of the brick supply paths.

[0031] In figure 3 the brick module T of 12 x 9 bricks laid in herringbone pattern is ready. By the end jig 23 and the lateral guides 22 as well as by the influence of the vibrating plates 10, on which the bricks still rest, a brick module T or placing layer with a precisely determined circumference is obtained. By this the module can be held to be concentrated in the centre of gravity surface Z without any loss of accuracy. With the help of suitable means the frame 25 with suction cups 26 can be aligned to this centre of gravity Z. The point of orientation Z which is decisive for the module T is then, as it were, transferred to the take-up and laying means 24. A suchlike point of orientation can be coupled in a way known to the expert with aligning means which have been installed for that purpose in the paving work and which measure the average position of modules previously placed in the work. Controlled by signals to be delivered by the aligning means, the laying means 24 will then be able to place the frame 25 and the suction cups 26 in exactly the correct position, after which the suction cups 26 are deactivated and the bricks can be left behind in the sand bed in the paving work.

[0032] The suction cups 26 are preferably composed as the suction cups in the Dutch patent application no. 86.00820. A suchlike suction cup made as a composite spring is shown with the reference number 26 in figure 6 and has a disc-shaped covering plate 42 with a hollow cylinder 43 of rubber of the like, in particular foam rubber with a closed cell structure, or massive soft rubber which is glued or vulcanized onto it.

[0033] The rubber cylinder 43 tapers conically at the bottom in a thin suction edge 44, which when pressing down the suction cup 41 onto a brick deforms over a

considerable length so that to perform a certain suction force quite a low suction pressure is required.

[0034] A central suction opening 45 is provided in the covering plate 42, into which a suction pipe 46 can be screwed, which can be secured by means of a screw head, or as represented, with a nut 47 to an attachment plate 48 of a suction unit. A suction connection, not shown in detail, is to be attached to the suction pipe 46, with therein a non-return valve.

[0035] A ring strip 50 is accommodated loosely with an interference fit in the cylinder cavity 49, which strip counteracts lateral deflection of the rubber cylinder 43 under the suction pressure exerted thereon.

[0036] A helix 51 is accommodated in the rubber casing 43, as a result of which the rubber casing shows a compression course which at first has a slack and later has a stiff compression characteristic, so as to be usable on heavy bricks. By making the rubber casing 43 according to the invention oval (with two axes of symmetry perpendicular to each other) or ellipse shaped in cross section, the bricks can be taken up with a very efficient use of suction force and can be transferred securely. It is noted that, whilst maintaining the oval or ellipse shape, suction cups in which there is no helix can also be used.

[0037] After delivering the bricks in the paving work the apparatus 24 can be swung back to above the place where already the next module is being made. The platform 5 and the slide 8 are operated in such a way that the stack S is lifted step by step and each time a layer of bricks is slid onto the vibrating plane. In this way a machine 1 is obtained, which can function fully automatically. When aligning means are used in the paving work, only the regular moving of the frame 2 has to be seen to, depending on the range of the working arm 27, and of regular supply of new stacks S. These stacks S can either consist of used bricks or new bricks.

[0038] In the figures 5A and 5B an alternative for the converting apparatus 14 is shown schematically. Here the converting apparatus 14' comprises a lazy-tongs structure (Neurenberger tongs) which is built up of three rods 29, 30 and 31 arranged transversely above the vibrating plate 10", the rod 29 being slidably arranged in the direction C and in horizontal direction and the rod 30 being fixedly arranged downstream, laterally therefrom and the rod 31 arranged upstream therefrom in the direction C. The rods 30 and 31 are hinged to the middle rod 29 in a parallelogram manner. The connections between the rods 29 and 31 and the rods 29 and 30 are formed by series of brick catchers 38, each of which is formed by an upper plate 37 and a U-shaped wall set 36 welding against that. This wall set 36 is arranged in such a way, that the open side of the U-shape is directed to the supplying side of the bricks. The one series of the plates 37 is attached by hinge connections 32 to the downstream rod 30 and with hinge connections 33 to the middle rod 29, while the other series of plates 36 is attached to the middle rod 29 by hinge connections 34 and by hinge connections 35 to the upstream rod 31. As

noted earlier figure 5A is a bottom view, i.e. on its lower edge the U-shaped wall 37 projects freely. This means that when a brick is accommodated therein this brick can maintain contact with the vibrating plate 10" above which the converting apparatus is arranged.

[0039] The rod 29 is connected to moving means, not shown, which are driven by the operation and controlling means 21 and are arranged to move the rod 29, as seen in the drawing, to the right in the direction E2 (or, alternatively, to the left in the direction E1) (and back again), in the course of which this rod will then move according to a parallelogram movement to the right and upwards against the rod 30 and the rod 31 vis-à-vis the rod 30 upwards and vis-à-vis the rod 29 upwards and to the left, until the situation as shown in figure 5B is reached. The transverse distance between the points 32 and 35 is the same again as that of the brick supply paths, that is $\frac{1}{2}\sqrt{2}L$. The bricks (e and c) and (b and d) respectively have been turned about the points 32 and 35, without being disturbed by the adjacent bricks. When by operating the pusher rods 12 near shoulder 11 (see also figure 1A) a complete transverse series of bricks of the uneven rows a, c etc. and the even rows b, d, etc. are delivered in one go, and these bricks have been received in the U-shaped brick catchers 38 intended for that purpose, they will be urged into a herringbone pattern by the movement of the rods 29 and 31. The U-shaped brick catchers 38 have dimensions vis-à-vis the bricks to be handled, such that the latter are turned in a sufficiently secure way. Then lifting means (not shown) see to it that the lazy-tongs structure is lifted sufficiently far, to permit free further movement in the direction C of the bricks in herringbone pattern to the module to be made. It is ensured that the contact planes of the end jig 23 or those of the rows which are laid in herringbone pattern afterwards, are sufficiently nearby.

[0040] The above mentioned use and design of the (Neurenberger) "lazy-tongs" has the advantage that the bricks, due to the staggered location of the brick catchers 38, are already spaced in longitudinal direction, subsequently that by the movement of the rod 31 during the tongs motion the bricks b and d are moved in the direction C, and then at the same time a complete row is brought into herringbone pattern.

[0041] In the figures 8A-8C a delivery conversion and a laying process is shown, which resembles that shown in the figures 2D-2E, but in this case the converting means are essentially different.

[0042] In the figures 8A and 8B two successive stages are shown, in which first the rows b and d have delivered a brick to the converting means and in the second rows a, c and e have delivered a brick to the converting means. This delivering again takes place with the help of a shoulder 11, against which the bricks in the rows a-e come to rest, while they are continually driven in the direction to the left, as seen in the drawing. By means of selective operation of the pusher bars 12 either the extreme left hand bricks in the rows a, c and e or the

extreme left hand bricks in the rows b and d etc. can be lifted so as to be brought with their downstream lower edge on a level with the vibrating plate 10", after which the series of bricks concerned can slide up in the direction of transport. The foremost bricks concerned in either the rows b, d etc. or the rows a, c, e etc. are pushed up by the bricks coming from behind (until they abut against the shoulder) and soon come into contact with their lower side with the rollers 63, which are connected to each other by the shaft 62, and reach in holes 64 in the vibrating plate 10". The rollers 63 turn with their surface in the plane of the vibrating plane 10". This shaft 62 is driven on one side, so that one drive is enough for all rollers 63.

[0043] As can be seen clearly in the figure 8C the brick will then still be restrained on one side by extension 60 of longitudinal guide 9a. With their centre line the drive rollers 63 are (seen in transverse direction) approximately on the same level as the ends 65 of the extensions 60, at $\frac{1}{2}L$ of the shoulder 11. On account of the bricks being engaged on one portion 57 their lower side by drive rollers 63 rotating in direction M, but are located on vibrating plane 10" at their other portion, accelerating longitudinal forces will be exerted on the bricks, the resultant of which being on the side of the roller vis-à-vis the centre of gravity of the brick concerned, so that a turning moment is exerted thereon and the bricks a etc. will tend to a rotation in the direction L and the bricks b etc. will tend to a rotation in the direction K. These rotations are initially checked by the extensions 60 of the longitudinal guides 9a, which are elongated over a distance of slightly more than $\frac{1}{2}L$ (half the brick length) with regard to the guides 9b, but at the end of the extensions 60 the front part of the bricks concerned which is moved past the end 65 is then free to turn away. The corners of the ends 65 thereby form the points of rotation for the bricks. Possibly assisted by making contact with the previous series of bricks already laid in herringbone pattern, the bricks then turn into herringbone pattern. During conversion of the joining of the bricks in the herringbone pattern, their centre of gravity remained substantially in line with the centre line of the supply path concerned (a-e). Thus in a very simple way, the bricks supplied in longitudinal rows are converted to a herringbone pattern, without any obstacle forming means. This contributes to a further compact embodiment of the apparatus according to the invention. It will, for that matter, be clear that each type of brick has its own optimum arrangement as far as the converting means are concerned. Variables can, among others, be the roller speed, the roughness of the roller surface, the length of the elongation of the longitudinal guide.

[0044] An alternative for the converting means according to the principle of the figures 8A-C is the arrangement according to the figures 9A, B and C, the axis 62 being substituted by a pipe 162, the centre line of which is placed at approximately $\frac{1}{2}L$ (half the brick length) downstream the shoulder 111. The pipe 162 is

attached rotatably about its axis to the frame which corresponds to the frame 1 of figure 1, and is connected with drive means not shown for its rotation in direction of revolution S.

[0045] At the level of the short longitudinal guides 161 the pipe 162 is provided with thickened portions 163, which are, for example, formed by two semi-cylindrical shaped shells 170, 171 which project at most over a $\frac{1}{2}$ B in the path of a brick and are attached on the pipe 162 and are provided on their outer side with a layer of synthetic material 172, 173 vulcanized thereon. The synthetic coverings 172, 173 are preferably formed of a rough synthetic material in order to generate as many frictional forces as possible. The brick will lie clear next to the thickened portions 163. Tilting of the brick in the vertical plane is prevented by the guide 160, against which the brick can find support with its side face. Retarding frictional forces which occur thereby can cooperate in turning the brick in the horizontal plane. Alternatively, next to the thickenings 163, the pipe can be provided with a covering 174 of a synthetic material which projects at least approximately just as far radially. The synthetic coverings 172, 173 on the one hand and 174 on the other hand can be chosen such that the former coverings are rougher than the latter, so as to accelerate the brick half which rests thereon vis-à-vis the brick half which is above the relatively smooth synthetic surface by transmission of a larger, accelerating frictional force alone.

[0046] In figure 9B a vertical view of the transition at the location of the converting means 162 is shown schematically. The shoulder 111 is formed by a plate 180, which is attached by a rubber body 182 to an angle iron 183. At the top a foam rubber filling piece 181 is placed between the plate 180 and angle iron 183. The upper side of the plate 180, the foam rubber filling piece 181 and angle iron 183 is at least approximately in the same plane as the horizontal tangent plane on the roller 162 and the upper surface of supporting plane 110" which is arranged to vibrate. Angle iron 183 is attached securely to the frame of the machine. By means of the described arrangement the shoulder 111 can be compliant in direction of transport, which is advantageous with a view to preventing damage to the brick pressed against it as well as with a view to reducing the noise made by the process.

Claims

1. Method for transforming an initial layer of paving bricks, which are laid in a uniformly oriented pattern to a placing layer of paving bricks, which are arranged in a mutual herringbone pattern, wherein the bricks of the initial layer are presented in a parallel way to brick turning means, to thereby be forced in the horizontal plane to an orientation at an angle to the working direction, characterized in that the

bricks are supplied row for row in working direction to said brick turning means and are thereafter fed until abutment against herringbone shaped stop means operative in counter working direction, wherein the laterally outer bricks are guided and confined by guiding jig means, wherein the herringbone shaped stop means comprise a driven herringbone shaped end jig, which is moved along with the formation of herringbone rows in the working direction.

2. Method according to claim 1, wherein the guide jig means are adjustable at a mutual distance of $(n_1 \cdot L + B)$, $\frac{1}{2}$ in a direction transverse to the supply direction, in which n_1 is the number of bricks per row in a transverse direction, L the practical length of the brick and B the practical width of the brick.
3. Method according to claim 1 or 2, wherein the placing layer is taken by take-up means which are positioned with regard to the centre of gravity of the placing layer, the bricks being each preferably taken up by means of one or more suction cups.
4. Method according to claim 3, wherein the placing layer is transferred to a paving work with the help of the take-up means and is there oriented in the correct way with the help of positioning means which detect the centre of gravity of the placing layer and is subsequently lowered into the paving work, wherein the positioning means preferably comprise a jig which is to be placed on the work.
5. Apparatus for transforming an initial layer of paving bricks, which are arranged in a mutually uniformly oriented pattern, to a placing layer (T) of paving bricks, which are laid in a mutual herringbone pattern, comprising a frame (2), supporting means (5) on the frame for supporting a pack (S) of stacked initial layers, take-off means (7, 8) for taking off an initial layer from the pack, converting means (14; 14', 29, 30, 31; 60, 63) for converting the bricks from the initial layer to a mutual herringbone orientation, and take-up means (24) for taking up and transferring the placing layer to a paving work characterized by first transport means (10') for transporting the bricks from the take-off means to the converting means, receiving means (22, 23) for receiving the converted bricks in a herringbone orientation and holding them in a placing layer in a herringbone pattern, and second transport means (10'') for transporting the stones from the converting means (14; 14', 29, 30, 31; 60, 63) to the receiving means, wherein the receiving means comprise a supporting plane (10'') and an end jig (23) with a contact wall which corresponds to the herringbone pattern, the apparatus further comprising means for moving the end jig (23) in the working direction of the second

transport means.

6. Apparatus according to claim 5, wherein the receiving means (22, 23) comprise confining means (22) for checking the bricks lying in herringbone pattern in a direction transverse to the working direction.

7. Apparatus according to claim 5 or 6 comprising brick, guide means (9; 109) placed upstream of the converting means (14; 14', 29, 30, 31; 60, 63) for spacing the bricks in transverse direction to a centre-to-centre distance of $\frac{1}{2}\sqrt{2}$ times the length of the brick.

8. Apparatus according to claim 7, wherein the converting means (14; 14', 29, 30, 31; 60, 63) are arranged for engaging the bricks for rotation thereof to a herringbone orientation whilst at least substantially maintaining the mutual centre-to-centre distance in transverse direction of the bricks.

9. Apparatus according to any one of the claims 5-8, wherein the converting means (60, 63; 160, 163) comprise drive means (63, 163) for drivingly engaging the bricks in direction of transport at a location situated on a first longitudinal half of those bricks in order to accelerate that first longitudinal half in transport direction with regard to the adjacent second longitudinal half, and bearing means (65; 165) for creating to a point of rotation for the second longitudinal half of those bricks by engagement of a place on said second half.

10. Apparatus according to claim 9, wherein the drive means comprise driven rollers (63; 163), which are arranged so as to engage the underside of the bricks.

11. Apparatus according to claim 10, wherein the drive rollers (63; 163) are placed so as to project in a recess in the supporting plane (10", 110") in order to engage the first longitudinal half of the bricks, while the second longitudinal half is supported by the supporting plane (10"; 110"), the drive rollers being preferably in each case placed in two adjacent brick supply paths.

12. Apparatus according to claim 10, wherein the drive rollers have a first portion which is provided with a rough surface and a second portion which is provided with a smooth surface, wherein the first portion and the second portion are placed in axial direction next to one another to engage the first and the second longitudinal half of the brick, respectively.

13. Apparatus according to claim 10, wherein the rollers (163) as considered in the direction of their axis, have dimensions such that the second longitudinal

halves of the bricks are at least with a part of the lower surface thereof free of support, and the bearing means (160; 165) are arranged to prevent tilting of the bricks in a vertical plane and preferably exert decelerating frictional forces on the second longitudinal half of the bricks.

14. Apparatus according to claims 9-13, wherein the bearing means (60; 160) are formed by extended longitudinal guides (9a; 109a) extending in transport direction to beyond the drive rollers (63; 163), which are interspaced in transverse direction at distances of approximately two rows of bricks and alternate in transverse direction with shorter longitudinal guides, which are interspaced in transverse direction at distances of approximately two rows of bricks, wherein the drive rollers, as seen in transport direction, are arranged downstream from the ends of the short longitudinal guides (9b; 109b) and substantially upstream from the end of the extended longitudinal guides, wherein the first transport means comprise means (11, 12; 111; 112) for alternately offering the converting means transverse series of bricks which, as seen in transverse direction, are located on 2n and 2n-1 positions, respectively.

15. Apparatus according to any one of the claims 5-8, wherein the converting means (14, 18) comprises turning means (18), which are placed so as to engage the side of the bricks at a distance from the horizontal middle thereof, as well as drive means for the converting means to turn the bricks in the horizontal plane after engagement thereof.

16. Apparatus according to claim 15, wherein the turning means comprise pusher bars (18), which depend from a suspension device, in line with the interspaces between the bricks interspaced in transverse direction, and wherein the first transport means (10') comprise means (11, 12) for alternately offering the converting means (14) transverse series of bricks which, as seen in transverse direction, are located on 2n and 2n-1 positions, respectively, wherein the drive means are adapted to urge the pusher bars alternately in one transverse direction and in the opposite direction.

17. Apparatus according to any one of the claims 5-8, wherein the converting means (14') comprise a double lazy-tongs, with three rods (29, 30, 31), which are connected in a parallelogram manner with one another, and are arranged horizontally and transversely to the working direction of the transport means, wherein the upstream, first rod (31) and the middle, second rod (30) are hinged to each other by a series of first brick cavities (38) and the downstream third rod (29) and the middle second rod (30) being hinged to each other by a series of second

brick cavities (38), wherein the first and second brick cavities (38) have preferably U-shaped, brick receiving openings, which are oriented for receiving and accommodating the bricks in one hinging position of the tongs, and are oriented crosswise in a second hinging position of the tongs, and wherein the apparatus comprises means for lifting and lowering the tongs, wherein preferably the third rod (29) is stationarily arranged, the second rod (30) is arranged to be slidable in a reciprocating manner in transverse direction and in working direction, and the first rod (31) is arranged to be slidable in a reciprocating manner, drive means being present for sliding the second rod in transverse direction to turn the first and the second brick cavities, respectively, about their hinging attachments (35, 34) on the first and second rods.

18. Apparatus according to any one of the claims 5-17, wherein the take-up means (24) operate with suction force and comprise suction cups (26, 41), which can each be brought into suctioning engagement with a brick, wherein the suction cups are provided with a rubber casing (43), which is oval or circular in cross section.

Patentansprüche

1. Eine Methode um eine ursprüngliche Schicht Pflastersteine, die in einem gleichmässig orientierten Muster gelegt sind, in eine zu legende Schicht Pflastersteine umzuändern, die im Zickzackmuster zueinander angeordnet sind, in der die Pflastersteine der ursprünglichen Schicht auf parallele Weise zu einer Pflasterstein umkehrenden Vorrichtung präsentiert werden, um dadurch in die horizontale Ebene in einer Orientierung in einem Winkel zur Arbeitsrichtung gezwungen zu werden, dadurch gekennzeichnet dass die Steine Reihe für Reihe in der Arbeitsrichtung zur besagten Stein umkehrenden Vorrichtung geliefert und danach gelegt werden, bis sie gegen eine zickzackförmige Anschlagvorrichtung stossen, die in der Gegenarbeitsrichtung funktioniert, in der die seitlich äusseren Steine durch eine Führungsvorrichtung geführt und begrenzt werden, in der die zickzackförmige Anschlagvorrichtung eine zickzackförmige, angetriebene Endvorrichtung enthält, die mit der Bildung von Zickzackreihen in der Arbeitsrichtung bewegt wird.
2. Eine Methode nach Anspruch 1, in der die Führungsvorrichtung in einem gegenseitigen Abstand von $(n_1 \cdot L + B) \cdot \frac{1}{2} \sqrt{2}$ in einer Richtung quer zur Lieferichtung einstellbar ist, in der n_1 die Anzahl Steine pro Reihe in einer Querrichtung wird, L die praktische Länge des Steins und B die praktische Breite des Steins wird.

3. Eine Methode nach Anspruch 1 oder 2, in der die zu legende Schicht durch eine Entnahmevorrichtung entnommen wird, die sich im Verhältnis zum Schwerpunkt der zu legenden Schicht befindet, wobei Leder der Steine vorzugsweise durch eine oder mehrere Saugschale/n aufgenommen wird.
4. Eine Methode nach Anspruch 3, in der die zu legende Schicht durch die Entnahmevorrichtung in eine Pflasteranordnung übertragen und dort auf korrekte Weise durch die Positioniervorrichtung orientiert wird, die den Schwerpunkt der zu legenden Schicht findet und danach in die Pflasteranordnung gesenkt wird, in der die Positioniervorrichtung vorzugsweise eine Vorrichtung enthält, die auf die Anordnung gesenkt werden muss.
5. Ein Apparat zum Ändern einer ursprünglichen Schicht Pflastersteine, die in einem gleichmässig zueinander orientierten Muster angeordnet sind in eine zu legende Schicht (T) Pflastersteine, die im Zickzackmuster zueinander gelegt werden, bestehend aus: einem Rahmen (2), einer Tragevorrichtung (5) auf dem Rahmen, um ein Päck (S) aufeinandergestapelter ursprünglicher Schichten zu tragen, einer Entnahmevorrichtung (7, 8) um eine ursprüngliche Schicht vom Pack zu nehmen, einer Änderungsvorrichtung (14; 14'; 29; 30; 31; 60; 63) zur Änderung der Steine von der ursprünglichen Schicht in eine gegenseitige Zickzackorientierung und einer Entnahmevorrichtung (24) zur Entnahme und Übertragung der zu legenden Schicht in eine Pflasteranordnung, gekennzeichnet durch: eine erste Transportvorrichtung (10') zum Transportieren der Steine von der Entnahmevorrichtung zur Änderungsvorrichtung, einer Aufnahmevorrichtung (22; 23), um die geänderten Steine in einer Zickzackorientierung aufzunehmen und sie in einer zu legenden Schicht in einem Zickzackmuster zu halten und eine zweite Transportvorrichtung (10'') zum Transportieren der Steine von der Änderungsvorrichtung (14; 14'; 29; 30; 31; 60; 63) zur Aufnahmevorrichtung, in dem die Aufnahmevorrichtung eine Tragefläche (10'') und eine Endvorrichtung (23) mit einer Kontaktwand enthält, die dem Zickzackmuster entspricht, wobei der Apparat ausserdem eine Vorrichtung zum Bewegen der Endvorrichtung (23) in die Arbeitsrichtung der zweiten Transportvorrichtung enthält
6. Ein Apparat nach Anspruch 5, in dem die Aufnahmevorrichtung (22; 23) eine Angrenzvorrichtung (22) enthält, um zu kontrollieren, dass die Steine im Zickzackmuster in einer Richtung liegen, die quer zur Arbeitsrichtung ist.
7. Ein Apparat nach Anspruch 5 oder 6, der eine Führungsvorrichtung (9; 109) für die Steine enthält, die

sich oberhalb der Änderungsvorrichtung (14; 14'; 29; 30; 31; 60; 63) befindet, um die Steine in der Querrichtung zu einem Mittelpunkt-zu-Mittelpunkt-Abstand von $\frac{1}{2}\sqrt{2}$ -mal der Länge des Steins im Abstand zu halten.

8. Ein Apparat nach Anspruch 7, in dem die Änderungsvorrichtung (14; 14'; 29; 30; 31; 60; 63) angeordnet ist, um die Steine zum Rotieren zu ihr in einem Zickzackmuster eingreifen zu lassen, während im wesentlichen mindestens der Mittelpunkt-zu-Mittelpunkt-Abstand in der Querrichtung der Steine beibehalten wird.

9. Ein Apparat nach irgendeinem der Ansprüche 5-8, in dem die Änderungsvorrichtung (60; 63; 160; 163) eine Mitnehmervorrichtung (63; 163) enthält, um die Steine mitnehmend in der Transportrichtung an einer Stelle eingreifen zu lassen, die sich auf einer ersten Längshälfte dieser Steine befindet, um diese erste Längshälfte in der Transportrichtung im Verhältnis zu der angrenzenden zweiten Längshälfte zu beschleunigen und eine Tragevorrichtung (65; 165), um einen Rotationspunkt für die zweite Längshälfte dieser Steine durch das Eingreifen auf einem Sitz auf der besagten zweiten Hälfte zu bilden.

10. Ein Apparat nach Anspruch 9, in dem die Mitnehmervorrichtung Mitnehmerrollen (63; 163) enthält, die derartig angeordnet sind, dass sie in die Unterseite der Steine eingreifen.

11. Ein Apparat nach Anspruch 10, in dem die Mitnehmerrollen (63; 163) derartig angebracht sind, dass sie sich in eine Vertiefung der Tragefläche (10"; 110") erstrecken, um in die erste Längshälfte der Steine einzugreifen, während die zweite Längshälfte von der Tragefläche (10"; 110") getragen wird, wobei die Mitnehmerrollen vorzugsweise in jedem Fall in zwei angrenzenden Zufuhrspuren für die Steine angebracht sind.

12. Ein Apparat nach Anspruch 10, in dem die Mitnehmerrollen einen ersten Abschnitt haben, der mit einer rauhen Oberfläche versehen ist und einen zweiten Abschnitt, der eine glatte Oberfläche hat, in dem der erste Abschnitt und der zweite Abschnitt in axialer Richtung nahe zueinander angeordnet sind, um jeweils die erste und die zweite Längshälfte des Steins eingreifen zu lassen.

13. Ein Apparat nach Anspruch 10, in dem die Rollen (163), wenn man sie in der Richtung ihrer Achse betrachtet, derartig dimensioniert sind, dass die zweiten Längshälften der Steine mindestens mit einem Teil deren unterer Oberfläche nicht getragen sind und die Tragevorrichtung (160; 165) angeordnet

ist, um ein Kippen der Steine in einer senkrechten Ebene zu vermeiden und dass sie vorzugsweise verlangsamende Reibungskräfte auf die zweite Längshälfte der Steine ausübt.

14. Ein Apparat nach den Ansprüchen 9-13, in dem die Tragevorrichtung (60; 160) durch sich längs erstreckende Führungen (9a; 109a) gebildet ist, wobei sich die Führungen in der Transportrichtung bis über die Mitnehmerrollen (63; 163) hinaus erstrecken, die in einer Querrichtung in Abständen von ungefähr zwei Reihen von Steinen dazwischengelegt sind und in der Querrichtung mit kürzeren Längsführungen abwechseln, die in der Querrichtung bei Abständen von ungefähr zwei Reihen von Steinen dazwischengelegt sind, in dem die Mitnehmerrollen, wie es in der Transportrichtung sichtbar ist, unterhalb der Enden der kurzen Längsführungen (96; 196) angeordnet sind und im wesentlichen oberhalb der Enden der sich erstreckenden Längsführungen, in dem die erste Transportvorrichtung eine Vorrichtung (11; 12; 111; 112) zum abwechselnden Präsentieren der querliegenden Serie Steine an die Änderungsvorrichtung enthält, die sich, wie es in der Querrichtung sichtbar ist, auf der jeweiligen 2n und 2n-1 Stellung befindet.

15. Ein Apparat nach irgendeinem der Ansprüche 5-8, in dem die Änderungsvorrichtung (14, 18) eine Drehvorrichtung (18) enthält, die derartig angeordnet ist, dass sie die Seite der Steine in einem Abstand von deren horizontaler Mitte eingreifen lässt, sowie eine Mitnehmervorrichtung für die Änderungsvorrichtung, um die Steine nach dem Eingreifen in die horizontale Ebene zu bringen.

16. Ein Apparat nach Anspruch 15, in dem die Drehvorrichtung Schubstangen (18) enthält, die von einer Aufhängevorrichtung abhängen, in einer Linie mit den Zwischenabständen zwischen den Steinen, die in der Querrichtung dazwischengeschoben sind und in dem die erste Transportvorrichtung (10') eine Vorrichtung (11; 12) enthält, um die querliegende Serie Steine der Änderungsvorrichtung (14) zu präsentieren, die sich, wie es in der Querrichtung sichtbar ist, auf den jeweiligen Positionen 2n und 2n-1 befindet in dem die Mitnehmervorrichtung geeignet ist, die Schubstangen abwechselnd in eine Querrichtung und in die gegenüberliegende Richtung zu zwingen.

17. Ein Apparat nach irgendeinem der Ansprüche 5-8, in dem die Änderungsvorrichtung (14') eine doppelte Zickzackzange mit drei Stangen (29; 30; 31) enthält, die sich in Parallelogramm-Anordnung zueinander befinden und horizontal und quer zur Arbeitsrichtung der Transportvorrichtung angeordnet sind, in dem die obere erste Stange (31) und die mittlere

zweite Stange (30) drehbar zueinander durch eine Serie von ersten Steinhohlräumen (38) und die untere dritte Stange (24) und die mittlere zweite Stange (30) drehbar zueinander durch eine Serie zweiter Steinhohlräume (38) angeordnet sind, in dem der erste und der zweite Steinhohlraum (35) vorzugsweise U-förmige, steinaufnehmende Öffnungen haben, die orientiert sind, um die Steine aufzunehmen und in eine drehbaren Stellung der Zange zu bringen und die kreuzartig in einer zweiten drehbaren Stellung der Zange orientiert sind und in dem der Apparat eine Vorrichtung zum Heben und Senken der Zange enthält, in dem die dritte Stange (29) vorzugsweise feststehend angeordnet ist, die zweite Stange (30) gleitbar in einer wechselweisen Art in der Querrichtung und in der Arbeitsrichtung ist und die erste Stange (31) angeordnet ist, um gleitbar auf eine wechselweise Art zu sein, wobei die Mitnehmervorrichtung einwirkt, um die zweite Stange in der Querrichtung gleiten zu lassen, um jeweils den ersten und zweiten Steinhohlraum um ihre drehbaren Befestigungen (34, 35) auf der ersten und der zweiten Stange zu drehen.

18. Ein Apparat nach irgendeinem der Ansprüche 5-17, in dem die Entnahmevorrichtung (24) mit einer Saugkraft fungiert und Saugschalen (26, 41) enthält, die in ein saugendes Eingreifen mit einem Stein gebracht werden können, in dem die Saugschalen mit einer Gummihülle (43) versehen sind, die oval oder rund im Querschnitt ist.

Revendications

1. Procédé de transformation d'une couche initiale de briques de pavage, qui sont disposées suivant un agencement à orientation uniforme, en une couche de mise en place de briques de pavage, qui sont disposées suivant un agencement mutuel à chevrons, dans lequel les briques de la couche initiale sont présentées d'une façon parallèle à un moyen de rotation de brique, afin d'être forcées ainsi dans le plan horizontal vers une orientation formant un angle avec la direction de progression, caractérisé en ce que les briques sont fournies rangée par rangée, dans la direction de progression audit moyen de rotation de brique, et sont ensuite avancées jusqu'en butée contre un moyen de butée en forme de chevrons pouvant être manoeuvré dans la direction de progression inverse, dans lequel les briques latéralement externes sont guidées et maintenues par des moyens de gabarit de guidage, dans lequel le moyen de butée en forme de chevrons comprend un gabarit actionné d'extrémité en forme de chevrons, qui est déplacé au fur et à mesure de la formation des rangées de chevrons suivant la direction de progression.

2. Procédé selon la revendication 1, dans lequel les moyens de gabarit de guidage peuvent être réglés à une distance mutuelle de $(n_1 \cdot L + B) \cdot \frac{1}{\sqrt{2}}$ suivant une direction transversale à la direction d'alimentation, où n_1 est le nombre de briques par rangée suivant la direction transversale, L est la longueur pratique de la brique, et B est la largeur pratique de la brique.

3. Procédé selon la revendication 1 ou 2, dans lequel la couche de mise en place est prélevée par un moyen de prélèvement qui est positionné par rapport au centre de gravité de la couche de mise en place, les briques étant, de préférence, chacune prélevée au moyen d'une ou plusieurs ventouses.

4. Procédé selon la revendication 3, dans lequel la couche de placement est transférée vers un chantier de pavage à l'aide du moyen de prélèvement, et y est orientée de la façon correcte à l'aide d'un moyen de positionnement qui détecte le centre de gravité de la couche de mise en place, et est ensuite abaissée jusqu'au chantier de pavage, dans lequel le moyen de positionnement comprend de préférence un gabarit qui doit être placé sur le chantier.

5. Dispositif destiné à transformer une couche initiale de briques de pavage, qui sont disposées suivant un agencement mutuel à orientation uniforme, en une couche de mise en place (T) de briques de pavage, qui sont disposées suivant un agencement mutuel en chevrons, comprenant un châssis (2), un moyen de support (5) sur le châssis destiné à supporter un paquet (S) de couches initiales empilées, un moyen d'enlèvement (7, 8) destiné à enlever une couche initiale du paquet, un moyen de réorientation (14 ; 14', 29, 30, 31 ; 60, 63) destiné à réorienter les briques provenant de la couche initiale vers une orientation mutuelle en chevrons, et un moyen de prélèvement (24) destiné à prélever et à transférer la couche de mise en place vers un chantier de pavage, caractérisé par un premier moyen de transport (10') destiné à transporter les briques depuis le moyen d'enlèvement jusqu'au moyen de réorientation, un moyen de réception (22, 23) destiné à recevoir les briques réorientées suivant une disposition en chevrons et à les maintenir dans une couche de mise en place suivant un agencement en chevrons, et un second moyen de transport (10'') destiné à transporter les pavés depuis le moyen de réorientation (14, 14', 29, 30, 31 ; 60, 63) vers le moyen de réception, dans lequel le moyen de réception comprend un plan de support (10'') et un gabarit d'extrémité (23) comportant une paroi de contact qui correspond à l'agencement en chevrons, le dispositif comprenant en outre un moyen destiné à déplacer le gabarit d'extrémité (23) dans la direction de progression du second moyen de transport.

6. Dispositif selon la revendication 5, dans lequel le moyen de réception (22, 23) comprend un moyen de maintien (22) destiné à maintenir les briques disposées en agencement en chevrons suivant une direction transversale à la direction de progression.
7. Dispositif selon la revendication 5 ou 6, comprenant un moyen de guidage de briques (9 ; 109) placé en amont du moyen de réorientation (14, 14', 29, 30, 31 ; 60, 63) destiné à espacer les briques suivant la direction transversale d'une distance d'axe en axe de $\frac{1}{2}\sqrt{2}$ fois la longueur de la brique.
8. Dispositif selon la revendication 7, dans lequel le moyen de réorientation (14 ; 14', 29, 30, 31 ; 60, 63) est agencé de façon à venir en contact avec les briques en vue de la rotation de celles-ci vers une orientation en chevrons tout en conservant au moins pratiquement la distance mutuelle d'axe en axe suivant la direction transversale des briques.
9. Dispositif selon l'une quelconque des revendications 5 à 8, dans lequel le moyen de réorientation (60, 63 ; 160, 163) comprend un moyen d'entraînement (63 ; 163) destiné à venir en contact avec les briques en les entraînant suivant la direction du transport à un emplacement situé sur une première moitié longitudinale de ces briques de manière à accélérer cette première moitié longitudinale suivant la direction du transport par rapport à la seconde moitié longitudinale adjacente, et un moyen d'appui (65 ; 165) destiné à créer un point de rotation pour la seconde moitié longitudinale de ces briques parvenue en contact avec un endroit sur ladite seconde moitié.
10. Dispositif selon la revendication 9, dans lequel le moyen d'entraînement comprend des rouleaux menés (63 ; 163), qui sont agencés de façon à venir en contact avec la face inférieure des briques.
11. Dispositif selon la revendication 10, dans lequel les rouleaux d'entraînement (63 ; 163) sont placés de façon à faire saillie dans un évidement du plan de support (10" ; 110") de manière à venir en contact avec la première moitié longitudinale des briques, tandis que la seconde moitié longitudinale supportée dans le plan de support (10" ; 110"), les rouleaux d'entraînement étant, de préférence, placés dans chaque cas dans deux voies d'alimentation de briques adjacentes.
12. Dispositif selon la revendication 10, dans lequel les rouleaux d'entraînement comportent une première partie qui est munie d'une surface rugueuse ainsi qu'une seconde partie qui est munie d'une surface lisse, dans lequel la première partie et la seconde partie sont placées, suivant la direction axiale, l'une après l'autre de façon à venir en contact avec la première et avec la seconde moitié longitudinale de la brique, respectivement.
13. Dispositif selon la revendication 10, dans lequel les rouleaux (163), observés suivant la direction de leur axe, présentent des dimensions telles que les secondes moitiés longitudinales des briques sont au moins exemptes de support sur une partie de la surface inférieure de celles-ci, et les moyens d'appui (160 ; 165) sont agencés de façon à empêcher le basculement des briques dans un plan vertical et, de préférence, exercent des forces de frottement de décélération sur la seconde moitié longitudinale des briques.
14. Dispositif selon les revendications 9 à 13, dans lequel les moyens d'appui (60 ; 160) sont formés par des glissières longitudinales allongées (9a ; 109a) s'étendant suivant la direction du transport jusqu'au-delà des rouleaux d'entraînement (63 ; 163), qui sont espacées suivant la direction transversale à des distances d'approximativement deux rangées de briques, et alternent suivant la direction transversale avec des glissières longitudinales plus courtes, qui sont espacées suivant la direction transversale à des distances d'approximativement deux rangées de briques, dans lequel les rouleaux d'entraînement, observés suivant la direction du transport, sont agencés en aval des extrémités des glissières longitudinales courtes (9b ; 109b) et pratiquement en amont de l'extrémité des glissières longitudinales allongées, dans lequel le premier moyen de transport comprend un moyen (11, 12 ; 111, 112) destiné à présenter en alternance, au moyen de réorientation, des séries transversales de briques qui, observées suivant la direction transversale, sont situées à des emplacements $2n$ et $2n - 1$, respectivement.
15. Dispositif selon l'une quelconque des revendications 5 à 8, dans lequel le moyen de réorientation (14, 18) comprend des moyens de rotation (18), qui sont placés de façon à venir en contact avec le côté des briques à une certaine distance du milieu horizontal de celles-ci, de même qu'un moyen d'entraînement destiné au moyen de réorientation afin de faire tourner les briques dans le plan horizontal après la venue en contact de celles-ci.
16. Dispositif selon la revendication 15, dans lequel les moyens de rotation comprennent des barres de poussée (18), qui dépendent d'un dispositif de suspension, alignées avec les espacements entre les briques espacées suivant la direction transversale, et dans lequel le premier moyen de transport (10') comprend un moyen (11, 12) destiné à présenter en alternance, au moyen de réorientation (14), des

séries transversales de briques qui, observées suivant la direction transversale, sont situées à des emplacements $2n$ et $2n-1$, respectivement, dans lequel le moyen d'entraînement est conçu pour solliciter les barres de poussée en alternance suivant une première direction transversale et suivant la direction opposée.

17. Dispositif selon l'une quelconque des revendications 5 à 8, dans lequel le moyen de réorientation (14') comprend une pince extensible double, comportant trois tiges (29, 30, 31), qui sont reliées l'une à l'autre à la manière d'un parallélogramme, et sont agencées horizontalement et transversalement à la direction de progression du moyen de transport, dans lequel la première tige amont (31) et la seconde tige médiane (30) sont articulées l'une par rapport à l'autre par une série de premières cavités pour briques (38), et la troisième tige aval (29) et la seconde tige médiane (30) sont articulées l'une par rapport à l'autre par une série de secondes cavités pour briques (38), dans lequel les première et seconde cavités pour briques (38) comportent de préférence des ouvertures de réception de briques en forme de U, qui sont orientées de façon à recevoir et loger les briques dans une première position d'articulation de la pince, et sont orientées en biais dans une seconde position d'articulation de la pince, et dans lequel le dispositif comprend un moyen destiné à soulever et abaisser la pince, dans lequel, de préférence, la troisième tige (29) est disposée de façon fixe, la seconde tige (30) est disposée de façon à pouvoir coulisser en mouvement alternatif suivant une direction transversale et suivant une direction de progression, et la première tige (31) est disposée de façon à pouvoir coulisser en mouvement alternatif, un moyen d'entraînement étant présent afin de faire coulisser la seconde tige suivant la direction transversale afin de faire tourner les première et seconde cavités pour briques, respectivement, autour de leurs fixations d'articulation (35, 34) sur les première et seconde tiges.
18. Dispositif selon l'une quelconque des revendications 5 à 17, dans lequel le moyen de prélèvement (24) agit avec une force d'aspiration et comprend des ventouses (26, 41), qui peuvent être chacune amenée jusqu'en contact d'aspiration avec une brique, dans lequel les ventouses sont munies d'une enveloppe de caoutchouc (43), qui est de section ovale ou circulaire.

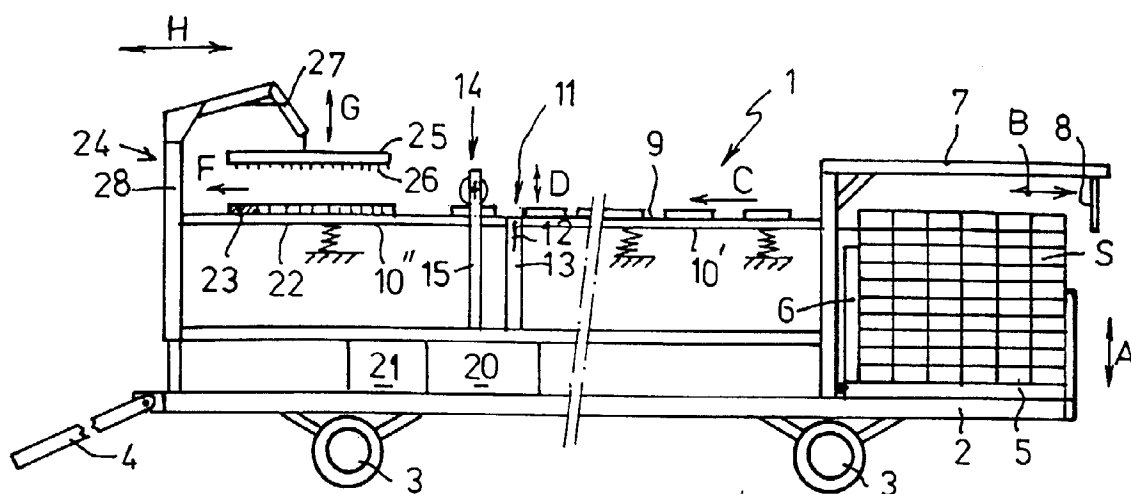


FIG. 1

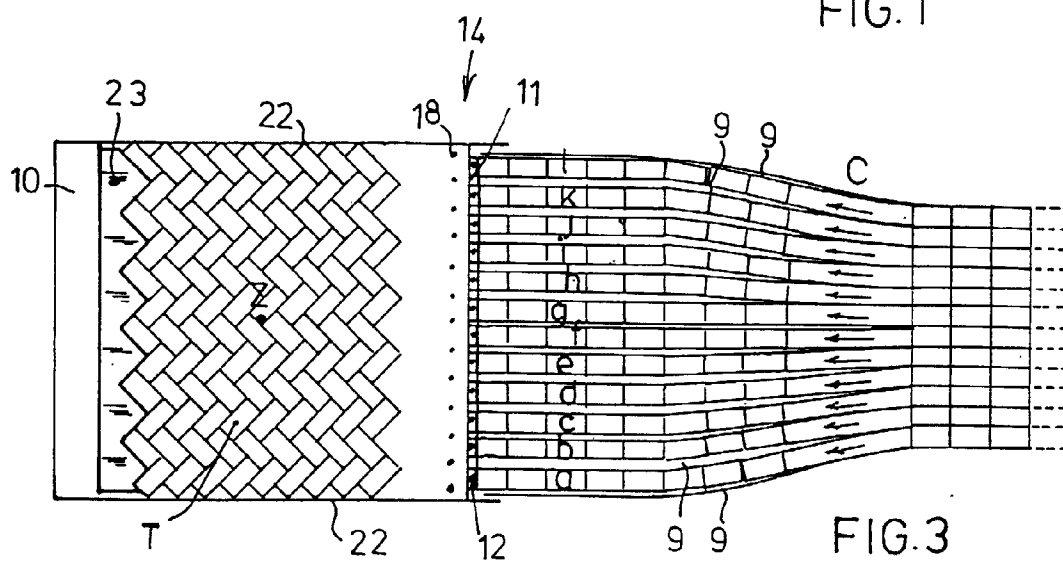


FIG.3

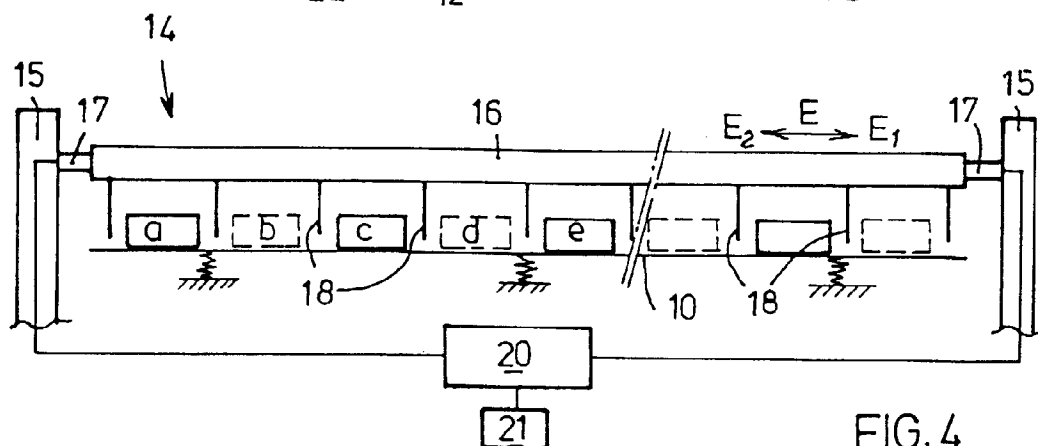


FIG. 4

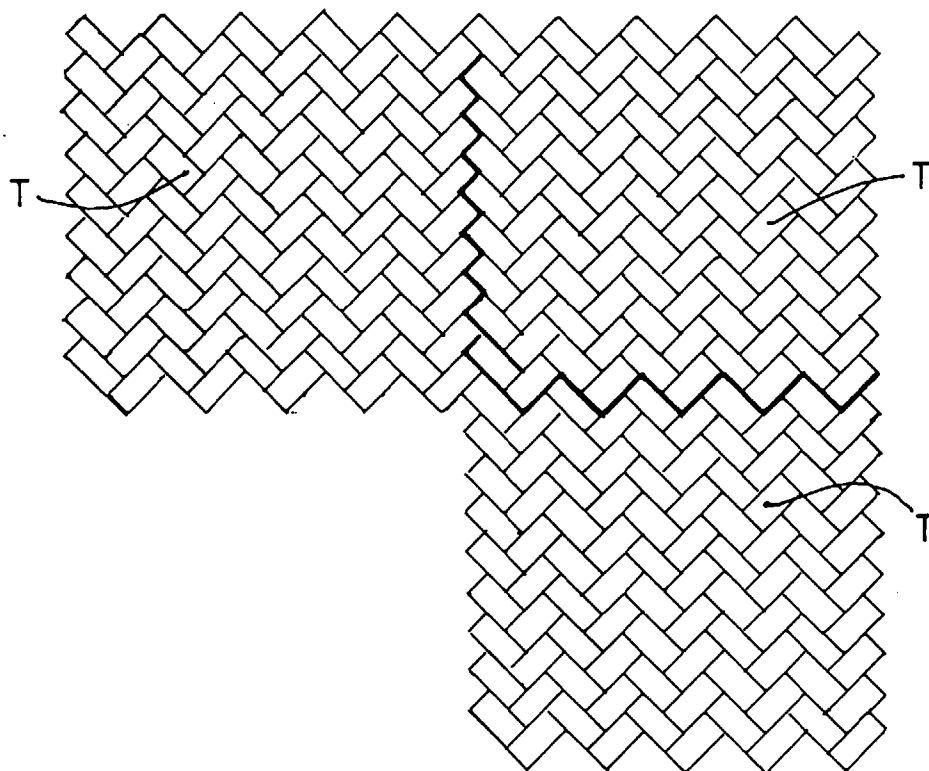


FIG. 7

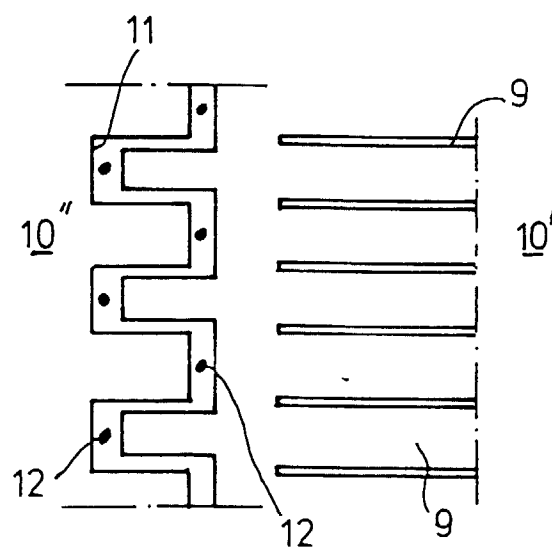
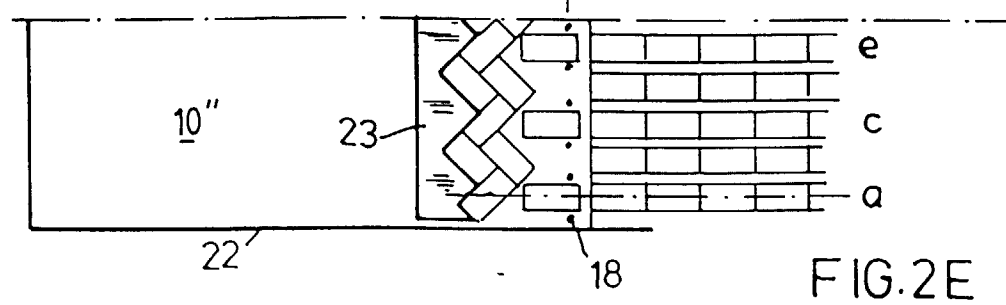
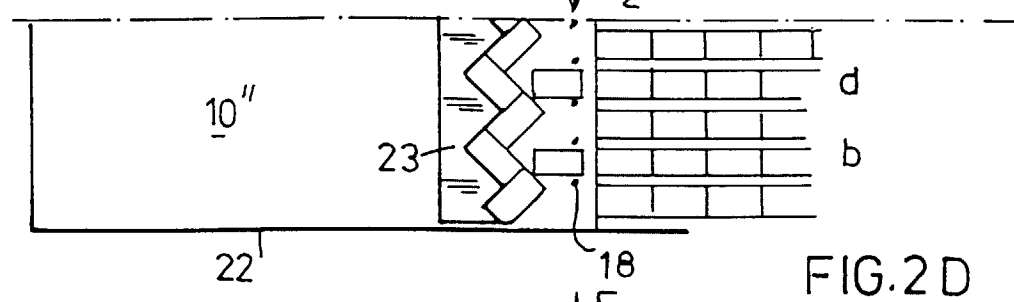
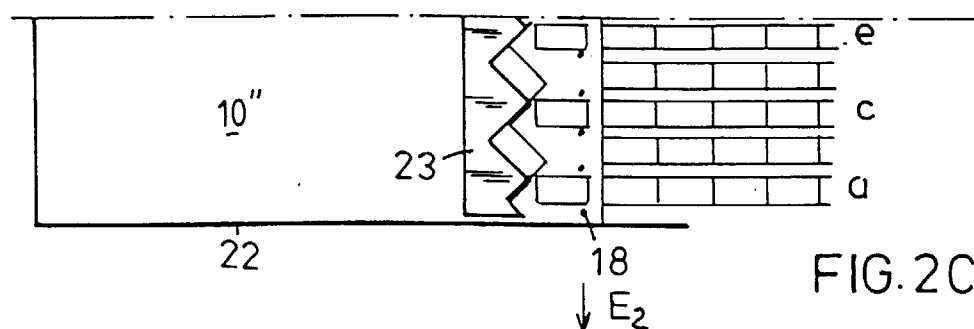
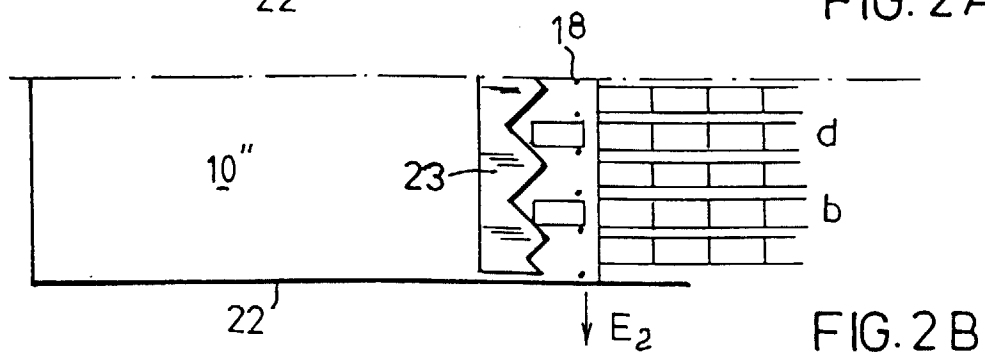
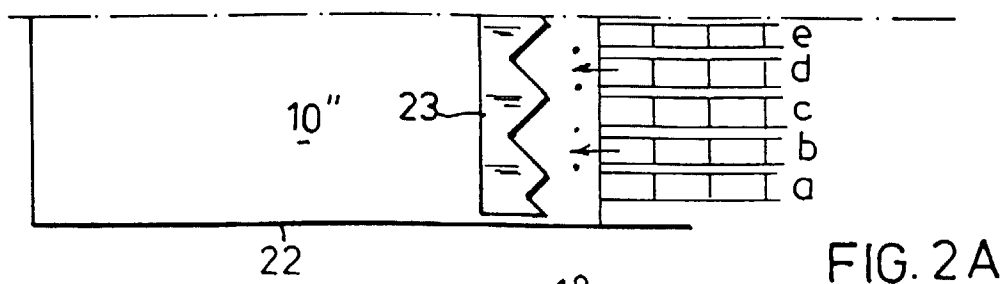


FIG. 1A



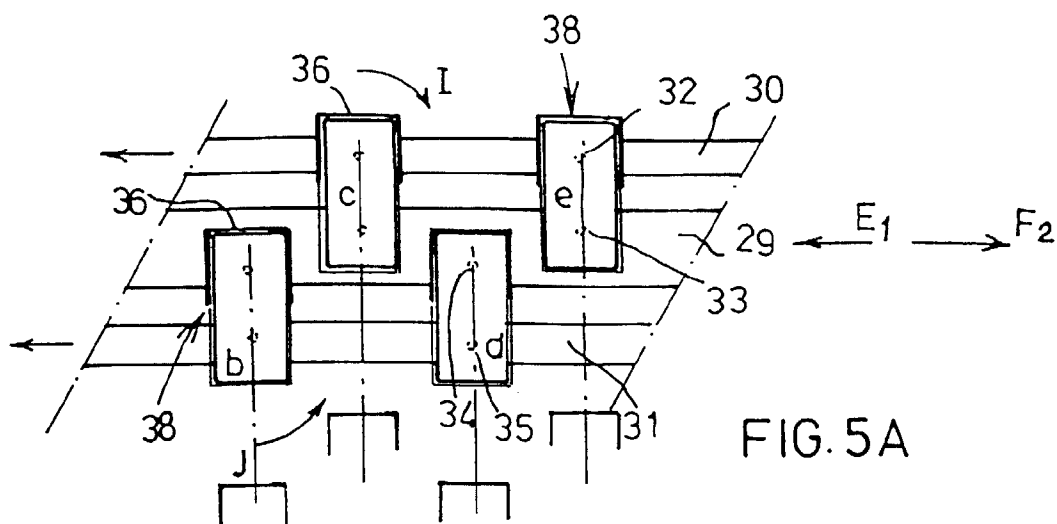


FIG. 5A

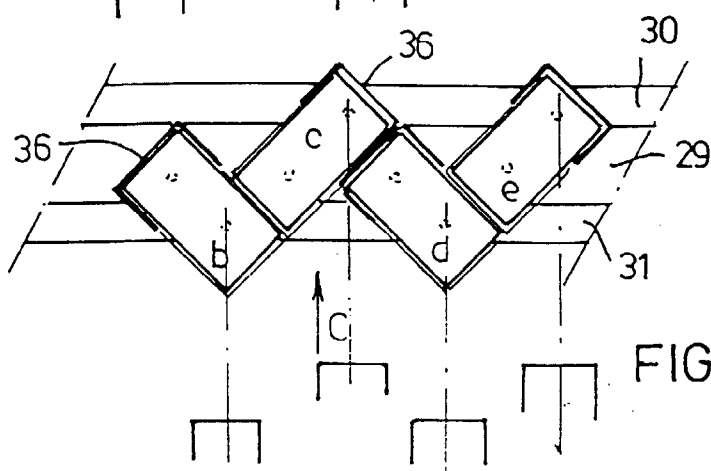


FIG. 5B

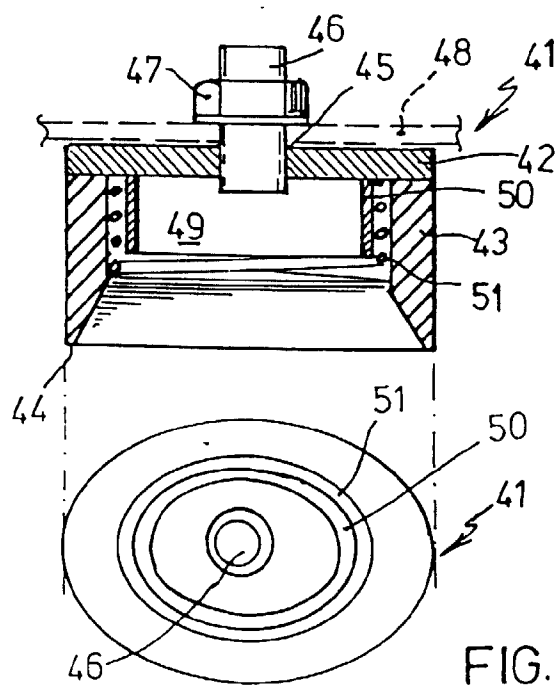
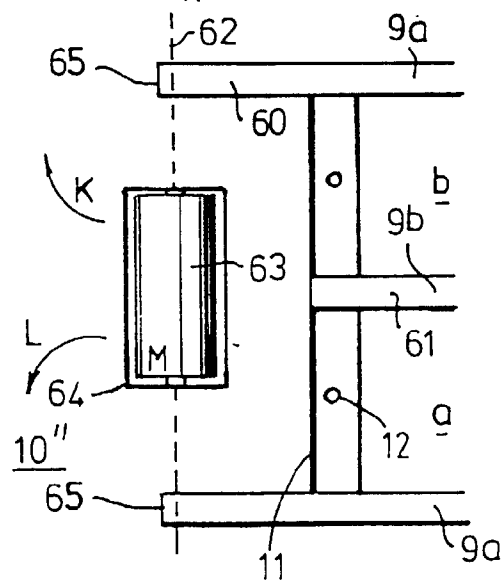
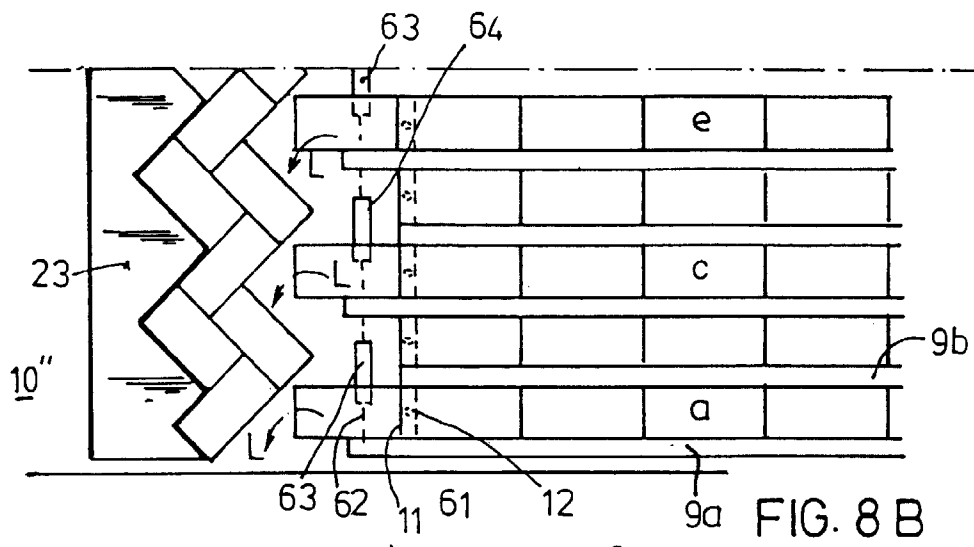
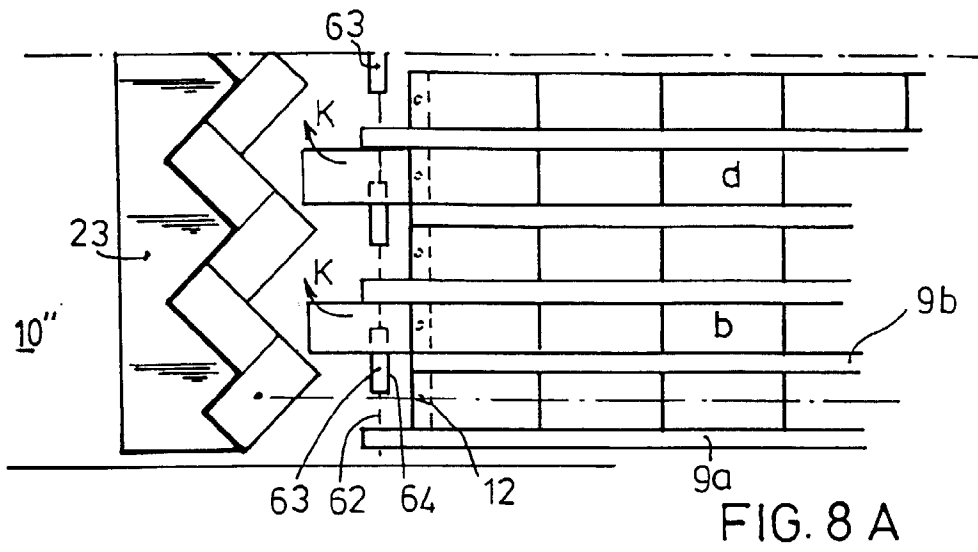


FIG. 6



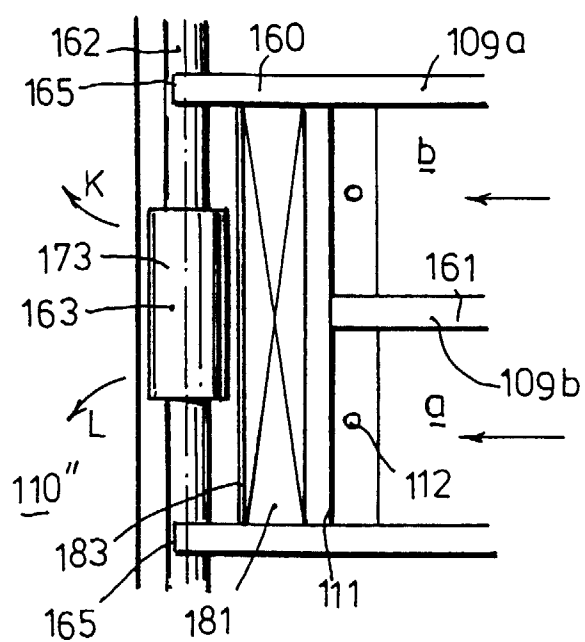


FIG. 9A

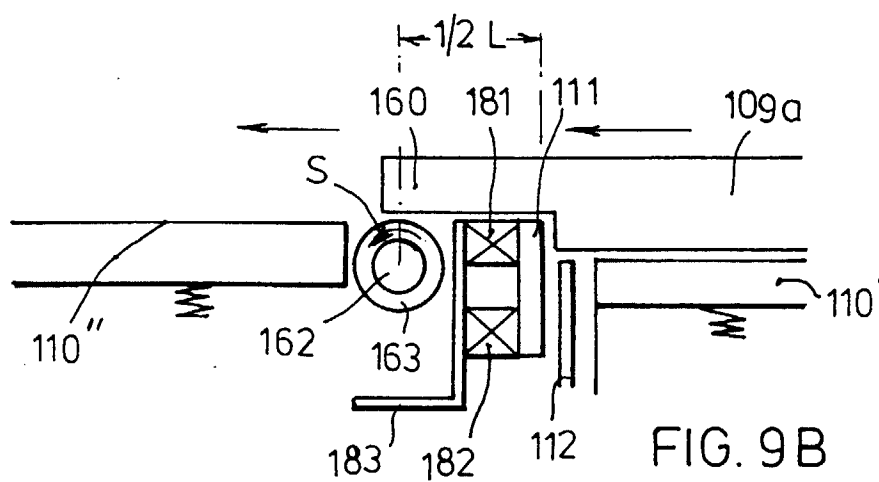


FIG. 9B

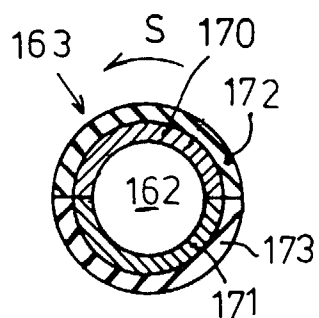


FIG. 9C