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(54) Mould for manufacturing agglomerated cork stoppers

(57) A mould and method for manufacturing agglomerated cork stoppers, comprising at least one moulding bush (15) arranged between two opposite plates (11) and displaceable along a displacement direction (L) between an open position for introducing cork granules or removing the formed stopper, and a closed position, **characterised in that** a single moulding bush (15) is arranged along the displacement direction (L).

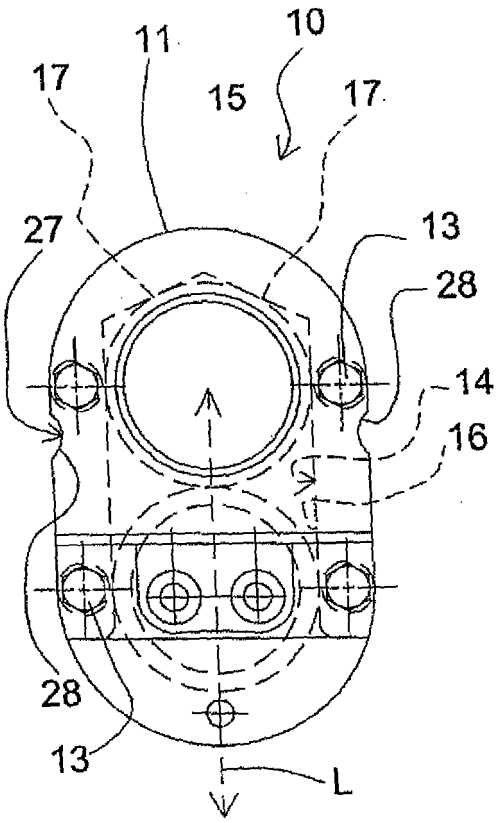

Fig. 1

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Description

[0001] The present invention relates to the field of the machines for manufacturing agglomerated cork stoppers, and more particularly it relates to a mould for manufacturing agglomerated cork stoppers. A method for forming agglomerated cork stoppers using such mould is also an object of the invention.

[0002] As known, agglomerated cork stoppers are manufactured according to different methods, depending on the quality of the raw material available. In high quality productions the stoppers are manufactured in a single piece from a compact cork matrix directly coming from a tree bark, while in lower quality products use is made of agglomerated cork granules obtained from the processing waste of high quality stoppers, or from batches that do not possess the required quality for one-piece stoppers; the granules are bonded by a non-toxic glue matrix.

[0003] Various methods are known for manufacturing agglomerated stoppers. One of these methods provides for the introduction of doses of agglomerated granules mixed with binding agents into moulds comprising moulding bushes. The agglomerate with binding agent is then pressed and subsequently transferred into an oven for the time required for solidification. After suitable cooling, the stopper is removed from the moulding bush by applying pressure using an extraction rod-like body. The preparation of the correct amount of granules to be introduced into the corresponding mould is carried out through dosing machines. Most commonly, the system for forming the stoppers provides for drive means made up of chains to which a sequence of moulds is connected. Such drive means carry the moulds according to a cycle comprising a passage in front of the dosing machine, through an oven and then in an extraction area.

[0004] The moulds for manufacturing agglomerated cork stoppers are made up of a framework with two elongated plates and a series of moulding bushes aligned between such plates. Holes are formed in the plates, one for each bush. The bushes are fixed to a common translation actuator which brings about a linear movement of the bushes from a position wherein the same are arranged in a manner corresponding to the holes to allow for the introduction of the doses of cork granules, to a displaced position wherein the bushes are closed by the inner faces of the plates, in view of the forming step.

[0005] Such moulds are generally bulky and poorly adapt to the possibility of varying the size of the moulding bushes. For example, in order to vary the gauge of the bushes, the entire mould needs be dismounted, hence making the operation scarcely practical. Even as far as the variation of the length of the bushes is concerned, the use of the mould is not flexible, given that only two pre-set sizes are provided for, in the construction stage of the mould. Such presetting is due to the fact that the mould comprises an intermediate plate arranged between an elongated plate of the framework, and the bush. Such intermediate plate is perforated in an identical manner with the holes of the elongated plate. The bush abuts against such intermediate plate. Depending on the activation of a given command, the bush may move from an open position to a closed position on said intermediate plate, while, alternatively, it may move integrally with such intermediate plate which, in correspondence with its hole, shall provide for an "extension" of the bush itself. The bush with the intermediate plate shall be closed by the elongated plate.

[0006] Another problem with the moulds of the known type is related to the fact that part of the cork granulate remains outside the bush, in correspondence with the thickness of the elongated plates. Such excess granulate dirties the mould and also represents a loss of material.

[0007] Another more general problem is related with the fact that, in order to reduce production costs, moulds are manufactured with a large number of cavities, thus being poorly flexible when it comes to obtaining batches with a reduced number of agglomerated cork stoppers.

[0008] The main object of the present invention is that of overcoming the drawbacks of the moulds of the above mentioned known type, and in particular of providing a mould for agglomerated cork stoppers which can be particularly flexible in use.

[0009] Another object of the present invention is to provide a mould for agglomerated cork stoppers which can be mounted and remounted easily.

[0010] Another object of the present invention is to provide a mould for agglomerated cork stoppers that works in a reliable manner.

[0011] A further object of the present invention is to obtain a mould for agglomerated cork stoppers in which the size of the stoppers obtainable is easily adjustable.

[0012] A still further object of the present invention is to provide a system for forming cork stoppers that is flexible in use and capable of reducing waste of material with respect to the prior art.

[0013] These and other objects, that will be made clearer hereinafter, are with the mould for manufacturing agglomerated cork stoppers according to the invention, comprising at least one moulding bush arranged between two plates opposite and displaceable along a displacement line between an open position for introducing cork granules or removing the formed stopper, and a closed position. The mould is **characterised in that** a single moulding bush is arranged along the displacement line.

[0014] Such configuration of the mould allows for better and quicker management of the operations for replacing the moulding bushes in order to vary their capacity, because the bushes are no longer sequentially linked with each other.

[0015] Advantageously, in a preferred embodiment, such mould has a single moulding bush, in such a manner to be able to fully control the dimensions of the production batch. Furthermore, the lower weight of each "single-cavity" mould makes the task of the operators easier when the mould is installed. The simplified structure of a mould having a single moulding cavity results in a more reliable

operation and makes the size adjustments much simpler.

[0016] The invention also provides for a method for manufacturing agglomerated cork stoppers comprising:

- providing a plurality of moulds as described above;
- driving the moulds through work stations which comprise at least one dosing device for dosing cork granules into the bushes of the moulds;
- displacing the bushes from a bush opening position, for the loading of the granules and the removal of the formed stopper, and a bush closure position.

[0017] The features and advantages of the mould and of the manufacturing method according to the present invention will be apparent from the following description of an embodiment thereof, provided for exemplifying and non-limiting purposes, with reference to the attached drawings, wherein:

- figure 1 represents a front view of a mould according to the invention;
- figure 2 represents a sectional side view of the mould of figure 1 showing the moulding bush in an open position;
- figure 3 represents a sectional side view of the mould of figure 1 showing the moulding bush in a closed position;
- figure 4 shows a front view of a bush length adjuster of the mould of the previous figures;
- figure 5 represents a sectional side view of the mould of the previous figures with the length adjuster of figure 4 arranged therein;
- figure 6 represents a schematic front view of a portion of an apparatus for forming agglomerated cork stoppers;
- figure 7 represents a schematic side view of a detail of the apparatus of figure 6 wherein the bush of the forming mould is in the open position for loading the granules;
- figure 8 represents a detail of figure 7 wherein the bush of the forming mould is shown in closed position;
- figure 9 represents a sectional side view of a mould according to a variant embodiment of the present invention;
- figure 10 is a front view of a removable contoured small plate, used in the mould of figure 9.

[0018] With reference to the above figures, a mould for manufacturing agglomerated cork stoppers according to the invention is indicated in its entirety at number 10.

[0019] Such mould 10 comprises two opposite plates 11, substantially symmetric, separated by four spacer elements 12, such as bars fixed to the plates 11 in proximity to the edges of the latter through screws 13.

[0020] On the inner faces 11 a of such opposite plates 11, guide means 14 are arranged for making a moulding bush 15 slide between an open position (see figures 1 and 2) for introducing cork granules and removing the formed stopper, and a closed position (see figure 3). The bases of the bush 15 are in contact with the inner faces 11a.

[0021] Such guide means 14 comprise, for each inner face 11 a, a track 16 made up of two parallel rails 16a defined at the side edges of the plates, spaced from each other by a length substantially equivalent to the outer diameter of the bush 15. Such rails are for example made up of a substantially U-shaped foil and welded on the inner faces 11a. The track 16 defines the displacement direction (indicated at L in figure 1) of the bush 15.

[0022] The upper part of the track 16 ends with two sections of the rails 16 converging with respect to each other to define upper stop abutments 17 for the bush 15. As noticeable in figures 1 and 2, when the bush 15 is in abutment against such upper stop abutments 17, it is in the opening position for introducing cork granules or for removing the stopper once it is formed. In such an open position, the bush is coaxial with two corresponding opposite circular apertures 18 formed through respective plates 11. The maximum inner diameter of the bushes 15 useable in the mould is smaller than the diameter of the circular apertures 18. Therefore, the bases of the bush 15, that are formed by circular rings, radially project inwards with respect to the apertures 18 thus defining an abutment for the nozzles of the dosing containers, as better explained hereafter.

[0023] The end of the track 16 opposite to the upper stop abutments 17 is open downwards in correspondence with the closed position of the bush (see figure 3). In such closed position, removable stop means 19, when present, define the positioning abutment of the bush 15 in closure; on the contrary, when removed, the stop means 19 permit the extraction or insertion of the bush from/to the plates. The removable stop means 19 comprise for example, for each plate 11, a seat 20, defined on the inner face 11a, for accommodating a stop insert 22 transversely projecting with respect to the sliding direction of the bush in the track 16. Associated to the stop insert 22 are reversible locking means 23 for locking the same insert in the seat 20. In particular, in this embodiment, the seat 20 is made up of a circular through hole inserted into which is a pin with the head protruding in the track 16 and the opposite end locked by an elastic ring which forms the reversible locking means 23.

[0024] Reference will be made now in particular to figures 4 and 5. In order to reduce the length of the moulding bush, for example to have a smaller stopper, use is made of a length adjusting element 24, practically made up of a sheet having a thickness equivalent to the difference between the maximum bush length available between the plates 11 (in the example of the description, the distance between the plates) and the length of the bush to be used for forming the stopper. In particular, such sheet is inserted into one of the two tracks 16 and locked at an end using the stop insert (in a longer version with respect to the case when element 24 is not present) associated

to that track. The sheet has a circular through hole 25, substantially having the same size as the apertures 18 formed in the plates 11. When the sheet 24 is arranged in position, such through hole 15 is coaxial with respect to the apertures 18. As clearly observable, the end of the sheet 24 opposite to the locking end is counter-shaped to the upper stop abutments 17 of the track 16.

[0025] Respective stirrups 26 are arranged on the outer faces 11 b of the plates 11 for allowing the connection of the mould 10 to drive means for driving the mould throughout the forming apparatus, such means being described hereafter.

[0026] A system for forming cork stoppers using a plurality of such moulds 10 can be seen in figure 6 and it is indicated at S in its entirety. Such system provides for means 30 for driving the moulds 10 throughout various work stations, among which a dosing station D which comprises, facing each other, two devices 31 for dosing granules inside the bushes 15 of the moulds 10. The devices 31 are of a type known as such.

[0027] The drive means 30 comprise two chains 30a (denoted with a dash-dot line) mounted parallel on respective motorized pulleys 33 (only one of them is shown in figure 6) and corresponding idler means (not shown) which allows the chains to move on two parallel vertical planes. In particular, each stirrup 26 of a mould 10 is reversibly fixed to a respective chain. The moulds 10 are fixed to the chains (for example through bolts screwed onto counter-supports provided for on the same chains) in such a manner that the track 16 takes on a vertical arrangement.

[0028] In figure 6 there is shown a lower branch 30a' of the chain which carries the moulds 10 returning from the stopper extraction zone, to a couple of granule dosing devices 31. From the lower branch 30a' the moulds are rotated by 180° on the pulley, thus positioning them on an upper branch 30a" of the chain which carries them to the dosing station.

[0029] Each granule dosing device 31 comprises a hopper 33 for introducing granules, drawers 34, delineated by a dashed line in figure 7, wherein the doses are prepared, and nozzles 35 for introducing the doses of granules into the bushes 15 of the moulds 10. The path of the granules is marked in figure 7 by a dashed line G.

[0030] In this example, each granule dosing device 31 comprises two dosing drawers 34 with corresponding nozzles 35 which simultaneously feed two respective moulds. The two dosing devices 31 facing each other work simultaneously and each prepare a half of the dose.

[0031] Means 27 for centering the mould 10 with respect to granule dosing devices for dosing the granules in the bush, are associated to the same mould. Such means are required due to the fact that the center-to-center distance between the moulds along the chain may vary over time (for example due to wear and occurrence of clearances on the chain and in the mechanisms associated thereto, and due to the stretching of the same chain) and it is therefore necessary to ensure a correct positioning of the mould on the dosing station in case of a displacement induced by the chain which might not be sufficiently precise.

[0032] In particular, in this embodiment such centering means 27 comprise two opposite centering references 28 defined on the lateral edges of the plates 11, such as two concave lateral recesses of the plates which are adapted to be coupled with respective centering pins 35a of respective nozzles 35.

[0033] Figure 7 shows a dosing station wherein a mould 10 is represented during the step of introducing a dose of granules with the bush at the open position to allow for the loading. The nozzles 35 which are performing the loading step, are moved towards the bush by means of horizontal translation actuators 36, such as cylinders. It should be observed how the nozzles end up in abutment against respective bases of the bush that project with respect to the diameter of the respective circular apertures 18 formed in the opposite plates 11. In practice, the nozzles 35 have dimensions in the range between the diameter of the circular apertures 18 and the inner diameter of the bush 15.

[0034] The bush 15 is displaced vertically through displacement means. In particular, when the bush is in the open position, it is supported at the lower part by a vertical displacement actuator 37, such as a cylinder, and abuts against the upper stop abutment 17. At the upper part of the bush, in contact therewith, there is a second vertical displacement actuator 38. When the bush is filled with granules, the second vertical displacement actuator 38, the upper one, is activated with a consequent pressure exerted on the bush 15 (see figure 8). The latter lowers, abutting against the vertical displacement actuator 36, which, retracting, still continues to support the bush. Upon reaching the closed position, the bush 15 is in abutment against the lower stop means 19. At this point, the nozzles 35 are moved backwards, freeing the mould, and the chain drive means transport the granule-filled moulds outside the dosing station, driving the subsequent moulds to be filled into the same station.

[0035] The described mould, which advantageously has only one moulding bush, can be made up of two opposite plates between which parallel guide means are arranged for guiding two bushes which may displace parallel with respect to each other but on distinct displacement lines. Such a solution slightly limits the flexibility in the control of the production batch, but not the characteristic of easy maintenance and adjustment of the capacity of the mould. Analogously, the mould may also comprise three bushes that are displaced on parallel lines.

[0036] It is clear that the described invention attains its prefixed objects. As a matter of fact, having obtained a mould wherein the bushes can be displaced parallel to each other, allows for avoiding the use of those intermediate elements between one bush and the other, which are required in the prior art moulds and imply long operations during the maintenance and capacity adjustment

steps.

[0037] Besides, having obtained a forming system wherein the moulds are single-cavity moulds, permits to achieve greater management flexibility of the production batch and easier general assembly of the components.

[0038] Furthermore, the interaction of the nozzles of the dosing devices with the loading apertures of the mould according to the invention permits to avoid wasting granules during the loading step, and at the same time the cleanliness of the components is improved.

[0039] Moreover, the particular structure of the mould allows for a wider adjustment range of the capacity of the moulding bushes with respect to the moulds of the prior art, in that a length adjusting element 24 of the moulding bush can be selected having the desired thickness, and replaced anytime at will.

[0040] Thanks to the particular configuration of the guide means of the moulding bush both the bush and the length adjusting element can be removed in an easy and quick manner.

[0041] Specifically with reference to the dismounting problems, the variant embodiment illustrated in figure 9 and figure 10 is capable of attaining a further important advantage. According to such variant, the guide tracks 116, and i.e. practically the foils which, welded to the inner faces 111a of the plates 111, define the tracks themselves, have a slightly greater thickness (increased for example to about 3 mm), in such a manner to allow the insertion, still between the plates 111, of small auxiliary plates 124 contoured identically to the above mentioned length adjuster of the bush (shown in figure 4).

[0042] Mounting of such contoured auxiliary plates 124 is carried out in a manner analogous to the length adjuster, by inserting the same auxiliary plates into respective tracks 116, and locking by means of the upper stop means 117 and the stop inserts 122, suitably increased in length. The auxiliary small plates 124 in turn have through holes 125 corresponding to the apertures 118 formed in the main plates 111, having a diameter greater with respect to the inner diameter of the bush 115, hence the latter is held tight by the abutment of the two small plates 124 on both sides.

[0043] Given that the elements at contact with the cork are - in this case - only the bush 115 and the auxiliary small plates 124, and considering that the Teflon® deposition treatment (or similar anti-stick treatments on the metal material) is limited to such parts only, when it comes to remedying the wear of said treatment, it is sufficient to slip the bush and the small plates off, after removal of the inserts 122, hence not requiring dismounting the entire mould from the chain.

[0044] In this way, the operations of maintenance and restoration of the Teflon® layer are significantly simplified, hence considerably reducing machine downtimes required periodically to this purpose.

[0045] The present invention has been here described with reference to preferred embodiments. It is clear however that the invention is not limited to these embodiments, which may undergo variants and/or modifications without for this reason departing from the scope of the invention, as defined by the appended claims.

Claims

1. A mould for manufacturing agglomerated cork stoppers, comprising at least one moulding bush (15) arranged between two opposite plates (11) and displaceable along a displacement direction (L) between an open position for introducing cork granules or removing the formed stopper, and a closed position, **characterised in that** a single moulding bush (15) is arranged along said displacement direction (L).

2. The mould according to claim 1, **characterised in that** guide means (14) are arranged on an inner face (11a) of at least one of said plates (11), for permitting the sliding of said single moulding bush (15) from said open position to said closed position, said guide means (14) comprising removable stop means (19) adapted to define an abutment for the bush at said closed position, and, when removed, to allow for the extraction/insertion of the bush (15) from the plates (11).

3. The mould according to claim 2, **characterised in that** said guide means (14) comprises a track (16) open at the end corresponding to said closed position of the bush.

4. The mould according to claim 2 or 3, **characterised in that** said stop means (19) comprises a seat (20), formed in the inner face (11a) of a corresponding plate (11), for accommodating a stop insert (22) transversely projecting with respect to the sliding direction of the bush (15), reversible locking means (23) being associated to said stop insert (22) for locking the same in said seat (20).

5. The mould according to claim 3 or 4, **characterised in that** said track (16) comprises two parallel rails (16a) defined at the lateral edges of the plates (11), spaced from each other by a distance substantially equivalent to the outer diameter of the bush (15), said rails being connected to the upper part of the track (16) to define upper stop abutments (17) for the bush (15).

6. The mould according to any of the previous claims, **characterised in that** it comprises a removable length adjusting element (24) for changing the length of said at least one removable bush (15), adapted to be arranged against the inner face (11a) of one of said plates (11), a base of said bush abutting against said length adjusting element (24), which has

a through hole (25) having a size substantially equivalent to apertures (18) formed in said plates (11), said through hole (25) being adapted to become coaxial with said apertures (18) when coupled to the corresponding plate (11).

7. The mould according to claim 6, **characterised in that** said length adjusting element (24) is made up of a sheet having a thickness equivalent to the difference between the maximum bush length available between said plates (11) and the length of the bush intended to be used for forming the stopper, said sheet being adapted to be inserted into one of said tracks (16) and locked at an end with a corresponding stop insert (22).

8. The mould according to any one of claims 2 to 5, **characterised in that** it comprises contoured auxiliary plates (124) adapted to be removably inserted into said guide means for providing an abutment to respective ends of said bush, said contoured plates (124) comprising through holes (125) which correspond to apertures (118) formed in said plates (111), and having a diameter greater than the inner diameter of said bush (115).

9. The mould according to claim 8, **characterised in that** said sheets (124) are locked at an end by a corresponding stop insert (122).

10. The mould according to claim 8 or 9, wherein said guide tracks (116) have an increased width in such a manner to allow the insertion of said sheets.

11. The mould according to any of the previous claims, **characterised in that** a single moulding bush (15) is comprised between said plates (11).

12. A method for manufacturing agglomerated cork stoppers with a plurality of moulds (10) with cork moulding bushes (15), said moulds being driven through work stations (D) which comprise at least one dosing device (31) for dosing cork granules into the bushes (15) of the moulds (10), the bushes (15) being displaced along a displacement direction (L) from a bush opening position, for the loading of the granules and the removal of the formed stopper, and a bush closure position, **characterized in that** a single moulding bush (15) is arranged along said displacement direction (L).

13. The method for manufacturing cork stoppers according to claim 12, **characterised in that** the bushes (15) of said moulds (10) are displaced vertically.

14. The method for manufacturing cork stoppers according to claim 12 or 13, **characterised in that** a loading nozzle (35) of said at least one dosing device (31) directly corresponds with the inside of said moulding bush (15) of the mould (10) during the granule loading step.

15. The method for manufacturing cork stoppers according to claim 14, **characterised in that** said nozzle (35) abuts against the base of said bush (15).

16. The method for manufacturing cork stoppers according to any of the claims from 12 to 15, **characterised in that** each mould (10) is centered with respect to said at least one granule dosing device (31).

17. The method for manufacturing cork stoppers according to claim 16, **characterised in that** two opposed centering references (28) of said centering centering means (27) defined on the lateral edges of said plates (11), couple with respective centering pins (35a) of respective nozzles (35).

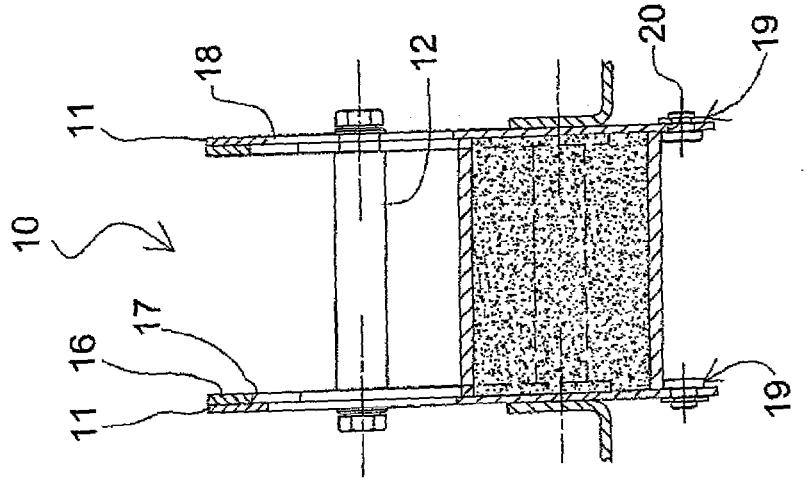

Fig. 3

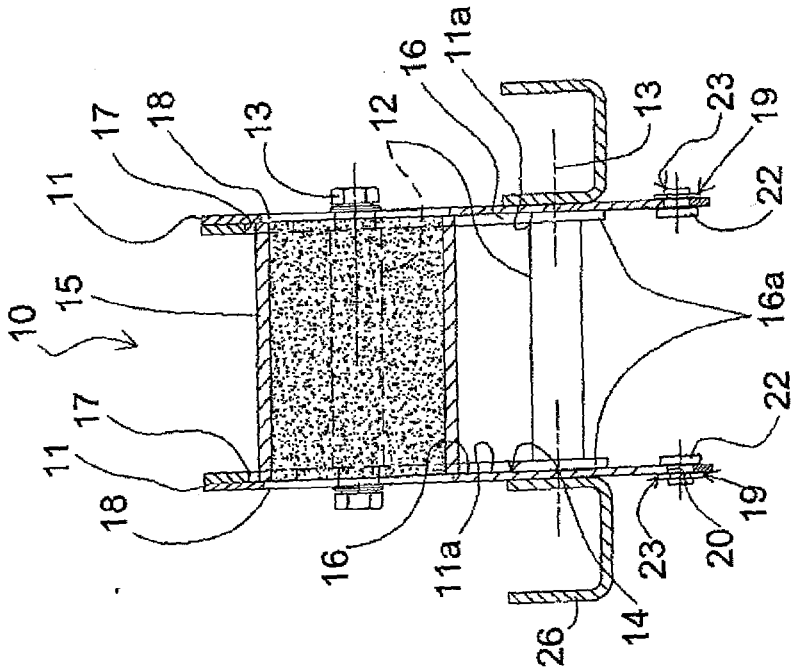

Fig. 2

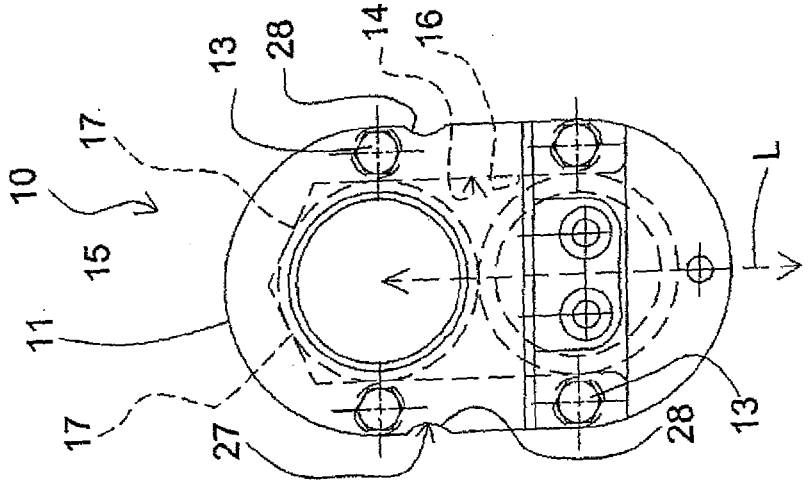

Fig. 1

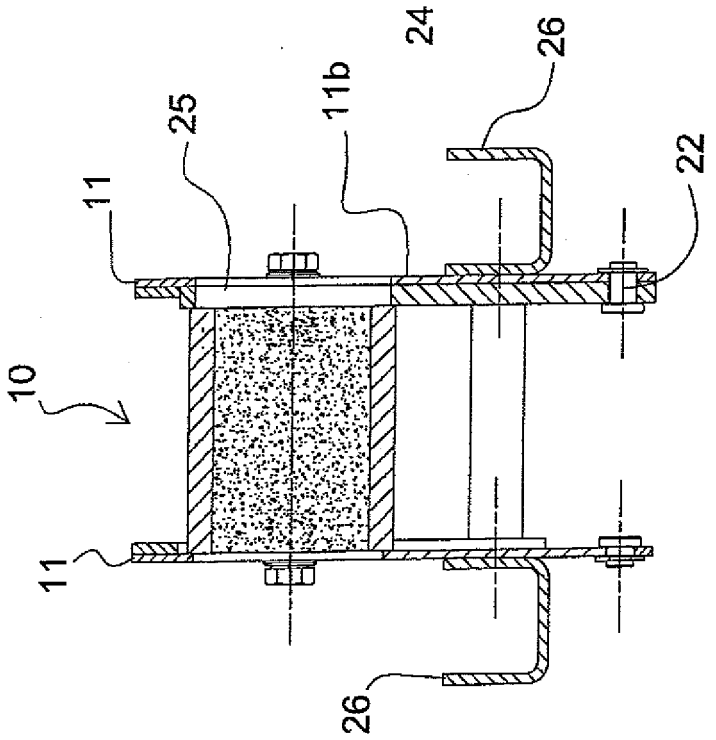

Fig. 5

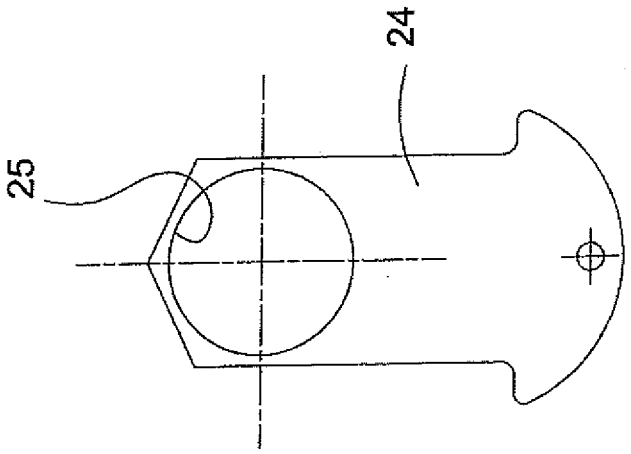

Fig. 4

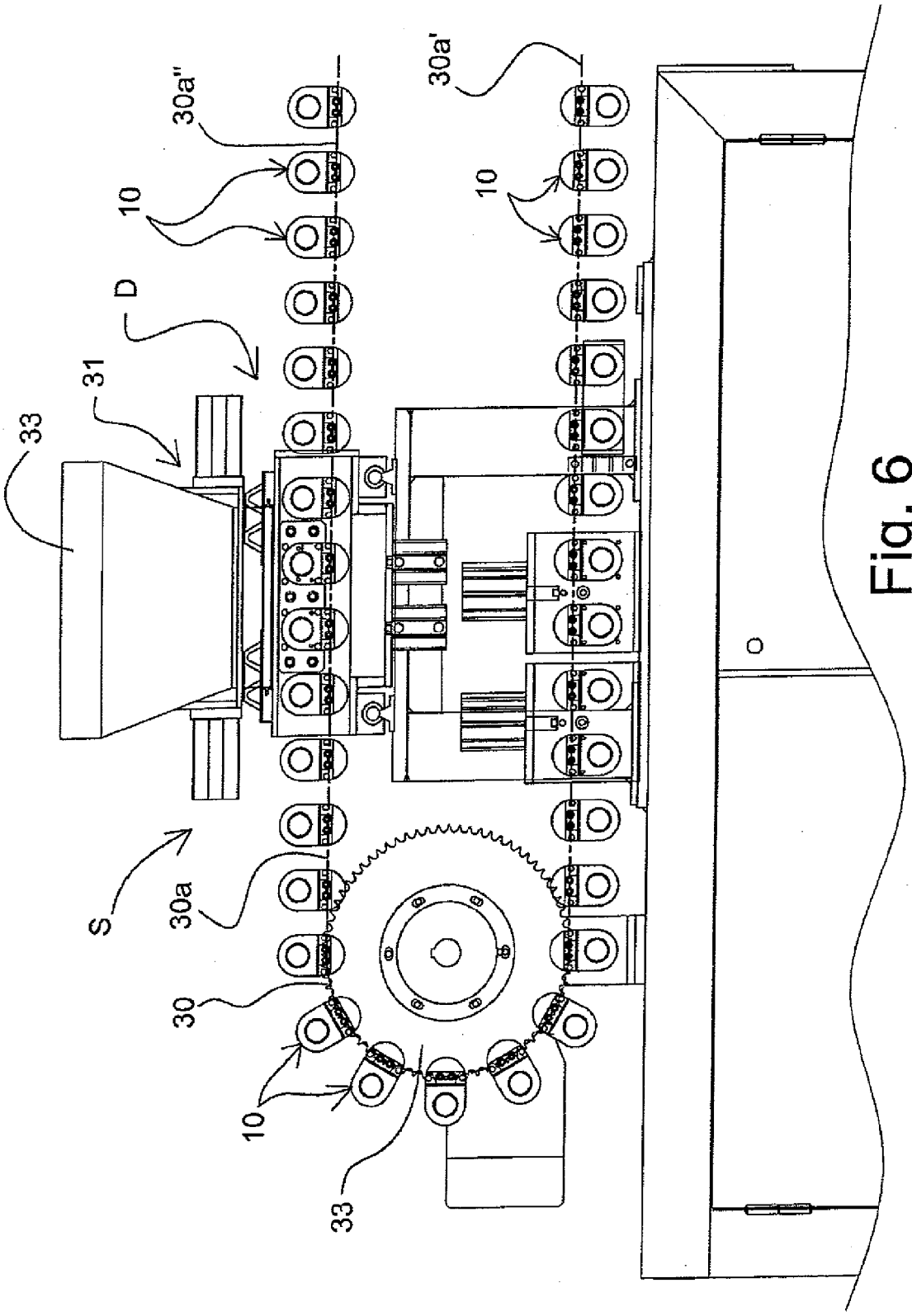

Fig. 6

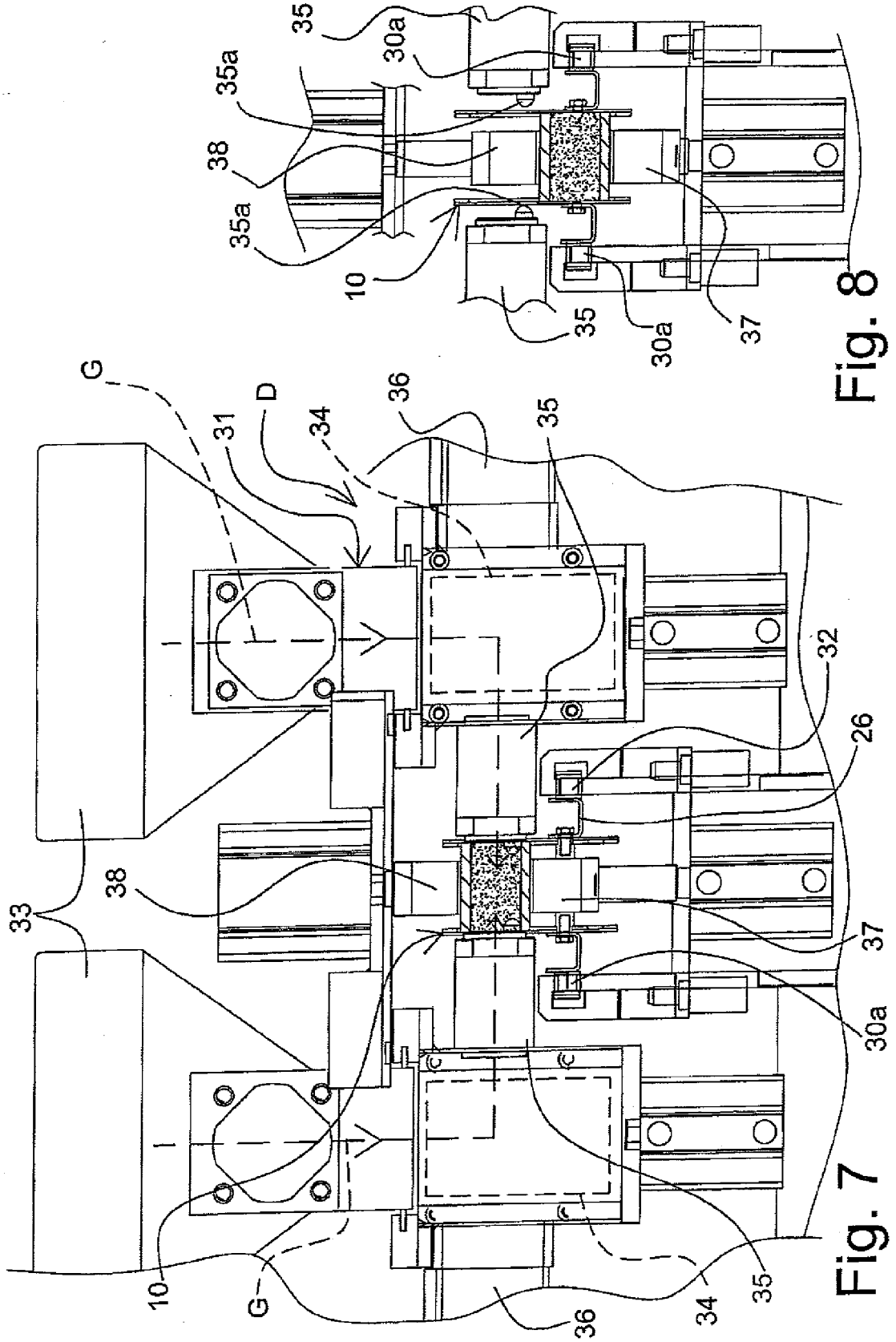
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Fig. 7

35
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Fig. 8

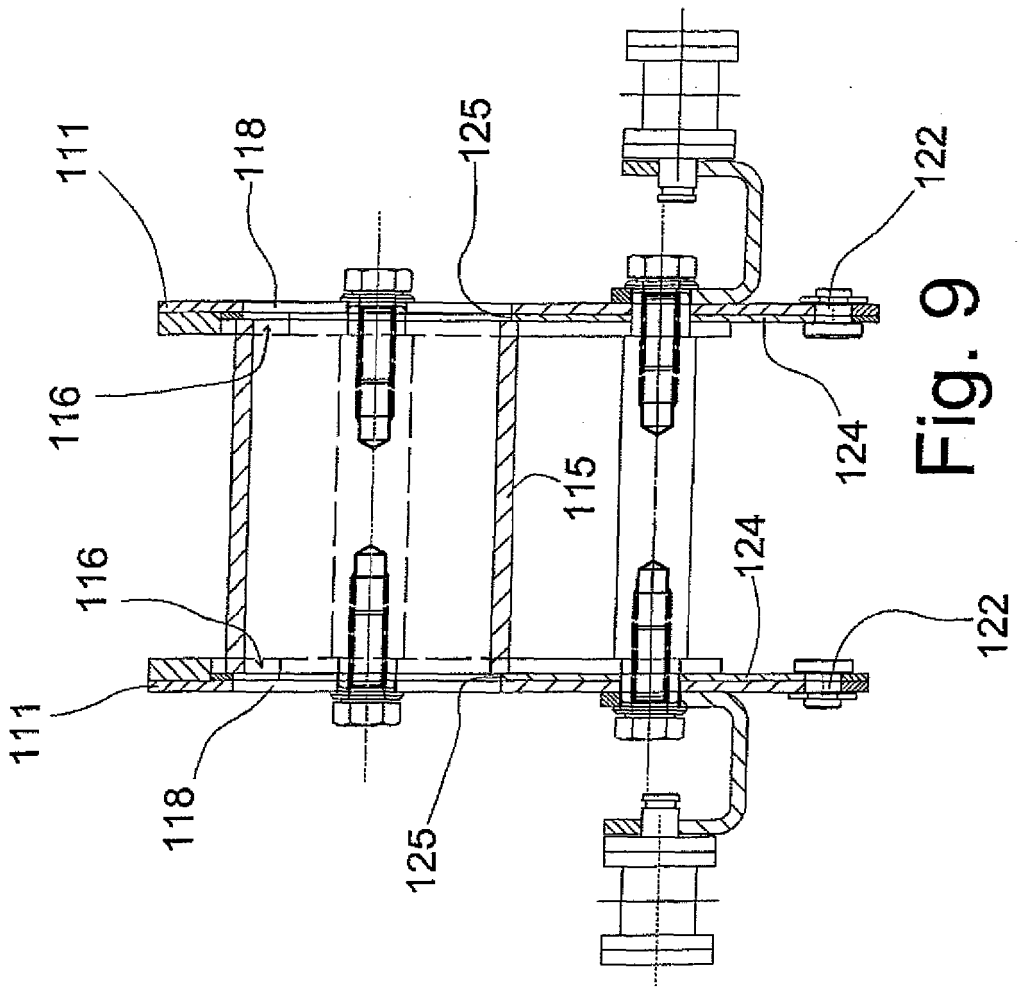

Fig. 9

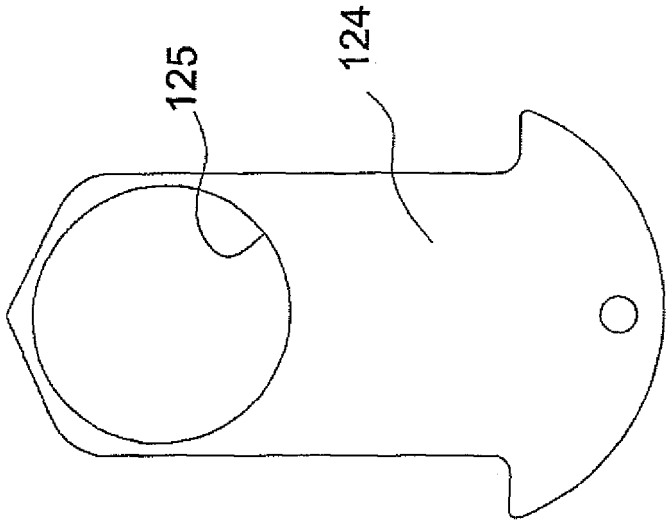

Fig. 10

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EUROPEAN SEARCH REPORT

Application Number
EP 09 17 3484

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2 830 326 A (ANDREW WEISENBURG) 15 April 1958 (1958-04-15) * column 3, line 27 - line 36 * * column 3, line 51 - line 75 * * column 5, line 17 - line 23 * * figures *	1,11	INV. B27J5/00
X	GB 177 474 A (CHARLES EDWARD MCMANUS) 30 March 1922 (1922-03-30)	1,11	
A	* the whole document *	2-3	
X	US 1 673 904 A (DIRZUWEIT CARL J) 19 June 1928 (1928-06-19) * page 1, line 17 - line 26 * * page 1, line 62 - line 106 * * page 2, line 28 - line 36 * * figures 3-5 *	12-17	
A	IT 1 218 538 B (MEACCI SRL [IT]) 19 April 1990 (1990-04-19) * the whole document *	1	
A	US 1 627 601 A (GEORGE GOEBEL) 10 May 1927 (1927-05-10) * figure 1 *	1	TECHNICAL FIELDS SEARCHED (IPC) B27J
A	US 2 477 258 A (MACMILLIN HOWARD F) 26 July 1949 (1949-07-26)	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 February 2010	Huggins, Jonathan

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 09 17 3484

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