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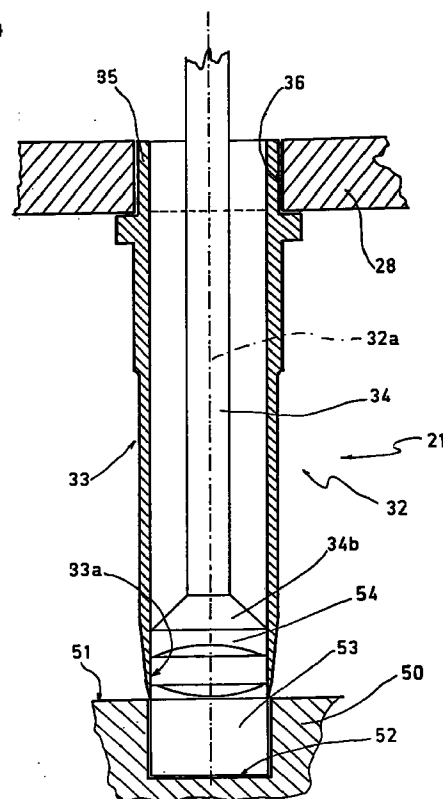
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(54) **Method and machine for producing tablets of medicinal powder**

(57) A method and machine (1) for producing tablets (9) of medicinal powder (3); the method including, for each cycle, the steps of withdrawing a number of quantities of medicinal powder (3) from a vessel (10) by means of a metering device (21), compressing the quantities of medicinal powder (3) to form respective tablets (9) of medicinal powder (3), and, finally, depositing the tablets (9) of compressed medicinal powder (3) inside containers (7) by which they are preserved; the compression step including a precompression step wherein a die forming device (21) compresses the quantities of medicinal powder (3) inside the vessel (10) to preform the tablets (9), and a compacting step wherein the die forming device (21) compresses the preformed tablets (9) on a horizontal plate (50) located outside the vessel (10) and having a number of dies (53) for imparting a given form to the tablets (9).

Fig.4



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Description

The present invention relates to a method of producing tablets of medicinal powder.

The present invention also relates to a machine for producing tablets of medicinal powder.

The method whereby currently marketed tablets of medicinal powder are produced comprises the steps of withdrawing a predetermined quantity of medicinal powder from a vessel; compressing said quantity of medicinal powder into a predetermined volume to form a tablet of compressed medicinal powder; and, finally, depositing and preserving said tablet of medicinal powder inside a container.

Tablets of medicinal powder formed using the above method present the drawback of being poorly identifiable as regards the medicinal product of which the tablet is formed, whereas the present demand among drug companies is for greater characterization to make the products easily identifiable by the user.

It is an object of the present invention to provide a method of producing tablets of medicinal powder, designed to overcome the aforementioned drawbacks.

According to the present invention, there is provided a method of producing tablets of medicinal powder, the method comprising, for each cycle, the steps of withdrawing a number of quantities of medicinal powder from a vessel by means of a metering device; compressing each said quantity of medicinal powder, by means of said metering device, to form a respective tablet of compressed medicinal powder; and, finally, depositing each said tablet of compressed medicinal powder inside a container; the method being characterized in that said compression step comprises a precompression step wherein each said quantity of medicinal powder is compressed by the metering device inside said vessel, and a compacting step wherein each said quantity of medicinal powder is compressed by said metering device outside the vessel; each said quantity of medicinal powder being subjected to die forming action in the course of said compacting step.

According to the present invention, there is also provided a machine for producing tablets of medicinal powder, the machine comprising a storage unit for storing the medicinal powder; a supply unit for supplying containers; and a tablet forming and conveying unit; said forming unit successively withdrawing a given quantity of medicinal powder from said storage unit, forming a number of tablets, and transferring said tablets into at least one of the containers of said supply unit; the machine being characterized in that said forming unit comprises die forming means movable between said storage unit and said supply unit, and die means located in a fixed position between said storage unit and said supply unit; said die forming means contacting said die means to compress said tablets on the die means.

A non-limiting embodiment of the present invention will be described by way of example with reference to

the accompanying drawings, in which:

Figure 1 shows a plan view of a machine implementing the method described above;

Figures 2 and 3 show side views, with parts in section and parts removed for clarity, of a detail of the Figure 1 machine in respective operating positions; Figure 4 shows a larger-scale side view, with parts in section and parts removed for clarity, of a detail in Figure 3.

Number 1 in Figure 1 indicates a machine for forming a number of tablets composed of one or more powdered pharmaceutical products 3. Machine 1 comprises a supporting frame 4; a storage unit 5 for storing powdered pharmaceutical product 3; a supply unit 6 for supplying a number of medicinal containers 7; and a metering unit 8 interposed between storage unit 5 and supply unit 6.

Metering unit 8 provides for withdrawing powdered pharmaceutical product 3 from storage unit 5, for successively compressing the withdrawn pharmaceutical product into a number of tablets 9 of powdered pharmaceutical product 3, and finally, for transferring tablets 9 into respective containers 7 carried on supply unit 6 and for preserving tablets 9.

Storage unit 5 is of known type, and comprises a vessel 10 fitted to frame 4, rotating about a vertical axis 11, and supplied constantly with powdered pharmaceutical product 3; a drive unit (not shown) for rotating vessel 10 in predetermined manner about axis 11; and a supply device 12 for supplying and homogenizing powdered pharmaceutical product 3, and for skimming over the upper surface of powdered pharmaceutical product 3 to keep it at a given level L.

Supply unit 6 comprises a horizontal supporting plate 13 fitted to frame 4 coaxially with an axis 14 parallel to axis 11, and which is rotated in predetermined manner about axis 14; and the upper surface 15 of plate 13 comprises a number of equally spaced seats 16, each for housing one or more medicinal containers 7.

Metering unit 8 comprises at least one operating head 17 located over units 5 and 6 and connected by a connecting arm 19 to an upright 18 extending from frame 4. Arm 19 is hinged at one end to upright 18, and is rotated, at said end, in predetermined manner about an axis 20 parallel to axis 11, so as to feed head 17 along a circular path P.

With reference to Figure 2, metering unit 8 also comprises, for each head 17, a device 21 for forming tablets 9, and which is fitted to head 17, facing units 5 and 6, and is movable in relation to head 17 along an axis 22 parallel to axis 20. More specifically, device 21 is connected to head 17 by a hollow shaft 23 coaxial with axis 22 and housing a second shaft 24 also coaxial with axis 22; and both shafts 23 and 24 of head 17 are movable axially in predetermined manner by actuating devices (not shown) housed inside head 17.

Tablet forming device 21 comprises a first substantially parallelepiped box 25 having a horizontal top wall 26 integral with a free end of hollow shaft 23, two lateral walls 27 facing each other and extending vertically downwards, and a bottom wall 28 parallel to and facing top wall 26.

Inside first box 25, device 21 comprises a second box 29 in turn comprising a top wall 30 integral with a free end of shaft 24, and a bottom wall 31 facing and parallel to bottom wall 28 of first box 25.

Device 21 also comprises a number of nozzles 32 arranged, in the example shown, in a number of rows and columns and fitted to bottom walls 28 and 31. Each nozzle 32 has an axis 32a parallel to axis 22, and comprises a hollow body 33 fitted to bottom wall 28 coaxially with axis 32a, and a pin 34 housed movably inside body 33 and fitted to bottom wall 31 coaxially with axis 32a.

Body 33 comprises an externally-threaded top end 35 screwed inside a threaded hole 36 formed through bottom wall 28 of first box 25; while pin 34 extends vertically beyond bottom wall 28, engages in sliding manner a respective hole 37 formed through bottom wall 31, and comprises, at the top end, a head 34a simultaneously contacting walls 30 and 31, and of such a size as to prevent pin 34 from withdrawing from through hole 37.

With reference to Figures 1, 3 and 4, metering unit 8 also comprises a horizontal plate 50 fitted to frame 4 and over which operating head 17 is positioned as it travels along path P. The surface 51 of plate 50 facing head 17 comprises a number of seats 52, each housing a respective die 53 of appropriate shape; and seats 52 are so arranged that, when operating head 17 positions device 21 over plate 50, each die 53 is aligned with a respective nozzle 32, and more specifically with the bottom end 34b of a respective pin 34 fitted integral with a respective die 54.

Operation of machine 1 will now be described with reference to one operating cycle. In actual use, operating head 17 rotates about axis 20 and along path P into a position over vessel 10 of storage unit 5; at which point, shafts 23 and 24 are extended simultaneously downwards to move tablet forming device 21 along axis 22 and bring the bottom ends of nozzles 32 into contact with powdered pharmaceutical product 3.

At this point, each body 33 penetrates powdered pharmaceutical product 3, while the bottom end of respective pin 34 remains substantially at level L, thus defining, inside body 33, a chamber 33a, which is filled with a given quantity of powdered pharmaceutical product 3. The withdrawal step terminates upon the bottom end of body 33 contacting the bottom wall of vessel 10 (Figure 2), and each of chambers 33a being filled with said quantity of powdered pharmaceutical product 3.

At this point, the precompression step commences, wherein shaft 24 moves down along axis 22 to gradually lower pins 34, reduce the volume of chambers 33a, compress the quantity of powdered pharmaceutical

product 3 contained inside chambers 33a, and so form tablets 9.

At the end of the precompression step, operating head 17 withdraws device 21 - inside which tablets 9 are retained - from vessel 10, and rotates about axis 20 to position device 21 over plate 50.

As head 17 is arrested over plate 50, the compacting step commences, wherein shafts 23 and 24 move axially downwards to bring the bottom end of hollow body 33 of each nozzle 32 into contact with plate 50, in which position, the tablet 9 inside each body 33 simultaneously contacts a respective die 54 and a respective die 53 (Figures 3 and 4). At this point, by means of dies 54 and 53, shaft 24 exerts a given pressure to complete the formation of and simultaneously impart a given shape to tablets 9.

Following the formation of tablets 9, operating head 17 lifts device 21 - which retains respective tablet 9 inside each nozzle 32 - off plate 50, and rotates about axis 20 into a position over unit 6 and in which device 21 is aligned with a seat 16 on supporting plate 13. At which point, head 17 lowers device 21 to deposit tablets 9 inside container/s 7.

Following withdrawal of powdered medicinal product 3, vessel 10 rotates by a given angle about axis 11; and, similarly, upon tablets 9 being deposited, plate 13 rotates by a given angle about axis 14 to position a seat 16 with empty containers 7, or one empty container 7, along path P.

Upon tablets 9 being deposited, operating head 17 is once again positioned over vessel 10 of storage unit 5, and the operating cycle is repeated.

Using appropriate dies 54 and 53, tablets 9 may be characterized by forming, on substantially any surface portion of tablets 9, letters or symbols enabling the pharmaceutical product and the maker to be more clearly identified.

Clearly, changes may be made to machine 1 and the method as described and illustrated herein without, however, departing from the scope of the present invention.

Claims

1. A method of producing tablets (9) of medicinal powder (3), the method comprising, for each cycle, the steps of withdrawing a number of quantities of medicinal powder (3) from a vessel (10) by means of a metering device (21); compressing each said quantity of medicinal powder (3), by means of said metering device (21), to form a respective tablet (9) of compressed medicinal powder (3); and, finally, depositing each said tablet (9) of compressed medicinal powder (3) inside a container (7); the method being characterized in that said compression step comprises a precompression step wherein each said quantity of medicinal powder (3) is compressed by the metering device (21) inside

said vessel (10), and a compacting step wherein each said quantity of medicinal powder (3) is compressed by said metering device (21) outside the vessel (10); each said quantity of medicinal powder (3) being subjected to die forming action in the course of said compacting step.

2. A method as claimed in Claim 1, characterized in that, in the course of said compacting step, said die forming action is performed on at least two opposite surface portions of each said tablet (9).
3. A machine (1) for producing tablets (9) of medicinal powder (3), the machine (1) comprising a storage unit (5) for storing the medicinal powder (3); a supply unit (6) for supplying containers (7); and a tablet (9) forming and conveying unit (8); said forming unit (8) successively withdrawing a given quantity of medicinal powder (3) from said storage unit (5), forming a number of tablets (9), and transferring said tablets (9) into at least one of the containers (7) of said supply unit (6); the machine (1) being characterized in that said forming unit (8) comprises die forming means (21) movable between said storage unit (5) and said supply unit (6), and die means (50) located in a fixed position between said storage unit (5) and said supply unit (6); said die forming means (21) contacting said die means (50) to compress said tablets (9) on the die means (50).
4. A machine as claimed in Claim 3, characterized in that said die means (50) comprise a base (50) in turn comprising a number of dies (53) in contact with which the tablets (9) are placed.
5. A machine as claimed in Claim 4, characterized in that said base (50) comprises a number of seats (52), each for housing a respective die (53).

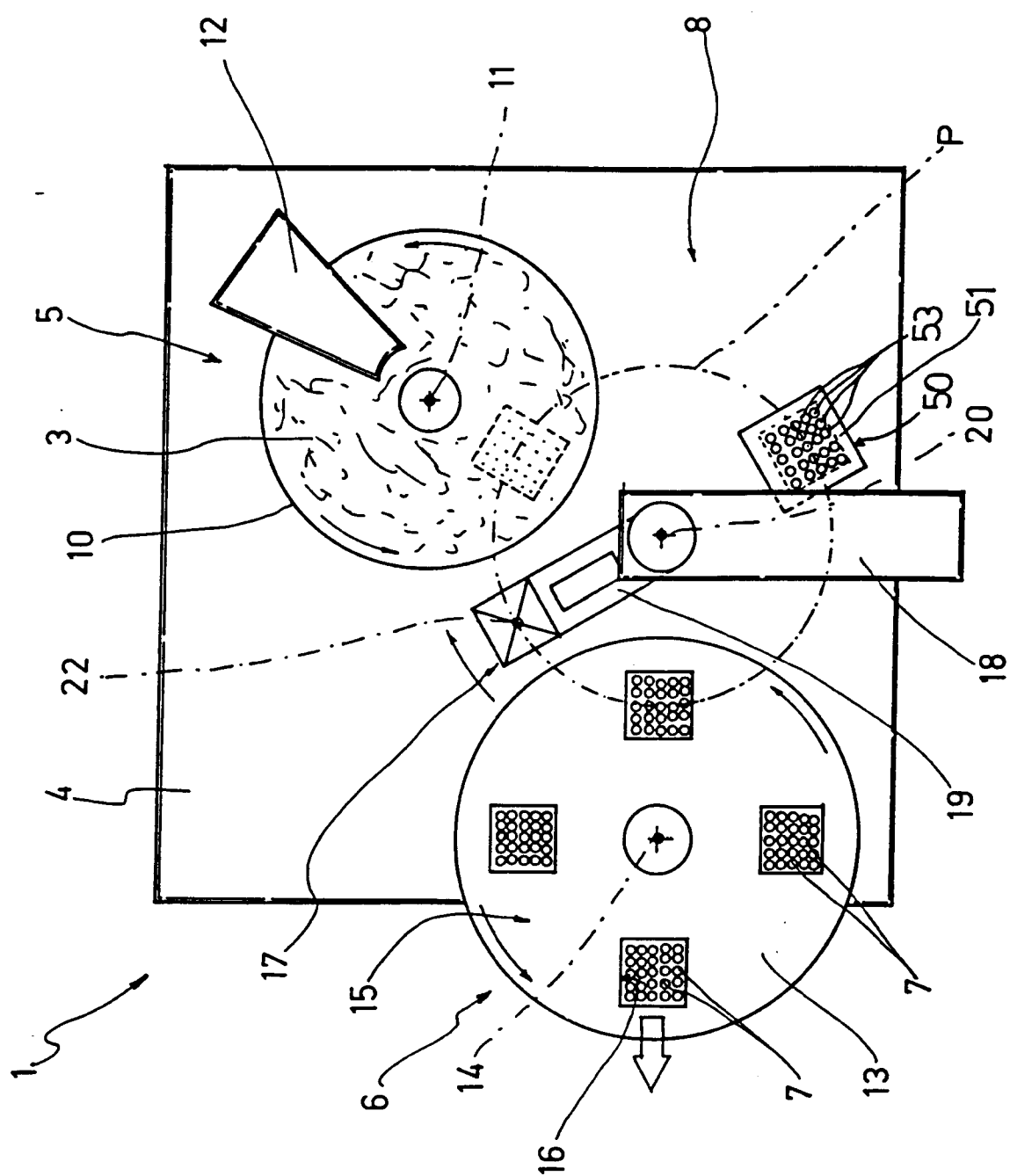


Fig.1

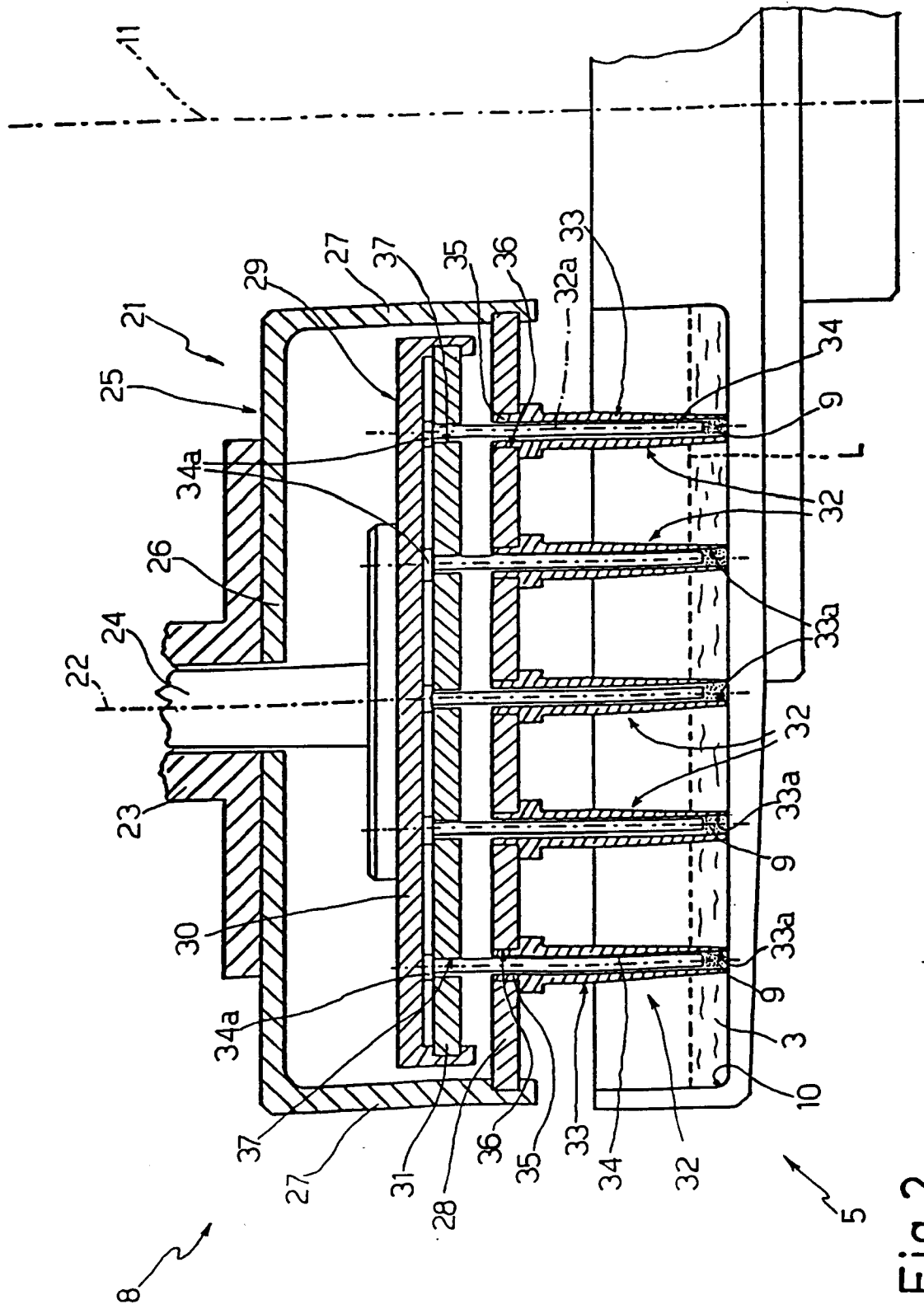


Fig. 2

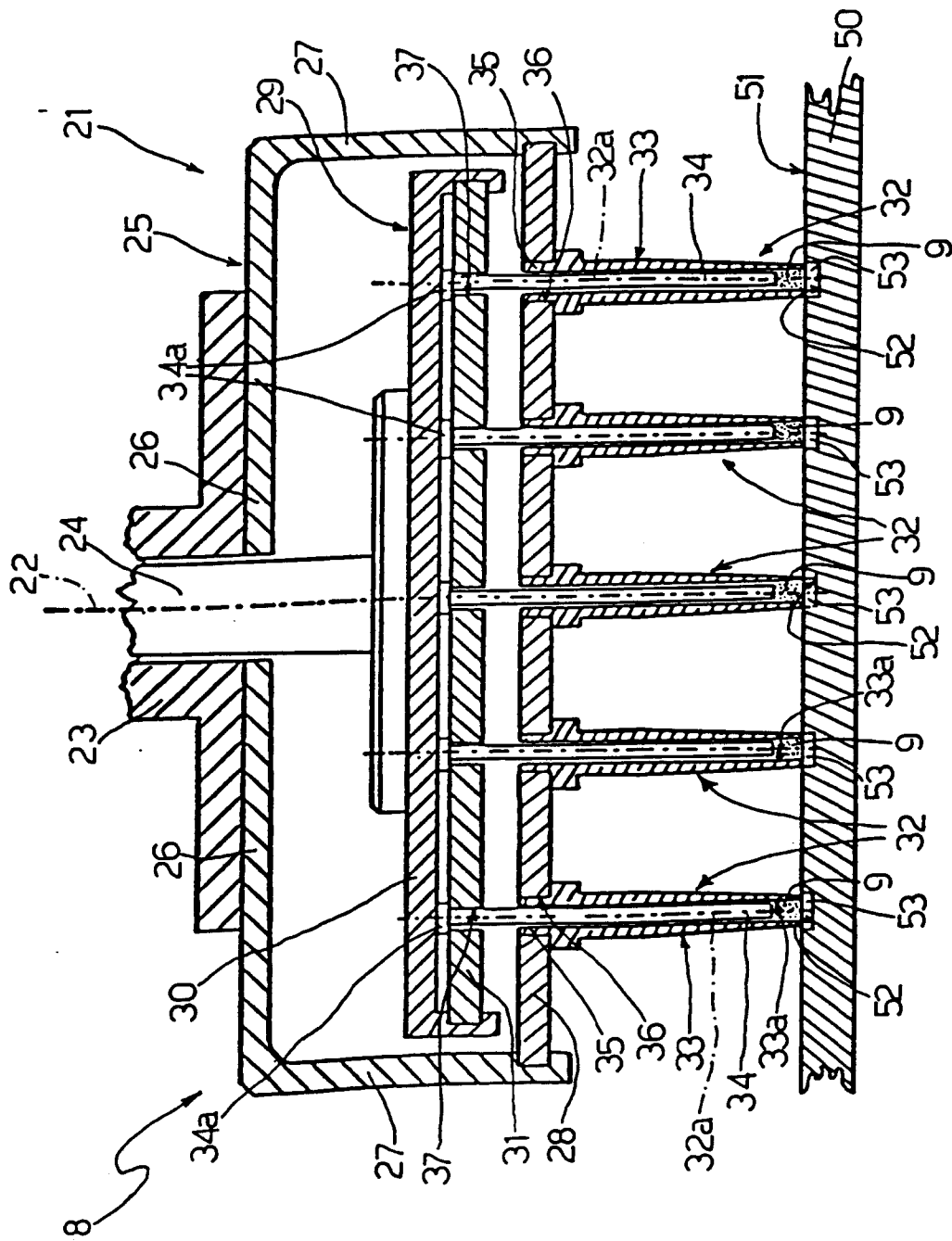


Fig.3

Fig.4

