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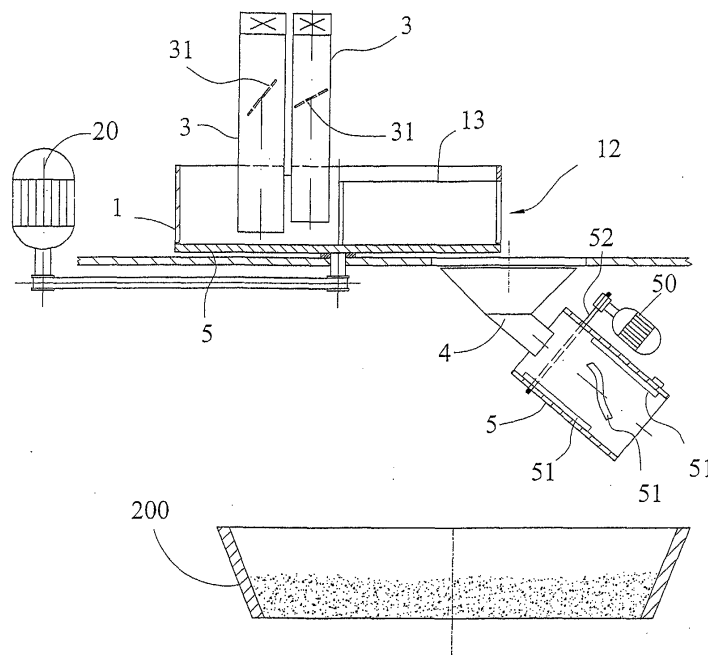
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(54) **Mixer unit for materials in granular or powder form**

(57) A unit for mixing materials generally in powder form, comprising a support frame for a rotary plate (2) above which there are positioned at least two members (3) for dispensing powders having different characteristics, their position being adjustable relative to said plate, with said plate there being associated, rigid with said

frame, a fixed hollow cylindrical body (1) for containing said powders and comprising in proximity to said plate at least one material discharge aperture (12) with which there is associated at least one deviator element (13) arranged to convey said powders towards said discharge aperture (12).



**FIG.1**

## Description

**[0001]** This invention relates in a totally general manner to the manufacture of ceramic tiles.

**[0002]** More particularly it relates to the preparation of the base or starting materials used in the pressing of said tiles.

**[0003]** Specifically, the invention concerns the preparation of masses of multiple colour and/or of differing morphology from which to obtain tiles having decorative elements typical of natural stone.

**[0004]** The ceramic sector is known to be constantly seeking new and innovative ornamental motifs, with current emphasis on decorations reproducing the appearance of natural stone, such a marble, which knowingly presents generally elongate veining and striations of various forms and colour.

**[0005]** The characteristic or most important aesthetic element of said natural stone, such as the said marble, derives mainly from the randomness with which the form, the extension, the distribution, the colour and the shading of said generally elongate veining and striations are presented.

**[0006]** Decorative motifs reproducing said aesthetic element typical of marble can be obtained by the modern ceramic technology involved in the manufacture of fine porcellainized stone, well known to the expert of the art, which will not be described in detail.

**[0007]** The main object of this invention is to provide a mixer unit able to prepare base or starting materials by which the tiles leaving one and the same forming press present similar but differing aesthetic characteristics with each pressing, such as veining or striations which differ each time in at least one of the following details: shape, extension, distribution, colour, shading, such as to reproduce the randomness with which such veining is present in natural stone, for example marble.

**[0008]** Another object of the invention is to provide a mixer unit presenting a productive capacity such as to satisfy the requirements of modern production plants.

**[0009]** A further object of the invention is to provide a mixer unit able to prepare said ceramic starting materials, with said productive capacity, within the context of a simple, rational, reliable and economical construction.

**[0010]** Said objects are attained by a mixer unit presenting the characteristics indicated in the claims.

**[0011]** Generally, it comprises a rotary plate above which there are positioned at least two members for dispensing powders having different characteristics, said members being adjustable relative to said plate, with said plate there being associated a fixed hollow cylindrical body for containing said powders and comprising in proximity to said plate at least one material discharge aperture with which there is associated at least one deviator element arranged to convey said powders towards said discharge aperture.

**[0012]** Said mixer unit is supported by a movable frame with which suitable drive means are associated

in order to move, either continuously or at discrete time intervals, the entire mixer unit above the upper mouth of a hopper for receiving the mixed powders.

**[0013]** The said independent drive means, consisting for example of a robotized work system or centre, are placed under the control of a processor the purpose of which is to control in a prearranged or random manner the movements of the mixer unit above said hopper.

**[0014]** Finally it should be noted that downstream of said continuous discharge system there is preferably provided a secondary fractionating/mixing device able to subject, if necessary or considered opportune, the veined multi-colour mass leaving the cylindrical body to further fractionation and/or more or less intense partial remixing.

**[0015]** All the objects of the invention are attained by virtue of the aforescribed solution. In this respect, because of the adjustment flexibility provided by the invention, the quantity per unit of time and the mutual arrangement of the partial streams of said two materials within the moving mass passing continuously through the unit can be randomly varied, so continuously varying the veining of said mass and hence also that of the tiles formed from the starting materials prepared in accordance with the invention. According to a variant of the invention, said at least two dispensing members are associated with a known robotized system which varies their position relative to the plate either continuously or at discrete time intervals.

**[0016]** In a further variant of the invention, a presser member, for example a roller, is associated with said plate upstream of said discharge aperture, to compact the powders deposited on the rotating plate by the dispensing members.

**[0017]** The constructional characteristics and merits of the invention will be apparent from the ensuing detailed description, given with reference to the figures of the accompanying drawings, which show a particular preferred embodiment thereof by way of non-limiting example.

**[0018]** Figure 1 is the section I-I indicated in Figure 2.

**[0019]** Figure 2 is a schematic top plan view of the invention.

**[0020]** Figures 3, 4 and 5 show some alternative forms of a part of the invention.

**[0021]** Figure 6 is a plan view of a variant of the invention.

**[0022]** Figure 7 is a plan view of the frame which manipulates the invention.

**[0023]** It should firstly be noted that hereinafter specific reference is made to ceramic materials in powder form, however that stated is also valid for other loose materials, such as ceramic materials in granular or flake form. Said figures, and in particular Figure 1, show a fixed hollow cylindrical body 1 of vertical axis which is closed lowerly by a horizontal plate 2 or bottom, which is rotated about itself (in the direction indicated by the arrow A of Figure 2) by an underlying drive unit 20, pref-

erably in the form of a gearmotor with incorporated speed variator.

**[0024]** Between said plate 2 and the base of the cylindrical body 1 a gasket can be provided to prevent undesirable seepage or spillage of the material being processed.

**[0025]** Above said plate 2 there is positioned a series of dispensing members 3, two in number in the illustrated example, which are of tubular form and arranged vertically.

**[0026]** Each of the dispensing members 3 is arranged to deposit onto the rotating plate 2 the ceramic powders fed to them from overlying ceramic powder supply sources, not shown because of usual type.

**[0027]** There is nothing to prevent at least two flexible feed pipes feeding different materials into at least one member 3, these materials being generally different in colour but can also differ in particle shape and dimensions, such as granules or flakes.

**[0028]** With reference to Figure 2, one of the dispensing members has a circular cross-section whereas the other has a square cross-section, however the cross-section through said dispensing members can be of any shape provided it is suitable for the purpose.

**[0029]** The discharge mouths of said dispensing members can also be of different shapes according to the type of powder deposit to be created on the plate 2. For example in the figures said mouths are of circular and square shape respectively, but they can have any other shape.

**[0030]** Each of the dispensing members 3 is provided with valve elements 31 provided to vary the powder quantity deposited on the plate 2. The position of said dispensing members on the plate can be adjusted by the operator according to the type of mixing and hence aesthetic effect which is to be obtained. The operator can also vary the height of each dispensing member above the plate to change the manner of delivery of the ceramic powders.

**[0031]** As can be seen, in the wall of the body 1 there is an aperture 12 for the continuous discharge of the multi-colour veined mass of powder deposited on the plate 2.

**[0032]** With said aperture 12 there is associated a stationary profiled deviator element (or blade) 13 for conveying the multi-colour mass towards the aperture 12.

**[0033]** In the illustrated example the deviator element 13 is in the form of a sector of a cylindrical surface with its axis parallel to that of the body 1, and with its concavity facing the arriving material (see Figure 2).

**[0034]** It has a height equal to that of the aperture 12 (see Figure 1), its outer lateral edge blending into the downstream (with reference to the rotation A of the bottom 2) vertical edge of the aperture 12, its inner lateral edge coinciding virtually with the axis of the body 1, and its lower edge being flush with the upper face of the bottom 2.

**[0035]** The deviator element 13 could also be shaped

as a ploughshare, so that in addition to said plan curvature it also has a curvature transverse thereto, in correspondence with its lower portion.

**[0036]** Downstream of the aperture 12 there is an underlying hopper 4 which discharges into a secondary fractionating/mixing device beyond which usual collection and removal means for the multi-colour ceramic material are positioned.

**[0037]** Said device comprises an inclined cylinder provided internally with one or more fins 51' and is rotated about itself by a drive unit.

**[0038]** In the illustrated embodiment the cylinder is rotated by a belt 52 driven by a gearmotor with an incorporated speed variator. However in other embodiments the cylinder can be rotated by other equivalent systems suitable for the purpose.

**[0039]** Preferably, as shown in Figure 1, the number, the position, the distribution, the dimensions, the shape and the pattern of said fins 51 can be varied on the basis of the results required. Figures 3, 4 and 5 show some possible forms which the fins 51 can assume.

**[0040]** This operates in combination with the preferably adjustable relatively low rotational speed of the cylinder 5.

**[0041]** The described unit, including the fractionating/mixing device, is supported by a movable frame 40, shown in Figure 7, which comprises a rectangular first carriage 41 supported on two parallel guides 42 via wheels 43. The carriage 41 is operated by usual means. Specifically, on each of the two guides 42 there is fixed a belt 44 and 44', which engage in pulleys 45 and 46 located on the shaft of a gearmotor 48, the operation of this latter causing the carriage 41 to translate along the guides 42. The carriage 41 supports a second carriage 49, substantially identical to the carriage 41, but translating in a direction perpendicular to the direction of translation of the carriage 41.

**[0042]** The carriage 49, which supports the entire already described mixer/fractionator unit, comprises a rectangular frame 490 which rests via wheels 491 on two parallel guides 492 rigid with the carriage 41.

**[0043]** The carriage 49 is operated by suitable drive means 60. Said means comprise a gearmotor 62 on the exit shaft of which there are fixed two pulleys 62 and 62', each of which engages in a belt 62, the ends of which are fixed onto the guides 492.

**[0044]** The entire movable frame 40 is controlled by a processor which provides for moving the entire unit, continuously or at discrete intervals, above the upper mouth of a hopper 200 for receiving the mixed powders, in such a manner as to deposit said powders into said hopper in a prearranged or random sequence.

**[0045]** In the operation of the invention, while the entire unit is being moved above the hopper 200, the powders deposited continuously on the bottom 2 are subjected to different remixing operations which can be delicate, more or less consistent, or extended according to the adjustment prevailing at that moment.

[0046] In general, before depositing the powders into the hopper 200, there occur a first mixing at the moment of this deposition, depending on the positions of the dispensing members 3 both relative to each other and to the bottom 2, and on the speed of rotation of this latter; a second mixing at the deviator blade where the arriving mass undergoes some turning about its sliding direction; and a (possible) third fractionation/mixing within the cylinder 5.

[0047] According to a variant of the invention, said dispensing members 3 are associated with a robotized system, not shown as of known type, which during powder deposition on the rotating plate 2 varies, either continuously or at predetermined time intervals, their position relative to the rotating plate in order to diversify the manner of mixing the powders. In a further variant of the invention, shown in Figure 6, at least one roller 100 is associated with said plate, to compact the powder mixture upstream of the discharge aperture 12. Said roller is rotated by a gearmotor 101. However in certain applications of the invention the roller can be mounted idle in order to obtain particular aesthetic effects.

[0048] The merits and advantages of the invention are apparent from the foregoing description and from the accompanying figures.

[0049] The invention is not limited to that illustrated and described, but also comprises all technical equivalents of the invention and their combinations if implemented within the context of the ensuing claims.

## Claims

1. A unit for mixing materials generally in powder form, **characterised by** comprising a support frame for a rotary plate above which there are positioned at least two members for dispensing powders having different characteristics, said members being adjustable relative to said plate, with said plate there being associated, rigid with said frame, a fixed hollow cylindrical body for containing said powders and comprising in proximity to said plate at least one material discharge aperture with which there is associated at least one deviator element arranged to convey said powders towards said discharge aperture.
2. A unit as claimed in claim 1, **characterised in that** each of said dispensing members is movable and adjustable within a plane parallel to said plate.
3. A unit as claimed in claims 1 and/or 2, **characterised in that** the height of each of said dispensing members above said plate can be adjusted.
4. A unit as claimed in claim 1, **characterised in that** each dispensing member is connected to at least one overlying hopper, and comprises at least one discharge mouth of suitable shape.
5. A unit as claimed in claim 4, **characterised by** comprising at least one valve element for intercepting the powders.
6. A unit as claimed in claim 1, **characterised in that** said dispensing members are associated with a robotized system which varies their position relative to said plate either continuously or at predetermined time intervals.
7. A unit as claimed in claim 1, **characterised in that** a presser roller is associated with said plate to compact the powders deposited on the plate upstream of said discharge aperture.
8. A unit as claimed in claim 7, **characterised in that** said roller is rotated by a gearmotor.
9. A unit as claimed in claim 1, **characterised in that** said plate is driven by a gearmotor with an incorporated speed variator.
10. A unit as claimed in claim 1, **characterised in that** said at least one deviator element is fixed to that vertical edge of said aperture positioned downstream with reference to the direction of rotation of the plate.
11. A unit as claimed in claim 1 or 10, **characterised in that** said at least one deviator element is shaped as a cylindrical surface sector having its axis parallel to that of said body.
12. A unit as claimed in claim 1 or 10, **characterised in that** said at least one deviator element is shaped as a ploughshare.
13. A unit as claimed in claim 1, **characterised in that** said support frame for said mixer unit is movable.
14. A unit as claimed in claim 13, **characterised in that** said frame is driven by suitable means controlled by a processor.
15. A unit as claimed in claim 1, **characterised in that** said frame also supports a secondary fractionating/mixing device the entry mouth of which is positioned in correspondence with the cylindrical body.
16. A unit as claimed in claim 15, **characterised in that** said device comprises a cylinder rotating about an inclined axis and provided on its inner surface with fractionating/mixing fins which are variously dimensioned, orientated and positioned.
17. A unit as claimed in claim 15, **characterised in that**

said cylinder is driven by a gearmotor unit with incorporated speed variator.

18. A powder fractionator/mixer **characterised by** comprising a cylinder rotating about an inclined axis and provided on its inner surface with mixing and/or fractionating fins which are variously dimensioned, orientated and positioned. 5
19. A fractionator/mixer as claimed in claim 18, **characterised in that** said cylinder is driven by a gearmotor unit with incorporated speed variator. 10

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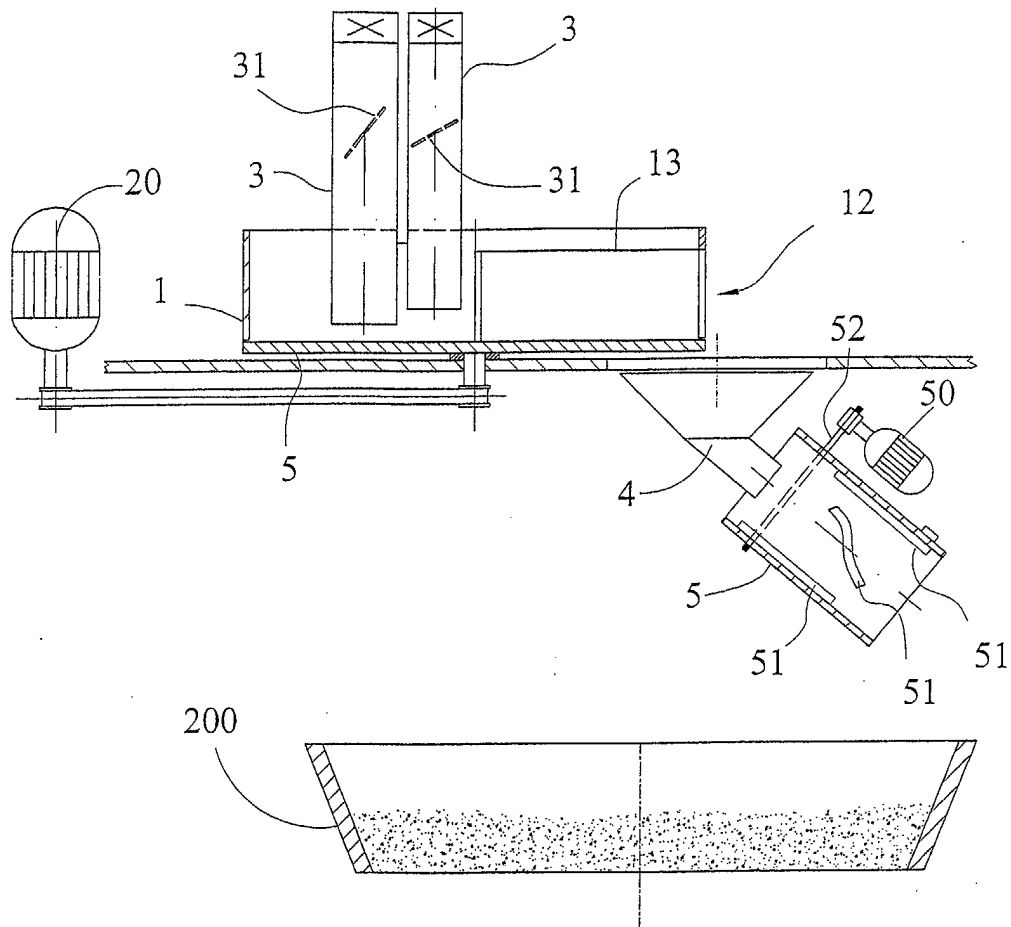


FIG.1

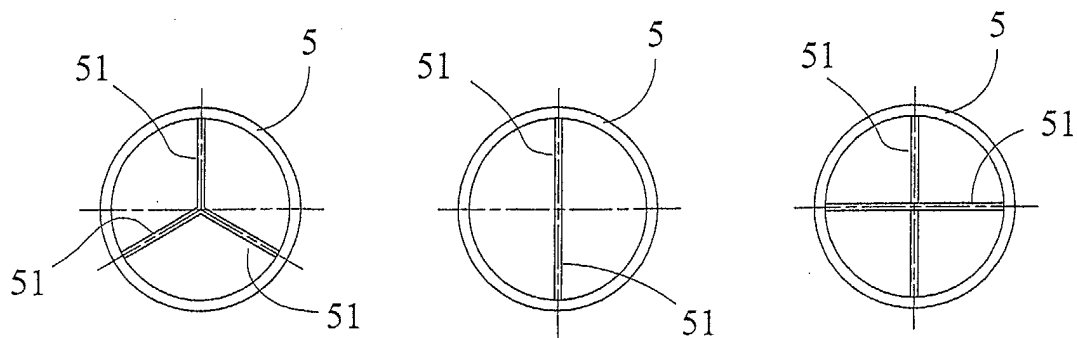


FIG.3

FIG.4

FIG.5

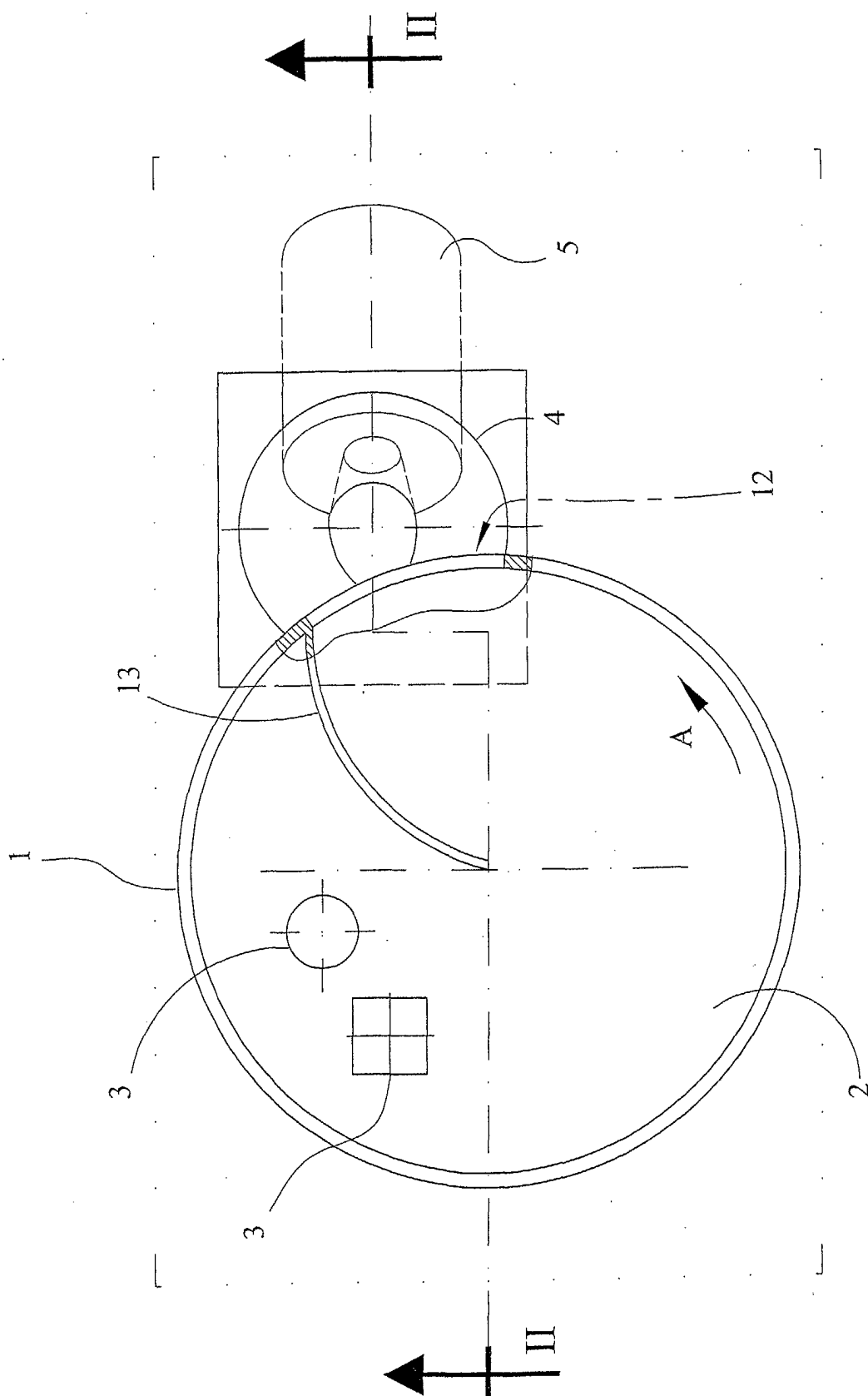


FIG. 2

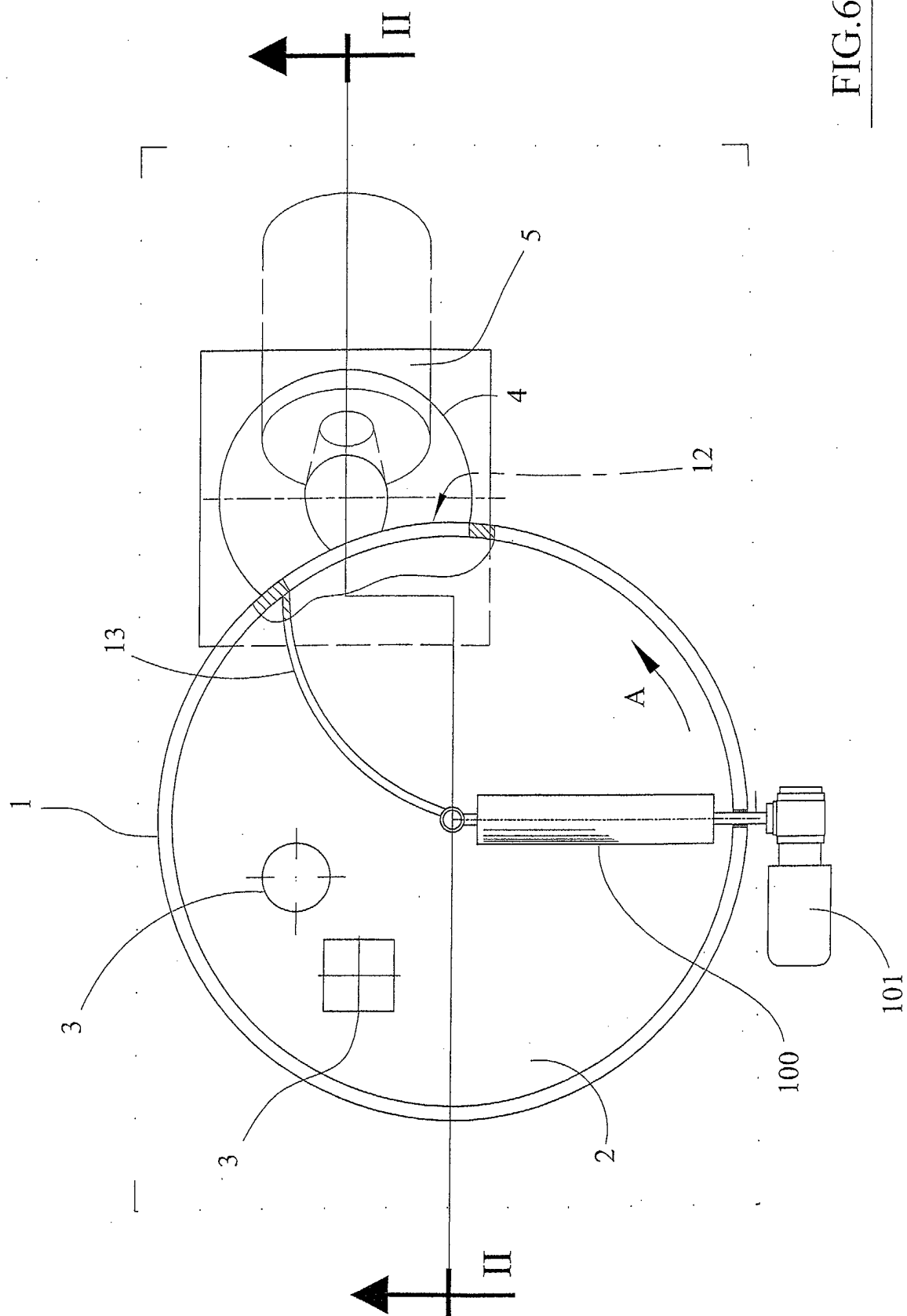


FIG. 6

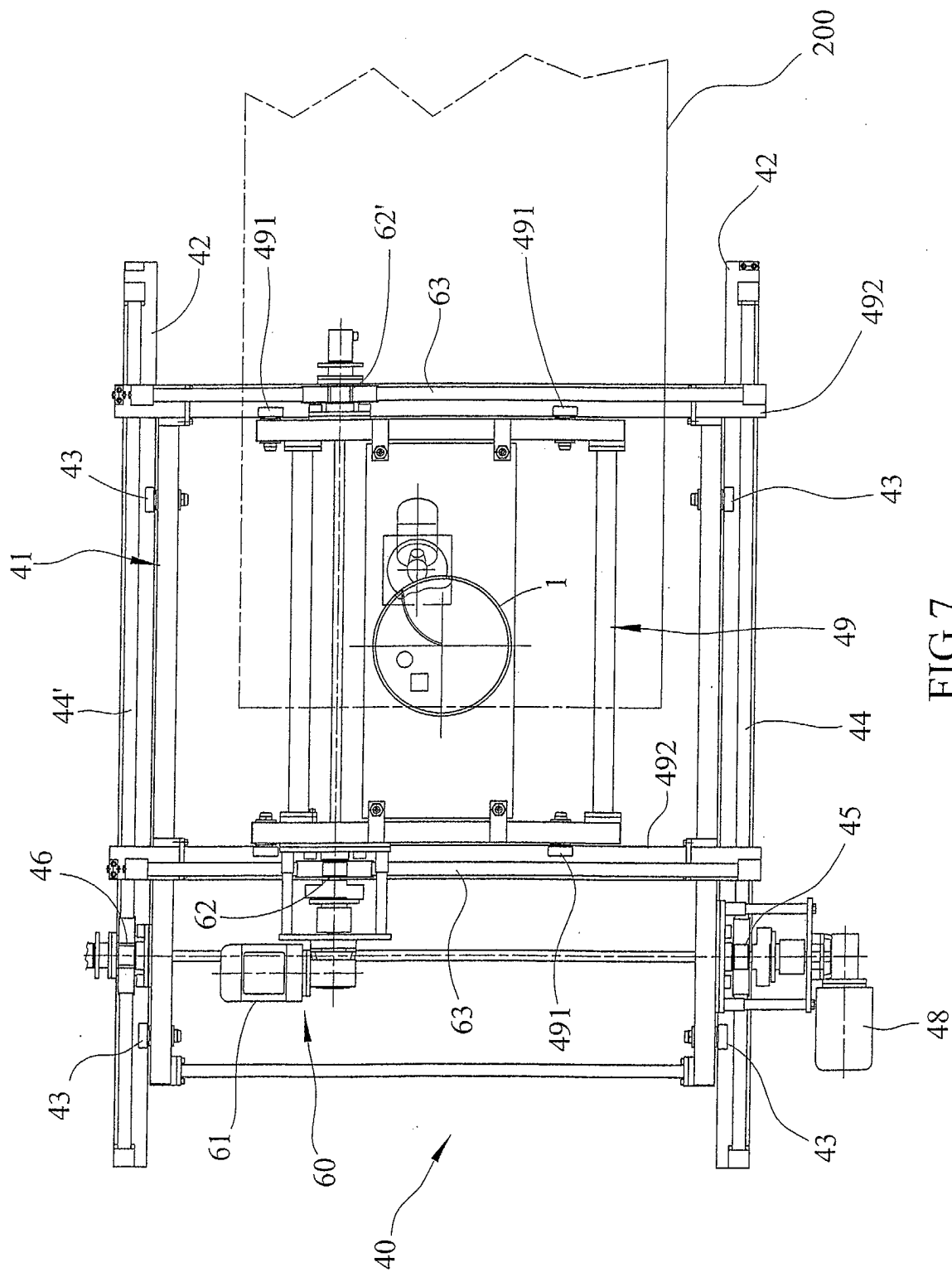


FIG. 7