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A MILK SAMPLING DEVICE

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(56) Prior Art Documents
US 3570555
US 3168124
EP 564023

(57) Claim

1. A milk sampling device, including a removable cassette in which milk sample collecting elements can be placed, and at least one filling member capable of being placed successively above various collecting elements, which filling member is capable of bringing milk samples, taken from milk yielded by means of an automatic milking machine, into the collecting elements, further including a guide means supporting the at least one filling member, which guide means is designed in such a way that the filling member is moved, by increasing the distance between the guide means and the cassette and by subsequently decreasing said distance, from a position above a collecting element to an adjacent position above a nearby situated collecting element.

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A MILK SAMPLING DEVICE

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The following statement is a full description of this invention, including the best method of performing it known to applicant(s):

A MILK SAMPLING DEVICE

The present invention relates to a milk sampling device, provided with a removable cassette in which milk sample collecting elements can be placed, and at least one filling member capable of being placed successively above various collecting elements, which filling member is capable of bringing milk samples, taken from milk yielded by means of an automatic milking machine, into the collecting elements.

A suchlike milk sampling device is described in EP-A1-0564023. The cassette described in said document is designed as a rotating box in which, along its circumference, the milk sample collecting elements can be arranged. The filling member is disposed in a fixed position, while the collecting elements can be placed successively under the filling member. The filling member is further provided with a vertically movable type of injection needle to be inserted into the collecting elements. In this construction, the cassette and the injection needle have to be moved synchronously. However, in case of a relatively large number of collecting elements, the space in the box is insufficiently utilized. Therefore, the cassette occupies relatively much room, which, in view of the extensive equipment present in a milking implement anyhow, is experienced as a drawback. Besides, the synchronous movement of the box and the injection needle requires specific measures to be taken in the control of said units.

According to the invention there is provided a milk sampling device, including a removable cassette in which milk sample collecting elements can be placed, and at least one filling member capable of being placed successively above various collecting elements, which filling member is capable of bringing milk samples, taken from milk yielded by means of an automatic milking machine, into the collecting elements, further including a guide means supporting the at least one filling member, which guide means is designed in such a way that the filling member is moved, by increasing the distance between the guide means and the cassette and by subsequently decreasing said distance,

from a position at a collecting element to an adjacent position above a nearby situated collecting element. In particular, the guide means is movable in height and the cassette is disposed in a fixed position. Such a sampling device has the great advantage that, by only one movement in upward and downward direction of the filling member relative to the cassette including collecting elements, said filling member is positioned automatically above a next collecting element.

In a preferred embodiment, the guide means is designed as a substantially vertically disposed strip, on whose upper edge there are provided tines extending obliquely upwardly and parallel to each other, while the mutual distance of said tines corresponds to that of collecting elements juxtaposed in the cassette. In order to utilize the space in the cassette optimally, the collecting elements can be arranged in the cassette in rows, and the guide means is disposed folded above the collecting elements placed in the cassette in such a way that the filling member is subsequently movable in opposite directions over the rows of collecting elements.

For the purpose of injecting each time a defined quantity of milk into the collecting elements, the filling member comprises a milk sample reservoir capable of being suspended, by means of a suspension element, from the guide means. In order to move the filling member, and in particular the milk sample reservoir, each time above a next collecting element, it will suffice to provide at least one operating cylinder, by means of which the guide means is movable in height relative to the cassette. In particular, there are provided two, preferably computer-controlled, operating cylinders for moving the guide means in height relative to a

support, while the cassette can removably be disposed thereunder. Said support will then be provided with apertures situated above the open ends of the collecting elements placed in the cassette located under the support.

In the filling position, the milk sample reservoir preferably rests on the support, i.e. in a position in which the discharge opening of the milk sample reservoir is situated above the open end of a collecting element or in the upper part thereof, and the suspension element is detached from the guide means. In said filling position, the guide means will take its lowest position relative to the support, in which position, by means of a discharge control member, a milk sample can flow out of the milk sample reservoir, while, upon moving the guide means upwards, the discharge control member will close off the discharge opening of said milk sample reservoir.

As a next collecting element only has to be filled when a next animal is milked and, consequently, taking of milk samples will be coupled with milking of the animals, it is advantageous when the supply of the milk to the milk sample reservoir will entirely be controlled by a computer. A milk sampling device of which both the supply of the milk to the milk sample reservoir and the upward and downward movement of the guide means are computer-controlled may advantageously be applied in an implement for automatically connecting teat cups to the teats of an animal, respectively disconnecting same therefrom and for automatically milking this animal. In such a machine connecting and disconnecting of teat cups and milking of the animal being effected without human intervention, taking of milk samples will have to take place likewise. In particular when such an implement is provided with a milk glass for collecting the milk obtained from the udder quarters of the animal via the teat cups, and a milk tank in which the milk pumped out of the milk glass is stored, the fraction of milk supplied from the milk glass to the milk sampling device will each time be determined by means of a computer.

For a better understanding of the invention and to

show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

Figure 1 shows schematically a vertical longitudinal cross-section of the milk sampling device according to the invention;

Figure 2 shows a plan view of said milk sampling device;

Figure 3 is a partial side view of the milk sampling device;

Figures 4 and 5 show the position of the filling member relative to the guide means when the filling member is moved, i.e. upon moving the guide means upwards and downwards,

and Figure 6 shows a vertical cross-section of the filling member in the filling position.

The milk sampling device represented in Figure 1 comprises a support 1, under which a cassette 2 for milk sample collecting elements 3 has removably been provided. For that purpose, under the support 1 there are fastened side plates 4, which are provided, at their lower sides, with supporting elements 5. The cassette 2 is movable between the side plates 4 and over the supporting elements 5 and can thus be removed from the milk sampling device. In the cassette 2, above the bottom plate 6 thereof, there are arranged plates 7 and 8, which are both provided with apertures 9, in which the milk sample collecting elements 3 can be accomodated so as to rest on the bottom plate 6. The apertures 9 in the plates 7 and 8 are arranged in rows, and are in the present embodiment circular so as to correspond with the tubular design of the milk sample collecting elements 3 to be arranged in rows in the cassette 2. The support 1, under which the cassette 2 has been disposed, is also provided with apertures 10, that have the same size as the apertures 9 in the plates 7 and 8 or are somewhat smaller. Said apertures 10 are situated above the open ends of the milk sample collecting elements 3 placed in the cassette. Under the support 1 there are mounted on both sides operating cylinders 11 and 12. The bars 13 and 14, that

are vertically movable in the housing of said operating cylinders, are rigidly connected, by means of bolts 15, to a plate 16 arranged thereabove. On said plate 16 there is vertically provided a guide means 17. The latter is made of strip-shaped material folded in such a way that the strip, once having been arranged vertically on the plate 16, passes all the apertures 10 in the support 1. The ends of the strip are welded against each other in such a way that the strip, although being folded in a zigzag line, constitutes a closed unit, as is shown in Figure 2. At the upper edge, the portion of the strip-shaped material constituting the circumference thereof is smooth, whereas the portion of the strip-shaped material folded in a zigzag line, that is located thereinside, is provided with tines extending at the upper edge obliquely upwardly and parallel to each other. The mutual distance A of these tines corresponds with the distance between two milk sample collecting elements 3 juxtaposed in the cassette 2.

The milk sampling device is further provided with a filling member 19, constituted by a milk sample reservoir 20, and a suspension element 21 attached to the upper side thereof, by means of which the milk sample reservoir 20 can be suspended from the guide means 17. To that end, the suspension element 21 comprises at the upper side a bended end 22 so as to be able to rest on the upper edge of the guide means 17. Near this bended end 22, there is provided an upwardly projecting portion 23 for the purpose of moving the milk sample reservoir 20 manually, if required, over the guide means 17. This will in particular be the case when the milk sample reservoir 20 has to be brought, from its position above a first milk sampling collecting element 24, over the circumferential edge of the guide means 17, which circumferential edge is smooth at the upper side, to the position above a last milk sampling collecting element 25. At the side of the guide means 17 where the suspension element 21 of the milk sample reservoir 20 is situated, there are provided in the plate 16, in longitudinal direction next to the guide means, slot-shaped apertures 26 that are designed in such a

way that, when the filling member 19 is moved over the guide means 17, the milk sample reservoir 20 can move underneath the plate 16.

In the filling position, the milk sample reservoir 20 rests on the support 1. In said position, the guide means 17 is in its lowest position, while the bended end 22 of the suspension element 21 is just detached from the tines 18, i.e. said bended end is situated just above the horizontal tangent of the tines. At the lower side of the milk sample reservoir 20 there is provided a discharge nozzle 27 which, in the filling position, is inserted through the relevant opening 10 in the support into the upper end of a relevant milk sampling collecting element 3. When, thereafter, the operating cylinders 11 and 12 are excited, the plate 16 is moved upwards together with the guide means 17. The bended end 22 of the suspension element 21 then moves obliquely downwards in the slot-shaped aperture between two tines 18, while the filling member takes a tilted position, as is shown in Figure 4. When, from the latter position shown in Figure 4, the guide means is moved upwards further, the milk sample reservoir 20 together with the discharge nozzle 27 is drawn out of the relevant aperture 10 in the support 1 and the milk sample reservoir 20, due to its own weight, will take the horizontally suspended position shown in Figure 5. In the latter position, the discharge nozzle 27 of the milk sample reservoir 20 is located above a next aperture 10 in the support 1. When, from said position, the guide means 17 is moved downwards by means of the operating cylinders 11 and 12, while the discharge nozzle 27 is already inserted into the aperture 10 in the support 1, the milk sample reservoir 20 is slightly pulled out of position until the bended end 22 comes out of the slot between two tines 18 and thus is detached from the guide means 17, so that the milk sample reservoir under the influence of its own weight will take the upright position and, resting on the support 1, will again reach the filling position, the discharge nozzle 27 being inserted this time into a next aperture. When, upon moving the guide means 17 downwards to its lowest position, i.e. the

filling position, the plate 16 will come in contact with a discharge control member 28 (shown in Figure 6). Said discharge control member 28 comprises a lever beam 29 one end of which, as soon as the filling position is reached by moving the guide means 17 downwards, is tilted downwards, while the other end is moved upwards, so that a closing member 30 connected to said other end releases the discharge opening 31 of the milk sample reservoir 20. When the guide means 17 is moved upwards, the lever beam 29 is tilted under spring force to a position in which the closing member is moved downwards and the discharge opening 31 is closed off. The milk sample reservoir 20 is further connected to a milk supply line 32. In this embodiment, there is provided in said milk supply line 32 a computer-controlled three-way cock 33, by means of which a defined quantity of milk can be supplied to the milk sample reservoir 20. For that purpose, first the cock 33 is set in the position in which milk is guided via the milk supply line 32 to the milk sample reservoir 20, and the space in the milk sample reservoir 20 is filled during a predetermined time. Said time is chosen in such a way that afterwards the milk level in the milk sample reservoir is above the outflow of the milk supply line 32 in the milk sample reservoir 20. Then, the cock 33 is set in the position in which it is connected to a vacuum line of the milk line system, e.g. to a milk glass included in said system, through which milk glass there is sucked milk out of the milk sample reservoir until the milk level has dropped so as to have reached the outflow of the milk supply line 32 in the milk sample reservoir 20. By providing an air suction opening 34 in the upper surface of the milk sample reservoir 20, the milk level will not drop further. The quantity of milk in the milk sample reservoir 20 is then accurately defined, which, because of foaming of the milk during filling, would not have been the case when the milk sample reservoir would entirely have been filled at once. In the filling position, by means of the discharge control member 28, the quantity of milk thus defined can be admitted to a relevant milk sample collecting element 3 located under the milk sample reservoir 20.

Therefore, by means of a non-shown computer, on the one hand there is admitted a defined quantity of milk to the milk sample reservoir, while on the other hand the filling member is moved by means of the computer-controlled operating cylinders 11 and 12 and, upon reaching each new position, will be located above a collecting element.

An above-described milk sampling device may advantageously be applied in an entirely automated milking implement, i.e. a milking implement that operates without human intervention. In a suchlike implement connecting teat cups to the teats of an animal to be milked, respectively disconnecting same therefrom as well as the milking proper are effected automatically. During the milking proper, the milk yielded from the udder quarters via the teat cups is usually stored in a milk glass, which milk glass often serves at the same time as a quantity meter, whereafter the milk is pumped from the milk glass to a refrigerated tank for milk storage. From the milk pumped out of a suchlike milk glass there may be taken a fraction to be supplied, via the milk supply line 32, to the milk sampling device. Each time a next animal is milked, there can be tapped, in this way, a milk sample from the milk obtained from this animal and be supplied to a next milk sampling collecting element.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A milk sampling device, including a removable cassette in which milk sample collecting elements can be placed, and at least one filling member capable of being placed successively above various collecting elements, which filling member is capable of bringing milk samples, taken from milk yielded by means of an automatic milking machine, into the collecting elements, further including a guide means supporting the at least one filling member, which guide means is designed in such a way that the filling member is moved, by increasing the distance between the guide means and the cassette and by subsequently decreasing said distance, from a position above a collecting element to an adjacent position above a nearby situated collecting element.

2. A milk sampling device as claimed in claim 1, wherein the guide means is movable in height.

3. A milk sampling device as claimed in claim 1 or 2, wherein the guide means is designed as a substantially vertically disposed strip on whose upper edge there are provided tines extending obliquely upwardly and parallel to each other, while the mutual distance of said tines corresponds to that of the collecting elements juxtaposed in the cassette.

4. A milk sampling device as claimed in any one of the preceding claims, wherein the collecting elements can be arranged in the cassette in rows, and the guide means is disposed folded above the collecting elements placed in the cassette in such a way that the filling member is subsequently movable in opposite directions over the rows of collecting elements.

5. A milk sampling device as claimed in any one of the preceding claims, wherein the filling member includes a milk sample reservoir as well as a suspension element attached to an upper side thereof, by means of which the milk sample reservoir can be suspended from the guide means.

6. A milk sampling device as claimed in any one of the preceding claims, further including at least one operating cylinder, by means of which the guide means is movable in height relative to the cassette.

7. A milk sampling device as claimed in claim 6, further including two operating cylinders for moving the guide means in height relative to a support, while the cassette can removably be disposed thereunder.

8. A milk sampling device as claimed in claim 6 or 7, wherein each operating cylinder is computer-controlled.

9. A milk sampling device as claimed in claim 7 or 8, wherein the support is provided with apertures situated above open ends of the collecting elements placed in the cassette located under the support.

10. A milk sampling device as claimed in claim 5 and 9, wherein, in the filling position, the milk sample reservoir rests on the support, i.e. in a position in which a discharge opening of the milk sample reservoir is situated above an open end of a collecting element or in the upper part thereof, and the suspension element is detached from the guide means.

11. A milk sampling device as claimed in claim 10, wherein, in the filling position, the guide means will take its lowest position relative to the support in which position, by means of a discharge control member, a milk sample can flow out of the milk sample reservoir.

12. A milk sampling device as claimed in claim 11, wherein upon moving the guide means upwards, a discharge control member will close off the discharge opening of the milk sample reservoir.

13. A milk sampling device as claimed in any one of the preceding claims, wherein the supply of milk to the milk sample reservoir is computer-controlled.

14. A milk sampling device as claimed in claim 13, further including a computer-controlled three-way cock by means of which, in a first position, during a predetermined time, there is supplied milk via a milk supply line to the filling member, while the predetermined time is chosen in such a way that the milk level in the filling member is located above the outflow of the milk supply line in the filling member, whereafter, the cock having been set in a second position, there is

sucked milk out of the filling member until the milk level has dropped so as to have reached the outflow of the milk supply line in the filling member.

15. A milk sampling device as claimed in any one of the preceding claims, applied in an implement for automatically connecting teat cups to the teats of an animal and disconnecting same therefrom and for automatically milking this animal.

16. A milk sampling device as claimed in claim 15, wherein said implement is provided with a milk glass for collecting the milk obtained from the udder quarters of the animal via the teat cups, and a milk tank in which the milk pumped out of the milk glass is stored, while the fraction of milk supplied from the milk glass to the milk sampling device will be determined by means of a computer.

17. A milk sampling device substantially as hereinbefore described with reference to the illustrations.

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PHILLIPS ORMONDE & FITZPATRICK

Attorneys for:

Maasland N.V.

ABSTRACT

A MILK SAMPLING DEVICE

A milk sampling device is provided with a removable cassette (2) in which milk sample collecting elements (3) can be placed, and at least one filling member (19) capable of being placed successively above various collecting elements (3). Said filling member (19) is capable of bringing milk samples, taken from milk yielded by means of an automatic milking machine, into the collecting elements (3). There is provided a guide means (17) supporting at least one filling member (19), which guide means is designed in such a way that the filling member (19) is moved, by increasing the distance between the guide means (17) and the cassette and by subsequently decreasing said distance, from a position above a collecting element (3) to an adjacent position above a nearby situated collecting element (3). In particular, the milk sampling device is appropriate to be applied in an implement for automatically connecting teat cups to the teats of an animal, respectively disconnecting same therefrom and for automatically milking this animal.

(Figure 1)

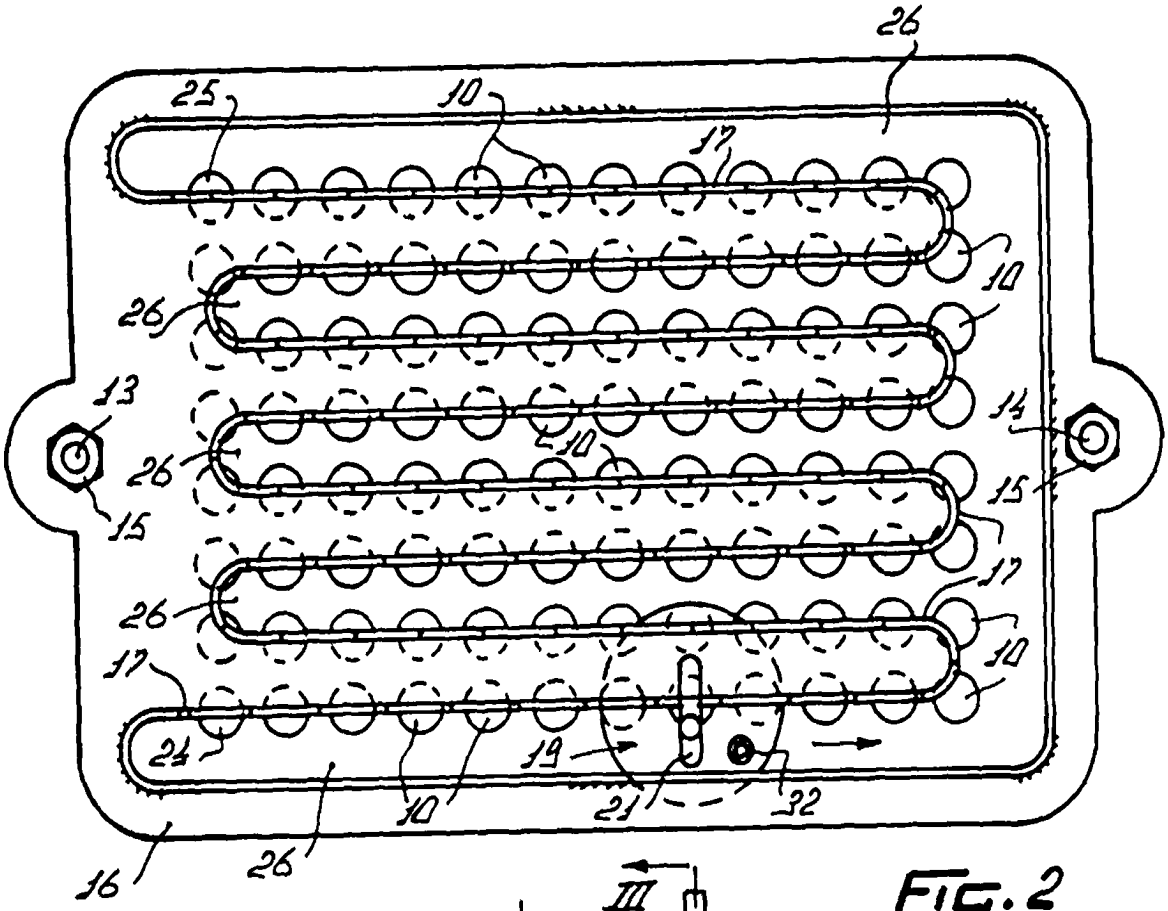
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FIG. 2

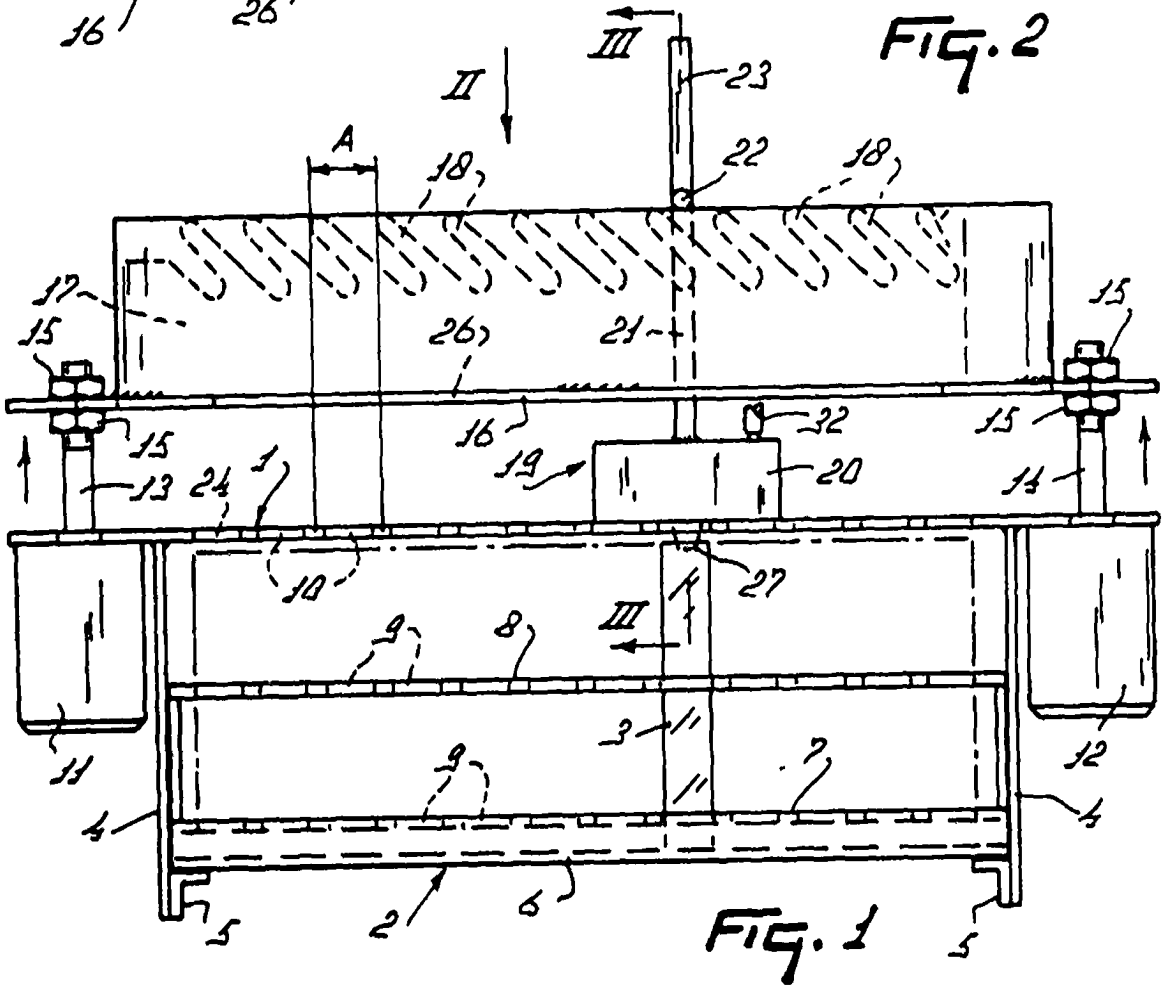
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FIG. 1

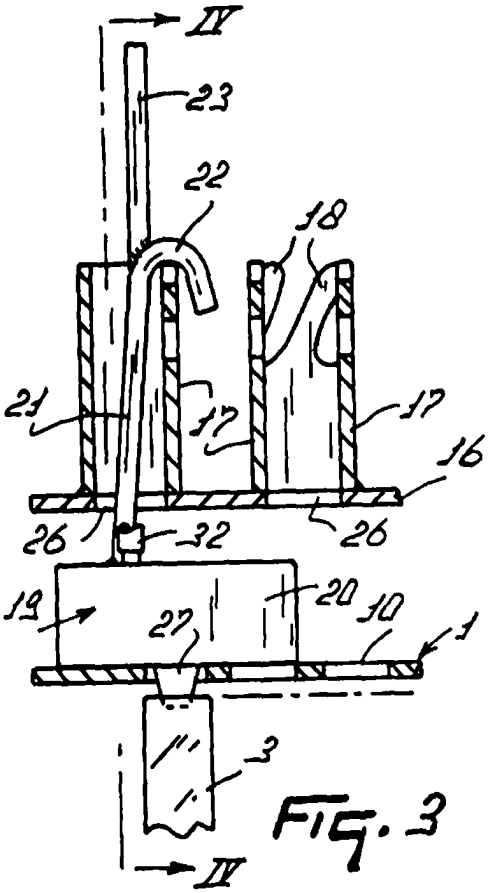

FIG. 3

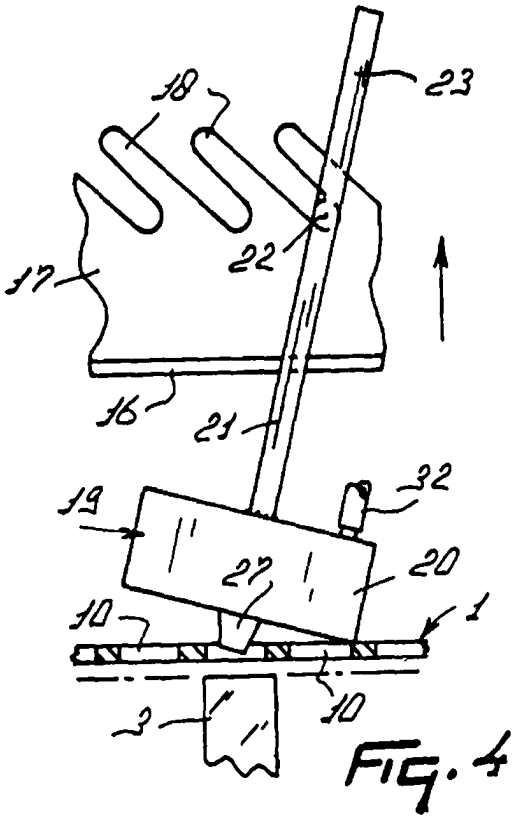

FIG. 4

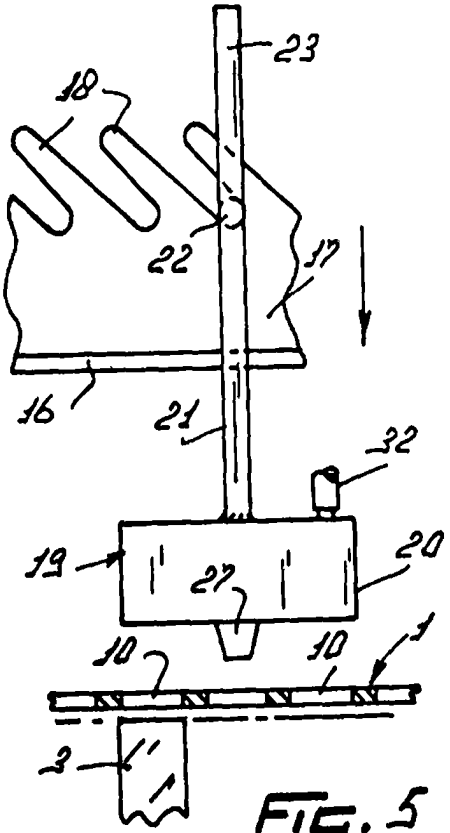

FIG. 5

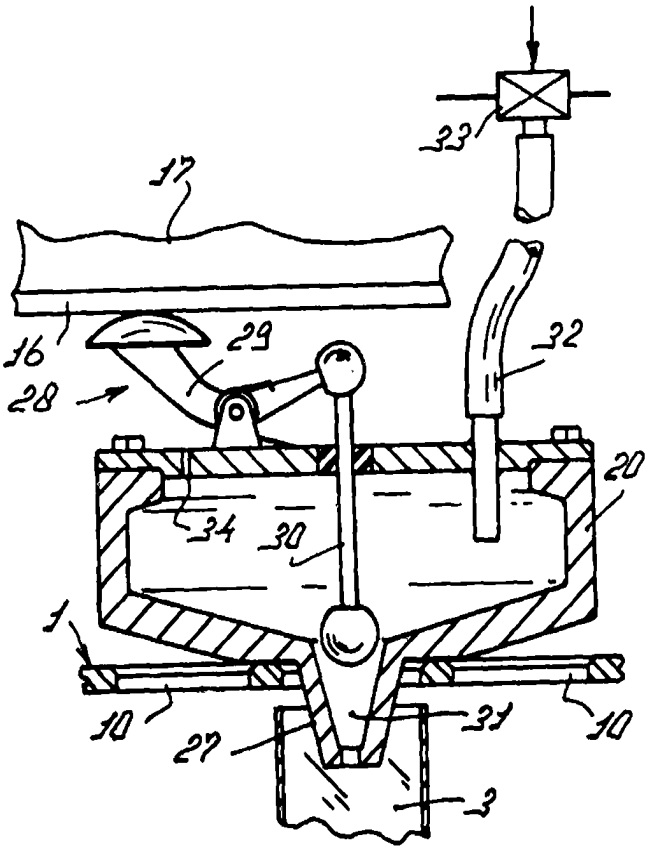

FIG. 6