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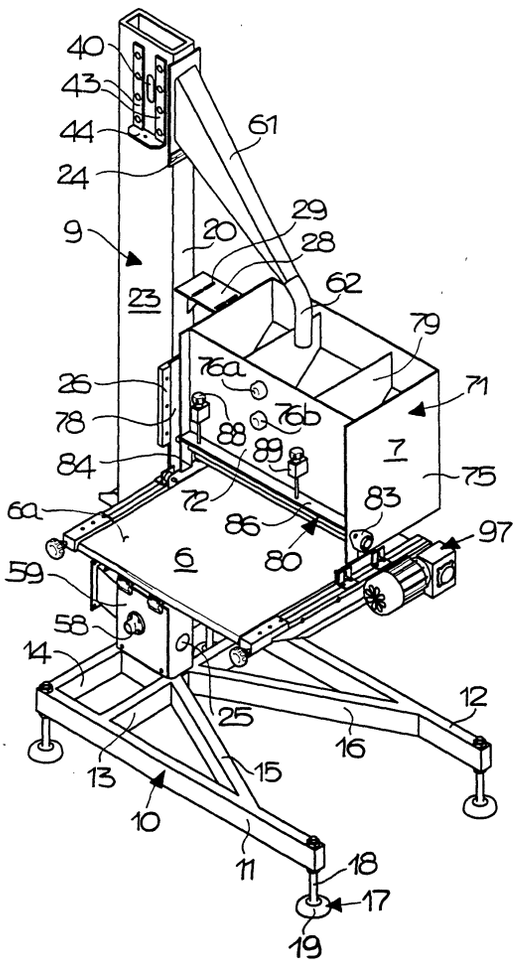
(54) Device for depositing powdered glaze on ceramic tiles

(57) A device for depositing powdered glaze on ceramic tiles, comprising a belt (6) that is closed in a loop, is arranged above a line (3) for the advancement of the tiles and forms an upper portion (6a) surmounted by a hopper (7) for feeding the powder, the belt (6) being provided with surface recesses, elements (20) for filling the recesses with the powder being provided, the powder being suitable to be deposited by gravity onto the tiles at the exit of the upper portion (6a).

FIG 2



EP 1 312 451 A2

Description

[0001] The present invention relates to a device for depositing powdered glaze on ceramic tiles.

[0002] Devices are currently known in which deposition of powdered glaze on ceramic tiles occurs by gravity from at least one fixed feeder hopper directly onto the tiles, which can move in a row on an advancement line and are supported for example by a plurality of parallel belts or by a conveyor belt.

[0003] If a particular aesthetic result, such as for example a decoration with relief patterns, is required on the tiles, known devices have limited effectiveness and versatility, since they do not allow to obtain particular shapes or designs and do not ensure sufficient accuracy in producing them.

[0004] The aim of the present invention is to provide a device that allows to deposit on ceramic tiles a layer of powdered glaze that forms decorative patterns in relief.

[0005] Within this aim, an object of the present invention is to provide a device that ensures that precise and accurate relief patterns are obtained.

[0006] Another object of the present invention is to provide a device that allows to provide diversified and variable patterns and designs in a versatile manner.

[0007] A further object of the present invention is to achieve the above aim with a structure that is simple, relatively easy to provide in practice, safe in use, effective in operation, and relatively low in cost.

[0008] This aim and these and other objects that will become better apparent hereinafter are achieved by the present device for depositing powdered glaze on ceramic tiles, characterized in that it comprises a belt that is closed in a loop, is arranged above a line for the advancement of said tiles and forms an upper portion surmounted by a hopper for feeding said powder, said belt being provided with surface recesses, means for filling said recesses with said powder being provided, said powder being suitable to be deposited by gravity onto said tiles at the exit of said upper portion.

[0009] Further characteristics and advantages will become better apparent from the detailed description of a preferred but not exclusive embodiment of a device for depositing powdered glaze on ceramic tiles according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a front view of the device according to the invention;
Figure 2 is a perspective view of the device;
Figure 3 is a rear view of the device;
Figure 4 is a partially sectional lateral elevation view of the belt, of the hopper and of the filling means;
Figure 5 is a partially sectional lateral elevation detail view of a constructive variation of the device;
Figure 6 is a perspective view of the belt of the device.

[0010] With particular reference to Figure 1, the reference numeral 1 generally designates a device for depositing powdered glaze on ceramic tiles according to the invention. The device comprises a footing 2, which can be arranged to the side of an advancement line 3 for the advancement of a row of tiles 4, which is constituted by a set of horizontal and parallel belts 5 or by a conveyor belt (Figure 4). The footing supports a belt 6 for depositing the powder on the tiles, which is closed in a loop and forms an upper portion 6a that is affected on its surface by recesses that are suitable to be filled with powder and is surmounted by a feeder hopper 7; in the operating condition, the belt 6 is arranged above the line 3. A tray 8 for collecting and feeding the powder is arranged detachably to the side of the footing 2.

[0011] The footing is substantially constituted by a column 9 that is connected to a base 10 (Figure 2). The base is composed of two longitudinal tubular portions 11 and 12 which are horizontal and elongated and arranged symmetrically on opposite sides with respect to the column 9 and are connected by first and second transverse tubular portions 13 and 14 from which said column extends vertically substantially at the central region. There are also oblique tubular portions 15 and 16 for stiffening the base, which connect respectively the longitudinal portions 11 and 12 to the central region of the first transverse tubular portion 13. Four respective feet 17 are provided at the opposite ends of the longitudinal portions 11 and 12 in order to support the device at an adjustable height; each foot is constituted by a threaded stem 18 that is connected, at one end, to a disk 19 made of antislip synthetic material; the stem 18 engages in a respective through hole in which it is locked adjustably by a lower nut 19a and an upper locking nut 19b.

[0012] The column 9 is substantially shaped like an elongated parallelepiped, is internally hollow and has a front face 20, a rear face 21, a first lateral face 22 and a second lateral face (Figures 1, 2, 3). On the front face 20 there is a rectangular opening 24 at the upper end, and a circular orifice 25 for optional connection to means for collecting excess powder is provided at the lower end. A rectangular plate 26 is fixed in the central region of the front face, and a vertical flat region is provided thereon; below the plate 26 there is a ledge 27, which protrudes horizontally from the front face 20. Moreover, a bracket 28 is rigidly coupled on the front face 20, above the plate 26, and is provided with four transverse slots 29 that are arranged side by side in pairs.

[0013] The rear face 21 has, in a downward region, an inlet 30 that has a quadrangular cross-section and is extended in a direction that is inclined with respect to the horizontal and ends with a respective flange 31 for connection to the tray 8; a transverse slot is formed in the upper face 32 of the inlet, and an L-shaped gate 33 for blocking said inlet can slide vertically in said slot. The rear face 21 is furthermore provided, above the inlet 30, with a support 34 for an actuator for actuating the gate

33 (Figure 3), for example a pneumatic piston 35, which is arranged so that its axis is vertical axis and its stem 36 is connected to said gate.

[0014] A lateral hole 37 (Figure 3) is formed in a downward region on the first lateral face 22; on the second lateral face 23 there is instead a rectangular opening 38 that lies opposite the hole 37. The column 9, moreover, is affected in an upward region by first and second vertical and mutually opposite slots 39, 40 provided respectively on the first lateral face 22 and on the second lateral face 23; the column also has, on the second face 23, electric actuation means contained in a corresponding cabinet 40a. A first pair of rectangular elongated plates 41 is fixed to the first lateral face 22, symmetrically at the sides of the first slot 39; said plates are connected in a downward region by a first strip 42 that protrudes at right angles from said face 22. In the same manner, a second pair of rectangular elongated plates 43 is rigidly coupled to the second lateral face 23; said plates are arranged symmetrically at the sides of the second slot 40 and are connected in a downward region by a second strip 44 that protrudes at right angles from said face 23 (Figure 2).

[0015] Means 45 for conveying the powder from the lower inlet 30 to the upper opening 24 (Figure 3) are provided inside the cavity of the column 9. The means 45 are constituted by a belt 46 with an active portion 47, which is provided on its surface with a distribution of mutually equidistant buckets 48 whose concavity is directed upward on the active portion 47. The belt 46 is wound in an upward region around a first pulley 49 which has a horizontal axis and is keyed onto a first shaft 50 that can slide with its opposite ends within the slots 39 and 40 and is supported rotatably by two bearings 51, which are accommodated respectively on an upper plate 52 and an upper contrast plate 53. The upper plate 52 is engaged slidingly, with respective vertical slots, on the second pair of plates 43, and is adjustable by means of a first screw 54 that is engaged on a female thread formed in the second strip 44, while the upper contrast plate 53 is slidingly engaged, with respective vertical slots, on the first pair of plates 41, and is adjustable by means of a second screw 55 that is engaged in a female thread formed in the first strip 42. The belt 46 is would in a downward region around a second pulley 56, which is keyed on a second shaft 57 that is supported rotatably by bearings 58 which are accommodated respectively in the lateral hole 37 and on a lower plate 59, which is fixed at the opening 38. The first shaft 50 is connected to an upper gearmotor 60, which is suitable to turn the belt 46 for conveying powder inside the buckets 48.

[0016] A duct 61 for conveying by gravity the powder carried by the buckets 48 into the feeder hopper 7 is fixed to the front face 20, at the opening 24. The. duct 61 is arranged so as to be inclined downward and has, at its free end, a nozzle 62 for dispensing the powder. The nozzle 62 is pivoted on a pivot 63, which is supported rotatably by the duct 61, and is connected to means for oscillating actuation 64, which are fixed to the bracket 28 and are suitable to impart an oscillating motion to said nozzle in order to achieve the uniform deposition of the powder inside the hopper 7.

[0017] The oscillating actuation means 64 comprise a central gearmotor 65 whose axis is horizontal and parallel to the front face 20 and on the output shaft on which a central pulley 66 is keyed; the pulley is contained within a cylindrical enclosure 67 that is rigidly coupled to the bracket 28 by fixing by means of bolts on the slots 29 and supports the gearmotor 65. The enclosure 67 has, on its lateral surface, a circumferential notch that is directed toward the hopper 7. The central pulley 66 has, on its base surface, a lateral pivot 68 whose axis is arranged eccentrically with respect to the axis of said pulley and on which a rod 69 is articulated, said rod being engaged in the notch and being connected to the nozzle 62 by means of a hinge 70.

[0018] The feeder hopper 7 (Figure 2) is constituted by a substantially box-like container 71 that is open in an upward region and comprises a vertical front wall 72, which is arranged at right angles to the front face 20 of the column 9, an inclined rear wall 73, a proximal lateral wall 74, and a distal lateral wall 75, both of which are vertical. The hopper has, in a downward region, a longitudinal outlet 76 (Figure 4) formed by the front wall 72 and the rear wall 73, which mutually converge.

[0019] An upper sensor 76a and a lower sensor 76b are arranged substantially at the centerline on the front wall 72 and are respectively suitable to sense the maximum and minimum levels of filling of the hopper; the distal lateral wall 75 instead supports, at the rear, a photocell 76c for sensing the presence of a tile 4 (Figure 3).

[0020] The hopper 7 can be connected to the front face 20 of the column 9 by means of an arm 77 that protrudes horizontally from the proximal lateral wall 74 toward said column and is connected, at the free end, to a vertical plate 78 that engages slidingly in the plate 26 and can be locked thereat in an adjustable manner; the ledge 27 constitutes a lower abutment for the plate 78. The volume enclosed by the hopper 7 can be divided by at least one partition 79 that is parallel to the side walls 74 and 75 (Figure 2).

[0021] The hopper 7 has means 80 for filling the recesses of the hopper 6, which are arranged at the longitudinal outlet 76 (Figure 4). The means 80 comprise a dosage roller 81, which is associated with a corresponding lateral gearmotor assembly 82 (Figure 1), which is arranged so that its axis is horizontal and perpendicular to the side walls 74, 75 of the hopper so as to partially occlude the outlet 76, and is rotatably supported by bearings 83 that are locked within recesses 84 and 85 that are formed vertically respectively on the proximal side wall 74 and on the distal side wall 75.

[0022] The filling means 80 furthermore comprise a gate 86, which is arranged horizontally, has an L-shaped transverse cross-section, and is provided with a horizontal surface 87; the gate is supported adjustably on

the front wall 72 by means of a pair of vertical screws 88, which are rigidly coupled by means of their respective lower ends to the horizontal surface 87 and are engaged in female threads formed in blocks 89 that are monolithic with said front wall (Figures 2 and 4). The gate 86 forms, together with the roller 81, a gap 90 of adjustable width, which allows to deliver the chosen amount of powder onto the belt 6.

[0023] The belt 6 is wound around a driving roller 91, which is arranged rearward with respect to the tile advancement direction, and is wound at the front around an adjustable tensioning bar 92; the roller and the bar are parallel and supported by a framework 93 supported by the side walls 74, 75 (Figure 6). The framework comprises a proximal longitudinal member 94 and a distal longitudinal member 95, which are mutually connected by cross-members 96. The driving roller 91 is associated with corresponding actuation means 97, constituted by an external gearmotor 98; the tensioning bar 92, provided at its opposite ends with horizontal through female threads 99, can be adjusted by means of threaded traction elements 100 that are screwed frontally into the longitudinal members 94, 95.

[0024] A first supporting surface 101 and a second narrower supporting surface 102 are mounted one after the other and rest on the cross-members 96. Between the supporting surfaces 101 and 102 there is an interposed vibrating surface 103 (Figure 6), which is elongated and has a substantially U-shaped transverse cross-section with the concavity facing downward, below the upper portion 6a of the belt and in contact with it, and is provided at its opposite ends with two shoulders 104 and 105 that are perpendicular to said deck. The shoulders 104 and 105 are provided respectively with holes 106, 107 at their opposite ends; said holes are suitable for connection by means of bolts 108 to corresponding pairs of slotted brackets 109 and 110 that are fixed on the longitudinal members 94, 95 in order to adjust the relative position of the surface 103 with respect to the framework 93. The surface 103 is connected, in a downward region, to a vibrating device 111 (Figure 4), which is arranged at one end and is suitable to distribute uniformly the powder inside the recesses of the belt 6.

[0025] The framework 93 is furthermore provided with a lower redirection roller 112 for the belt 6, which is arranged substantially at the centerline and is supported rotatably by corresponding plates 113 that accommodate bearings and are connected to the longitudinal members 94 and 95.

[0026] The operation of the device according to the invention is as follows. After adjusting the position of the hopper 7 with respect to the plate 26 and the tension of the belt 46 by means of the first screw 54 and the second screw 55, one acts on the actuation means provided in the cabinet 40a, starting the device and opening the gate 33 by means of the pneumatic piston 35. The powder descends, along the inlet 30, from the feeder tank 8 filled earlier, and is collected by the buckets 48 that are rigidly coupled to the belt 46, which is driven, by means of the first pulley 49, by the upper gearmotor 60.

[0027] The powder is lifted along the column 9 and reaches, inside each bucket 48, the opening 24, where it is deposited inside the duct 61, descending by gravity toward the nozzle 62. Said nozzle is made to oscillate transversely by the oscillating actuation means 64, unloading the powder uniformly into the hopper 7. When the maximum filling level of the hopper is reached, as sensed by the upper sensor 76a, the gate 33 is closed by means of the descent of the stem 36 of the piston 35.

[0028] At this point the device is ready to receive the tiles 4. The external gearmotor 98, which turns the belt 6, and the lateral gearmotor 82, which drives the dosage roller 81 that deposits the powder onto the belt, are actuated with the clearance signal of the photocell 76c that detects the presence of tiles. The vibrating surface 103 allows to fill the recesses of the upper portion 6a of the belt 6, which deposits a layer of powder onto the underlying tile; the thickness of said layer is variable according to the width of the gap 90, which is adjustable by lifting and lowering the gate 86 by means of the pair of screws 88.

[0029] The gradual emptying of the hopper 7, sensed by the lower sensor 76b when the minimum level is reached, determines the lifting of the gate 33, which allows to convey additional powder.

[0030] In a constructive variation of the device (Figure 5), the means 80 for filling the recesses of the belt 6 comprise a spatula 114, which is arranged transversely to the upper portion 6a and is inclined with respect to the vertical, so as to scrape its surface; the spatula 114 is suitable to compact the powder into the recesses, retaining the excess thereof.

[0031] The device is capable of depositing even thin layers of powdered glaze on tiles, with reliefs having different shapes and in an accurate and flexible manner.

[0032] It has thus been shown that the invention achieves the intended aim and objects.

[0033] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept.

[0034] All the details may further be replaced with other technically equivalent ones.

[0035] In practice, the materials used, as well as the shapes and the dimensions, may be any according to the requirements without thereby abandoning the scope of the protection of the appended claims.

[0036] The disclosures in Italian Patent Application No. BO2001A000687 from which this application claims priority are incorporated herein by reference.

[0037] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. A device for depositing powdered glaze on ceramic tiles, **characterized in that** it comprises a belt (6) that is closed in a loop, is arranged above a line (3) for the advancement of said tiles (4) and forms an upper portion (6a) surmounted by a hopper (7) for feeding said powder, said belt (6) being provided with surface recesses, means (80) for filling said recesses with said powder being provided, said powder being suitable to be deposited by gravity onto said tiles (4) at the exit of said upper portion (6a).

2. The device according to claim 1, **characterized in that** said belt (6) is wound around a driving roller (91), which is rotatably supported on a framework (93) and is associated with actuation means (97), and around an adjustable tensioning bar (92), said roller (91) and said bar (92) being arranged horizontal and parallel and surmounting transversely said advancement line (3).

3. The device according to claim 1, **characterized in that** said feeder hopper (7) is constituted by a substantially box-like container that is open at the top and is provided, in a downward region, with a longitudinal outlet (76) formed by a vertical front wall (72) and an inclined rear wall (73) which mutually converge.

4. The device according to claims 1 and 3, **characterized in that** said filling means (80) comprise a dosage roller (81), which has a horizontal axis and is arranged transversely to said belt (6) so as to close said outlet (76) partially, forming with it a gap (90) whose width can be adjusted by means of a gate (86) that is supported adjustably on said front wall (72).

5. The device according to claim 1, **characterized in that** said filling means (80) comprise a spatula (114), which is arranged transversely to said upper portion (6a) so as to scrape its surface and is suitable to compact said powder inside said recesses and retain the excess amount thereof.

6. The device according to claim 1, **characterized in that** said belt (6) is associated with a vibrating surface (111) that is arranged below said upper portion (6a) and in contact with it and is suitable to distribute uniformly said powder inside said recesses.

FIG 1

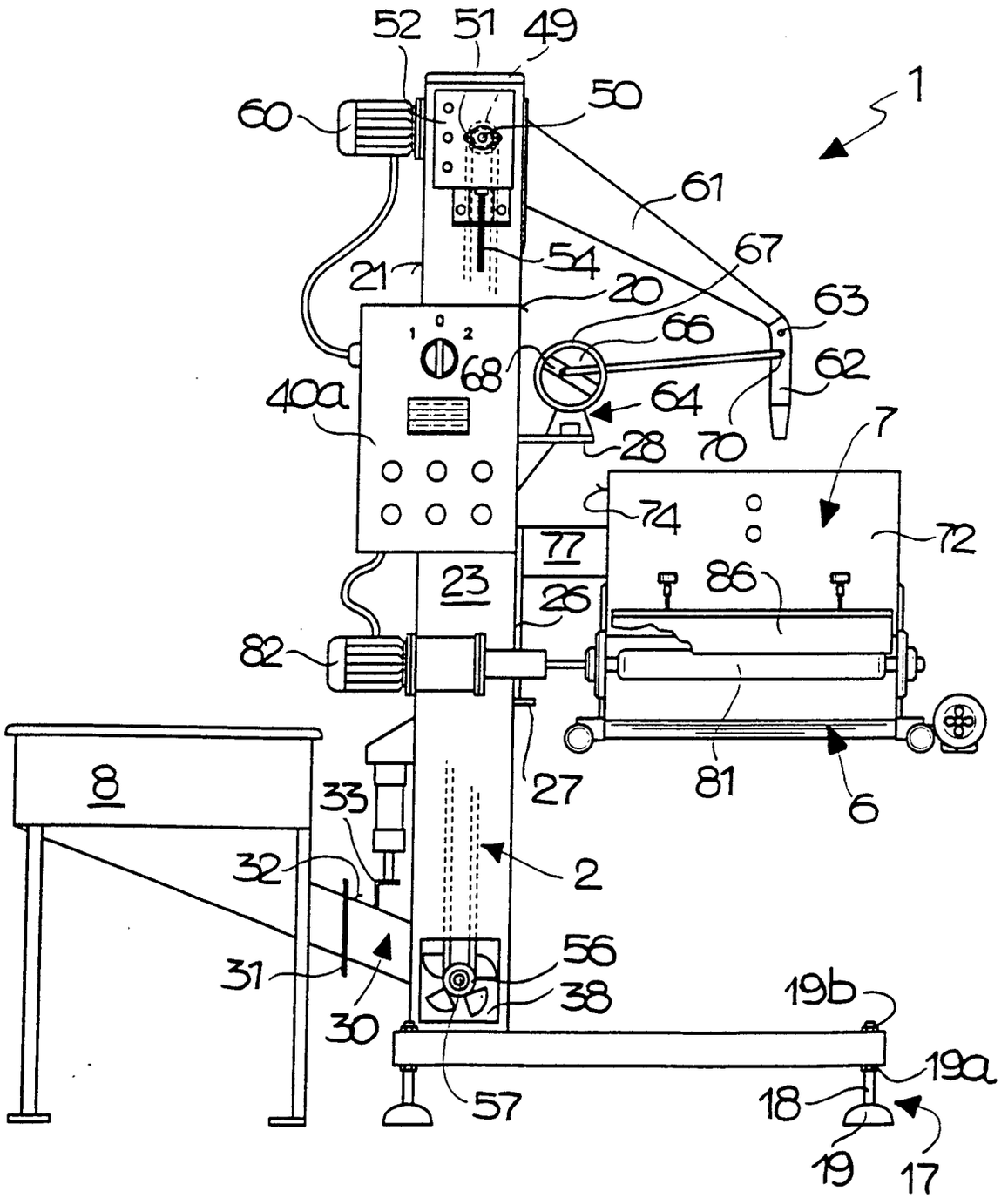

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FIG 2

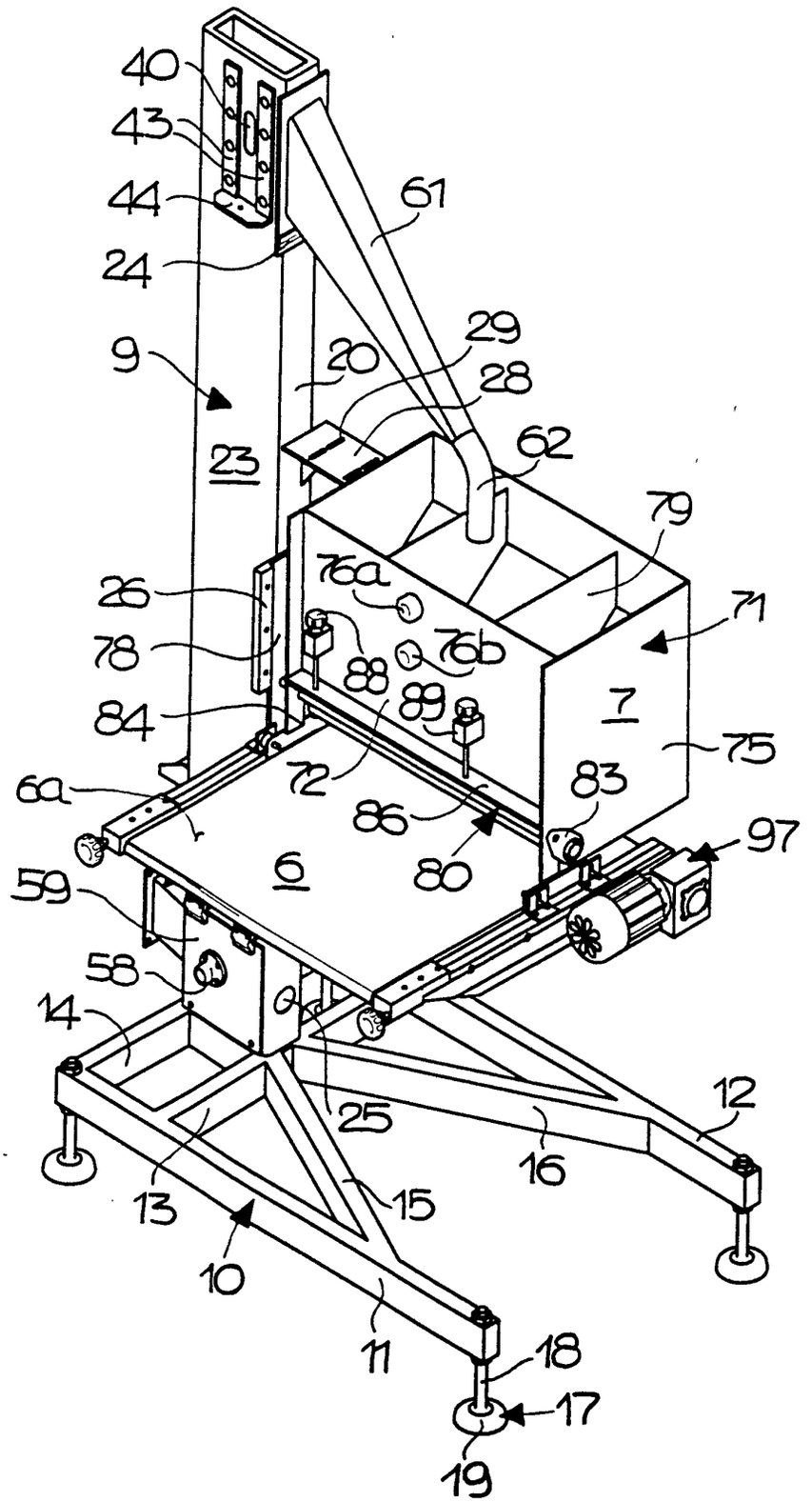
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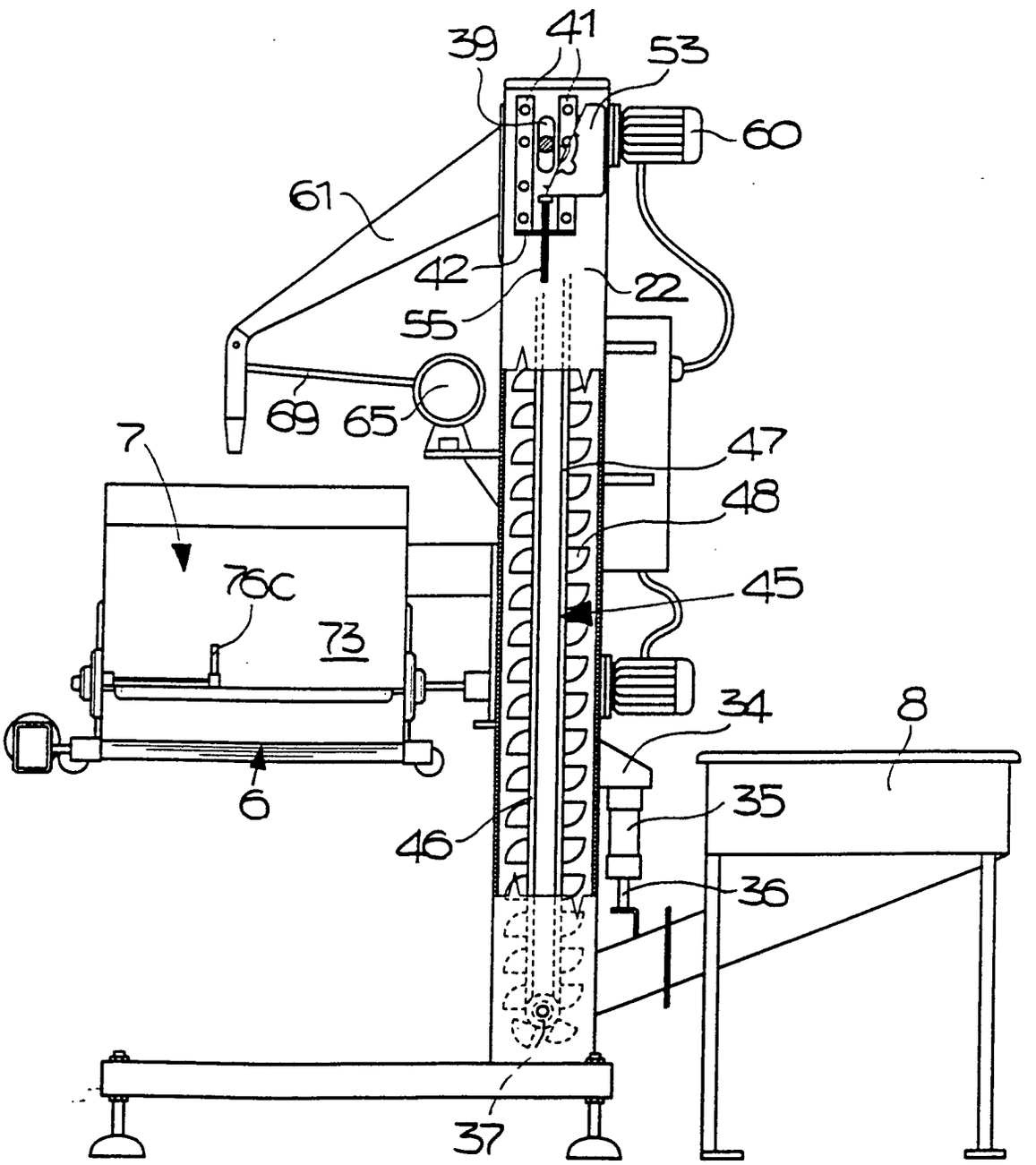
FIG 3



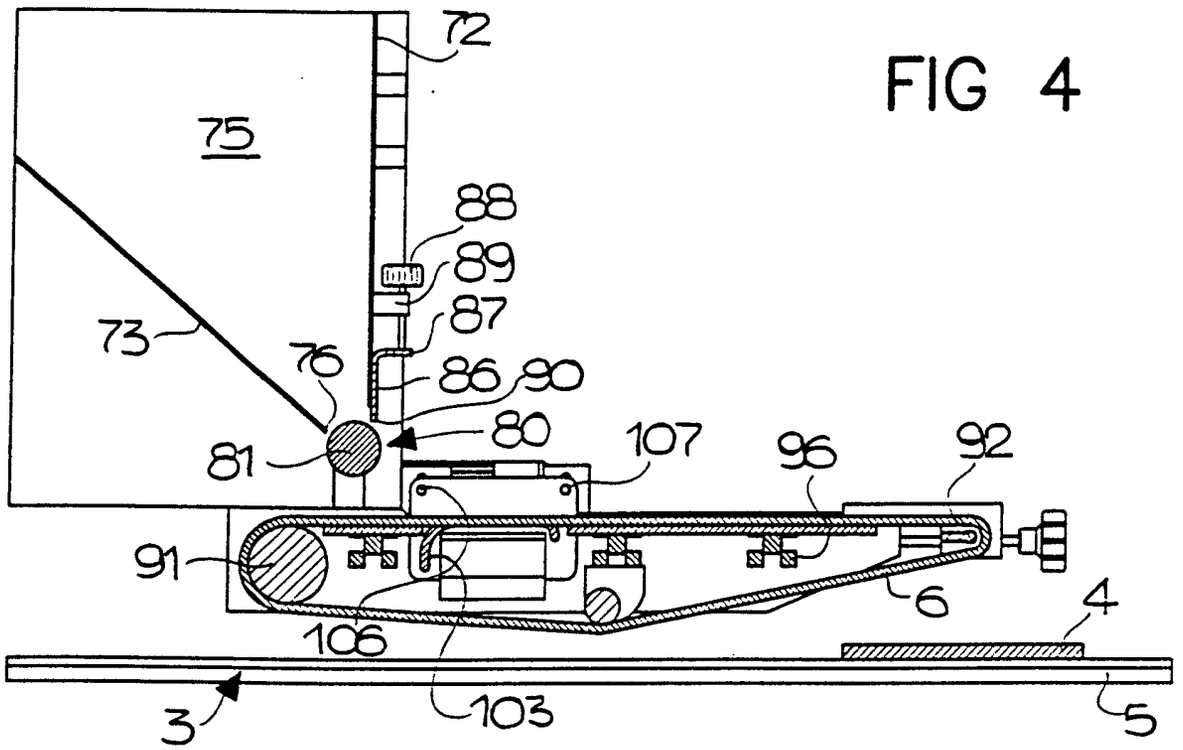

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FIG 4

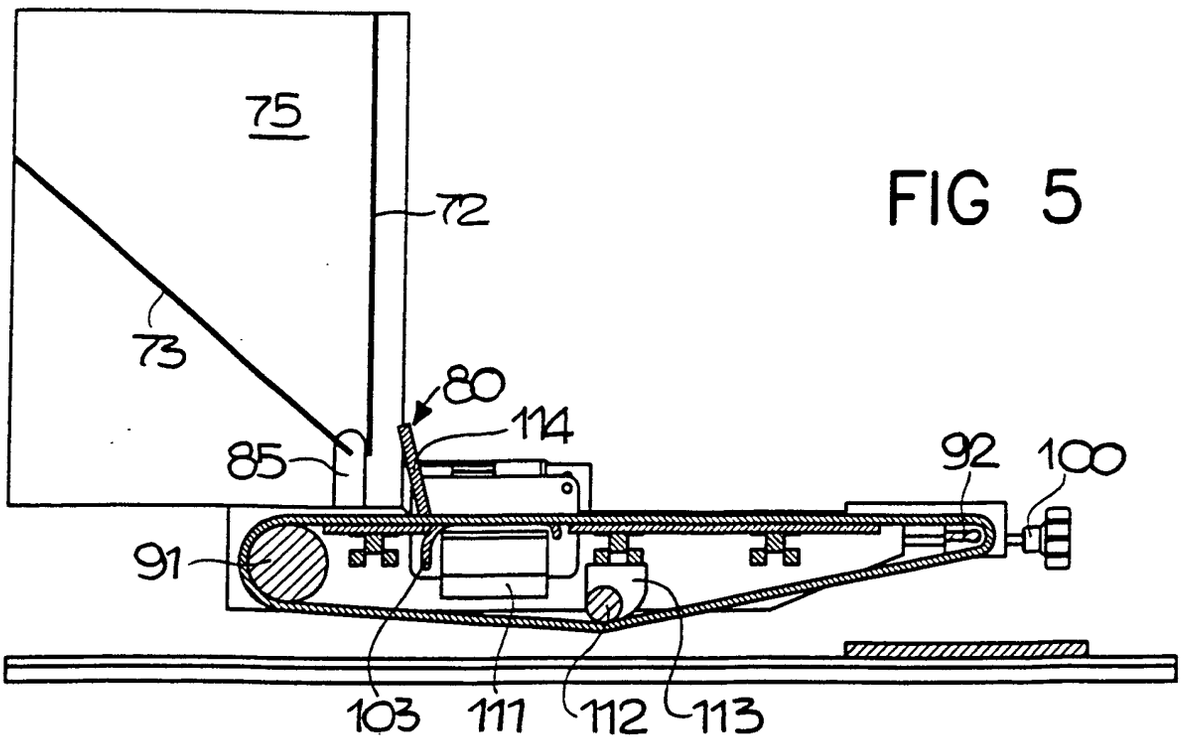
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FIG 5

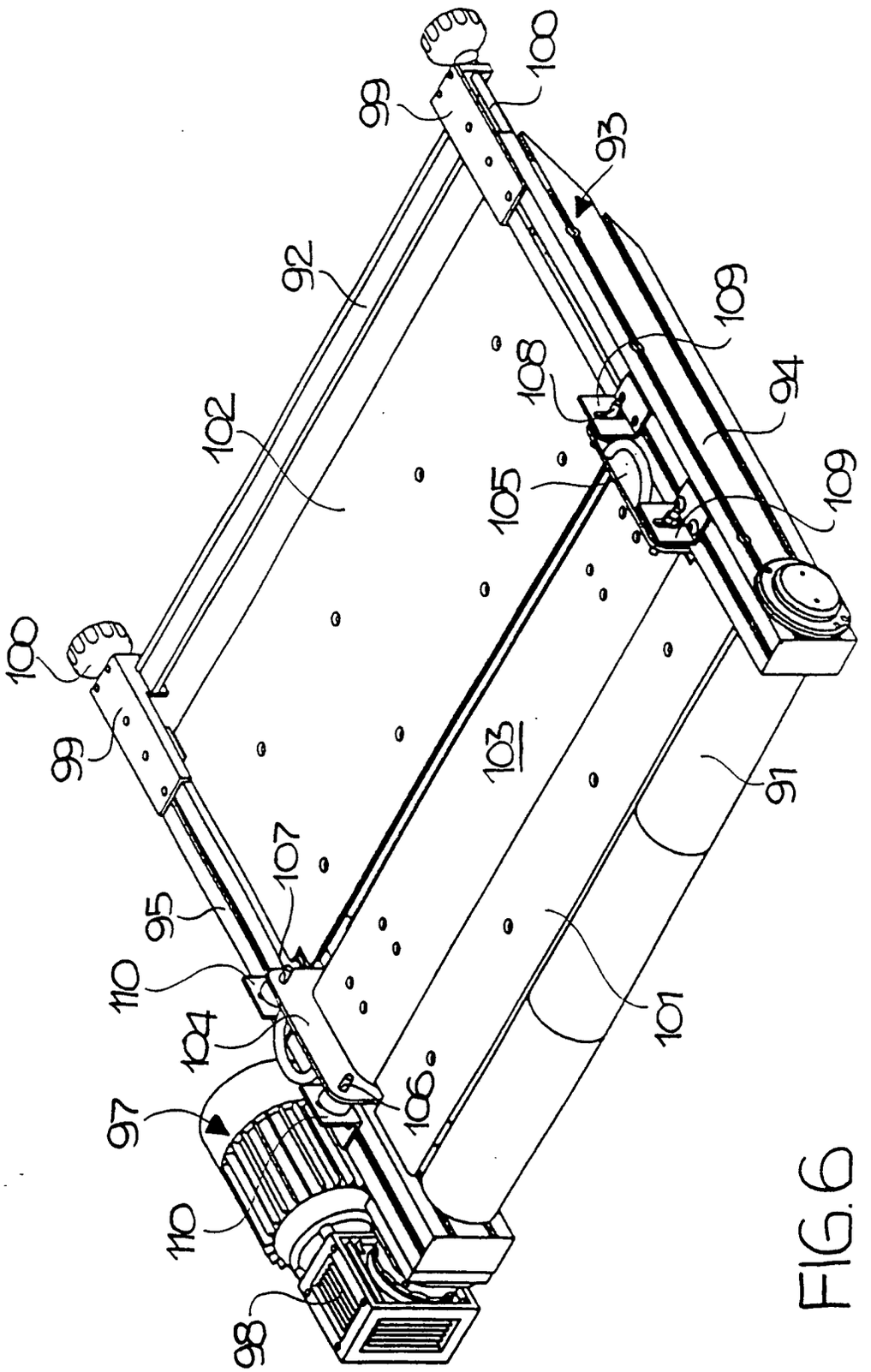
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FIG.6