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## (54) Agitator apparatus for mixing paints, lacquers and the like

(57) An agitator apparatus for mixing lacquers, paints and the like, comprising a supporting frame (1) inside which a sleeve (2) is fixed, the sleeve accommodating a hollow shaft (3) being suitable to transmit a rotary motion, about its own axis, to two arms (6,7) provided with respective plates (15,14) suitable to abut against a can which contains lacquer or paint to be mixed; two sliding guides (4) for the arms, arranged so as to be rigidly coupled to the hollow shaft (3); actuation means (5) for the sliding of the arms along the pair of guides, which can be actuated when the hollow shaft is not rotating; the actuation means comprise screw means arranged parallel to the two guides and actuated by a bevel gear pair (8) being in turn actuated by a first shaft (9), in which a second shaft (10) is suitable to engage with an axial movement determined by the action of electromagnet means (13).

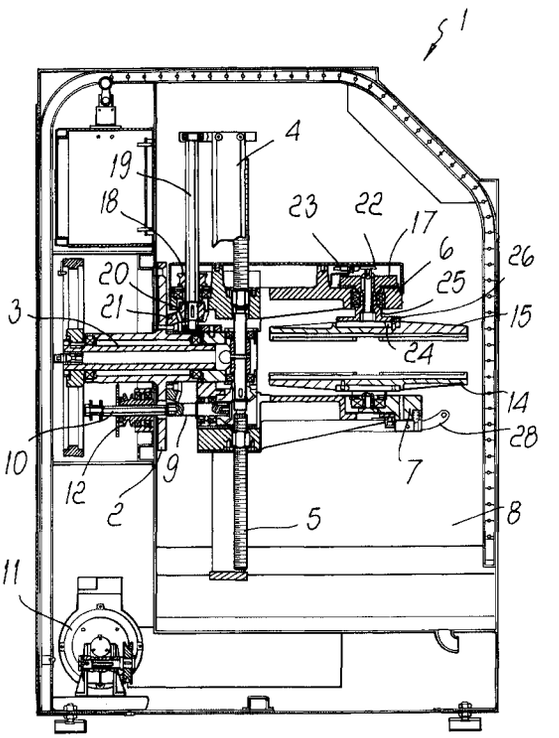


Fig.1

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## Description

**[0001]** The present invention relates to an agitator apparatus for mixing paints, lacquers and the like.

**[0002]** Currently devices known as paint mixing stations are widely used and allow to prepare any selected color from a limited number of base colors by mixing said base colors in appropriate doses.

**[0003]** This spares color manufacturers from having to prepare colors in a very large number of shades, with consequent manufacturing and storage problems, and also allows retailers to have a very small stock of color cans, with the advantage of not having colors that are unlikely to be sold but nonetheless must be part of stock reserves because a customer might ask for them.

**[0004]** Accordingly, these devices have introduced a considerable advantage for paint manufacturers and for retailers as well as for end customers, who can enjoy lower retail prices.

**[0005]** However, mixing multiple base colors in appropriate doses in order to obtain a preset final color entails not only the need to mix together the base colors but also the need to achieve their complete amalgamation so that the resulting color is perfectly uniform.

**[0006]** For this purpose, known types of devices have agitator elements, such as paddles and the like, which are inserted in the can that contains the plurality of base colors used for the mix and which amalgamate the product more or less effectively when they are turned.

**[0007]** However, this method is useful only for preparing large amounts of lacquer or paint in the same shade. When the color of the lacquer or paint to be amalgamated changes, it is obviously necessary to replace the agitator elements with other clean ones or to clean the previously used agitator element.

**[0008]** This clearly entails long times for replacement and cleaning of the dirty agitator element, thereby affecting the cost of the product; moreover, if two customers are waiting at the point of sale, this of course increases the time required to prepare the lacquer or paint that the customer wishes to purchase.

**[0009]** Stand-alone agitator apparatuses are currently known for this purpose as a replacement of the above cited agitator elements; in these apparatuses, a motor drives a number of gear pairs by way of a belt and a pulley in order to turn, like a gyroscope, the can of paint containing the plurality of base colors to be amalgamated, such can being clamped between two plates which are arranged respectively in contact with the top and bottom surfaces of the can.

**[0010]** Moreover, in view of the large mass to be turned, this solution entails the presence of a motor which is powerful enough to turn the entire assembly and overcome frictions.

**[0011]** Moreover, the complexity of the structure entails a significant final cost of said agitator apparatus.

**[0012]** Another solution, disclosed in Italian utility model application no. PV97U 000006, provides for the presence of two mutually coaxial shafts which are respectively actuated by an electric motor and of a support for a lower plate, which can be moved manually forward in order to load a can of lacquer and cooperates with an upper support which carries an upper plate for locking the can. One of the two shafts drives the upper plate in rotation in order to turn the container about its own axis, while the second shaft, which is coaxial to the first one, drives a secondary shaft which has, at its end, a worm screw in order to move the two plates closer or further apart one another. A fork-like element, actuated by the first shaft, turns the two plates about an axis which is perpendicular to the axis of the can of paint. In this manner, the agitator apparatus allows to turn the can both about its own axis and about an axis which is perpendicular to the axis of the can.

**[0013]** This allows to achieve effective amalgamation of the product.

**[0014]** However, although the above proposed solution is satisfactory from the point of view of the capacity to mix the base colors that are present in the can, it is affected by drawbacks caused by the fact that the partial extraction of the lower plate reduces the operating capability in terms of loading and unloading the cans of color.

**[0015]** The known apparatus further has an insufficient mechanism for locking the lower plate in the extraction position.

**[0016]** Moreover, the lack of a mechanical control which ascertains that the closure of the plates with the can loaded thereon causes the operation of the apparatus to be unreliable, with problems of breakage if the loaded can loses its position.

**[0017]** Moreover, the minimum downward stroke for the closure of the plates is insufficient to accept the smallest size of current commercially available color cans.

**[0018]** Finally, the known apparatus is not provided with a system for controlling the maximum stroke limit when the plates are fully open; if the plates are fully opened by mistake or manually, the worm screw reaches a dead point and accordingly the mechanism jams, thus requiring a manual reset.

**[0019]** The aim of the present invention is to provide an agitator apparatus for mixing lacquers, paints and the like in which the movement for clamping the arms with the corresponding plates around the can of lacquer or paint is performed in a controlled manner and the rotation of the can is started only after clamping has been performed.

**[0020]** Within the scope of this aim, an object of the present invention is to provide an agitator apparatus for mixing lacquers, paints and the like in which the lower plate can be extracted completely in order to facilitate the loading of the can of lacquer or paint.

**[0021]** Another object of the present invention is to provide an agitator apparatus for mixing lacquers, paints or the like in which an accidental opening of the arms

with the corresponding plates arranged around the can of lacquer or paint is avoided during the rotation of the can for mixing the lacquer or paint.

**[0022]** Another object of the present invention is to provide an agitator apparatus for mixing lacquers, paints or the like in which the can is turned by means of two simultaneous rotary motions about mutually perpendicular axes.

**[0023]** Another object of the present invention is to provide an agitator apparatus for mixing lacquers, paints or the like which is highly reliable, relatively simple to manufacture and at competitive costs.

**[0024]** This aim and these and other objects which will become better apparent hereinafter are achieved by an agitator apparatus for mixing lacquers, paints and the like, characterized in that it comprises a supporting frame inside which a sleeve is fixed, said sleeve accommodating a hollow shaft being suitable to transmit a rotary motion, about its own axis, to two arms provided with respective plates which are suitable to abut against a can which contains lacquer or paint to be mixed; two sliding guides for said arms, arranged so as to be rigidly coupled to said hollow shaft; actuation means for the sliding of said arms along said pair of guides, which can be actuated when said hollow shaft is not rotating, said actuation means comprising screw means which are arranged parallel to said two guides and are actuated by a bevel gear pair which is in turn actuated by a first shaft, in which a second shaft is suitable to engage with an axial movement determined by the action of electromagnet means.

**[0025]** Further characteristics and advantages of the invention will become better apparent from the following description of a preferred but not exclusive embodiment of the apparatus according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a sectional lateral elevation view of the agitator apparatus according to the invention;
Figure 2 is a sectional bottom plan view of the agitator apparatus according to the invention; and
Figure 3 is a cutout side elevation view of the apparatus according to the present invention.

**[0026]** With reference to the figures, the agitator apparatus according to the invention comprises a supporting frame 1, inside which a flanged sleeve 2 is rigidly fixed; a hollow shaft 3 is in turn inserted in said sleeve and two sliding guides 4 are bolted thereto.

**[0027]** The hollow shaft 3 is actuated by movement means 27 being conveniently constituted for example by an electric motor which turns the hollow shaft 3 by way of a belt-and-pulley transmission.

**[0028]** Means 5 for the actuation of two arms 6 and 7 are suitable to move said arms along the guides 4 symmetrically with respect to the rotation of the hollow shaft 3.

**[0029]** Said means for the actuation of the arms 6 and 7 are conveniently constituted, for example, by a right and left trapezoidal screw.

**[0030]** The trapezoidal screw 5 is actuated by a bevel gear pair 8 having a shaft 9 which is provided, at one end, with a hexagonal hole for the engagement of a hexagonal shaft 10, being actuated by a pulley which is in turn actuated by a gearmotor 11.

**[0031]** The pulley is designated by the reference numeral 12. The axis of motion of the bevel gear pair is parallel to the axis of the hollow shaft 3.

**[0032]** The hexagonal shaft 10 moves axially in order to engage and disengage the shaft 9 of the bevel gear pair 8. Such axial movement is ensured by an electromagnet 13.

**[0033]** The arms 6 and 7 each support a plate, designated by the reference numerals 15 and 14, respectively.

**[0034]** At least one of the two plates, for example the plate 14, in the initial position is arranged downward and horizontally and can slide freely on a pair of guiding stems 16 so as to be extracted in order to facilitate the loading/unloading of the cans of lacquer. Stroke limiting means 28 allow to lock the lower plate 14 both in the extraction position for loading the can and in the retraction position for removing the can.

**[0035]** The upper plate 15 is instead keyed to a pulley 17 which is driven by means of a belt (not shown) by another pulley 18 which is in turn keyed to another shaft 19 which has for example a hexagonal cross-section and to the end of which a bevel pinion 20 is rigidly fixed.

**[0036]** The bevel pinion 20 meshes with a fixed bevel gear 21 which is bolted to the flanged sleeve 2.

**[0037]** The upper plate 15 is fixed to a sliding shaft 24, and a cam 22 is arranged at the opposite end of said shaft 24 with respect to the plate; such cam is designed to excite sensor means 23, conveniently constituted for example by a proximity sensor.

**[0038]** Motion is transmitted from the pulley 17 to the plate 15 when, under the action of a compression force, a shaft 25, which is coaxial to the shaft 24 and is rigidly coupled to the pulley 17, presses, together with the shaft 24, against a disk 26 of material having a high friction coefficient, which rigidly couples the two shafts.

**[0039]** With reference to the figures, the operation of the agitator apparatus according to the invention is as follows.

**[0040]** After a can of paint or lacquer has been placed on the plate 14, being extracted along the guides 16, such plate is pushed inside the apparatus.

**[0041]** This operation occurs while the guides 4 are in a vertical position. The correct position is determined by a photosensor.

**[0042]** The hexagonal shaft 10 is inserted in the hexagonal slot of the shaft 9 of the bevel gear pair 8 by virtue of the action of the electromagnet 13.

**[0043]** Once it has engaged the shaft 9, the hexagonal shaft 10 starts to turn, actuated by the gearmotor 11, by

way of the pulley 12.

**[0044]** The motion is transmitted to the bevel gear pair 8, which turns the right and left trapezoidal screw 5, thereby closing or opening the arms 6 and 7. The arms close until the plates 14 and 15, with a symmetrical motion, abut against the opposite end surfaces of the can of lacquer or paint. The upper plate 15, under the compression action, performs a short vertical stroke with respect to its arm 6, so that the cam 22 excites the proximity microswitch 23. The microswitch provides the clearance signal indicating that a can of color is clamped between the two plates 14 and 15; thereafter, the hexagonal shaft 10 disengages from the shaft 9.

**[0045]** The hollow shaft 3, actuated by the belt drive, starts to turn and during the rotation the bevel pinion 20 rolls along the fixed bevel gear 21, thus imparting a rotary motion to the hexagonal shaft 19, to the pulley 18 (keyed on the shaft 19) and, by way of a belt, to the pulley 17 and therefore to the upper plate 15 and to the can of lacquer or paint.

**[0046]** In this manner, the can has two simultaneous rotary motions: one with respect to the horizontal axis of the hollow shaft 3 and one with respect to the longitudinal axis of the can.

**[0047]** After a preset time has elapsed, the hollow shaft 3 ceases to turn and stops in the initial position again. At this point the shaft 10 again engages the slot of the shaft 9 in order to act on the bevel gear pair 8 and open the plates 14 and 15, so as to allow to remove the can of lacquer or paint, whose content is by then perfectly mixed and amalgamated by the above described rotary motions.

**[0048]** In this manner, the can of lacquer or paint is turned exclusively in the presence of the clearance signal indicating that the arms 6 and 7, with the corresponding plates 15 and 14, have clamped around the can whose content is to be mixed.

**[0049]** Moreover, the sliding of the lower plate on the guides 16 allows to perform easy loading/unloading of the can of lacquer or paint to be processed.

**[0050]** In practice it has been found that the apparatus according to the invention fully achieves the intended aim and objects, since it allows to move the can of lacquer or paint on two mutually perpendicular axes with simultaneous rotary motions in which the rotary motion about the axis of the hollow shaft of the agitator apparatus can be performed only when the arms of the apparatus have abutted against the opposite end surfaces of the can whose content is to be mixed.

**[0051]** The apparatus thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may furthermore be replaced with other technically equivalent elements.

**[0052]** In practice, the materials used, so long as they are compatible with the specific use, as well as the dimensions, may be any according to requirements and to the state of the art.

**[0053]** The disclosures in Italian Patent Application No. MI2000A000208 from which this application claims priority are incorporated herein by reference.

**[0054]** 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 interpretation of each element identified by way of example by such reference signs.

## Claims

1. An agitator apparatus for mixing lacquers, paints and the like, characterized in that it comprises a supporting frame inside which a sleeve is fixed, said sleeve accommodating a hollow shaft being suitable to transmit a rotary motion, about its own axis, to two arms provided with respective plates which are suitable to abut against a can which contains lacquer or paint to be mixed; two sliding guides for said arms, arranged so as to be rigidly coupled to said hollow shaft; actuation means for the sliding of said arms along said two guides, which can be actuated when said hollow shaft is not rotating, said actuation means comprising screw means which are arranged parallel to said two guides and are actuated by a bevel gear pair which is in turn actuated by a first shaft, in which a second shaft is suitable to engage with an axial movement determined by the action of electromagnet means.

2. The apparatus according to claim 1, characterized in that said first and second shafts are arranged so that their axes are parallel to the axis of said hollow shaft, said second shaft being actuated by a gearmotor.

3. The apparatus according to claim 2, characterized in that it comprises means which are suitable to actuate said arms with a rotary motion about the axis of said can of lacquer or paint clamped between the respective plates of said arms.

4. The apparatus according to one or more of the preceding claims, characterized in that said means for actuating the arms with a rotary motion about the axis of said can comprise additional screw means which have, at one end, a bevel pinion suitable to engage a bevel gear which is rigidly coupled to said sleeve, a first pulley being rigidly coupled to said additional screw means, a second pulley being rigidly coupled to one of said plates, for the transmission of the rotary motion of said additional screw means from said first pulley to said second pulley, and from said second pulley to said one of said plates.

**5.** The apparatus according to one or more of the preceding claims, characterized in that the plate of said two plates that is suitable to be driven by said additional screw means is fixed to a sliding shaft, a cam element being arranged at the opposite end of said shaft respect to the plate, said cam element being suitable to excite a proximity sensor, an additional shaft being arranged coaxially to said sliding shaft and being suitable to be rigidly coupled to said sliding shaft by interposing a disk made of a material which has a high friction coefficient when said arm is pushed against the upper surface of said can.

**6.** The apparatus according to one or more of the preceding claims, characterized in that said first pulley, which is rigidly coupled to said additional screw means, and said second pulley, on which said plate is keyed, are actuated by way of a belt.

**7.** The apparatus according to one or more of the preceding claims, characterized in that it comprises at least one motor which is suitable to turn said hollow shaft.

**8.** The apparatus according to one or more of the preceding claims, characterized in that said screw means comprise a right and left trapezoidal screw.

**9.** The apparatus according to one or more of the preceding claims, characterized in that said first shaft of said means for the actuation of the two arms for opening/closure along said screw means has, at the opposite end with respect to the end where said bevel gear pair is provided, a slot allowing the engagement of said second shaft, which is hexagonal.

**10.** The apparatus according to one or more of the preceding claims, characterized in that said sleeve is provided with a flange having a hole inside which said second shaft can slide freely in order to engage or disengage from said first shaft for the movement of said two arms along said guides.

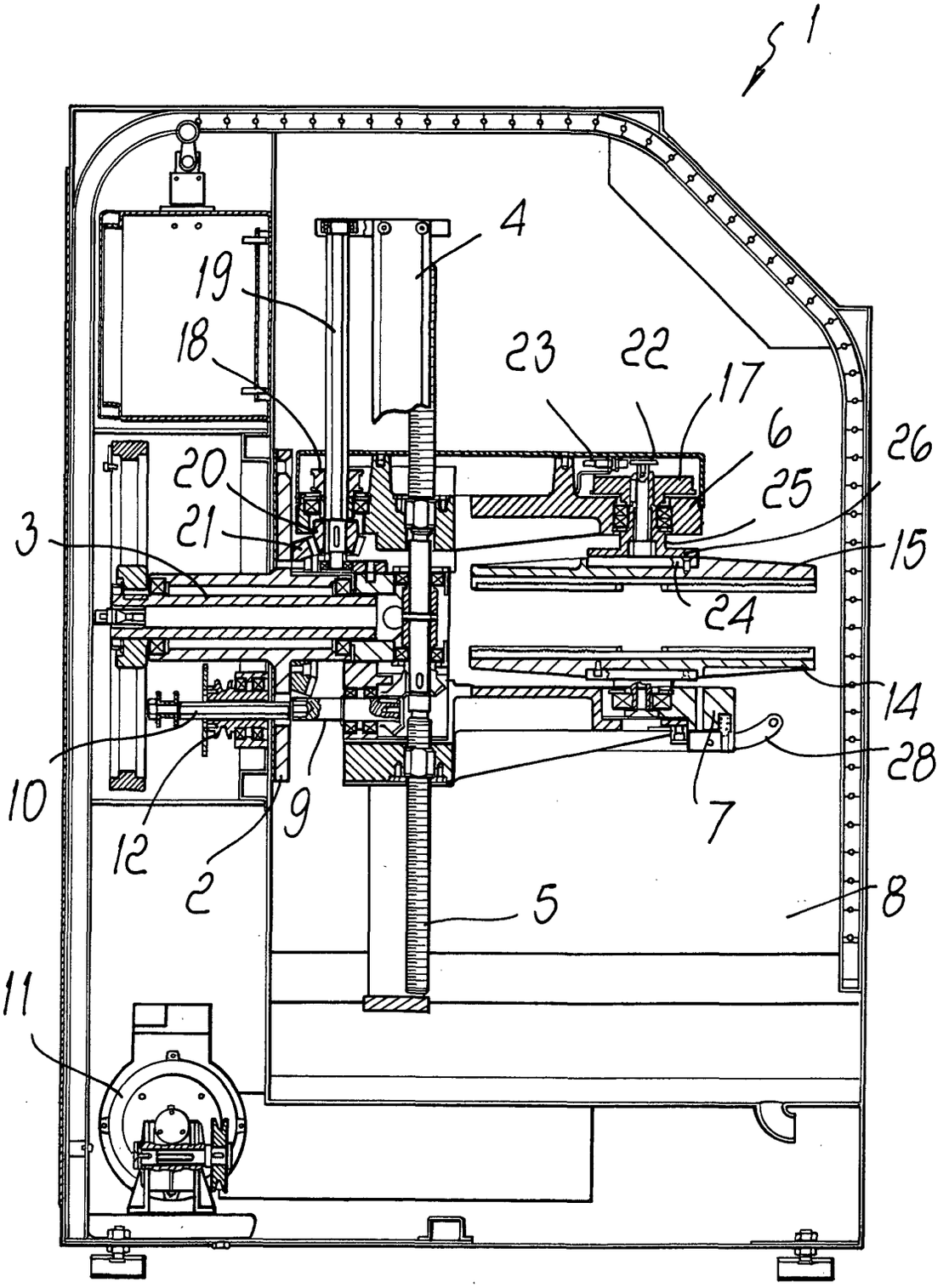


Fig. 1

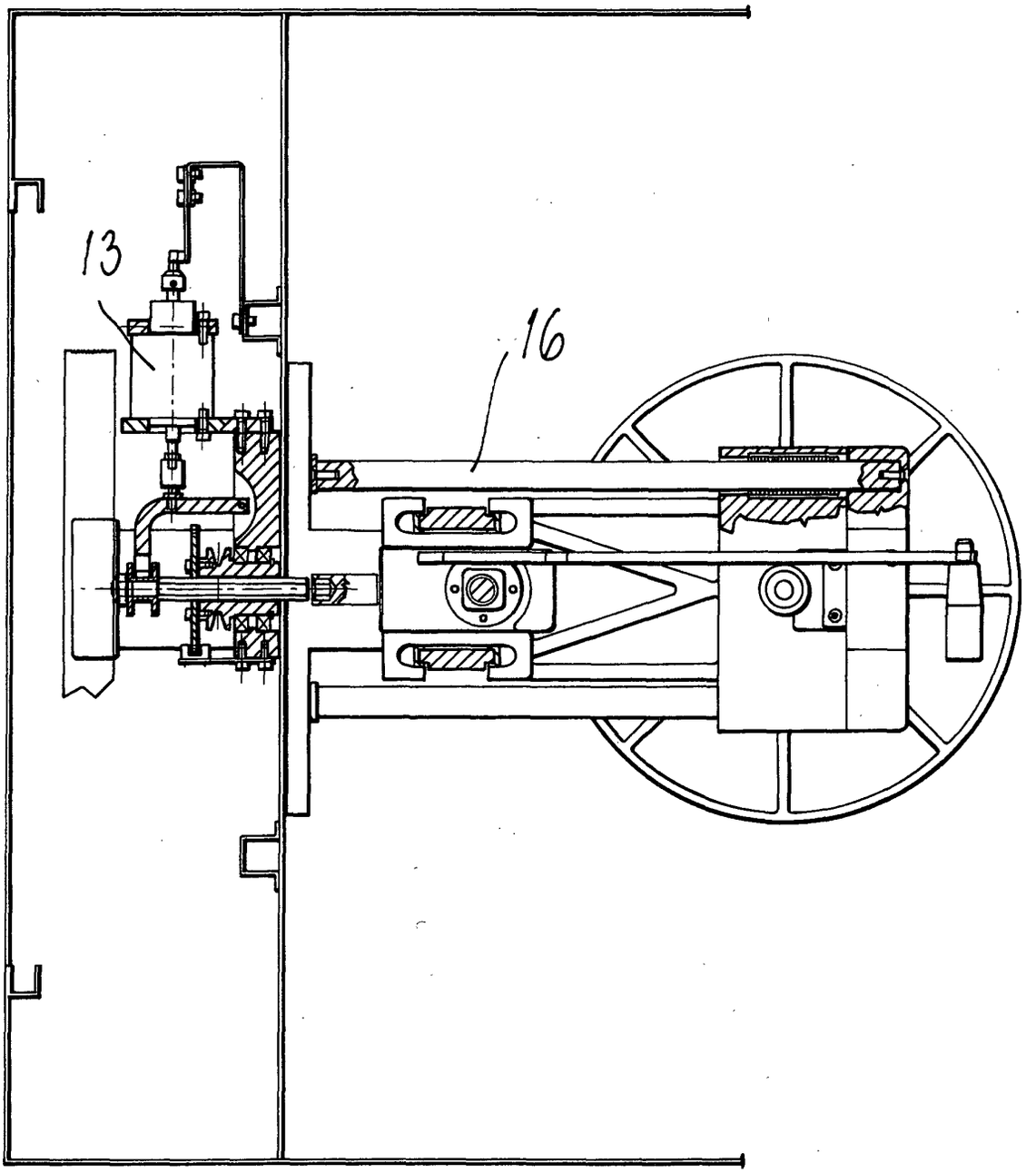


Fig. 2

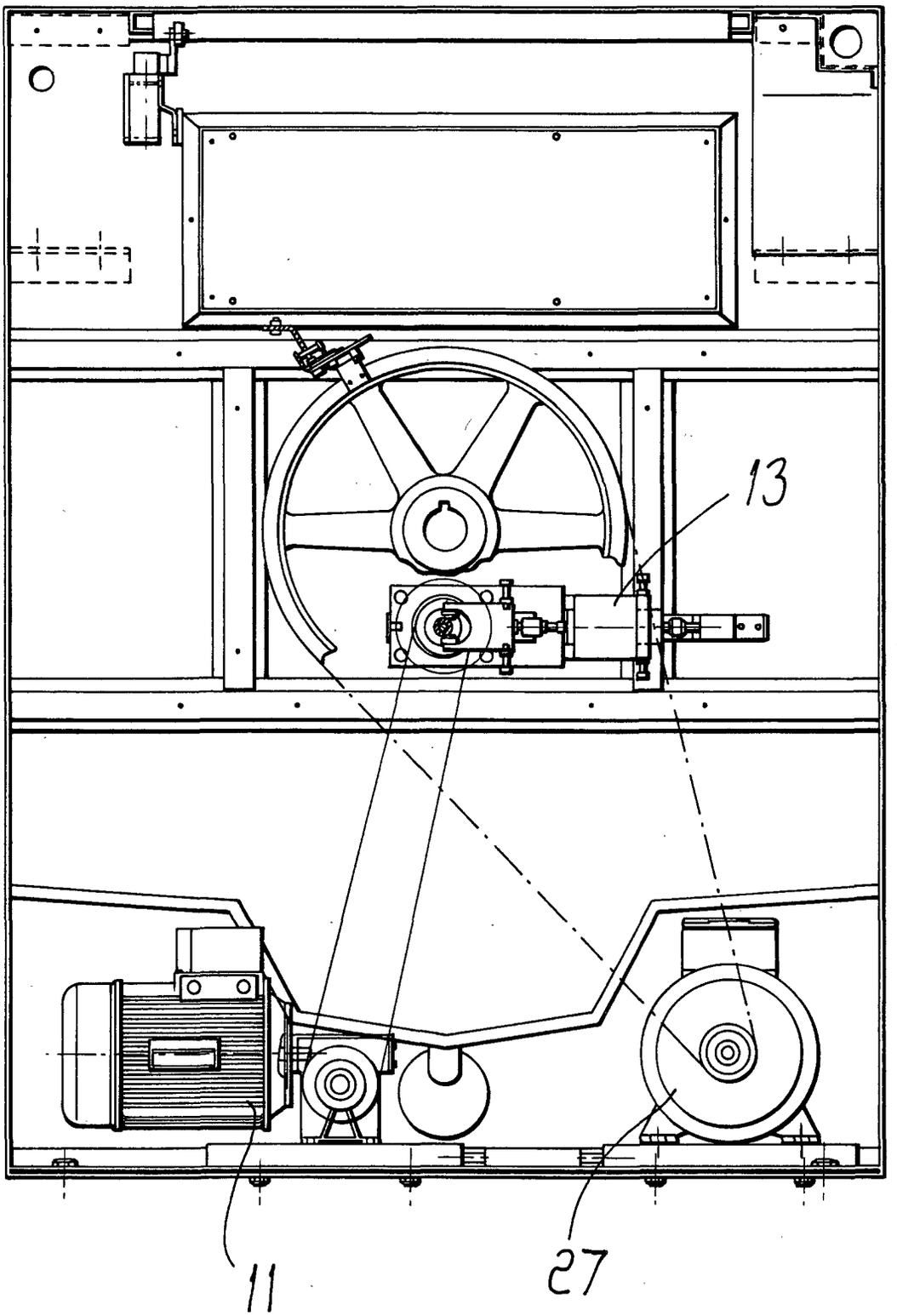


FIG. 3