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(54) Machine for filling and closing containers, in particular tubes

(57) A machine (M) includes an endless close-looped conveying line (1): in a loading station (S1) the tubes (3) are fed while being kept with the open end upwards and are carried to an infeed station (SA) in which product dispensing means (5) feeds paste product to the tubes. In a following station (S2) overhanging gripper means (6) close the tubes (3), which are then downloaded from the conveying line (1) at a download station (S3) situated downstream and near to said loading station (S1). The gripper means (6) are designed in such a way that they have no mechanical means, requiring lubrication, which are situated above the tubes (3) and the product dispensing means (5) can be removed from the machine structure (100) to be cleaned and sterilised in a room away from the machine (M).

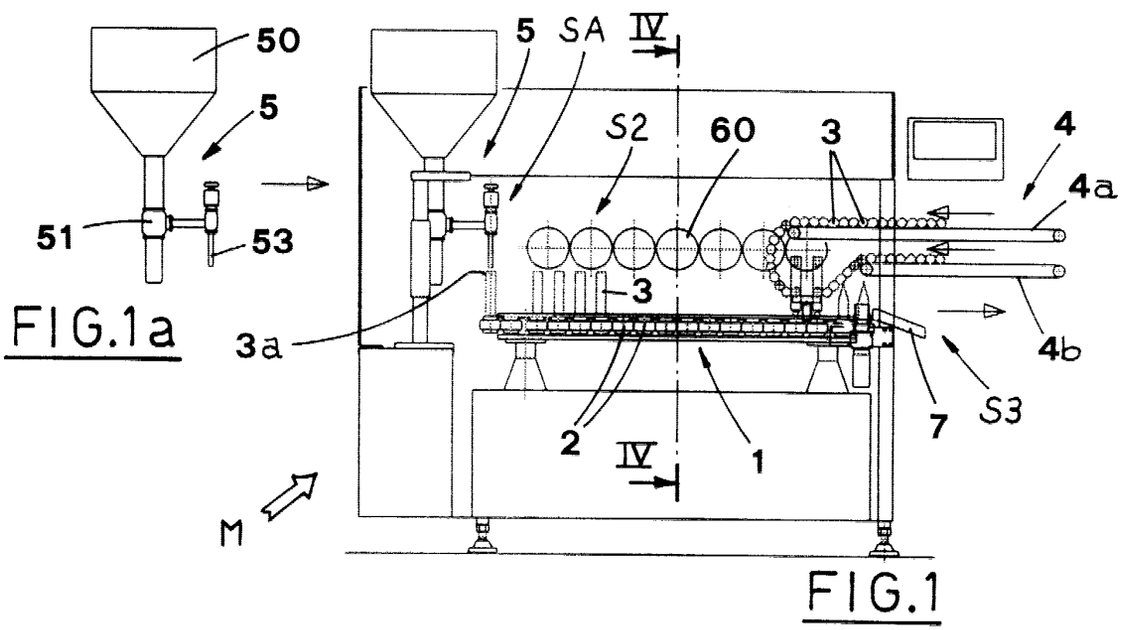


FIG.1a

FIG.1

EP 1 170 210 A1

Description

[0001] This invention relates to filling known containers such as tubes made from, for example, aluminium or synthetic material, with products in paste form.

[0002] The machines for filling and closing these tubes are known as "tube filling machines"

[0003] It is a known fact that the tubes are produced with a cylindrical shape, open at the bottom and with a relative pre-sealed cap at the other end. They are fed upside-down onto the tube filling machine line to enable the product dispensing means in an infeed station to fill said tubes with the product.

[0004] At subsequent stations, the tube is closed and undergoes any subsequent processes such as coding before being discharged from the line and packaged.

[0005] The fact that the tubes are arranged on the line with the open end upwards means there is a risk that pollutant substances such as traces of lubricating oil or grease deriving from overhanging operational parts of the machine may enter the tube along with the product, with the obvious problems this implies.

[0006] Another problem with known tube filling machines becomes evident whenever the said product dispensing means in the feed station must be cleaned and/or sterilised, for example, to change the type of product or for other reasons (for example, at the end of the cycle etc.).

[0007] In this situation, the machine - and therefore also production - must be stopped to carry out washing and/or sterilising of all the parts in contact with the product.

[0008] This is an extremely laborious operation and may dirty surrounding areas which must then in turn be cleaned and/sterilised, increasing the time necessary for the operation.

[0009] This may be further aggravated by the fact that the products may contain acid or corrosive substances or substances damaging to the materials and/or components of the machine concerned and/or in contact with said products, with the obvious problems this implies.

[0010] The object of the present invention is to provide a tube filling machine which is made is such a way as to keep free, as far as possible, the conveying line zone along which the tube containers are carried upside down, so as to make minimal any risk of contaminating the product already inserted into the tubes.

[0011] A further object of the invention is to propose a machine conceived in such a way that cleaning and sterilising operations of the product dispensing means are made easier and require the machine being stopped for a shorter time, with respect to the known machines.

[0012] Yet a further object of the present invention is to propose a machine designed in optimal way with reference to its management by operators, easy maintenance operations and limited volume occupied.

[0013] The invention will now be described in more detail with reference to particular, non-limiting embodiments and with reference to the accompanying drawings, in which:

- Figures 1, 2 and 3 show schematically front, plan and lateral vies of the tube filling machine subject of the invention;
- Figure 1a shows a front view of product dispensing means which are released from the machine shown in Figure 1;
- Figure 3a shows a lateral view of the above mentioned product dispensing means released from the machine shown in Figure 3;
- Figures 3a and 4b show an enlarged fragmentary views of the machine taken along the IV-IV line of Figure 1, in which views different embodiments are illustrated.

[0014] With reference to the above mentioned Figures, the tube filling machine subject of the invention has been generally indicated with reference M.

[0015] Machine M is equipped with an endless close-looped conveyor line 1 extending in a horizontal plane with grippers 2 a certain distance apart to support the relative vertical upturned tubes 3.

[0016] The tubes 3 are transferred to the conveyor line 1 by a known type of transfer means, not illustrated, located in a loading station S1, which pick them up from the infeed means 4 at a pre-established pickup zone.

[0017] According to a preferred configuration, the conveyor line 1 follows a substantially oval route and is operated in a clockwise direction with an alternating movement with a pitch double that of the grippers 2.

[0018] The latter are not illustrated in the detailed drawing as they are already known.

[0019] In the example illustrated, the infeed means 4 comprises two conveyors 4a and 4b which each feed a tube 3, open at the bottom 3a, into said pickup zone.

[0020] It should be noted that the two conveyors 4a and 4b are superimposed to limit dimensions.

[0021] The tubes 3 are thus conveyed by line 1 to an infeed station SA equipped with product dispensing means 5 to insert a given quantity of paste product into each tube 3 through the open bottom 3a.

[0022] The product dispensing means 5 essentially comprises a hopper 50 from which the product is taken and inserted into dosing units 51, for example the syringe type, communicating with the relative nozzles 53 located over the open bottoms 3a, facing upwards, of the corresponding tubes 3.

[0023] The plungers of the dosing units 51 are operated, by means of rods 54, by respective actuators 55 mounted on the structure 100 of the machine M and connected to said rods 54 by means of known rapid couplings not illustrated.

[0024] The product dispensing means 5 are mounted on a plate 100a constrained to the structure 100 of the machine M by a known type of quick locking means 10, not illustrated in detail, which engages a collar 56a formed centrally by the casing 56 supporting said product dispensing means 5.

[0025] Downstream of station SA there is at least one closing station S2 equipped with means 6, for example grippers, to close the bottoms 3a of the tubes 3.

[0026] The machine may have a certain number of closing stations S2. The number of these activated depends on the material of tube 3 and the way it is to be closed..

[0027] It is considered preferable, in fact, to break down the basic phases of the work cycle and divide them between a number of stations to avoid complicating construction of the working means.

[0028] The closing stations S2 are arranged in a straight section 1a of the conveying line 1 and are consecutive and aligned with each other. In particular configurations of machine M, one of the closing stations S2 is equipped with devices to code said tubes 3.

[0029] These coding devices are known and therefore not illustrated.

[0030] The structure 100 of the machine M in the zone corresponding to the closing stations S2 may advantageously be of the so-called "abutment" type.

[0031] The gripper-type closing means 6 have an "overhang" configuration so as to keep the number of mechanical parts operating in the work zone 90 above the tubes 3 during the tube closing phases to a minimum.

[0032] The driving means of said grippers 6 are housed inside a compartment 200 formed by the structure 100, generally known by those skilled in the art as the "grey zone".

[0033] By way of example, figure 4a shows one embodiment of the proposed closing station S2 in which the gripper-type closing means 6 have a pair of opposing grippers, first 61 and second 62, operating in the work zone 90 to close the bottoms 3a of the tubes 3.

[0034] The grippers, first 61 and second 62, are moved alternately along an axis W, substantially transversal to the infeed direction Z of the conveyor line 1, in the region of said closing stations S2.

[0035] These grippers, first 61 and second 62, are constrained to respective horizontal rods, first 63 and second 64, which partially protrude from a drum 60 fixed to a vertical wall 101 of the structure 100 near compartment 200.

[0036] The rods, first 63 and second 64, slide in substantially horizontal respective guide holes, first 63a and second 64a, made in said drum 60, by means of respective bushings, for example, of the "self-lubricating" type.

[0037] Said rods, first 63 and second 64, extend inside compartment 200 formed by the "abutment" portion of structure 100 where they are associated with respective linkages, first 610 and second 620, operated by appropriate movers of the tube filling machine M designed to impose synchronised pre-established axial movements to said rods, first 63 and second 64, along axis W, first in one direction, then the other.

[0038] As can easily be deduced from figure 4a, the rods, first 63 and second 64, are parallel and guided by the relative guide holes, first 63a and second 64a.

[0039] In this case, the first rod 63, associated with the first gripper 61, is positioned at a lower level than the second rod 64, which is longer and associated with the second gripper 62.

[0040] According to a second embodiment, which is illustrated in Figure 4b, the first rod 630 and the second rod 640 are in coaxial relation with each other and the second rod 640 is longer than the first one and is guided slidably within a guide housing 650 formed coaxially in the first rod 630, which is therefore tubular.

[0041] In both embodiments, the first linkage 610 and the second linkage 620 move in synchrony and drive the respective first rod (63, 630) and second rod (64, 640) so that the respective first gripper 61 and second gripper 62 can correctly perform the closure of the bottom parts 3a of the tubes 3.

[0042] It clearly appears that the closing station S2, in both the proposed embodiments, advantageously permits to hold within the compartment 200 of the structure 100 all the mechanical means which necessitate lubrication, and the sliding bushing are self-lubricating.

[0043] A better tightness can be ensured by mounting commercially available oil seals on the rods.

[0044] Downstream of the closing station S2 there is a download station S3, in which the tubes 3 are removed from the conveying line 1 and placed on an outlet line 7, by transferring means similar to the ones provided at the loading station S1.

[0045] It should be noted that the outlet line 7 is located alongside the conveyors 4a, 4b, so that the tubes 3 enter and exit the machine on the same side.

[0046] More particularly, the tubes entering and exiting directions are parallel to each other and are lined up with the machine; this allows to perform feeding of the tubes to the machine and removal of the already filled tubes from the machine in optimal way.

[0047] This last mentioned technical-operational feature allows to limit the dimension of the machine.

[0048] The advantages obtained the machine M described above relates to various points, starting from the side by side location of the loading station S1 and downloading station S3, which is favourable for verifying by the operator.

[0049] It is also to be stressed that the constructive configuration of each closing station S2 reduces to a minimum, in fact it eliminates, possible contamination of the product contained in the tubes 3 with polluting substances, while they are being closed.

[0050] This is mainly due to the fact that the first and second linkages 610 and 620 of the operative gripper means 6, which usually cause most of the soiling, are

located inside the compartment 200, hermetically separated from the zone 90 where the filling process is performed and the first and second grippers 61 and 62 operate, these gripper being made basically in overhanging fashion.

[0051] Consequently, the closure means 6 operate in a process zone which can be easily included in an isolation system fed with germ-free air, kept practically aseptic, e.g. by means that creates an air, preferably downward, laminar flow.

[0052] The general configuration of the machine is designed to make easier maintenance operations, both in the conveying line area, due to its oblong shape, and in the mechanical means area, due to the so-called "shoulder structure".

[0053] Beside these advantages, another advantageous feature of the machine includes the possibility of removing the product dispensing means 5 from the machine when they are to be cleaned and/or sterilised because the product is changed or other reasons.

[0054] To perform this operation, the machine M is stopped, all the openings (such as nozzles, hopper outlets and so on) are closed by means of suitable plugs to prevent the product from coming out, the rapid connection coupling are released as well as the quick locking means 10, the product dispensing means 5 to be cleaned and sterilised are removed and replaced by product dispensing means 5 already cleaned and sterilised.

[0055] Then the machine M can be re-started (so the production is resumed) with a very limited loss of production time, without soiling any other part of the machine.

[0056] The soiled product dispensing means 5 are easily taken to another suitable place, away from the machine M, to be cleaned and sterilised in the most proper way.

Claims

1. A machine for filling and closing containers, in particular, tubes open at the bottom, **characterised in that** it includes:

   an endless close-looped conveyor line (1) extending in a horizontal plane and equipped with equispaced grippers (2) for supporting vertical upturned tubes;

   a loading station (S1) equipped with transfer means to pick up said tubes (3) fed in a pickup zone by infeed means (4) and load them onto said grippers (2);

   a feed station (SA) downstream of said loading station (S1);

   product dispensing means (5) situated at said feed station (SA) for inserting product inside said tubes (3);

   at least one closing station (S2) downstream of said feed station (SA) equipped with means (6) for closing said tubes (3) in a process zone (90);

   an unloading station (S3) downstream of said closing station (S2) equipped with second transfer means for removing said tubes (3) from the above mentioned conveyor line (1) and transfer them to an unloading line (7).

2. A machine according to claim 1, **characterised in that** said conveying line (1) follows a substantially oval route which include at least one straight section (1a) situated in the region of said closing station (S2).

3. Machine according to claim 1, **characterised in that** said infeed means (4) include two conveyors (4a, 4b), each of said conveyors being provided for feeding the tubes (3) to said pickup zone.

4. Machine according to claim 3, **characterised in that** said conveyors (4a, 4b) are superimposed.

5. A machine according to claim 1 **characterised in that** said product dispensing means (5) may be constrained to the structure (100) of said machine (M) in a position where they are associated with driving actuators (55) on said machine (M) positioned in such a way as to actuate said feeding, together with said product discharge means, said product dispensing means being removable from said structure (100) to enable them to be cleaned and/or sterilised in a suitable location away from said machine.

6. A machine according to claim 5 **characterised in that** it includes quick locking means (10) designed for fastening said product dispensing means to said structure (100).

7. A machine according to claim 6, **characterised in that** said quick locking means (10) are joined to a plate (100a) made integral with said structure (100) and designed to support said product dispensing means (5), the said quick locking means (10) being capable to engage with a collar (56a) formed on the casing (56) which supports said product dispensing means (5).

8. A machine according to claim 5, **characterised in that** it includes quick connection coupling means for connecting said product dispensing means (5) to said driving actuators (55).

9. A machine according to claim 1, **characterised in that** it includes at least two closing stations (S2).

10. A machine according to claim 1 **characterised in that** said closing means (6) in at least one closing station (S2) are mounted on relative rods, namely a first rod and a second rod, freely passing through a wall (101) of a compartment (200) formed by the structure (100) of the machine, located on the opposite side to said closing means (6), designed to enclose the driving means (610, 620) for driving said rods and hermetically separated from said process zone (90).

11. A station according to claim 10, **characterised in that** said closing means (6) for closing said tubes (3) are "gripper-type" and comprise a pair of opposing first grippers (61) and second grippers (62), projecting from said first rod (63, 630) and second rod (64, 640) and protruding partially from a drum (60) constrained to said wall (101) dividing said work zone (90) from said compartment (200), with said first rod (63, 630) and second rod (64, 640) axially moved by said operating means (610, 620) housed within the above mentioned compartment (200).

12. A station according to claim 11, **characterised in that** it includes, within said drum (60), two through holes namely a first through hole (63a) and a second through hole (64a), substantially parallel to each other, designed for guiding said first rod (63) and second rod (64) in cooperation with associated bushings.

13. A station according to claim 11, **characterised in that** the said first rod (630) and second rod (640) are set in coaxial relation, with the longer rod (630,640) slidingly guided, by means of corresponding bushings, inside a guide housing (650) made coaxially in said shorter rod (630, 640), this last mentioned rod being tubular in shape.

14. A station according to claim 12 or 13, **characterised in that** said guide bushings for said first rod (63, 630) and second rod (64, 640) are of the self lubricating type.

15. A station according to claim 10, **characterised in that** in the said process zone (90) there are means capable of creating therein a germ-free air zone, substantially aseptic.

16. A machine according to claim 1, **characterised in that** said infeed means (4) and said outlet line (7) are located on the same side of the machine M.

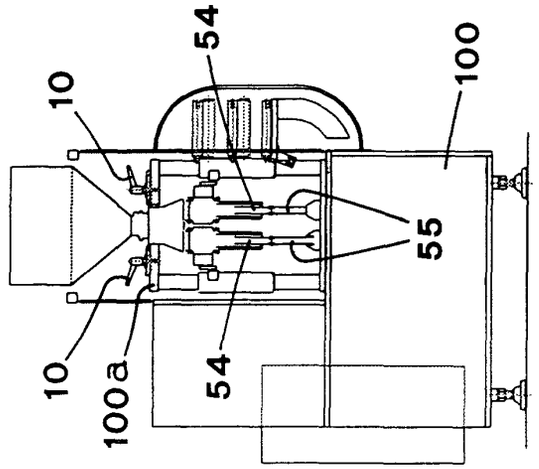


FIG.3

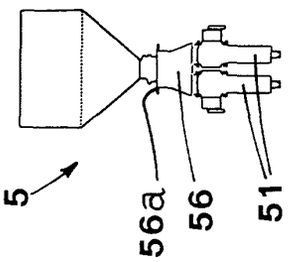


FIG.3a

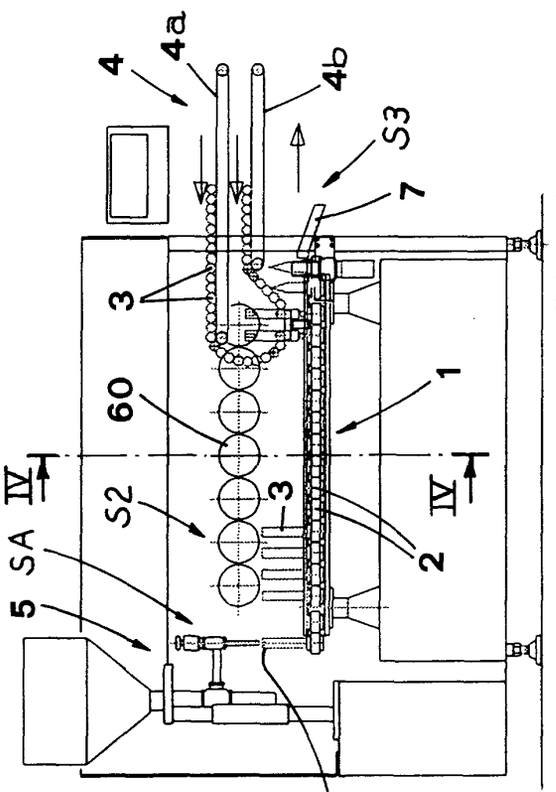


FIG.1

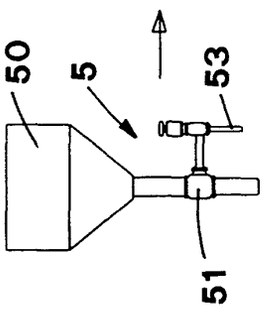


FIG.1a

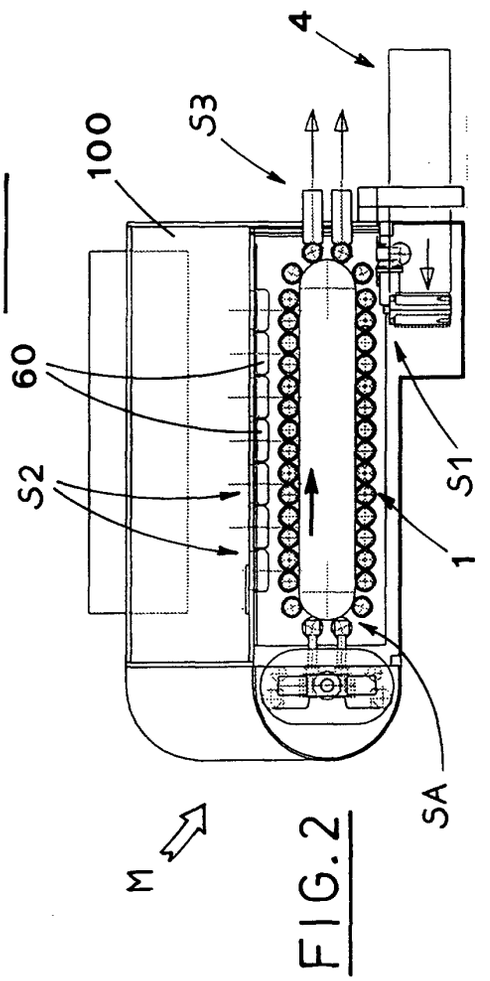


FIG.2

FIG.4a

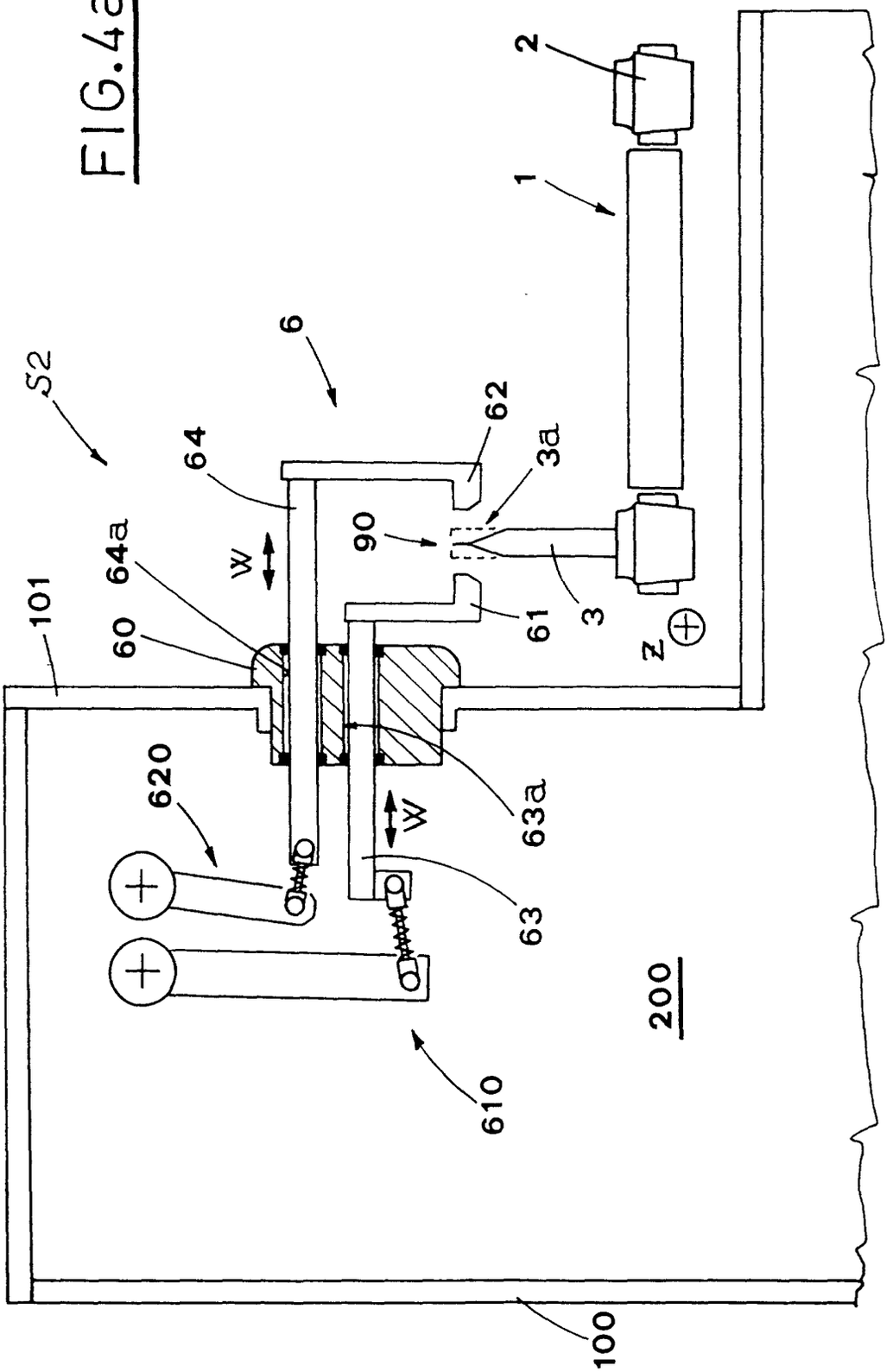
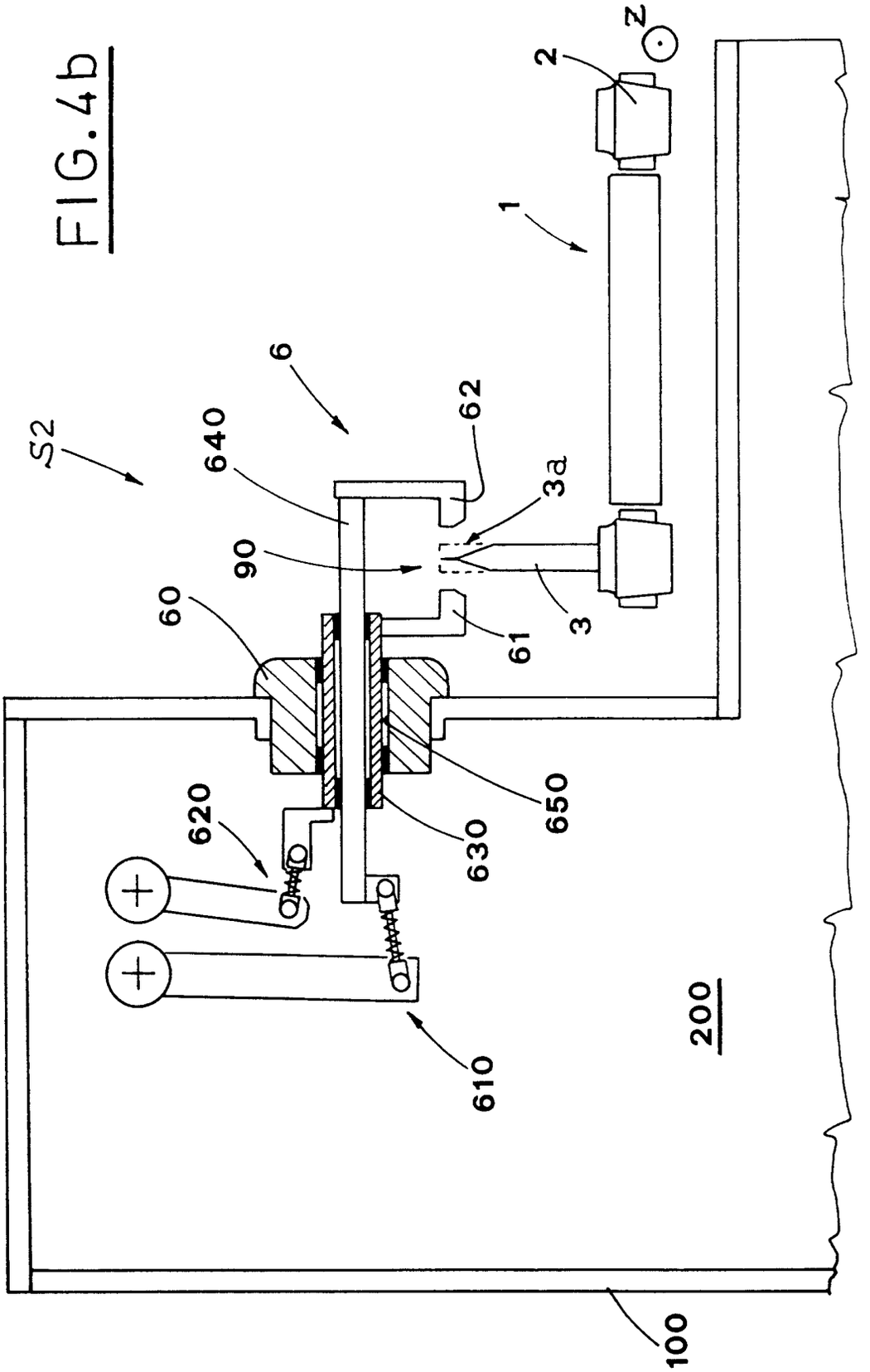


FIG.4b



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EUROPEAN SEARCH REPORT

Application Number
EP 01 11 5624

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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Y	US 3 760 853 A (TRUSSELLE W) 25 September 1973 (1973-09-25) * column 3, line 20 - column 4, line 45 * * column 15, line 53 - column 16, line 8; figures * ---	5-7	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18 October 2001	Jagusiak, A

CATEGORY OF CITED DOCUMENTS

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