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(19) **United States**(12) **Patent Application Publication**
FRABETTI(10) **Pub. No.: US 2017/0015446 A1**(43) **Pub. Date: Jan. 19, 2017**(54) **FEEDING ASSEMBLY TO DOSE TABLETS IN CAPSULES****Publication Classification**(71) Applicant: **MG 2 - S.r.l.**, Pianoro (IT)(72) Inventor: **Davide FRABETTI**, Baricella (IT)(73) Assignee: **MG 2 - S.r.l.**, Pianoro (IT)(21) Appl. No.: **15/209,367**(22) Filed: **Jul. 13, 2016**(30) **Foreign Application Priority Data**

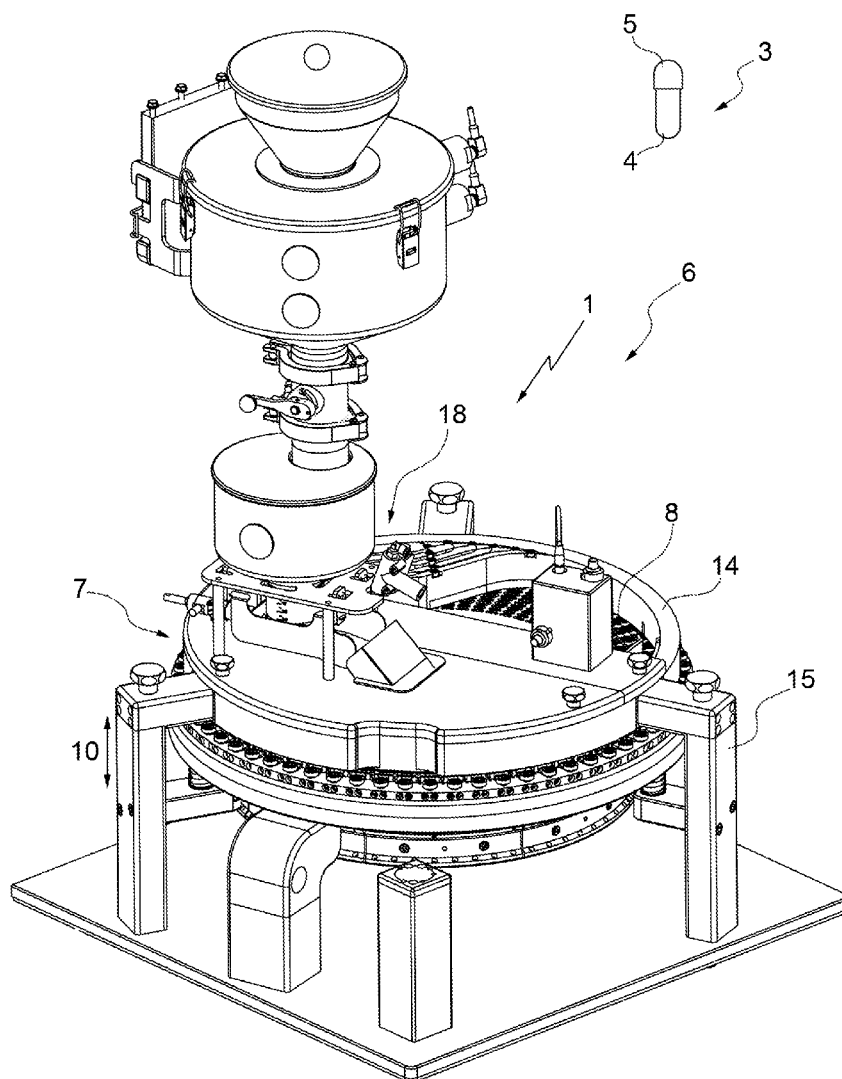
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(57)

ABSTRACT

In a feeding assembly to dose tablets in capsules, each capsule is arranged at the outlet of a feeding channel, which, at its inlet, receives a given quantity of tablets delivered by a rotating distribution platen provided with at least one group of dosing holes which are normally closed by a closing plate, which is angularly integral with the distribution platen, and is mobile between a closing position and an opening position of the dosing holes.



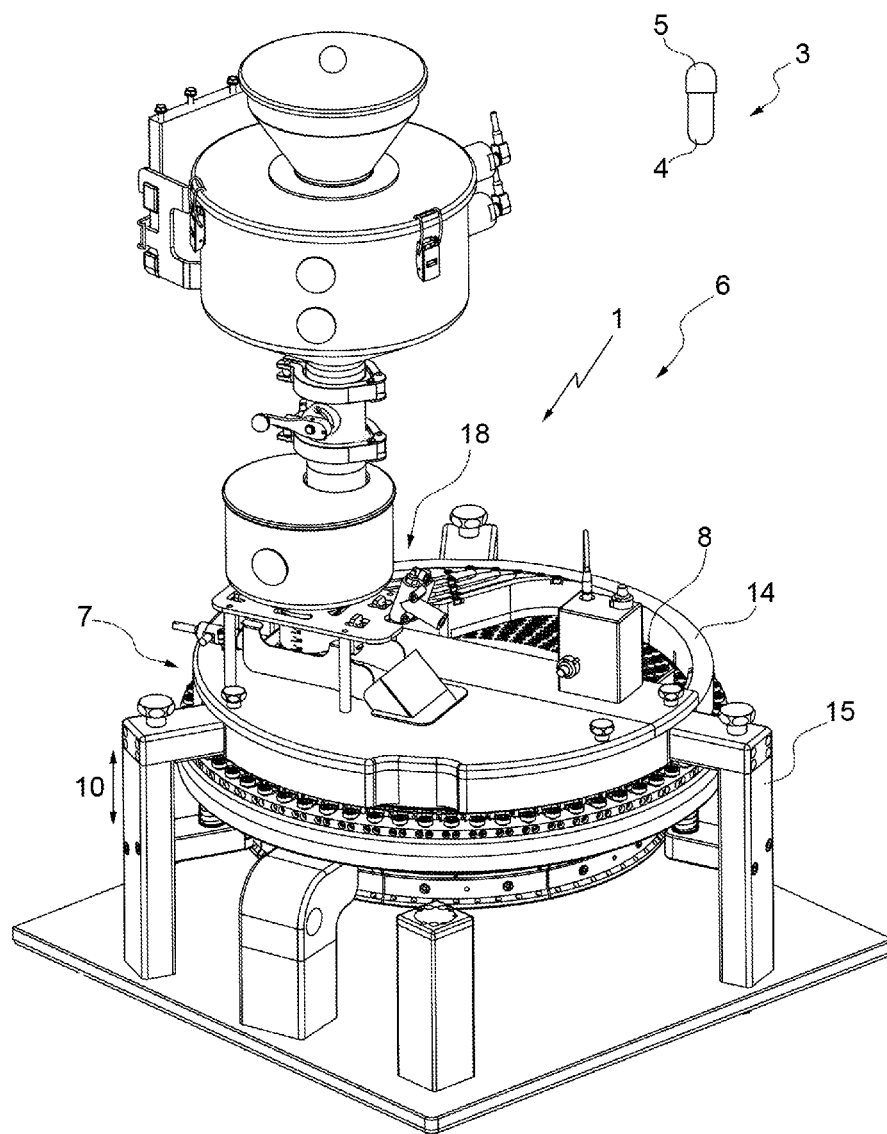


FIG.1

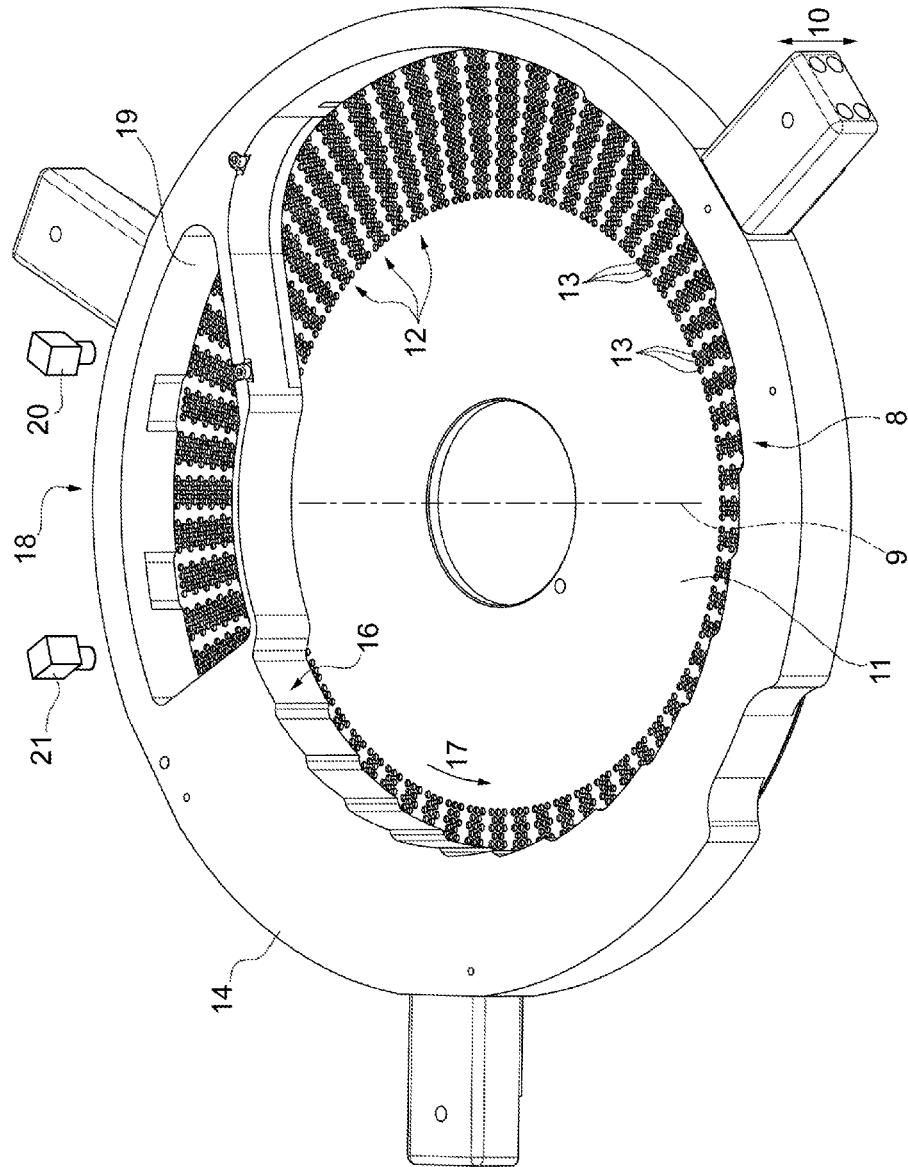
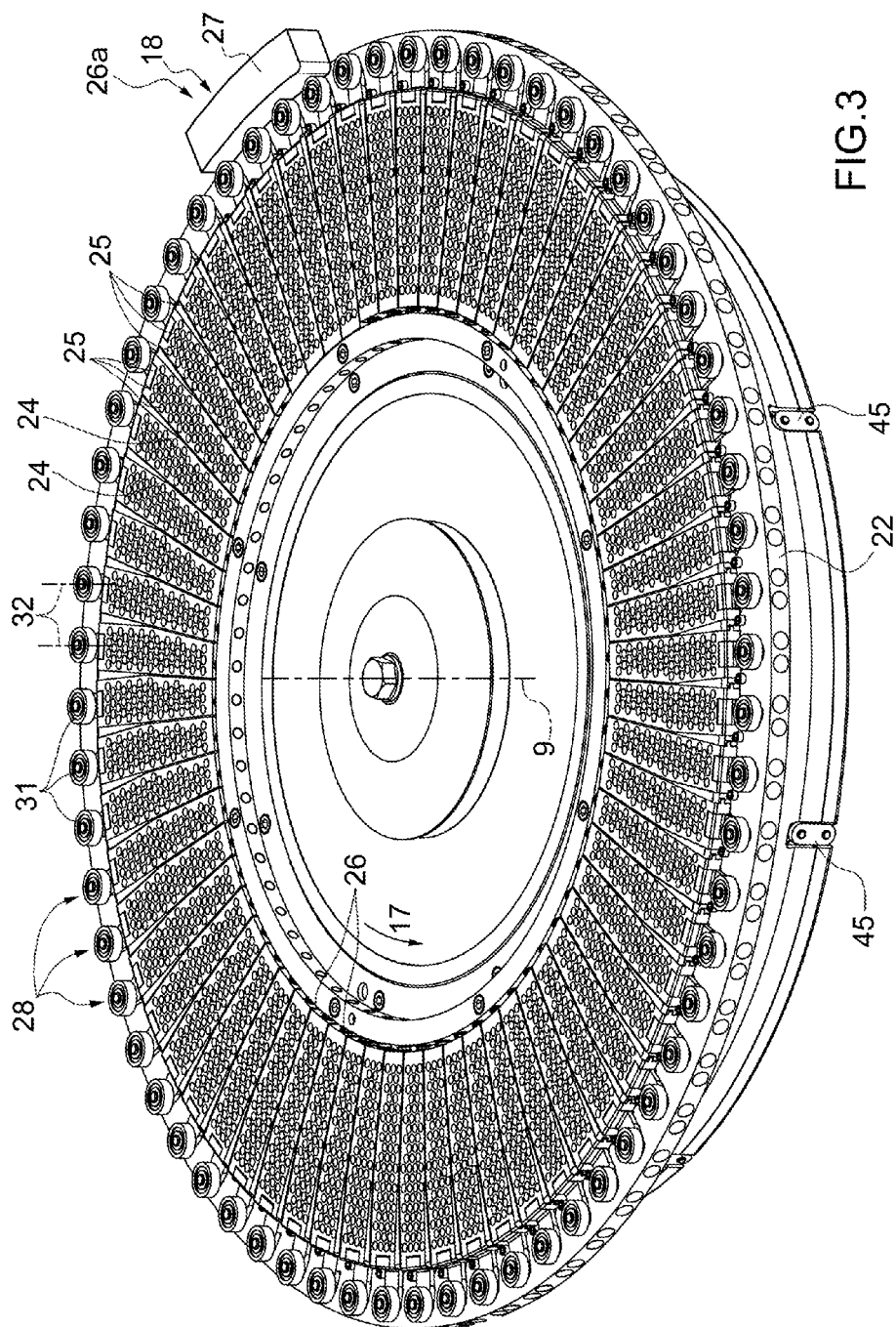
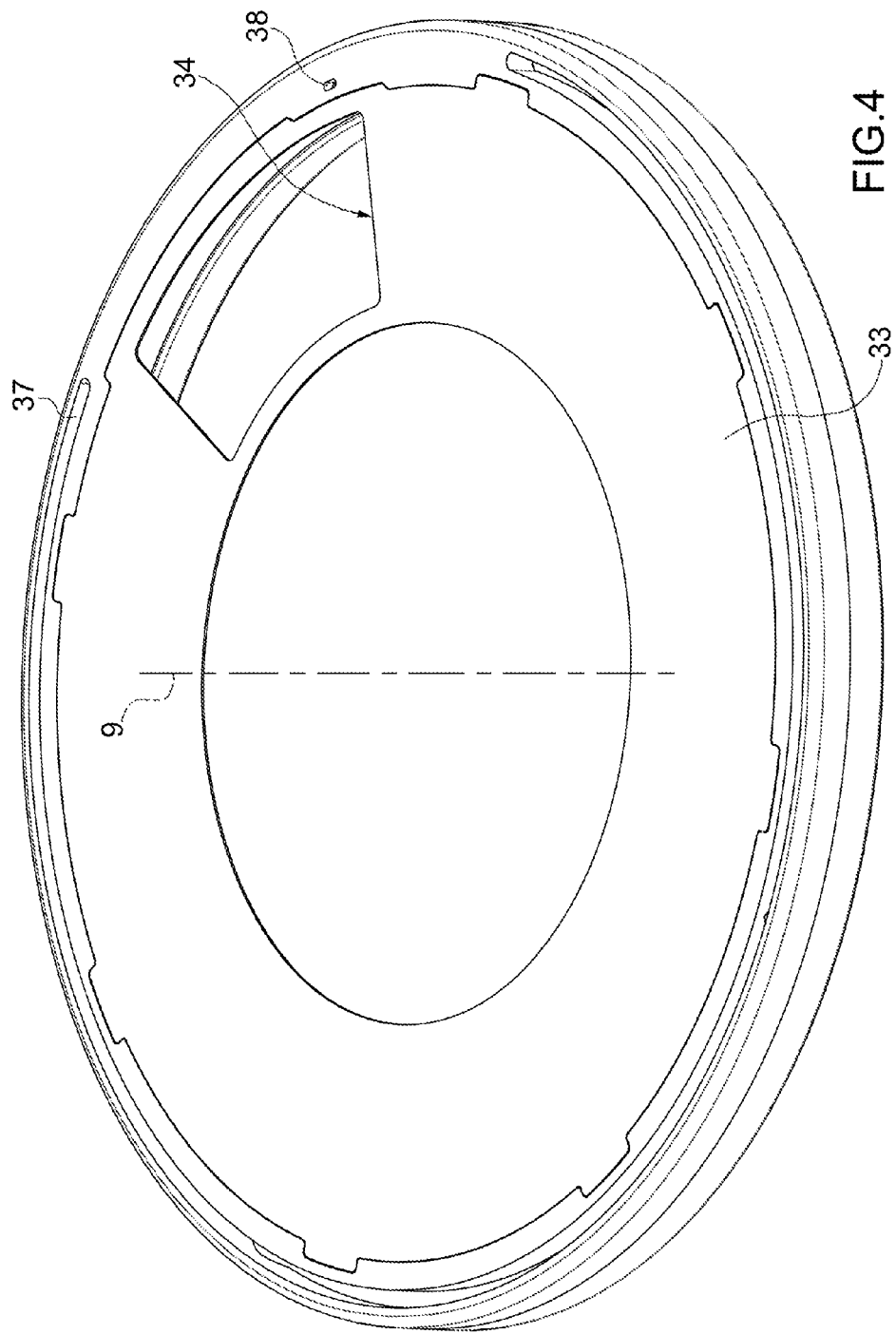


FIG.2





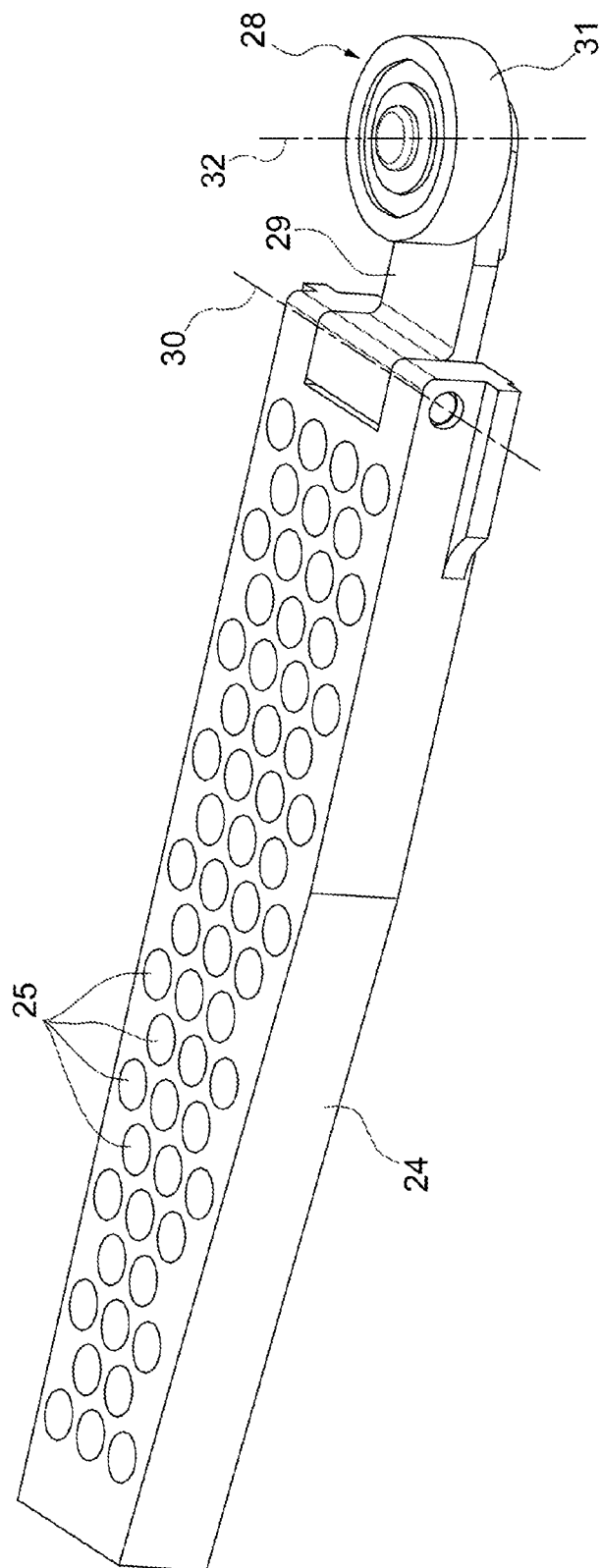
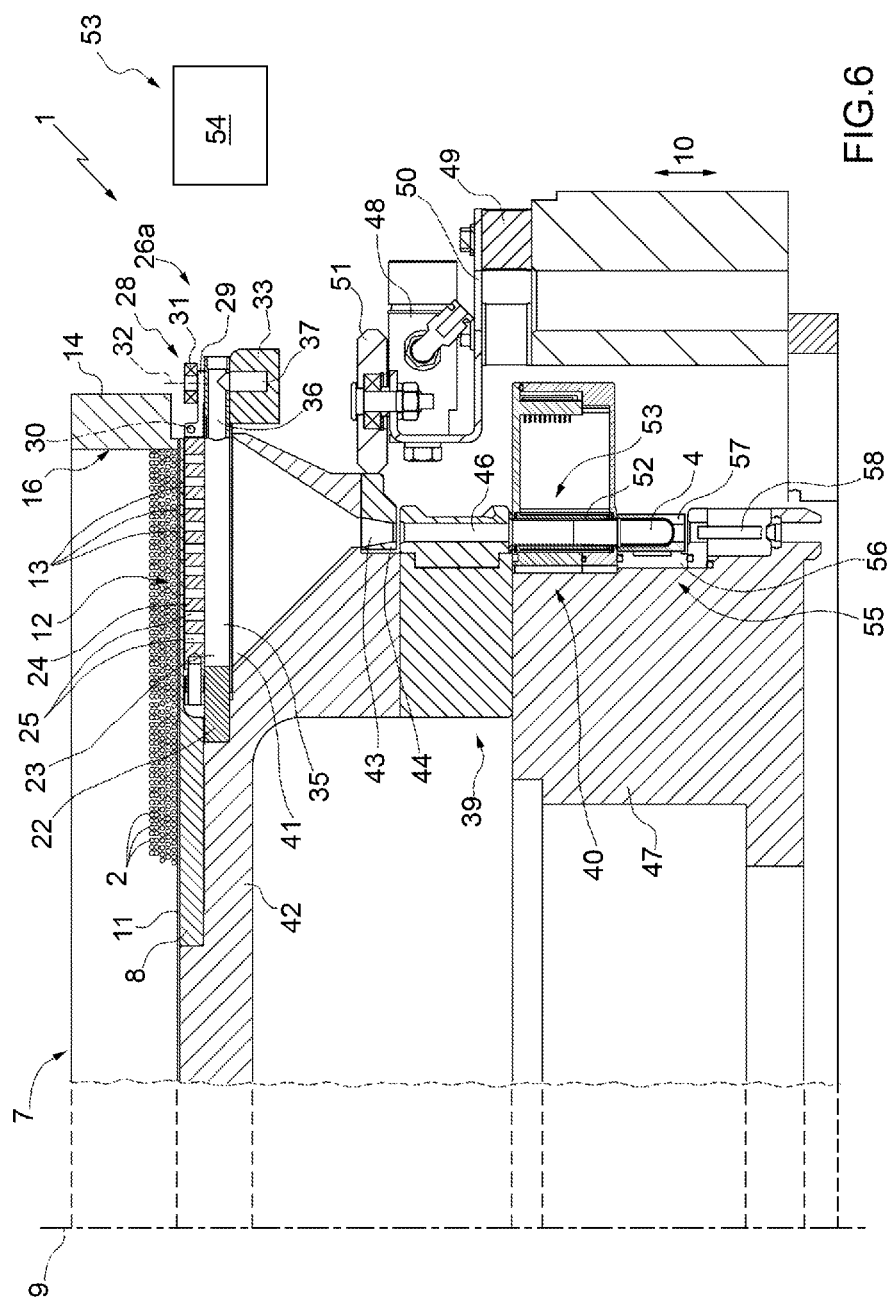
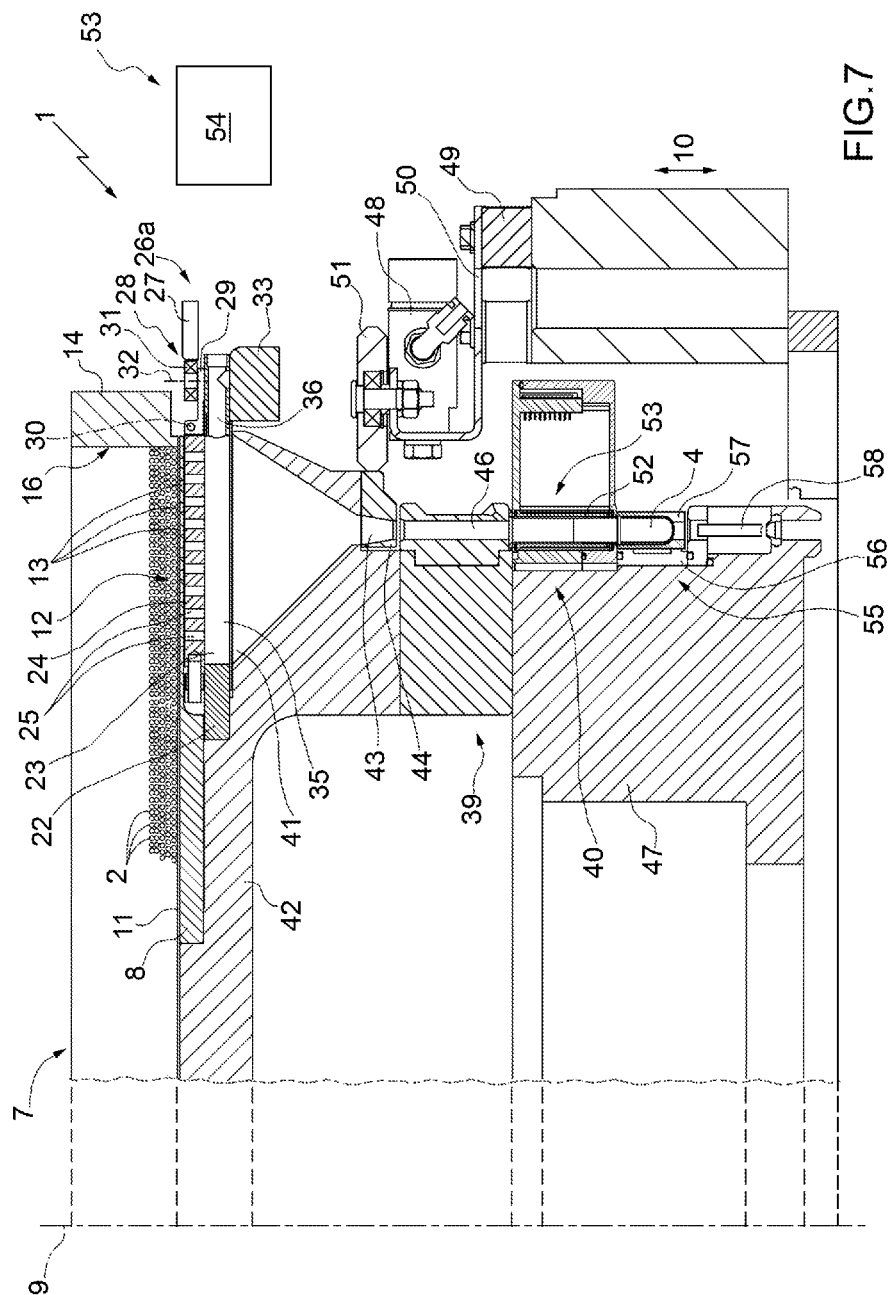
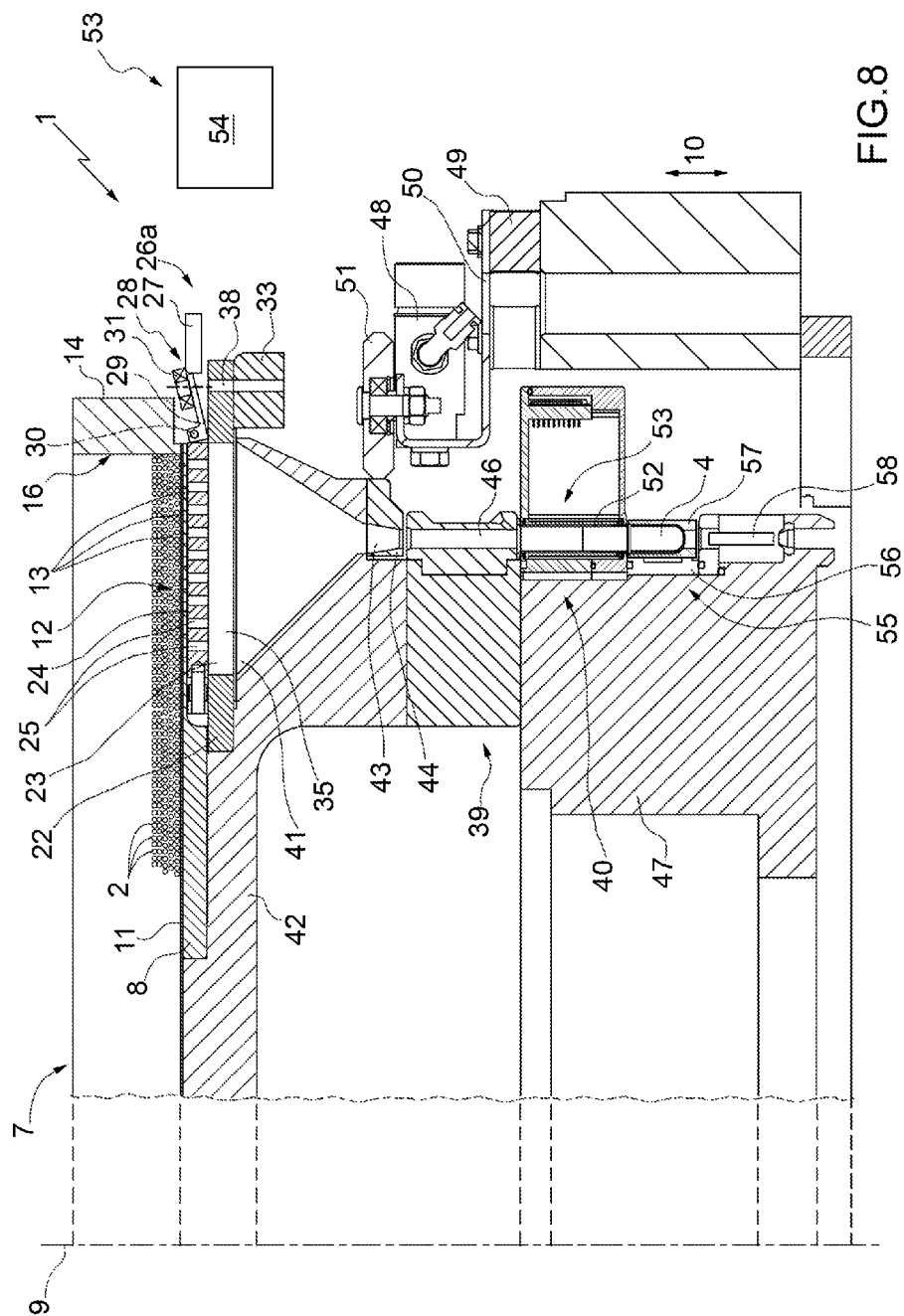


FIG. 5



6
6^x
L





FEEDING ASSEMBLY TO DOSE TABLETS IN CAPSULES

[0001] The present invention relates to a feeding assembly for dosing tablets in capsules.

[0002] In this description the term tablets refers to tablets of any kind, regardless of their size and, thus, also to so-called micro-tablets.

BACKGROUND OF THE INVENTION

[0003] In the pharmaceutical industry, it is known to provide a feeding assembly of the type comprising a dosing station; a dosing wheel mounted in the dosing station to deliver a given quantity of tablets into a bottom shell of each capsule; and a conveyor device for transferring the bottom shells in succession through the dosing station.

[0004] The dosing wheel comprises a rotating distribution platen provided with a plurality of groups of dosing holes evenly distributed around an axis of rotation of the distribution platen.

[0005] Each group of dosing holes is associated with a respective feeding channel that passes through the dosing wheel to transfer the tablets from the respective dosing holes into the bottom shell of the respective capsule.

[0006] The distribution platen cooperates with an annular closing plate, which is mounted under the distribution platen in order to normally close the dosing holes, and is provided, in the area of the dosing station, with an opening shaped so as to allow the tablets contained in the dosing holes to fall first of all into the respective feeding channels and, thus, into the respective bottom shells.

[0007] The prior art feeding assemblies of the type described above have a number of drawbacks, mainly associated with the fact that, during the rotation of the distribution platen, the tablets slide on the closing plate and may be damaged.

SUMMARY OF THE INVENTION

[0008] The object of the present invention is to provide a feeding assembly to dose tablets in capsules that overcomes the drawbacks mentioned above and is simple and inexpensive to produce.

[0009] According to the present invention, there is provided a feeding assembly to dose tablets in capsules as disclosed in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The present invention will now be described with reference to the accompanying drawings, illustrating a non-limiting embodiment thereof, in which:

[0011] FIG. 1 is a schematic perspective view, with parts removed for the sake of clarity, of a preferred embodiment of the feeding assembly according to the present invention;

[0012] FIG. 2 is a schematic perspective view, with parts removed for the sake of clarity, of a first detail of the feeding assembly of FIG. 1;

[0013] FIG. 3 is a schematic perspective view, with parts removed for the sake of clarity, of a second detail of the feeding assembly of FIG. 1;

[0014] FIG. 4 is a schematic perspective view, with parts removed for the sake of clarity, of a third detail of the feeding assembly of FIG. 1;

[0015] FIG. 5 is a schematic perspective view of a detail of FIG. 3; and

[0016] FIGS. 6, 7 and 8 are three schematic side views, with parts shown as cross-sectional views and parts removed for the sake of clarity, of the feeding assembly of FIG. 1 illustrated in three different operating positions.

DETAILED DESCRIPTION OF THE INVENTION

[0017] With reference to FIGS. 1 and 2, denoted as a whole by reference numeral 1 is a feeding assembly to dose tablets 2, in particular micro-tablets of pharmaceutical products, in capsules 3, each of which comprises a substantially cup-shaped bottom 4 and a lid 5 to close the bottom 4.

[0018] The feeding assembly 1 defines part of a machine 6 for filling capsules 3, and comprises a dosing wheel 7 provided with a distribution platen 8, which is mounted so as to rotate continuously about an axis of rotation 9 substantially parallel to a vertical direction 10, and is limited by a flat inner bottom wall 11 that is substantially perpendicular to the axis 9.

[0019] The platen 8 is provided with a plurality of groups 12 of dosing holes 13 that pass through the wall 11 parallel to the direction 10. The groups 12 are obtained along a perimeter edge of the platen 8, and are evenly distributed around the axis 9.

[0020] The wheel 7 further comprises an upper trimming disc 14, which is fixed to a frame 15 of the machine 6, extends above the platen 8, has an annular shape, and is radially limited by an inner wall 16, the distance of which from the axis 9 increases in a direction 17 of movement of the platen 8 about the axis 9.

[0021] In particular, the distance of the wall 16 from the axis 9 ranges from a minimum value, in correspondence to which the holes 13 are covered by the disc 14, and a maximum value, in correspondence to which the disc 14 extends outside the platen 8 and is radially staggered with respect to the groups 12 of holes 13.

[0022] The groups 12 of holes 13 are moved by the platen 8 around the axis 9 and through a dosing station 18, in the area of which the disc 14 is provided with a slot 19 suitable to allow a first control device 20 mounted upstream of the station 18 in the direction 17 to check for the presence of tablets 2 in each hole and a second control device 21 mounted downstream of the station 18 in the direction 17 to check for the absence of tablets 2 in the holes 13.

[0023] As illustrated in FIGS. 3, 5 and 6, the wheel 7 further comprises a lower closing disc 22, which is mounted under the platen 8 coaxially with the axis 9, is coupled in an angularly fixed manner to the platen 8 and which, in correspondence with each group 12 of holes 13, has an opening 23 obtained through the disc 22 in the direction 10.

[0024] The disc 22 supports a plurality of closing plates 24, which are evenly distributed around the axis 9, and are equal in number to the number of the groups 12, and each of which has a respective plurality of transfer holes 25 equal in number to the number of the holes 13 in a group 12 of holes 13.

[0025] The plates 24 are coupled to the disc 22 in a sliding manner so as to move radially between a closing position (FIG. 6), in which the respective holes 13 and 25 are not aligned with one another in the direction 10 to prevent the tablets 2 from disengaging the holes 13, and an opening position (not illustrated), in which the respective holes 13

and 25 are aligned with one another in the direction 10 to allow the tablets 2 to fall out of the holes 13.

[0026] Each plate 24 is moved to its closing position, and normally kept in that position, by a spring 26, which is interposed between the platen 8 and the plate 24, and defines part of an operating device 26a configured to move the plates 24 between their opening and closing positions.

[0027] The device 26a further comprises a cam 27, which is mounted in the area of the station 18; and, for each plate 24, a respective cam follower 28.

[0028] The cam follower 28 comprises a supporting bracket 29 coupled in a rotating manner to the plate 24 so as to rotate, with respect to the plate 24, about a fulcrum axis 30 crosswise to the direction 10; and a cam follower roller bearing 31 coupled in a rotating manner to the bracket 29 so as to rotate, with respect to the bracket 29, about an axis of rotation 32 parallel to the direction 10.

[0029] The cam follower 28 is mobile about the axis 30 between a lowered operating position (FIGS. 6 and 7), in which the roller bearing 31 intercepts the cam 27 in order to move the respective plate 24 to its opening position, and a raised rest position (FIG. 8), in which the roller bearing 31 avoids the cam 27 in order to keep the respective plate 24 in its closing position and so prevent the tablets 2 from being fed into the respective bottom 4.

[0030] With reference to FIG. 4, on the outside of the dosing station 18, the openings 23 are closed by an annular disc 33, which is fixed to the frame 15 under the disc 22, extends around the axis 9, and has, in the area of the dosing station 18, an opening 34 that passes through the disc 33 in the direction 10 to permit the passage of the tablets 2.

[0031] The disc 33 closes each opening 23 to define a respective suction chamber 35, which is moved by the wheel 7 about the axis 9, and is suitable to be connected by means of at least one suction channel 36 passing through the disc 22 to a pneumatic manifold 37 provided in the disc 33.

[0032] The manifold 37 extends around the axis 9 at an angle of less than 360°, and is shaped to connect the chambers 35 to a pneumatic suction device of a known type that is not illustrated here upstream and downstream of the station 18 in the direction 17.

[0033] In connection with the above description, it is important to note that the cam followers 28 are moved from their lowered operating positions to their raised rest positions by a jet of compressed air delivered against the cam followers 28 through an outlet hole 38 obtained in the disc 33 upstream of the station 18 in the direction 17.

[0034] The cam followers 28 are moved from their raised rest positions to their lowered operating positions by a contact roller (not illustrated) mounted along the path of movement of the cam followers 28 about the axis 9.

[0035] As illustrated in FIGS. 6 to 8, the wheel further comprises a feeding drum 39, which is coupled in an angularly fixed manner to the platen 8, and comprises, in turn, for each group 12 of holes 13, a respective feeding channel 40, which extends below the disc 33 to transfer the tablets 2 from the holes 13 into the respective bottom 4.

[0036] Each channel 40 comprises, in succession and starting from the respective opening 23, an input segment 41, which is funnel-shaped and converges downwards, and is obtained in an upper disc angularly integral with the platen 8; a vibrating intermediate segment 43 obtained in an intermediate disc 44 hooked to the disc 42 by means of a plurality of flexible hooking tongues 45; and an output

segment 46, which faces the respective bottom 4, and is obtained in a lower disc 47 angularly integral with the disc 42.

[0037] To prevent the tablets 2 from getting jammed in the segments 43, the disc 44 is made to vibrate by means of a vibrating device 48, which is mounted on the frame 15 by means of the interposition of a damping device 49, and imparts a vibrating motion to a supporting bracket 50, on which a roller 51 is mounted in a rotating manner and arranged so as to come into contact the disc 44.

[0038] Each segment 46 is provided with a capacitive transducer 52 (described and illustrated in patent application WO-2006/035285-A2 filed by this same Applicant, the content of which is fully incorporated in this patent application), which defines, with the capacitive transducers 52 of the other segments 46, part of a weighing system 53 further comprising a processing unit 54 connected to the capacitive transducers 52.

[0039] The bottoms 4 are moved in succession through the station 18, each in phase with a respective feeding channel 40, by a pocket conveyor 55 extending across the machine 6.

[0040] The conveyor 55 is wound in a loop about a plurality of spools (of which only the spool 56 on the wheel 7 is illustrated in FIG. 6), and is provided with a plurality of pockets 57, which are substantially cup shaped with the concavity upwards, are evenly distributed along the conveyor 55, and each of which is designed to receive a respective bottom 4 arranged inside the respective pocket 57 with its concavity upwards.

[0041] In use, when the wheel 7 rotates about the axis 9, the tablets 2 contained in the platen 8 are arranged inside the holes 13 which are gradually uncovered by the inner wall 16 of the trimming disc 14.

[0042] The holes 13 are filled upstream of the dosing station 18 and of the cam 27 in the direction 17 and starting from an instant in which the plates 24 are arranged in their closing positions, the suction chambers 35 are closed by the disc 33 so that the tablets 2 can be sucked into the holes 13, and the cam followers 28 are arranged in their lowered operating positions.

[0043] The groups 12 of holes 13 are moved in succession into the slot 19, under the control device 20 in order to check for the presence of the tablets 2 in each hole 13 of each group 12, and through the station 18.

[0044] In the area of the dosing station 18, each group 12 of holes 13 and the respective feeding channel 40 are moved in phase with a respective bottom 4, the respective cam follower 28 engages the cam 27 to move the respective plate 24 into its opening position, and the tablets 2 contained in the holes 13 fall due to the force of gravity first through the opening 23 in the disc 22 and the opening 34 in the disc 33, and then along the channel 40 and into the bottom 4.

[0045] Downstream of the station 18 in the direction 17, each cam follower 28 disengages the cam 27 to allow the respective spring 26 to move the respective plate 24 back into its closing position, and the groups 12 of holes 13 are moved in succession under the control device 21 in order to check for the absence of tablets 2 in the holes 13.

[0046] In connection with the above description, it is important to note that each pocket 57 is associated with a lower pushing member 58, which lifts the respective bottom 4 into the output segment 46 to allow the respective capacitive transducer 52 first of all to measure the weight of the

bottom 4, and then the weight of the bottom 4 with the tablets 2 it contains, and to allow the processing unit 54 to calculate the weight of the tablets 2 contained in the bottom 4 as the difference between the two values.

[0047] As described above, the dosing of the tablets 2 in the bottoms 4 is prevented by the selective activation of the jet of compressed air that is delivered through the outlet hole 38 and by the consequent movement of the cam followers 28 into their raised rest positions.

[0048] Since the closing plates 24 are made to move around the axis 9 with the distribution platen 8 and, thus, with the groups 12 of dosing holes 13, and since the movement by the plates 24 from their closing positions to their opening positions is relatively small, the integrity of the tablets 2 is not undermined by the relative motion of the platen 8 and the plates 24.

1. A feeding assembly to dose tablets (2) in capsules (3), each capsule (3) comprising a respective bottom (4) and a lid (5) to close the bottom (4), the feeding assembly comprising a dosing station (18) to dose a given quantity of tablets (2) in each bottom (4); a distribution platen (8), which is mounted so as to rotate around a rotation axis (9) and is provided with at least one group (12) of dosing holes (13), which are each suitable to house at least one respective tablet (2) and to be fed by the distribution platen (8) through the dosing station (18); closing means (22), which are mounted under the distribution platen (8) so as to close the dosing holes (13); and a feeding drum (39), which is mounted so as to rotate around the rotation axis (9) and comprises, for each group (12) of dosing holes (13), a relative feeding channel (40) to transfer the relative tablets (2) into a respective bottom (4); and being characterized in that the closing means (22) comprise, for each group (12) of dosing holes (13), a respective closing plate (24), which is angularly integral with the distribution platen (8) so as to rotate around the rotation axis (9) and is mobile between a closed position and an open position of the relative dosing holes (13).

2. A feeding assembly according to claim 1, wherein each closing plate (24) has a plurality of transfer holes (25), which are as many as the dosing holes (13) of the relative group (12) of dosing holes (13) and are moved by the closing plate (24) between the closing position, in which each transfer hole (25) is not aligned with the relative dosing hole (13), and the opening position, in which each transfer hole (25) is aligned with the respective dosing hole (13).

3. A feeding assembly according to claim 1, wherein each closing plate (24) is coupled to the distribution platen (8) in a sliding manner, so as to radially move between said opening and closing positions.

4. A feeding assembly according to claim 1 and comprising, furthermore, for each closing plate (24), a respective elastic pushing device (26) to move the closing plate (24) to its closing position and normally keep it there.

5. A feeding assembly according to claim 4 and comprising, furthermore, a cam operating device (27, 28) to move the closing plates (24) from their closing positions to their opening positions against the action of said elastic pushing devices (26).

6. A feeding assembly according to claim 5, wherein the cam operating device (27, 28) comprises a cam (27), which is mounted in the area of the dosing station (18), and, for each closing plate (24), a respective cam follower (28), which is suitable to be engaged in the cam (27).

7. A feeding assembly according to claim 6, wherein each cam follower (28) is coupled to the relative closing plate (24) so as to move between an operating position, in which the cam follower (18) intercepts the cam (27) in order to move the relative closing plate (24) to its opening position, and a rest position, in which the cam follower (28) avoids the cam (27) in order to keep the relative closing plate (24) in its closing position.

8. A feeding assembly according to claim 7 and comprising, furthermore, actuator means (38), which are mounted in the dosing station (18) upstream of the cam (27) in a direction (17) of movement of the distribution platen (8) around the rotation axis (9), so as to selectively move the cam followers (28) from their operating positions to their rest positions.

9. A feeding assembly according to claim 1 and comprising, furthermore, a trimming disc (14), which is fixed above the distribution platen (8), has an annular shape and is radially limited by an inner wall (16) having a distance from the rotation axis (9) that increases in a direction (17) of movement of the distribution platen (8) around the rotation axis (9).

10. A feeding assembly according to claim 9, wherein said distance ranges from a minimum value, in correspondence to which the dosing holes (13) are closed by the trimming disc (14), and a maximum value, in correspondence to which the dosing holes (13) are radially staggered with respect to the trimming disc (14).

11. A feeding assembly according to claim 1 and comprising, furthermore, a vibrating device (48) to impart a vibrating motion to at least part of each feeding channel (40).

12. A feeding assembly according to claim 1, wherein each feeding channel (40) comprises an input segment (41), which converges towards the relative bottom (4) starting from the relative group (12) of dosing holes (13).

13. A feeding assembly according to claim 1 and comprising, furthermore, an annular disc (33), which is mounted under the closing plates (24) so as to close the closing plates (24) on the outside of the dosing station (18) and to define respective suction chambers (35) to suck the tablets (2) into the dosing holes (13); the annular disc (33) having a suction manifold (37), which is connected to the suction chambers (35) upstream and downstream of the dosing station (18).

14. A feeding assembly according to claim 13, wherein the annular disc (33) has, in the area of the dosing station (18), an opening (34) to allow the tablets (2) to fall along the feeding channels (40).

15. A feeding assembly according to claim 1 and comprising, furthermore, a first control device (20), which is arranged upstream of the dosing station (18) in a direction (17) of movement of the distribution platen (8) around the rotation axis (9), so as to check for the presence of tablets (2) in each dosing hole (13).

16. A feeding assembly according to claim 1 and comprising, furthermore, a second control device (21), which is arranged downstream of the dosing station (18) in a direction (17) of movement of the distribution platen (8) around the rotation axis (9), so as to check for the absence of tablets (2) in each dosing hole (13).

17. A feeding assembly according to claim 1, wherein each feeding channel (40) is provided with a measuring

device (52) to measure the weight of the bottom (4) or the sum of the weights of the bottom (4) and of the tablets (2) contained in the bottom (4).

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