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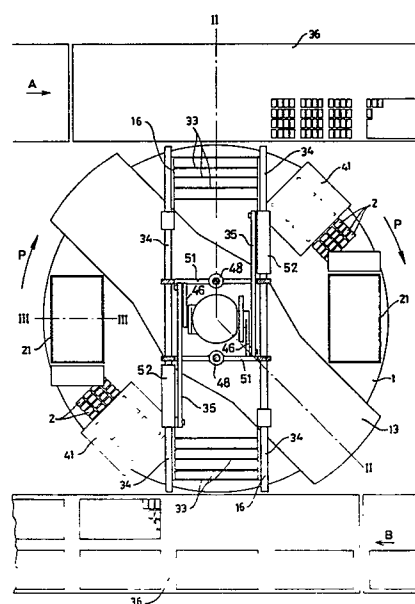
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Apparatus for shaping cubes.

Apparatus for shaping cubes or similar products from granular material comprising a stepwise revolving table (1) containing groups of pockets (2) the bottom of which is constituted by plungers (4). The table cooperates with a double set of filling hoppers (21), cleaning devices (41) and pushing means (16) for the discharge of the shaped products, situated above the table and with a double set of three different drive means (5, 23, 32) for the plungers positioned under the table.

The first drive means (5) serves for the compression of the granular material, the second (auxiliary) drive means (23) is active for improving the filling of the pockets and the third driving means (32) lift the products in a correct level for their discharge from the apparatus.



Apparatus for shaping cubes.

The invention relates to apparatus for shaping cubes or similar products from granular material, more particularly for shaping cubes from moisterized crystallized sugar, which apparatus is provided with a filling device for the granular material, a shaping and delivery table supported in a frame and revolvable in a horizontal plane, said table comprising pockets for cubes to be shaped and ejecting plungers fitting into said pockets defining the filling volume of said pockets and being vertically displaceable, as well as a counter pressure block being present at the location of compression of the material, further a pushing means being provided above said table for removing the shaped cubes from the delivery table, at the highest position of the ejecting plungers, said table with the plungers being stepwise revolvable in a frame along a number of stations. An apparatus of this type is known from French Patent Specification 532.258.

This known apparatus comprises a delivery table rotating around a vertical axis; it further comprises a number of shaping pockets situated in a circle around the axis. The reciprocating ejecting plungers fitting into the shaping pockets define in their lowermost position the filling volume of the shaping pockets. Filling said pockets occurs by means of a hopper with agitating means positioned above the delivery table at the

first station. The ejecting plungers will conventionally first compress the granular material in a second station and subsequently raise the cubes formed in that manner upwards in a third station until their lower side will be at the same level
5 as the upper surface of the delivery table.

In this known apparatus the various different operation stations are spaced over 90° from the neighbouring stations such, that a full revolution of the table is required for the completion of the entire manufacturing cycle. Each time only
10 a single product (cube) is delivered. It is therefore a first object of the invention to improve the productive capacity of the apparatus, without increasing the operational speed of the revolving table.

It is a further object of the invention to improve the shaping
15 of cubes from granular material, more particularly the shaping of cubes from moisterized crystallized sugar, thus causing the cubes to have a more uniform weight and density.

It is another object of the invention to manufacture cubes in such a manner that their density and dimensions may be adapted
20 to a certain demand, if so desired.

According to the present invention this is attained by means of an apparatus of the afore-mentioned kind in which the table is cooperating with at least two stationary counter pressure blocks disposed upon said table in diagonal opposite position
25 and capable of sealing off the upper side of a group of shaping pockets, the combination of said blocks and the plungers forming at least two pressure units, three separate drive members being present, all three in duplicate, two drive members being situated below said table, the first one of which
30 carrying out the pressure stroke, the second auxiliary one

being operative during the filling operation.

By means of these features the beneficial result is obtained that it is now possible to perform a complete manufacturing cycle in an arc of 180° or less, which means that at least
5 a doubling of the productive capacity of the apparatus is obtained. The shaped cubes can be brought upon two or more conveyors by the pushing means.

In accordance with the invention the apparatus may be plural symmetrical (i.e. 180° or 120°), to which end the apparatus
10 will comprise a plurality of pressure and delivery units. For that aim the table comprises a carrousel of shaping pockets positioned in groups spaced over 45° or 30° .

In a dual symmetrical apparatus according to the invention two counter pressure blocks resting upon the table are mount-
15 ed to a yoke extending diagonally across the table, said yoke being connected with the frame supporting the drive members for the plungers. The table is further revolvably supported in the frame in such a manner that it is slightly axially displaceable.

20 The advantages of these features consist in that not only the productive capacity can be slightly more than doubled but that during the pressing operation deflective loads upon span parts are prevented. There will hardly be any bending stress upon the stepwise revolving table.

25 The invention will now be illustrated by means of the accompanying drawings, wherein:

Fig. 1 shows a schematic plan view of an apparatus for shaping cubes, either side of which comprising a tray of a

conveyor upon which the cubes have to be delivered;

Fig. 2 is a cross-section according to line II-II in Fig. 1;

Fig. 3 is a section according to line III-III in Fig. 1, and

Fig. 4 is a cross section corresponding to Fig. 2, being,
5 however, a different structural embodiment.

The apparatus for shaping cubes comprises a shaping and
delivery table 1, being revolvable in a horizontal plane,
including groups of shaping pockets 2 spaced over 45° . There
are two counter pressure blocks 3, each sealing off the upper
10 side of one group of pockets. Fig. 2 shows ejecting or
pressure plungers 4 in operative connection below the
pressure block 3. A drive member 5 is disposed below the
table 1, for performing the pressure stroke.

The pressure plungers 4 are mounted in one central block 6,
15 below which a shank 7 is slideably supported in axial
direction in flanges 8 and 9, being integral with the
revolvable table 1. The stationary part 10 of the frame of the
apparatus supports a pushing rod 11, positioned between
the shank 7 and the drive member 5, being in this embodi-
20 ment an eccentric disc mounted upon a rotatable shaft 12.

The counter pressure block 3 resting upon the table 1 is
mounted under a yoke 13 extending diagonally across the
table 1. The drive member 5 is mounted on a support 14
connected to the frame 10. The yoke 13 is also connected
25 to frame 10 through an upright 15 (see Fig. 2). The yoke
13 extends as a bridge above the revolvable table 1 (Fig. 1)
and simultaneously serves as a support for two blocks 3 and
for two pushing means 16 to be described hereinafter.

The table 1 comprises a carrousel of eight groups of shaping pockets 2 with an angular spacing of 45° . The table is revolvably supported on a hub 17 in the frame 10 comprising a stepwise drive device 18, and in the yoke 13. For that purpose a ball bearing or roller bearing 19a is mounted in yoke 13 while a ball bearing or roller bearing 19b is mounted in frame 10. The ball bearings 19a and 19b allow for a little play of the hub 17 in axial direction, for a purpose which will be explained hereinafter.

10 In the embodiment of Fig. 4 the support of the pressure means 5 inclusive of the counter pressure block 3, with a portion of the yoke, extends as a C-shaped hook 13a about a side edge of the table 1 which hook is pivotally suspending from the remaining central part 13b of the yoke 13. One leg of the hook 13a is likewise extending across the table 1. The support 14a for the drive member 5 with its shaft 12 is attached to said hook 13a, so that part 10a of the frame and part 13b of the yoke are not subjected to any pressure exerted by the eccentric 5 and its subsequent reaction. The hook 13a may be attached to the remaining part 13b of the yoke 13 by means of a simple pivot pin 20.

Fig. 3 shows that a filling device 21 for the shaping pockets 2 is accommodated above the table 1. Said filling device consists, in a manner known per se, of a hopper to be filled with granular material, rotatable doctor blades 22 being mounted within said hopper, pressing the crystallized sugar into the shaping pockets 2. Below the filling device 21 and the table 1 an auxiliary drive member 23 is disposed below the frame 10 for the plungers 4. During the filling operation, the plungers 4 ly somewhat lower than the aimed level, to compensate for non-filled locations within the pockets 2. At the end of the filling operation the drive

member 23 will somewhat lift the plungers 4, thus effecting a partial pressure stroke of the plungers 4 and obtaining perfectly filled pockets. For that aim the drive member 23 in the form of an eccentric disc is mounted upon a rotatable and driven shaft 24.

A pushing rod 25 cooperates with the eccentric disc 23 which pushing rod may press against the shank 7. In between those parts which form an operative connection between the drive member 23 and the pressure plungers 4, a movably supported wedge block 26 is provided, being adjustable in transverse direction, mainly parallel to its wedge planes, in order to adjust the position of the pressure plungers 4 in the shaping pockets 2. For that purpose the wedge block 26 is slideable by means of trunnions 27 supporting a screw block 28, cooperating with an adjusting screw 29.

A displacement of the wedge block 26 in a direction in which the wedge planes of the block are more remote from each other, will cause the pushing rod 25 to be pressed upwards against the action of a spring 30, so that the shank 7 with block 6 and the pressure plungers 4 are likewise pushed upwards. Consequently, the filling volume of the shaping pockets 2 becomes smaller so that less material can be delivered to said pockets. Furthermore shank 7 comprises an adjustable head 30 thus causing the active length of said shank to be adjustable for the entire cycle.

The aim of drive member 23 is to completely fill the shaping pockets 2 with granular material. For, when crystallized sugar arrives in the shaping pockets, the lowermost corners of the pockets upon the plungers 4 might not be filled entirely, due to the mutual friction of the respective crystals. When, during the filling operation the pressure

plungers 4 have their lowest position in the shaping pockets 2, material from the filling device 21 will be able to deeper penetrate into said shaping pockets 2. When subsequently the eccentric disc 23 rotates and the plungers 4 will move upwards
5 for a partial pressure stroke, the material will be somewhat pushed against the pressure exerted by the doctor blades 22, thereby filling possible empty spaces in the lowermost corners of the shaping pockets 2, above the somewhat raised pressure plungers 4, with granular material.

10 Before fully describing ^{the} entire cycle of operation it is observed that a roller 31 is mounted sidewise of each shank 7. This roller will arrive upon a rail cam 32 (vide Figs. 2 and 4) comprising an elevation for the ejection of the cubes from the pockets 2, said cubes having previously been shaped in a
15 pressure unit 3-15 illustrated on the right-hand side of Fig. 2. The left-hand side of Fig. 2 relating to the discharge of the cubes, shows that the upper surface of the pressure plungers 4 are at that moment flush with the upper surface of the table 1. The shaped cubes are then lying on the common
20 level of the pressure plungers 4 and the table 1, so that the pushing means 16 can be activated.

For that aim the hub 17 of the table 1 is hollow and comprises a shaft 42 for driving one or more pushing means 16, supported upon the bridge-shaped yoke 13. The shaft 42 is driven by means
25 of a lower gear 43. At the upper end a conical gear 44 is mounted on the shaft 42. Through a further conical gear a shaft 45 is rotated, comprising two cranks 46 and an eccentric 47. Two vertically movable sleeves 48 are provided with an arm 49 carrying a roller 50, cooperating with the eccentric 47. Both sleeves
30 48 support a transverse bar 51, carrying two guide rods 34. Both cranks 46 are connected to a drive link 35, pivotally attached to a sleeve 52.

The pushing means 16 comprise upright transverse combs 33 which fit inbetween the rows of cubes raised upon the plungers 4 and standing at the level of the table 1. By the rotation of the shaft 32, the eccentric 47 will cause the roller 50 with the arm 49 and the transverse bars 51 to be lowered; consequently both guide rods 34 will descend, so that the combs 33 will also descend and arrive between the rows of cubes. Subsequently the links 35 will cause the sleeves 52 and the combs 33 to push the rows of shaped cubes in **radial** direction to be removed from the table 1 upon a conveyor 36 (see Figs. 1 and 2).

In the shown embodiment the hub 17 is provided with a kind of Geneva drive 18 having an arm 37, cooperating with a star wheel 53 the slots 54 of which cooperate with the driving arm 37 adapted thereto. The rotatable table 1 can now be revolved stepwise over 45° in the direction of the arrow P, whereby a group of shaping pockets 2 can subsequently be conveyed from one treatment station to another one, as will now be elucidated.

As can be clearly seen in Fig. 1, the respective apparatus is a double acting apparatus comprising two filling devices 21, two pressure units 3 - 6 diametrically facing each other below yoke 13 and two delivery units 16 also diametrically facing each other, followed by cleaning devices 41 which are likewise diametrically facing each other. The cleaning devices 41 may e.g. comprise rotating brushes for brushing away any remaining material.

The cycle of operation comprises the following steps:

- a group of pockets 2 is first filled with granular material under the device 21, vide Fig. 3;
- in the same position of the table 1 the eccentric 23 sub-

sequently lifts the shank 7 and the plungers 4 for eliminating any possible empty spaces in the pockets 2;

- 5 - the drive 18 will revolve the table 1 over 45° so that the group of pockets filled with material is then positioned under the block 3, vide right-hand side of Fig. 2;
- in the same position of the table 1 the eccentric 5 will push the shank 7 upwards, thus exerting a pressure stroke for the plungers 4 within the pockets 2 for compressing the cubes against the resistance of the block 3;
- 10 - after the release of the pressure, the drive 18 will revolve the table over a further 45° to the discharge station, vide the left-hand side of Fig. 2; during the last portion of that revolving movement, the roller 31 will be lifted by the rail cam 32, thus raising the compressed cubes to the level of the
15 upper surface of the table 1;
- in the same position of the table 1, the pushing means 16 is activated through the mechanism 44-52 for removing the cubes from the table 1 upon the conveyor 36;
- the table is once again rotated over 45° in order to bring
20 the group of (empty) pockets 2 under a cleaning device 41;
- a further revolving step over 45° brings the group of pockets again under a filling device 21.

It is emphasized that the table 1 with its hub 17 is axially displaceable in its support by means of the bearings 19a and
25 19b over a small distance, with a view to relieving said table during the pressure operation. By performing a pressure stroke the plungers 4 will cause an upward load upon the table 1, due

to the friction of the crystallized sugar with the walls of the shaping pockets 2, resulting in said table 1 to firmly contact the counter pressure block 3.

With respect to counter pressure block 3 it is observed that
5 said block may exert a grating action, due to its weight upon the table 1 and to any adhering sugar particles. Each counter pressure block 3 possesses a considerable weight compensated for by means of a spring 38 and a bolt 39 such, that the counter pressure block 3 is suspending from yoke 13 (Fig. 2), or
10 from the C-shaped hook 13a (Fig. 4). Due to the action of the spring 38 the pressure of the weight of the counter pressure block 3, can be decreased. By means of adjusting bolts 40 the counter pressure block 3 can be accurately-
adjusted so as to be able to absorb the pressure exerted by
15 the pressure plungers 4 through the sugar cubes, in a correct manner.

In a delivery station below the pushing means 16, a tray of the conveyor 36 is now stepwisely displaced in the direction of arrow A (at the top-side of Fig. 1). Said tray may be
20 part of a conveyor belonging to the conditioning device. The pushing means 16 will consequently deliver groups of cubes upon the tray of conveyor 36. When one side of the conveyor 36 is loaded, the tray is displaced parallel to itself, to the other side of the table 1. Subsequently, said tray is
25 displaced in the direction of arrow B (lower side of Fig. 1) so that the side of the tray being unloaded as yet, can be filled with groups of cubes. After a complete filling of the tray with cubes, said tray may be transported again upon the conveyor towards a conditioning device.

Claims:

1. Apparatus for shaping cubes or similar products from granular material, more particularly for shaping cubes from moisterized crystallized sugar, said
5 apparatus being provided with a filling device for the granular material, a shaping and delivery table supported in a frame and revolvable in a horizontal plane, said table comprising pockets for cubes to be shaped and ejecting plungers fitting into said pockets defining the filling
10 volume of said pockets and being vertically displaceable, as well as a counter pressure block being present at the location of compression of the material, further a pushing means being provided above said table for removing the shaped cubes from the delivery table, at the highest position
15 of the ejecting plungers, said table with the plungers being stepwise revolvable in a frame along a number of stations, c h a r a c t e r i z e d in that the table (1) is cooperating with at least two stationary counter pressure blocks (3) disposed upon said table in diagonal opposite
20 position and capable of sealing off the upper side of a group of shaping pockets (2), the combination of said blocks and the plungers (4) forming at least two pressure units, three separate drive members (5, 23 and 32) being present, all three in duplicate, two drive members (5, 23) being
25 situated below said table, the first one (5) of which carrying out the pressure stroke, the second auxiliary one (23) being operative during the filling operation.

2. Apparatus according to claim 1, in which two counter pressure blocks (3) resting upon the table (1)
30 are mounted to a yoke (13) extending diagonally across the table, said yoke being connected with the frame (10) supporting the drive members (5, 23, 32) for the plungers (4).

3. Apparatus according to claim 2, in which the table (1) is revolvably supported in the frame (10) in such a manner that it is slightly axially dis-placeable.
4. Apparatus according to claim 2, in which
5 a part of the frame supporting the drive member (5) for the pressure plungers' stroke and supporting said counter pressure block, extends as a C-shaped hook (13a) about the side edge of the table (1) and is pivotally suspended from a central portion (13b) of the bridge-shaped yoke (13) extending across
10 the table.
5. Apparatus according to claim 1, in which an auxiliary drive member (23) for the ejection plungers (4) is accommodated below the filling device (21), said drive member effecting a partial upward stroke of said plungers,
15 as a completion of the filling operation.
6. Apparatus according to claim 1 or 5, in which between the parts (7, 25) forming an operative connection between the auxiliary drive member (23) and the ejection plungers (4), a displaceable supported wedge block (26) is
20 accommodated, being adjustable transverse to the direction of the stroke of the plungers for determining the level of the ejection plungers in the shaping pockets (2).
7. Apparatus according to any one of claims 1, 4 and 5, in which the length of the mechanism (7) between
25 the drive members (5, 23) and the pressure plungers (4), is adjustable.
8. Apparatus according to any one of the pre-ceeding claims, in which the shaping and delivery table (1) has a hollow hub (17) for accommodating a driving device (32)

for the pushing means (33) mounted above said yoke (13).

9. Apparatus according to claim 2 or 8, in
which the yoke (13) extends as a bridge above the revolvable
table (1) and likewise serves as a support for the pushing
5 means (33).



Fig: 1.

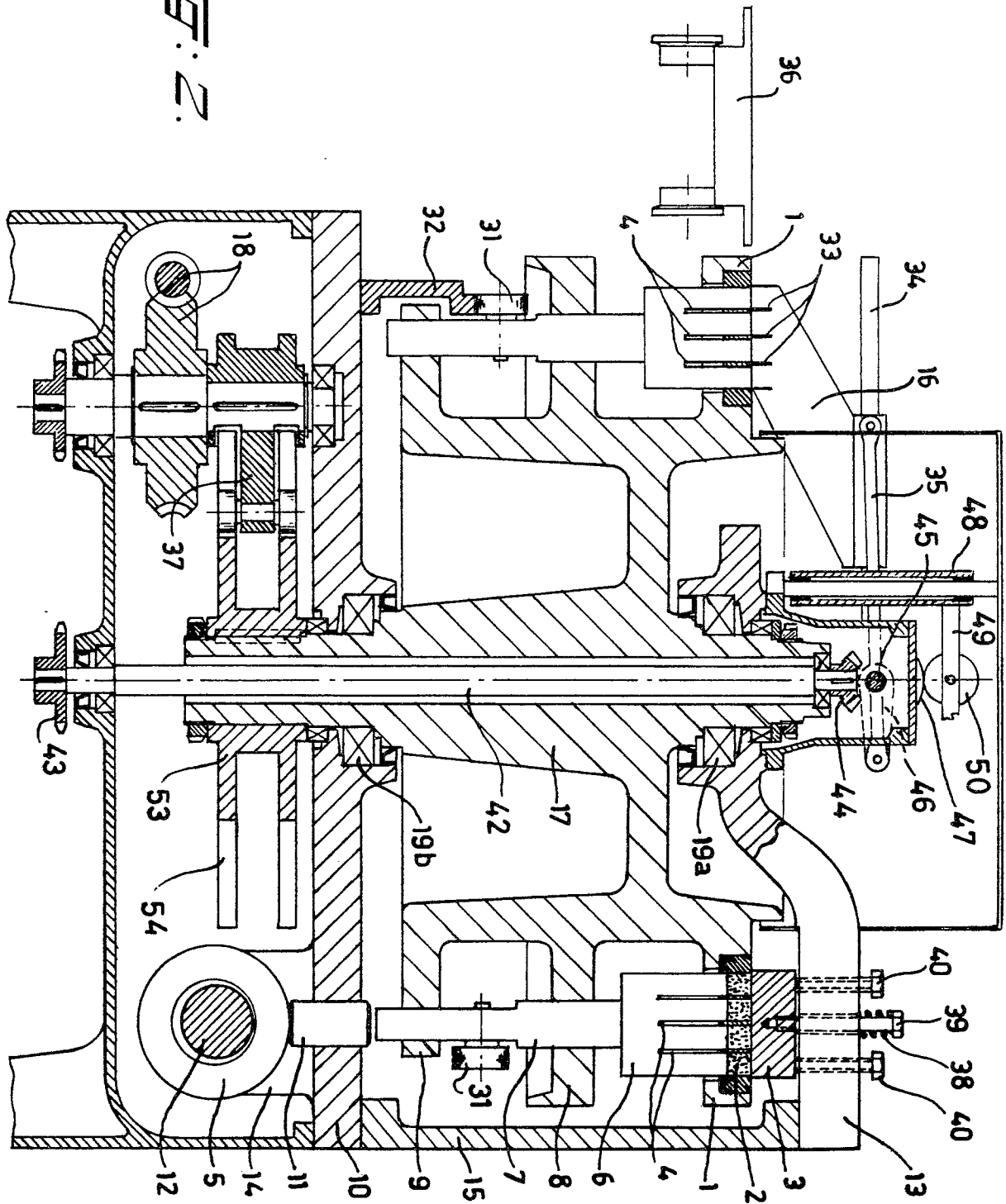


Fig. 2.

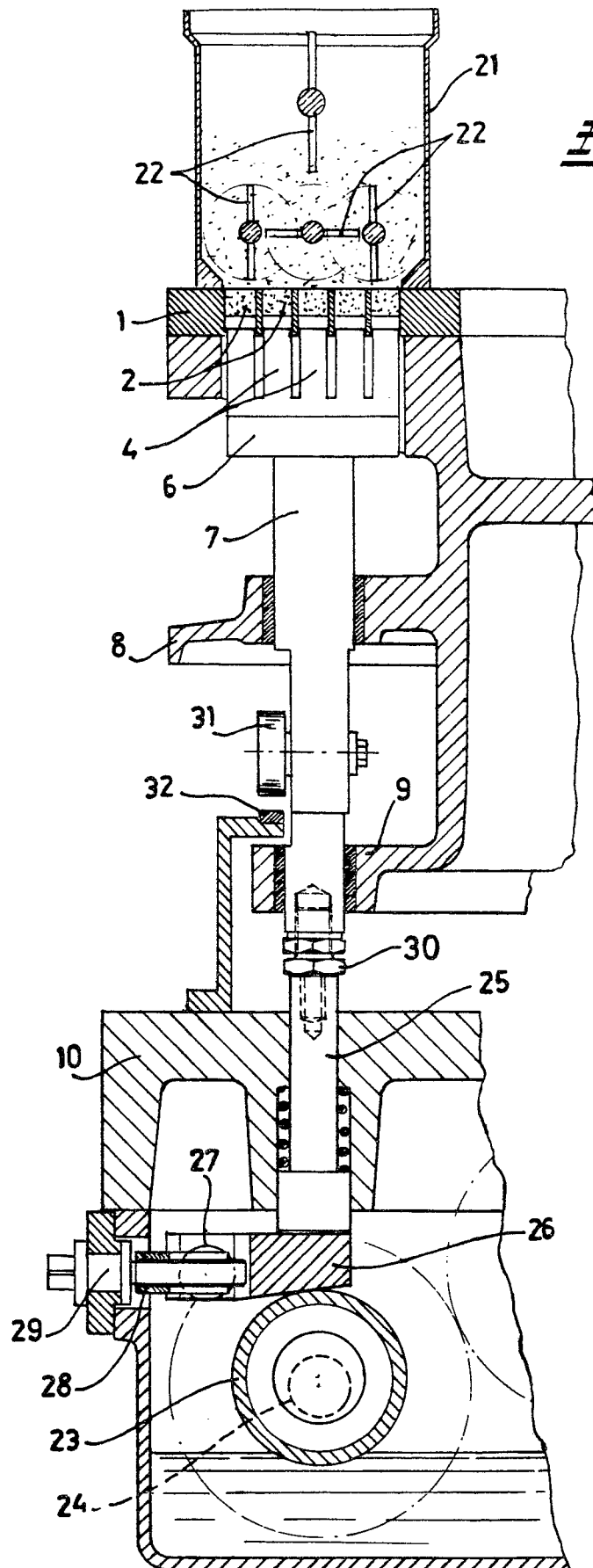


FIG. 3.

