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(54) Method for filling vials with liquid.

(57) The method consists in measuring the tare of a vial 2 in a first weighing station P1, partially filling the said vial, in a station R located downstream of the said first station P1, with an amount having a lower weight than the weight of a predetermined dose of liquid, and finally in completing the filling of the said vial, such that the weight of the liquid injected into the latter is equal to the weight of the said dose, in a second weighing station P2 located downstream of the aforementioned partial filling station R.

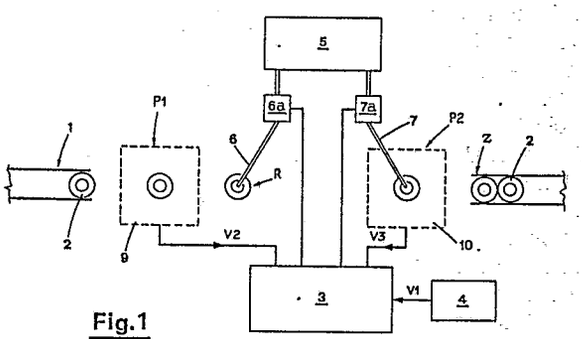

Fig.1

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Description

METHOD FOR FILLING VIALS WITH LIQUID

In the technical sector concerning the packaging of vials, the method followed in filling the vials themselves is of considerable importance.

In a first known method, the weight of the dose of liquid with which the vials are to be filled is predetermined a priori, by, for example, determining the corresponding volume.

The vials are conveyed with an intermittent motion to filling stations in which, in a completely automatic manner, suitable ejectors are inserted in the necks of the related vials in order to inject the preset dose of liquid inside the latter.

The injection of the said doses is effected in various modes, by, for example, pumping means, or by gravity feed, or by a pressure source acting on the said dose, etc.

The difference between the preset weight of liquid in a dose and that effectively injected into the vial is, obviously within predetermined tolerances, influenced by a variety of factors, particularly those regarding the means and/or systems used to effect the injection of the liquid, and the timed allocated to these means for effecting this injection stage.

Indeed, if on the one hand decreasing this time leads to an increase in productivity, it on the other hand has a negative effect on the extent to which the specifications governing the filling of the vial are respected, which is to say on the extent to which the weight of the dose injected corresponds to the preset dose.

Since an a posteriori check on the weight of every dose of liquid contained in the vials is impracticable with the above-mentioned method for obvious technical and economic reasons, a statistical check is effected to measure the gross weight of each vial, from which, presupposing a mean empty-vial weight, the weight of the dose of liquid may be indirectly obtained.

If this last value differs from the predetermined value, exceeding the admissible tolerances, it is necessary to operate on the means used both for determining the weight of the dose, and for injecting the latter into the vial.

A second known method involves using what are known as electronic weighing units.

The empty vial is brought to a filling station, more precisely a scale for measuring the tare of the vial; this stage, although rapid, takes place in an interval of time dependant upon the inertia of the moving parts of the weighing unit as well as on the speed of response (reaction time) of the weighing unit's electronic measuring circuit.

The information regarding the tare value of the vial is sent to an electronic control unit, where it is memorised, this unit actuating the means for injecting the liquid into the vial, with the ejector that works in conjunction with the latter already being situated in the vial.

The aforementioned control unit de-activates the said means on reaching the preset weight of the dose injected into the vial.

The filling of a vial is thus completed; the latter finally being conveyed, in a known manner, from the weighing unit to a station in which the neck of the vial is sealed (e.g. by plugging).

With this second method, the weight of the dose respects the preset value from which it is only permitted to vary by very narrow tolerances, but the electronic weighing unit is not exploited to the full in that the function of the latter is limited to simply determining the weight of the vial and the weight of the latter when already filled with the predetermined dose of liquid.

With this above second method, the demands of operating efficiency and reliability are undoubtedly satisfied, but the resultant productivity certainly does not bear comparison, being lower, for the same number of filling stations, than that which may be obtained using the first method described above.

This has constrained manufacturers to produce machines using the second method which feature a series of feed stations, with the same number of electronic weighing units, in order for the machines to achieve the same productivity as the other equipment located upstream and downstream of the latter, albeit at the expense of raising the unit filling costs due to the high cost of the electronic weighing units.

The BE-A- 901 407 discloses a process and device for filling a container. The process envisages placing the container in a first weighing station, where the tare of the container is measured.

Further the container is moved to a partially filling station, where the container is filled up to a preset quantity of material. The container is then conveyed to a second weighing station where the amount of material dropped into it is measured, taking in account the tare.

Finally the container is displaced in a second filling station, where it is completely filled. This process foresees four stages to be completed, and requires an additional device to determine and set the right quantity of material to drop into the container during it being in the second filling station.

The object of the invention is propose an original method for filling vials with liquid, which differs from the known methods and is able to fully exploit the characteristics of electronic weighing units, thus conferring not only the advantages deriving from their use, but also a level of productivity that is comparable to that of machines using the above-mentioned first method, and with unit vial filling costs that are lower than those which may be obtained with machines using the aforementioned second method.

This is obtained by the process set forth in the claim.

In fact the proposed method enables optimum use to made of weighing means (e.g.: electronic weighing unit); these means represent the most sophisticated and costly part of the machine effecting the method, such that their optimum use is

advantageous where limiting the unit cost for filling each vial is concerned.

In the prior art the vial is located on the electronic weighing unit, remaining there until filling is completed.

The time that passes between the measurement of the tare of the vial and the final filling stage represents dead time in the prior art insofar as use of the electronic weighing unit is concerned.

This dead time is eliminated with the method that is the subject of the present invention; the weighing unit in a first weighing station is only used to measure the tare of the vial, whilst a second weighing unit in a second weighing station is only used in the final stage during which the filling of the vial is completed.

Indeed, machines effecting the present method would not only benefit from the advantages involved in using electronic weighing units, but would, for the same number of electronic weighing units used, more than double their productivity in relation to the known machines using the second method described in the introduction.

The proposed method therefore satisfies the objects of the invention presented in the introduction.

The characteristics of the invention are emphasised below with specific reference to the enclosed tables of drawings, in which:

- Figure 1 is a block diagram showing one possible layout of the means and/or devices with which to carry out the method that is the subject of the present invention;
- Figures 2a, 2b are diagrammatic illustrations showing the plan and side view respectively of an unlimited example of a machine which carries out the said method.

With reference to the said figures, 1 indicates a known feed line for the vials 2.

3 indicates an electronic control unit connected to a periphery unit 4, using which the operator memorises, in the same control unit, the measurement (first signal V1) of a preset dose of liquid in relation to the capacity of the vials 2 and type of liquid in question.

This liquid is supplied by a feed device 5, of known type, working in conjunction with first and second ejector means 6, 7, from which the liquid flows following the enabling of corresponding interceptor means 6a, 7a, which latter are connected to the electronic control unit 3.

The proposed method includes the following stages:

a) A vial 2 is conveyed from line 1 to a first weighing station P1, taking the form of an electronic weighing unit 9; the latter measures the weight of the empty vial in a relatively short period of time, in the order of a second: the value of the said measurement is sent (electric signal V2) to the electronic control unit 3, where it is memorised.

b) The vial 2 is conveyed from the weighing station P1 to a partial filling station R, in which, using suitable means, not illustrated, connected to the electronic control unit 3, the first ejector means 6 are inserted in the neck of the vial; at this point the electronic control unit 3 actuates the interceptor means 6a for a sufficient period of time to permit the injection into the vial, by means of the device 5 - first ejectors 6 complex, of a quantity of the aforesaid liquid whose weight is less than the weight of the predetermined dose of liquid.

c) The above-mentioned vial 2, partially filled with liquid, is conveyed to a second weighing station P2, which takes the form of a corresponding electronic weighing unit 10.

In appropriate synchrony with the above, suitable means, not illustrated, connected to the control unit 3, insert the second ejector means 7 in the neck of the vial, and the interceptor means 7a are actuated, the aforementioned liquid consequently being gradually injected into the flask by the device 5 - second ejectors 7 complex.

The measurement (third signal V3) effected by the weighing unit 10 is sent to the control unit 3, which compares the difference between the third electric signal V3 and second electric signal V2, with the first electric signal V1.

When the said difference is equal to the first signal V1, the control unit 3 de-activates the interceptor means 7a.

The filling of the vial is thus completed, and the weight of the liquid injected into the latter is equal to the weight of the preset dose of liquid.

d) The vial which has been filled in this way is conveyed to an operating station Z located downstream of the second weighing station P2; this station may feature means for fitting a corresponding plug in the neck of the vial.

The proposed methods involves measuring the tare of the vial in a first weighing station P1, partially filling the vial in filling station R, separate from the previous station, and, finally, completing the said filling in a second weighing station P2 that is separate from the previous stations P1, R.

The vials stop in the first weighing station for a very short period of time, corresponding to the time necessary to measure the tare of the vial (second electric signal V2).

The vials also stop in the filling station R for only a very brief period of time, in that a portion of liquid is injected into the vial in the said station without it's weight being checked, although it is obviously determined a priori with an ample tolerance, but in such a way that it weighs less than the weight of the predetermined dose.

The vials stop in the second weighing station P2 for a longer period of time than they do in the first weighing station P1; it being necessary to weigh the vial when partially filled with liquid (which takes practically the same amount of time as its stop in the first station), and subsequently complete this filling operation.

Optimisation of the proposed method is effected by having the first weighing station P1 work in conjunction with a series of lines L1, L2, ... Ln, with each of these latter lines featuring a partial vial-filling station R and second-weighing station P2.

Figures 2a, 2b are diagrammatic illustrations of a

machine featuring two lines L1, L2, both of which pass through a first weighing station PI, as described above.

Each of the said lines L1, L2 features a partial filling station R and a second weighing station P2.

First means, indicated by 20, and shown in outline, being of known type, intermittently convey the vials 2 from the vial feed line 1 to the first weighing station P1, where the electronic weighing unit 9 is located, and also convey the same vials alternately to the beginning of one or another of the lines L1, L2.

Lines L1, L2 feature second and third means 21a, 21b, which operate in synchrony with the first means and are shown in outline, being of known type. The said first and second means convey the corresponding vials from the first means 20 to the partial filling station R, from the latter station R to the second weighing station P2, and finally to an operating station Z, located downstream of the second weighing station P2, in which, for example, known means 23 insert at least one plug in the neck of each vial.

The machine illustrated in Figures 2a, 2b is purely an unlimited example of how the method which is the subject of the present invention might be put into effect.

Should it be necessary, the relevant machine may feature two or more partial filling stations R, instead of a single station R.

Claims

1) Method for filling vials with liquid, in which use is made of an electronic control unit (3) in which a first electric signal (V1) corresponding to the weight of a preset dose of liquid is memorised, characterised in that it includes the stages listed below:

- transfer of a vial (2) from a vial feed line (1) to a first weighing station (P1) for measuring the weight of the said vial (2), and the subsequent memorising of a second electric signal (V2) corresponding to the weight of said vial (2) in said electronic control unit (3):
- transfer of said vial (2) to at least one partial filling station (R), in which, due to the activation of first ejector means (6), which couple with the neck of said vial, an amount of liquid weighing less than the weight of said preset dose of liquid is injected into the vial;
- transfer of said partially filled vial (2) to a second weighing station (P2) in which, due to the activation of second ejector means (7), which couple with the neck of the vial (2), a further amount of the said liquid is injected into the vial until the aforesaid second ejector means (7) are deactivated, this being commanded by said control unit when the weight of said preset dose is reached for the dose inside the vial;
- transfer of the said vial (2), filled with liquid, to an operating station (Z) located downstream of the said second weighing station (P2).

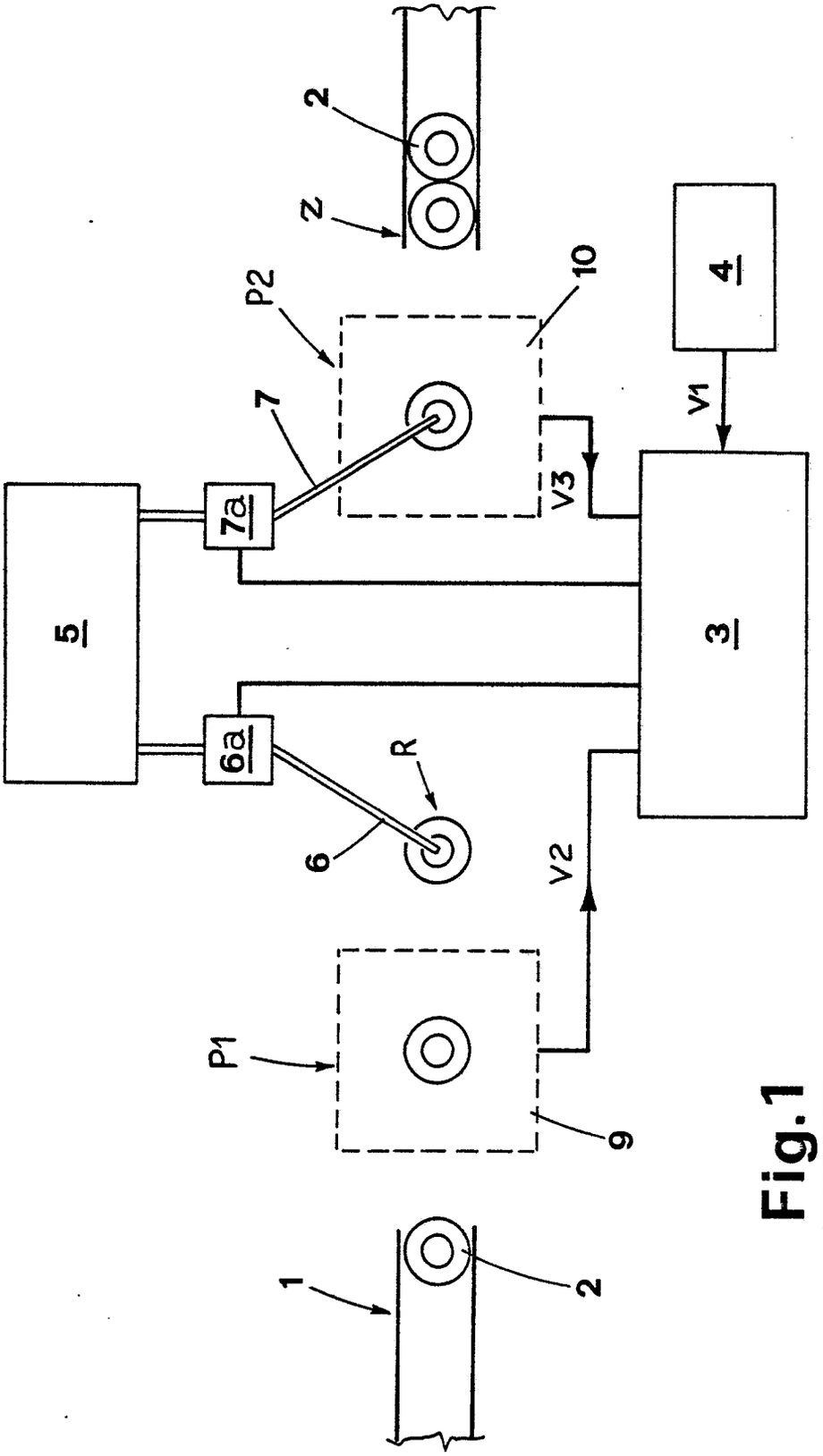


Fig.1

Fig. 2b

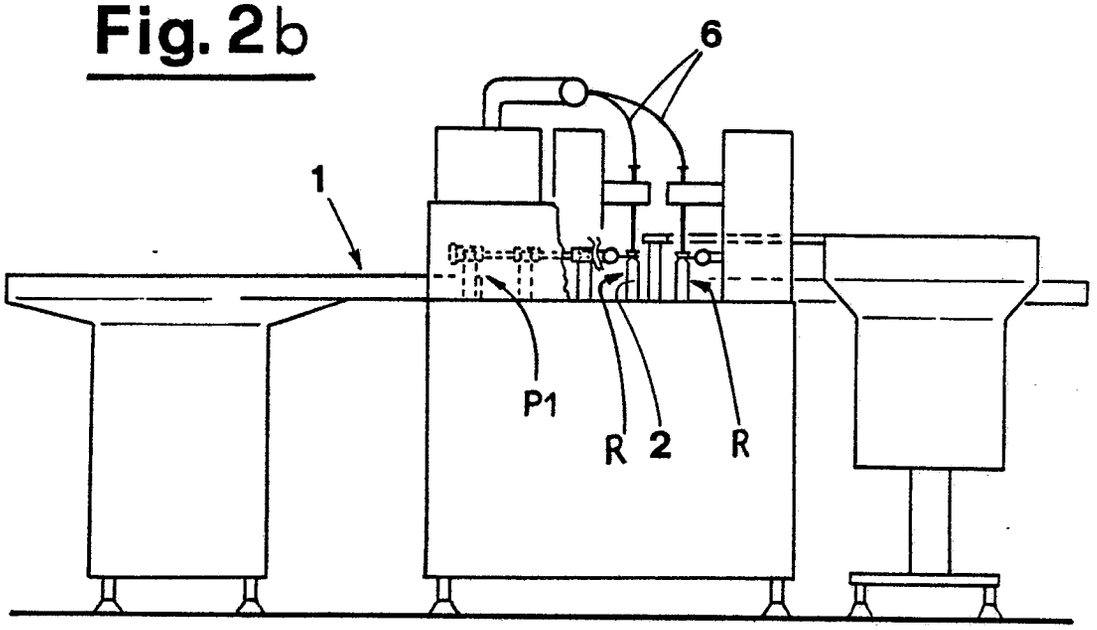
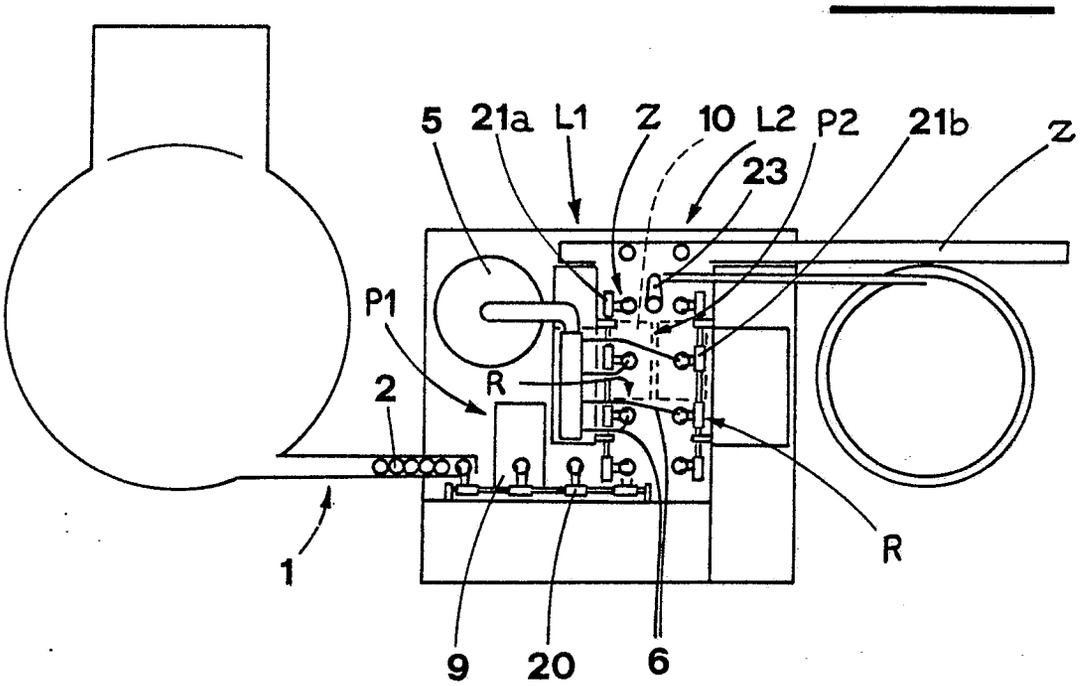


Fig. 2a



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EUROPEAN SEARCH REPORT

Application Number

EP 89 83 0225

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y,D	BE-A- 901 407 (DU PONT DE NEMOURS) * Page 3, line 16 - page 4, line 7; figure *	1	B 65 B 3/28 B 67 C 3/20
Y	DE-A-3 411 155 (ABEL GmbH) * Page 4, last paragraph *	1	
A	US-A-3 162 258 (R.W. SCHMIDT)		
A	US-A-2 608 371 (J.B. McMAHON et al.)		
A	DE-A-2 900 863 (J. RAMONEDA-SIBIDI)		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 65 B
B 67 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	01-08-1989	SCHELLE,J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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