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## (54) Ceramic mould loading device

(57) A ceramic mould loading device, comprising a loading carriage (2) which is provided with a compartment (7) for filling the at least one forming cavity (4) of a ceramic mould positioned on a press, and is driven with horizontal reciprocating rectilinear movement between a withdrawn position in which it disposes said compartment below a hopper (9) for supplying at least one base material in powder form, and an advanced position in which it disposes said compartment above said at least one mould cavity, in front of said compartment there being provided at least one distributor unit (14-18), which is arranged to deposit, on at least a part of the plan profile of said at least one mould cavity, a desired quantity of at least one finishing powder material.

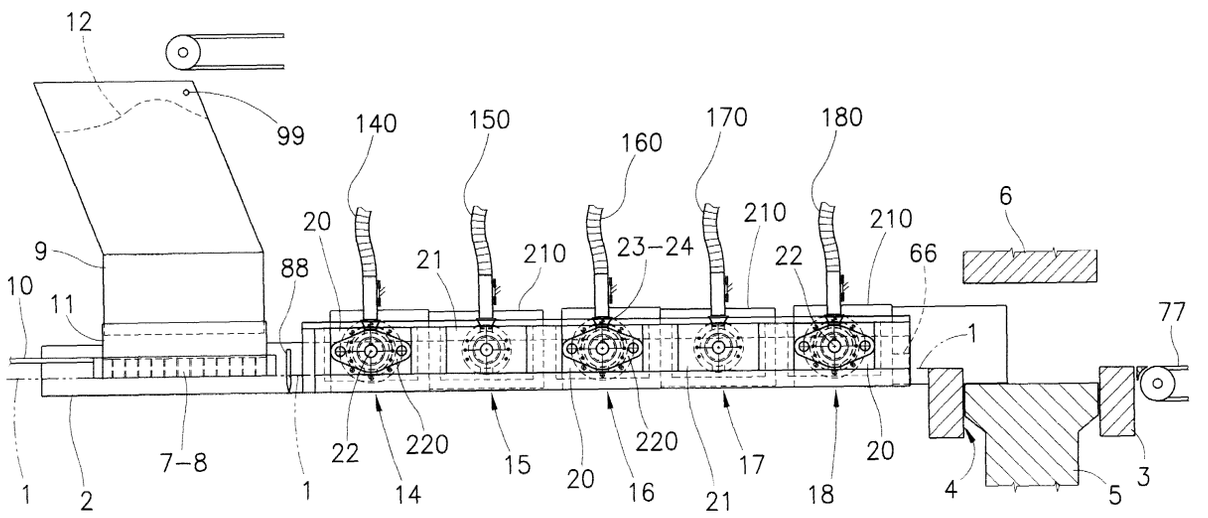


FIG.1

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## Description

**[0001]** This invention relates to a device for loading ceramic tile forming moulds.

**[0002]** In the ceramic tile manufacturing sector it is known to constantly seek new materials, or at least new aesthetic-ornamental effects to confer on the tiles.

**[0003]** The present invention falls within the context of said search, its object being to provide a loading device able to obtain unusual and decorative motifs, such as tiles having their exposed surface shaded, or provided with decorations which distinctly project above the surrounding regions, this being achieved within the context of so-called pressure-glazing processes.

**[0004]** A further object of the invention is to provide a loading device the mode of operation of which can be varied at will while the process is underway, even at each cycle if desired.

**[0005]** A further object is to obtain said results within the context of a simple, rational and reliable construction.

**[0006]** These objects are attained by a loading device having the characteristics defined in the claims.

**[0007]** In particular, it comprises a loading carriage which is provided with a compartment for filling the forming cavity or cavities of a ceramic mould positioned on a press, and driven with horizontal reciprocating rectilinear movement between a withdrawn position in which it disposes said compartment below a hopper for supplying at least one base material in powder form, and an advanced position in which it disposes said compartment above said cavity or cavities with simultaneous closure of the discharge port of said supply hopper.

**[0008]** According to the invention, in front of said compartment, and rigid therewith, there is provided at least one distributor unit, described in detail hereinafter, which is arranged to deposit, on at least a part of the plan profile of the mould cavity, a desired or predetermined quantity of at least one finishing powder material for the tile to be formed.

**[0009]** All the objects of the invention are attained by the simple provision of said at least one distributor unit.

**[0010]** In this respect, both the operation and the feed of said at least one distributor unit can be adjusted at will during the course of manufacture, even at each cycle, to consequently obtain unusual decorative motifs.

**[0011]** The constructional and operational characteristics and merits of the invention will be apparent from the ensuing detailed description and of a particular preferred embodiment thereof given with reference to the figures of the accompanying drawings, which illustrate a particular preferred embodiment thereof by way of non-limiting example.

**[0012]** Figure 1 is a side elevation of the invention.

**[0013]** Figure 2 is a partial plan view of the preceding figure, in which those members lying above the carriage have been omitted for clarity.

**[0014]** Figure 3 is a section on the line III-III of Figure 2 to an enlarged scale.

**[0015]** Figure 4 is a part of the section on the line IV-IV of Figure 3.

**[0016]** Figure 5 is a section on the line V-V of figure 2 to an enlarged scale.

**[0017]** Figure 6 is a part of the section on the line VI-VI of Figure 5.

**[0018]** Figure 7 shows a further embodiment of the invention.

**[0019]** Said figures, and in particular Figures 1 and 2, show a horizontal operating surface 1 on which there is provided a carriage 2 driven to traverse forwards and rearwards, for example by a motorised connecting rod-crank unit (not shown), in synchronism with the operating stages of a ceramic press, also not shown.

**[0020]** On the base of this latter there is positioned a usual ceramic mould, having a single exit in the illustrated example, its die plate 3 being either stationary or non-stationary in level, as is known to the expert of this specific sector.

**[0021]** The cavity 4 of said die plate 3 receives a vertically slidable reverse face die 5, i.e. for moulding the tile laying face.

**[0022]** With this die there is vertically aligned an exposed face die 6, i.e. to mould the tile visible face, fixed to the vertically movable crosspiece of the press.

**[0023]** The upper face of the die plate 3 is coplanar with the upper face of the operating surface 1.

**[0024]** As can be seen, said carriage 2 comprises a usual loading compartment 7 provided with a likewise usual grid 8.

**[0025]** During the forward and rearward travel of the carriage 2, said compartment 7 is arranged to occupy a withdrawn position in which it lies below a supply hopper 9, and an advanced position in which it lies above the forming cavity 4 and closes the discharge port of the hopper by means of the flat horizontal plate 10 fixed to the structure of the carriage 2.

**[0026]** With said the discharge port there is associated an outer perimetral frame 11 which rests on the plate 10 and is mounted about said mouth as a precise but freely slidable fit, its purpose being to retain the powder material 12 present in the hopper 9.

**[0027]** The material 12, also known as the base material as it is intended to form the tile body, is fed into the hopper 9 by suitable known means.

**[0028]** According to the invention, along that end of the compartment 7 distant from that occupied by the plate 10, there are five distributor units indicated by 14,15,16,17 and 18 respectively, these being supported by the side walls of the carriage 2 and disposed transversely to its direction of movement.

**[0029]** The number of said distributor units can obviously vary.

**[0030]** As can be seen from the accompanying figures overall, each individual distributor unit comprises an outer horizontal cylindrical chamber 19 fixed to two centrally holed opposing end shoulders 20,21, and an internal

rotatable coaxial drum 22 having its outer diameter less than the inner diameter of the chamber 19, and being clad with a jacket 245 of elastically deformable material to which reference will be made hereinafter.

**[0031]** The drum 22 is mounted at a shoulder 20 on a support to 220, and is connected at its opposite shoulder 21 to the exit of a geared motor unit 210 with an incorporated variable-speed gear.

**[0032]** It should be noted that said geared motor units 210 are connected to the control system of the press loading system, which in its turn is in continuous dialogue with the general control and regulator system of the press, in such a manner as to enable the production personnel to select at will those which are to operate and their operating speed, even at each pressing cycle if necessary.

**[0033]** In the complete withdrawal position of said distributor units 14-18 there are provided a like number of feed systems indicated by 140, 150, 160, 170 and 180 respectively, and represented in the present case by flexible hoses.

**[0034]** Said systems from 140 to 180 are connected to respective supply sources of powders having different characteristics, for example in terms of colour and particle size, and can be made to slide transversely to the travel direction of the carriage 2 (see Figure 1).

**[0035]** Said powders constitute the finishing material for the tiles to be formed.

**[0036]** According to the invention said materials can be selected from the following: Powdered ceramic glaze, bulk-coloured atomized clay, surface-coloured atomized clay and micronized clay, or a mixture of one or more thereof.

**[0037]** As will be apparent hereinafter, there is nothing to prevent the use of ceramic glaze in flake form, or flakes based on coloured or non-coloured atomized clay, whether mixed or not mixed with the aforestated materials.

**[0038]** Each individual system 140-180 is arranged to feed a respective hopper 23, which is provided with a level probe 230 and communicates with an entry port 24 provided along the upper generators of the chamber 19 of each distributor unit 14-18.

**[0039]** It should be noted that the probe is preferable but is not indispensable.

**[0040]** More than one feed hose for powder materials of different characteristics can clearly be provided, converging into each hopper 14-18, for example two hoses can be provided having their mouths aligned in the travel direction of the carriage 2.

**[0041]** With particular reference to Figure 2, said entry port 24 is of small width, and of length practically equal to the dimension of that mould cavity 4 positioned in front of the carriage 2.

**[0042]** In an opposing position, i.e. along the lower generators of the chamber 19, there is an exit port 25 the dimensions of which are similar to those of said entry port 24.

**[0043]** In particular, the lower generators of said exit port 25 are positioned just spaced from the lower face of the mould die plate 3 (see Figure 1).

**[0044]** The jacket 245 which encloses the drum 22 of the distributor units 14-18 consists, as stated, of an elastically deformable material, which in the present case is a closed or open-cell spongy material.

**[0045]** In a first embodiment, the outer surface of said jacket 245 can be substantially smooth and be slightly spaced from the inner surface of the chamber 19, such as to provide a thin toroidal gap 26 for transfer of the powder material from the entry port 24 to the exit port 25 following rotation of the drum 22.

**[0046]** Said solution, shown in Figures 3 and 4, enables the distributor unit 18 to deliver a continuous adjustable sheet of powder material.

**[0047]** In an alternative embodiment, the outer surface of the said jacket 245 is of irregular shape, i.e. rough, with parts slightly spaced from the inner surface of the chamber 19, and parts practically in contact with the said inner surface.

**[0048]** In this case the exit sheet is irregular and/or discontinuous.

**[0049]** As an alternative, shown in Figures 5 and 6, the jacket 245 is inserted into the chamber 19 as a lightly forced fit, and on its surface there is provided at least one impression or recess 33 in which the powder material provided by the hopper 23 collects.

**[0050]** In this case, the distributor unit 17 delivers at least a small mass of powder material having, in plan view, a shape determined by the contour of said at least one impression or recess 33. If the impression or recess is in the shape of a straight or curved line, a pattern, possibly repetitive, identical to said shape will be formed on the tile.

**[0051]** The shape and depth of said recess or impression 33 can obviously vary, and more than one of the three aforedescribed solutions can be used for each individual layer 245.

**[0052]** It should be noted that at least one portion of the outer surface of the jacket will be smooth and slightly spaced from the jacket 19, at least one portion will be rough as aforestated, and at least one portion will be smooth and in contact with the jacket 19, and provided with at least one impression 33. This obviously also applies to longitudinal bands of the said outer surface of the jacket 245.

**[0053]** Finally, between the compartment 7 and the distributor units 14-18 there is positioned a powder scraper 88, and beyond the distributor unit 18 a pusher 66 (see Figure 2) for discharging the tiles onto a removal conveyor 77.

**[0054]** One or more of the distributor units 14-18 can be configured to form and distribute material flakes.

**[0055]** In this case, as shown in Figure 7, one or more of the units 14-18 comprises an outer casing 190 having in its interior two semi-cylindrical recesses, each of which receives a roller 220, 221 respectively.

**[0056]** At the top of the casing 190 an aperture carries a small hopper 230 similar to, and performing the same function as, the hopper 23.

**[0057]** The roller 220 has a smooth indeformable surface and is constructed preferably of steel, whereas the roller 221 has a slightly deformable hard rubber surface.

**[0058]** The two rollers are tangential, and the material lying above them is compressed into flakes when they are rotated.

**[0059]** The nature of the roller surface can evidently be chosen from a large variety of types with easily intuitable results, just as the roller drive system can be intuitively derived from the drive system for the single roller of the preceding example.

**[0060]** The invention operates as follows.

**[0061]** When the carriage 2 advances, the distributor units 14-18 are all deactivated.

**[0062]** On termination of the advancement travel of the carriage 2, said distributor units lie above the conveyor 77, and the compartment 7 lies above the mould cavity 4, which at that moment is closed by the lower die 5 which had been raised to extract the previously formed tile therefrom.

**[0063]** At this point the lower die 5 is lowered, and the cavity 4, freed in this manner, receives the powder contained in the compartment 7, and is completely filled.

**[0064]** The return travel of the carriage 2 then commences, and the scraper 88 scrapes the powder present in the cavity 4.

**[0065]** When one of the selected distributor units 14-18 sweeps the upper mouth of the cavity 4, the respective geared motor unit 210 rotates the drum 22 with a tangential speed which can be less than, equal to or greater than the average traversing speed of the carriage 2, depending on the aesthetic effect required and the type of jacket 245 associated with the distributor unit active at that moment.

**[0066]** The said geared motor unit 210 halts on the basis of the selected program, when the discharge port 25 of the respective distributor unit, for example 14, and abandons the cavity 4, or even beforehand.

**[0067]** Any desired number of distributor units 14-18, or even none of them, can intervene in each cycle or pressing operation.

**[0068]** Once the carriage 2 has withdrawn from the mould, the upper die 6 is lowered to effect the pressing operation while the lower die 5 lies resting on the press bed.

**[0069]** On termination of pressing, the carriage 2 lies at the end of its withdrawal travel, with the compartment 7 positioned below the hopper 9, and the hoppers 23 situated below the respective hoses 140-180, which if required restore within them the correct quantity of powder.

**[0070]** The lower die 5 is then raised to position the just formed tile flush with the upper face of the die plate 3, after which the cycle is repeated identically except for any changes to the manufacturing program.

**[0071]** At least one relatively thin layer of powder is deposited on the mass previously loaded into the mould cavity 4, this layer involving all or only part of the plan profile of said cavity 12, in the manner programmed, as stated, by the operator, the manner of which can also vary at each pressing cycle.

**[0072]** Hence there is nothing to prevent the lower die 5 from being correspondingly lowered, in particular when said layer is deposited via jackets 245 having said at least one impression or recess 33.

**[0073]** The invention is not limited to that illustrated and described, but can comprise all technical equivalents thereof, and their combinations, if implemented within the context of the following claims.

**[0074]** For example, instead of loading the materials directly into the mould cavity, the system can prearrange them on a belt which transfers them into said cavity.

**[0075]** Again, if the tile is to be moulded with the exposed side facing downwards, the loading cycle is inverted, in the sense that the material which falls first into the cavity is that originating from the compartment 7.

## Claims

1. A ceramic mould loading device, comprising a loading carriage (2) which is provided with a compartment (7) for filling the at least one forming cavity (4) of a ceramic mould positioned on a press, and is driven with horizontal reciprocating rectilinear movement between a withdrawn position in which it disposes said compartment below a hopper (9) for supplying at least one base material in powder form, and an advanced position in which it disposes said compartment above said at least one mould cavity, **characterised in that** in front of said compartment there is provided at least one distributor unit (14-18), which is arranged to deposit, on at least a part of the plan profile of said at least one mould cavity, a desired quantity of at least one finishing powder material.

2. A device as claimed in claim 1, **characterised in that** said at least one distributor unit comprises a horizontal-axis cylindrical chamber which is fixed transversely to said carriage, is provided with an upper longitudinal entry port for said at least one powder material, and a lower longitudinal exit port for said material, and within which there is rotatably mounted a motorized cylindrical shutter element.

3. A device as claimed in claim 2, **characterised in that** when said carriage is in its withdrawn position there is associated with said entry port of said chamber a device for feeding the required quantity of finishing powder.

4. A device as claimed in claim 2, **characterised in**

**that** said lower port of said chamber is slightly spaced from the level occupied by the upper mouth of said at least one forming cavity.

**5.** A device as claimed in claim 2, **characterised in that** said shutter element is operated by a motor unit of controlled speed which is governed by the general control and regulator system of the ceramic press.

**6.** A device as claimed in claim 2, **characterised in that** said shutter element comprises a drum covered with a jacket of elastically deformable material, between said jacket and said chamber there being provided a passage path for the powder finishing material directed to discharge.

**7.** A device as claimed in claim 6, **characterised in that** said jacket consists of a layer of spongy material.

**8.** A device as claimed in claim 6, **characterised in that** for said passage, said jacket presents a substantially smooth surface slightly spaced from the inner surface of said chamber.

**9.** A device as claimed in claim 6, **characterised in that** for said passage, said chamber presents an irregular rough surface with parts slightly spaced from the inner surface of the chamber and parts substantially in contact with said inner surface.

**10.** A device as claimed in claim 6, **characterised in that** said jacket presents a practically smooth surface which is inserted as a lightly forced fit into said chamber, and presents at least one recess.

**11.** A device as claimed in claim 6, **characterised in that** said jacket presents at least one portion in accordance with claim 8, at least one portion in accordance with claim 9, and at least one portion in accordance with claim 10.

**12.** A device as claimed in claim 6, **characterised in that** said jacket presents at least one longitudinal band in accordance with claim 8, at least one longitudinal band in accordance with claim 9, and at least one longitudinal band in accordance with claim 10.

**13.** A device as claimed in claim 6, **characterised in that** said jacket presents at least one portion in accordance with claim 11 and at least one portion in accordance with claim 12.

**14.** A device as claimed in claim 2, **characterised in that** said longitudinal entry and exit ports are of narrow elongate shape, of length practically equal to the dimension of the at least one mould cavity lying in front of the carriage.

**15.** A device as claimed in claim 1, **characterised in that** said at least one distributor unit comprises, fixed transversely to said carriage, a cylindrical chamber having in its interior two semi-cylindrical recesses of horizontal axis and being provided with an upper longitudinal entry port for said at least one powder material, and a lower longitudinal exit port for said material; in each of said recesses there being rotatably mounted a roller 220, 221, said rollers being tangential to each other and at least one of them being covered with hard rubber.

**16.** A plant for manufacturing ceramic tiles, characterised by comprising at least one loading device in accordance with claims 1 to 15.

**17.** Ceramic tiles obtained by a loading device in accordance with claims 1 to 15, and/or by a plant in accordance with claim 16.

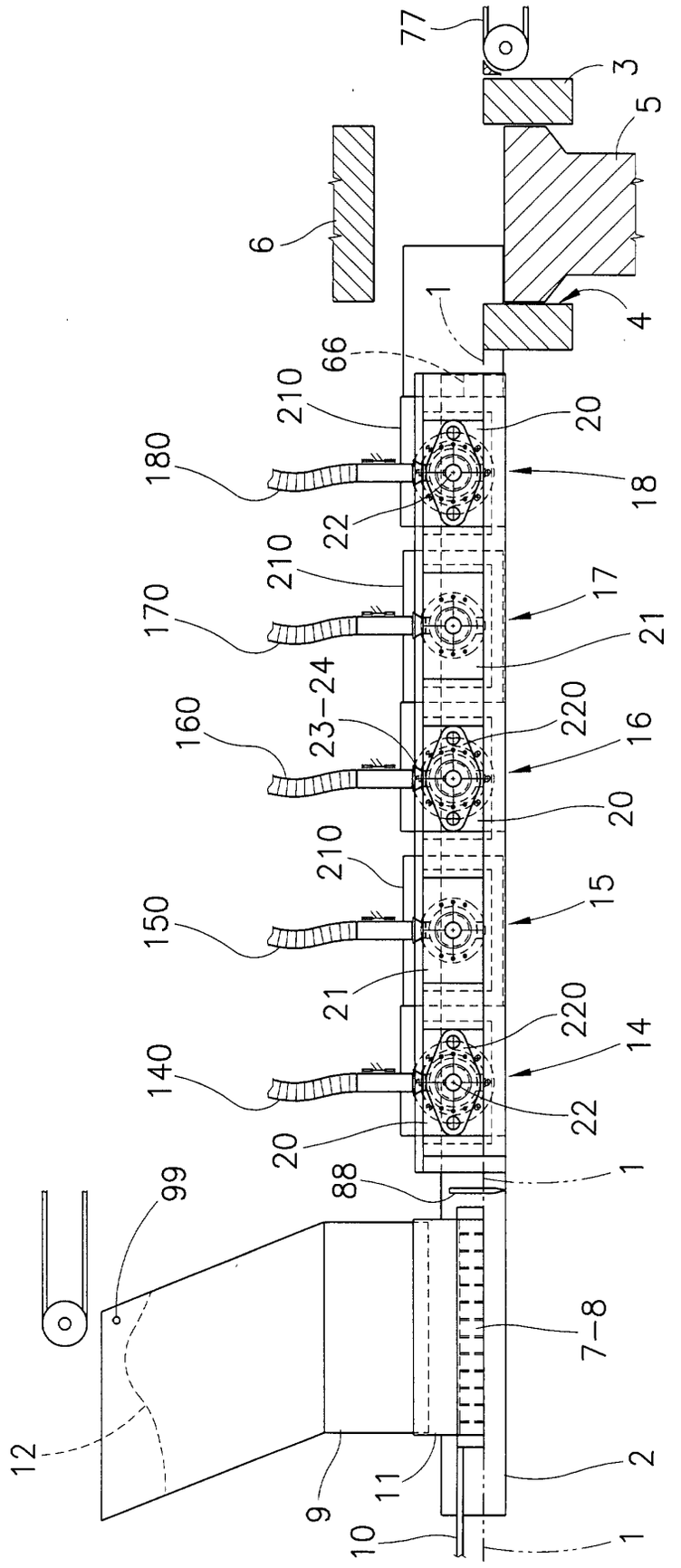
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FIG. 1

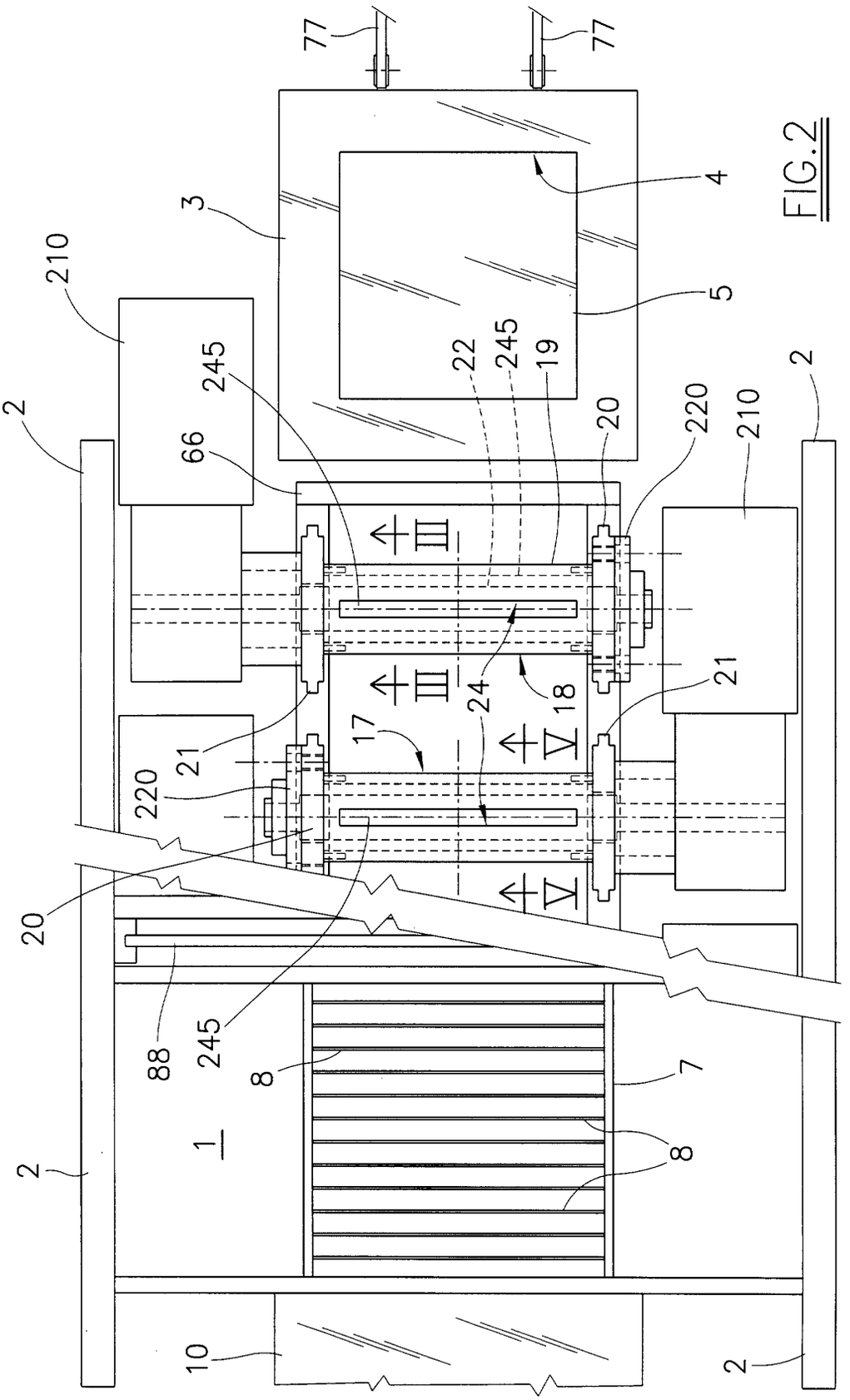
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FIG.2

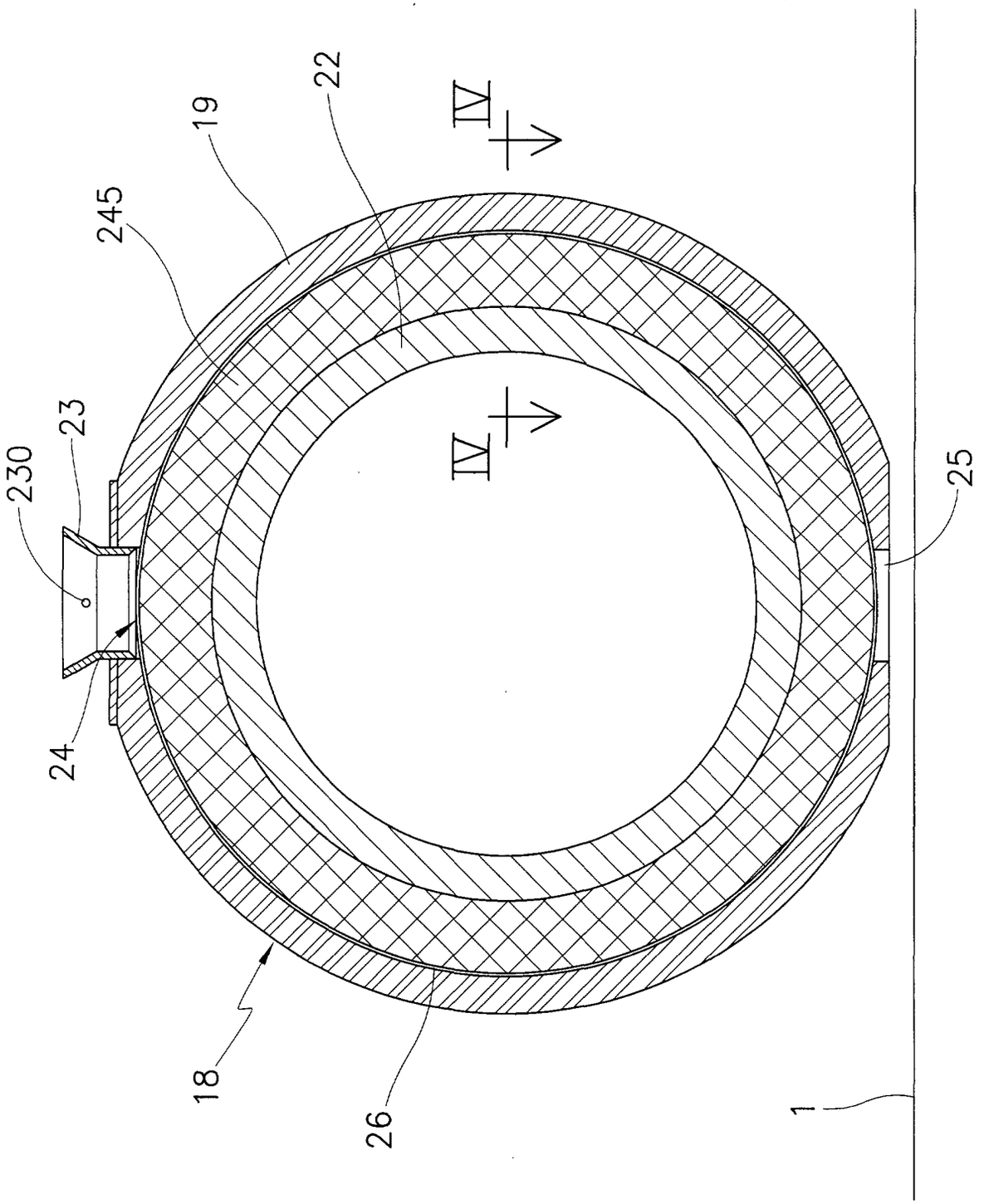


FIG.3

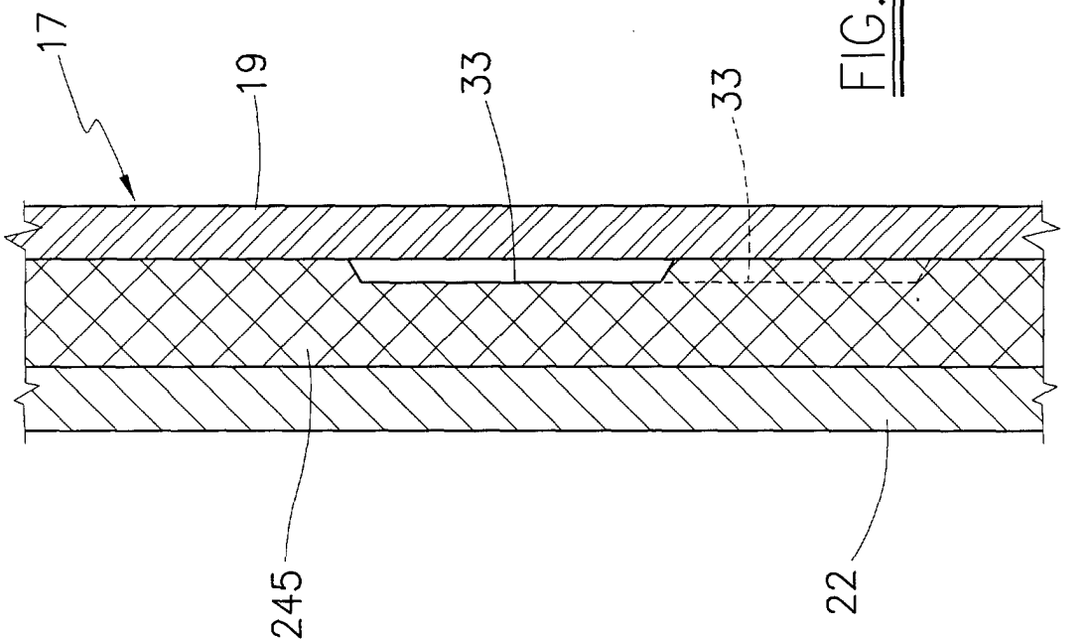


FIG.6

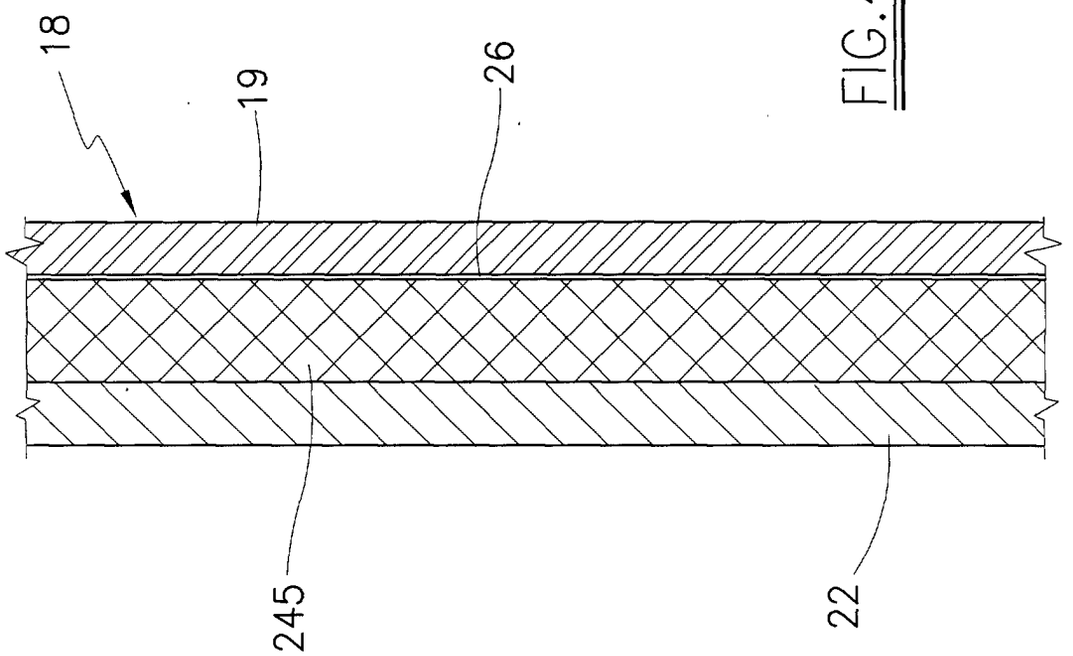


FIG.4

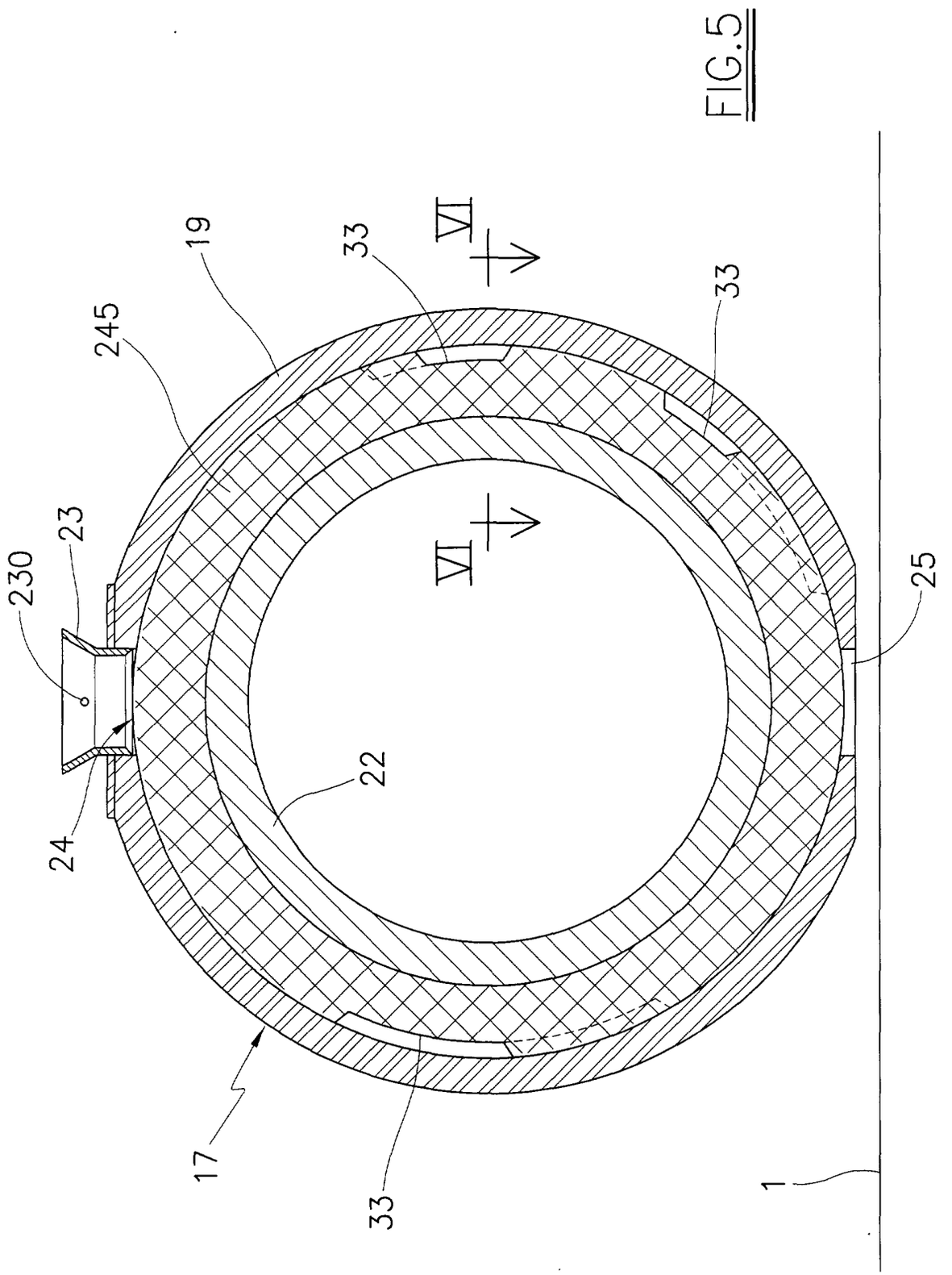


FIG.5

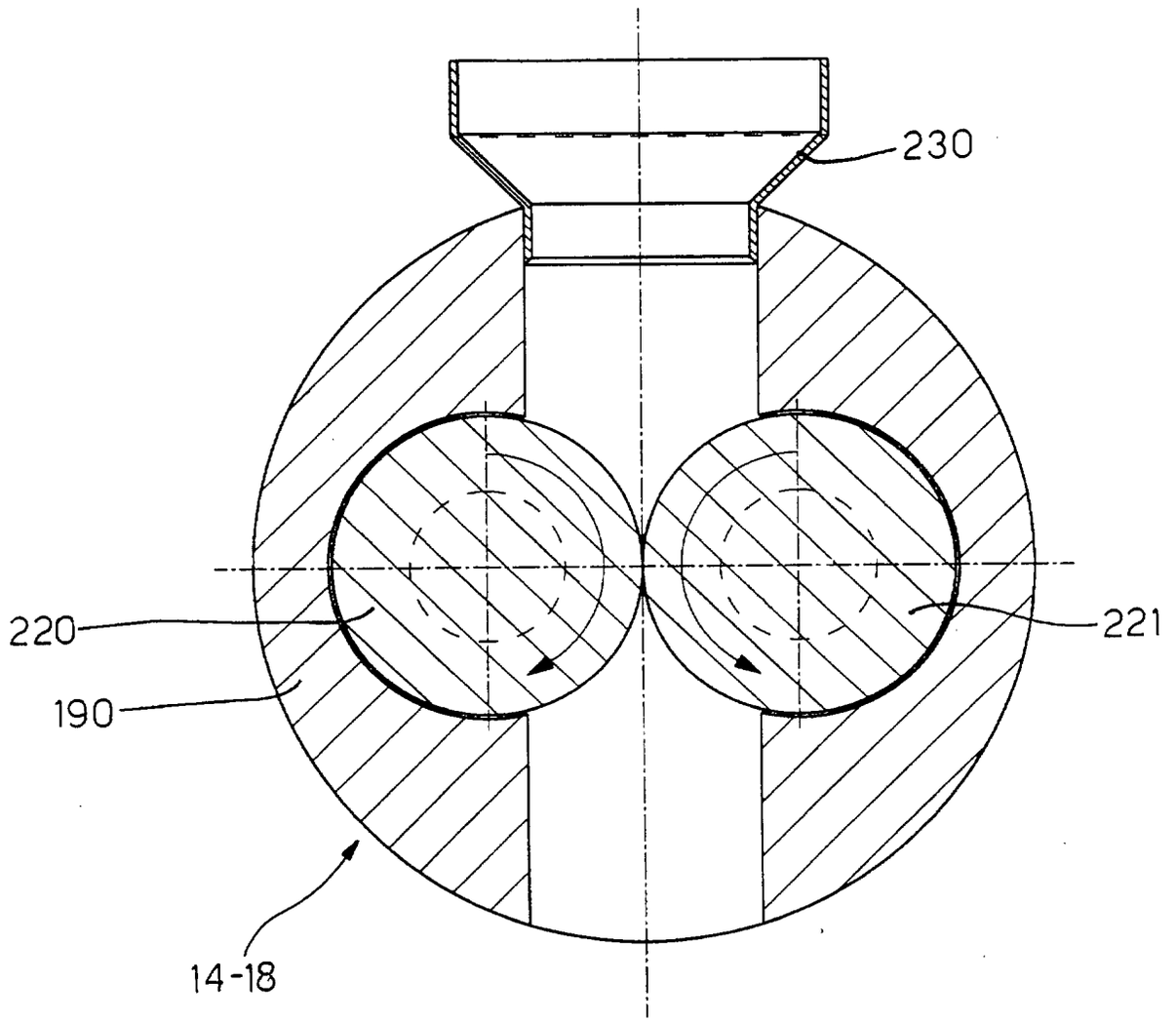


FIG. 7