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(54) **AN APPARATUS FOR MOVING CONTAINERS TO BE FILLED WITH A PREDETERMINATED NUMBER OF ARTICLES COUNTED BY COUNTING MACHINES AND UNLOADED BY RESPECTIVE UNLOADING MOUTHS OF THE COUNTING MACHINES**

(57) The apparatus (100) comprises a movement station (80) for the movement of containers to be filled with a predetermined number of counted articles counted by counting machines and unloaded by respective unloading mouths (M). The movement station (80) comprises a support plane (81), in the unloading area (Z) of the unloading mouths (M), on which empty containers (E) are positioned in respective first stop positions (P1) in front of respective unloading mouths (M). The movement station (80) comprises a series of translation units (1, 2), activatable independently of one another, and cyclically, each to translate respective empty containers (E) on the support plane (81) from the first stop position (P1) to the second stop position (P2), in which the container is below an unloading mouth (M), so as to receive the counted articles in the predetermined number, thus becoming a full container (T), and then to translate the full container (T) from the second stop position (P2) to a third position (P3), and at the same time to translate a successive empty container (E1) from the first stop position (P1) to the second stop position (P2) beneath the unloading mouth, for the successive filling thereof.

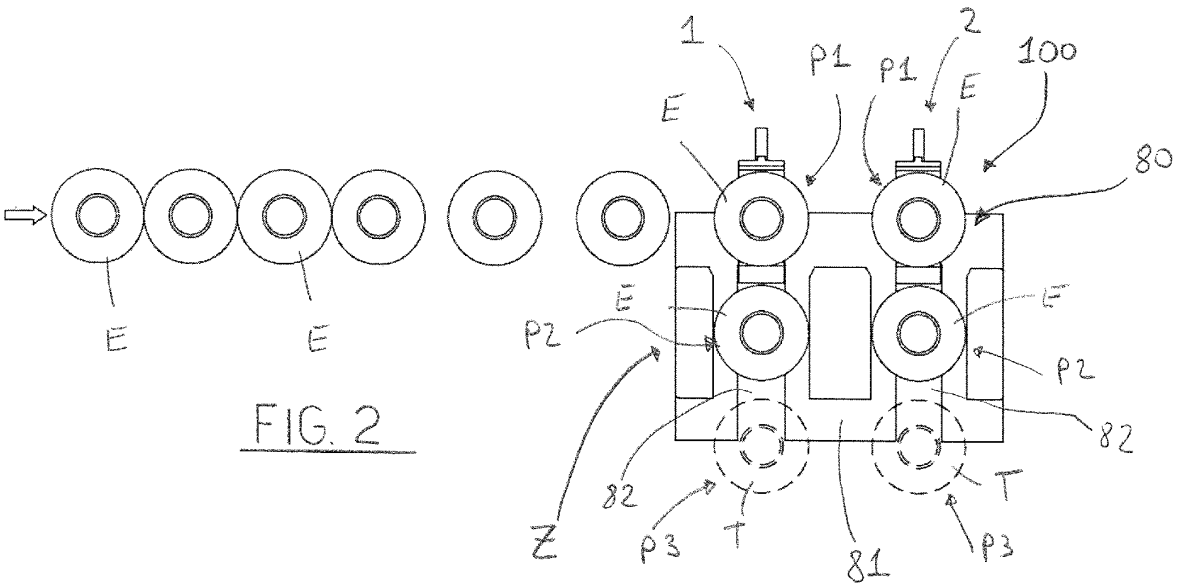

FIG. 2

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Description

[0001] The present invention relates to the technical sector concerning the packaging of articles internally of relative containers, in particular to packaging with a predetermined number of articles that are to be inserted internally of respective containers.

[0002] In greater detail, the present invention relates to an apparatus for moving containers to be filled with a predetermined number of articles, such as for example pharmaceutical articles / parapharmaceutical articles! cosmetics, etc., which have previously been counted by suitable counting machines and which are successively unloaded by respective unloading mouths of the counting machines. To carry out the packaging of articles internally of respective containers there may be the need to have to carry out the packaging thereof by proceeding to the filling of the containers with a predetermined and very precise number of articles.

[0003] It is therefore necessary to first make a count of the pharmaceutical articles and to provide temporary accumulation thereof until the predetermined number of articles that are to be inserted in a respective container has been reached, before carrying out the unloading and insertion thereof internally of the container.

[0004] The realising of a filling of containers with a predetermined number of articles, previously counted and temporarily accumulated, is particularly important, for example, in the pharmaceutical sector, where it is necessary to carry out the filling of containers with exactly the predetermined number of pharmaceutical articles set for putting on sale.

[0005] In this regard, special automatic machines are utilised, known by the name of counting machines, which carry out the count, and the temporary accumulation, of the pharmaceutical articles that are to be inserted in a given number into a container, and then, once the count of the predetermined number of articles has been achieved, to carry out the following unloading internally of the container. Pharmaceutical articles are usually accumulated in a storage hopper while the containers to be filled are advanced one following another along a conveying line. The pharmaceutical articles contained in the storage hopper are unloaded onto a conveyor which is provided with a series of transport channels, for example having a "V" shape, which receive the articles from the hopper and transfer them, keeping them apart from one another, to a filling area situated above the conveying line of the containers.

[0006] In the filling area, a suitable counting machine is positioned between the end of the conveyor and the conveying line of the containers, which is configured to receive the pharmaceutical articles falling from the conveyor, to count them and then accumulate them temporarily until the predetermined number of pharmaceutical articles that are to be inserted in a respective container has been reached, and then, once the count of the predetermined number of articles has been reached, to carry out the unloading of the articles, through a relative unloading mouth, into a respective container that in the meantime has been positioned, stopped, beneath the unloading mouth of the counting machine.

[0007] Usually, as for example schematically illustrated in figure 1, a counting machine (A) is made in such a way as to comprise a plurality of descent channels (D), each having an entry opening (a) and an exit opening (b).

[0008] The descent channels (D) are arranged in such a way that the entry openings (a) are located immediately downstream of the ends of the transport channels of the conveyor (V) so that the pharmaceutical articles, having passed beyond the end of the transport channels, can fall by force of gravity into the entry openings (a) of the descent channels (D), and thus fall along the descent channels (D) and be conveyed towards the exit opening (b).

[0009] The counting machine (A) further comprises sensor means (not illustrated in detail), which are arranged so as to detect the pharmaceutical articles that fall internally of each descent channel, and which are configured in such a way as to provide the apparatus with a datum relative to the overall number of pharmaceutical articles present internally of the descent channels.

[0010] The counting machine (A) further comprises an accumulation chamber (C), generally having a funnel shape, arranged below the descent channels (D), which receives and accumulates the pharmaceutical articles exiting from the exit openings (b) of the descent channels (D), until the number necessary for the following insertion thereof into a relative container (F) has been reached.

[0011] The lower ends of the descent channels (D) are provided with closing elements (not illustrated), activatable to close the descent channels (D) once that internally of the accumulation chamber (C) the predetermined number of articles to be unloaded into a respective container has been reached.

[0012] In turn, the accumulation chamber (C) comprises, beneath it, an exit (S), provided with an openable hatch door (not illustrated) for unloading the pharmaceutical articles accumulated internally thereof into an unloading mouth (BS) (for example having a conical shape) which carries out the transfer and unloading of the pharmaceutical articles, counted and received from the accumulation chamber (C) of the counting machine, into a respective container (F) that in the meantime has been positioned stopped, beneath the unloading mouth (BS), by the conveying line (L) of the containers.

[0013] Figure 1 is an entirely schematic view, representing the various components involved in the counting and unloading of the pharmaceutical articles into a respective container; clearly the unloading mouth will be arranged in such a way that the relative exit opening is located at the mouth of the container to be filled.

[0014] The productivity, i.e. the number of containers that are filled in the time unit, or machine cycle, is influenced by the modalities with which the conveyor trans-

fers the pharmaceutical articles to the end thereof, for the articles to fall into the descent channels of the counting machine.

[0015] It is usually not possible to have a continuous infeed, and to regulate the articles falling from the conveyor, and this impacts on the number of containers filled in the time unit (machine cycle).

[0016] The increase in the operating velocity of the conveyor has not been found to be an effective method for the aims of increasing productivity.

[0017] Another method at present used in seeking to increase productivity, i.e. the number of containers filled in the time unit (or machine cycle) involves using two or more conveyors and therefore two or more respective counting machines arranged flanked to one another, such as for example illustrated in figure 1, in which various conveyors are illustrated (V, V1, V2, V3, V4, V5) as well as respective six counting machines (A, A10, A20, A30, A40, A50), for example of the type as described above.

[0018] In this situation, therefore, there will be two or more respective unloading mouths, for example, as shown in the illustration of figure 1, six unloading mouths (BS, BS1, BS2, BS3, BS4, BS5) situated beneath respective accumulation chambers (C, C1, C2, C3, C4, C5) of the various counting machines (A, A10, A20, A30, A40, A50), which are arranged flanked to one another and aligned along a common direction which must be positioned superiorly and parallel to the advancement direction (AV) of the containers (F) by the conveying line (L).

[0019] The conveying line (L) of the containers (F) to be filled, in this regard, comprises a spacing member (CD) of the containers (F), for example in the form of a screw conveyor, which is dimensioned and configured to space the containers (F) away from one another by a reciprocal distance corresponding to the distance between the various unloading mouths (BS, BS1, BS2, BS3, BS4, BS5) used for receiving the counted articles counted by the counting machines (A, A10, A20, A30, A40, A50) and for unloading them into the containers (F).

[0020] A procedure of this type for carrying out the filling of containers with a series of counting machines arranged flanked to one another can to some extent enable obtaining an increase in productivity, but presents some drawbacks.

[0021] In fact, a situation can frequently arise in which one or more of the counting machines accumulates the predetermined number of articles to be unloaded in the accumulation chamber thereof with some delay, or in advance, with respect to the remaining counting machines.

[0022] This circumstance depends largely on the above-mentioned issue of the irregularity of the conveying flow of the pharmaceutical articles along the respective conveyors.

[0023] In other words, the unloading of the counted articles in the predetermined number by the various unloading mouths in the respective containers may not occur contemporaneously.

[0024] In all these cases, before being able to activate the screw conveyor of the conveying line in order to transfer the containers stopped beneath the various unloading mouths downstream, it will be necessary to wait for all the unloading mouths to have received from the respective counting machines the counted articles in the predetermined number, and to have unloaded those articles into the respective containers positioned stopped beneath the unloading mouths.

[0025] This situation thus represents a limit in the search to further increase the productivity in filling the containers with counted articles in un predetermined number by counting machines arranged flanked to one another, with the respective unloading mouths flanked and aligned above the conveying line of the containers to be filled.

[0026] There are also counting machines that are made in such a way as to comprise two or more accumulation chambers internally of which the counted articles are accumulated falling from the respective chute channels, and thus having two or more respective unloading mouths arranged inferiorly of the respective accumulation chambers for unloading the counted articles in the predetermined number into respective containers positioned and stopped beneath the unloading mouths by a conveying line of containers.

[0027] In these cases too, however, the above-described drawback still persists, as, before the conveying line can be activated to transfer the filled containers, it is necessary to wait for all the accumulation chambers present in the counting machine to have unloaded the articles accumulatedand counted therein to the predetermined number internally of the respective container, through the relative unloading mouths.

[0028] The above-described situation, with reference to the particular case of packaging pharmaceutical articles, can also occur in the case of packaging of other types of articles that are to be inserted internally of a respective container, such as, for example, a bottle, or other type of receptacle, in a predetermined number, and which therefore have to be previously counted, temporarily accumulated and the unloaded, once the predetermined count has been reached, from suitable unloading mouths of respective counting machines which are arranged flanked to one another, and beneath which the various containers are positioned stopped and supplied.

[0029] An aim of the present invention is therefore to provide an apparatus for moving containers to be filled with a predetermined number of articles, for example pharmaceutical articles, which have been counted by counting machines and which are unloaded by respective unloading mouths of the counting machines arranged flanked to one another, able to obviate the drawbacks present in the prior art and as previously mentioned.

[0030] In particular, an aim of the present invention is to provide an apparatus which enables moving, and there-

fore supplying and making available, containers already filled with the predetermined number of articles unloaded from the respective unloading mouths of counting machines, without having to wait for remaining other containers arranged beneath respective other unloading mouths to have internally received the predetermined number of counted articles.

[0031] The above aims are attained with an apparatus for moving containers to be filled with a predetermined number of articles which have been counted by counting machines and unloaded from respective unloading mouths of the counting machines according to the contents of the claims.

[0032] The characteristics of a preferred, but not exclusive, embodiment of the apparatus of the present invention will be described in the following with reference to the appended tables of drawings, in which:

- figure 1, already referred to in the foregoing, illustrates, in a schematic and perspective view, a configuration at present used in the prior-art for carrying out the filling of containers with a predetermined number of articles, such as, for example pharmaceutical articles, which have been counted by one or more counting machines and which are unloaded by means of one or more unloading mouths arranged flanked to one another internally of respective containers positioned stopped beneath the unloading mouths by means of a conveying line;
- figure 2 illustrates, schematically and in a plan view from above, an operating station for movement of the containers by the apparatus of the invention to beneath the unloading mouths, not illustrated, of counting machines, in which some elements of the apparatus responsible for the movement of the counting machines are visible and in which the containers represented by dotted lines illustrate the final movement position of the containers by the apparatus once they have been filled with articles in the predetermined number unloaded by the unloading mouths of the counting machines;
- figure 3 illustrates, again schematically and in a plan view from above, a possible further embodiment of the apparatus of the invention relating to the supplying of the empty containers to be filled at the operating station for movement of the apparatus of figure 2, as well as for what regards the removal of the filled containers from the operating area of the movement beneath the unloading mouths of the counting machines;
- figures 4, 5, 6, 7, 8 and 9 illustrate, with respective lateral schematic views, significant components of the apparatus of the present invention in different respective possible operating configurations for the movement of the containers to the operating area for movement beneath the unloading mouths, in particular for the movement of empty containers beneath respective unloading mouths of counting machines, and thus for the movement of the full containers, once filled with a predetermined number of articles counted by the counting machines and unloaded by the respective unloading mouths, away from the unloading mouths in order to free up space beneath the unloading mouths for the positioning of successive empty containers to be filled;
- figure 10 illustrates in a lateral view, and in isolation, some other special components of the apparatus of the invention utilisable for the detection of the weight of the empty containers, therefore prior to the filling thereof, and of the weight of the containers once filled with a predetermined number of articles;
- figures 11A and 11B illustrate, in respective lateral views, a possible further embodiment of the apparatus of the invention in which the detection of the weight of the empty containers, therefore prior to the filling thereof, and of the weight of the containers once filled with a predetermined number of articles;
- figures 12A, 12B, 12C, 12D illustrate, schematically and according to respective views from above, a movement sequence of the containers by the apparatus of the invention to the operating station for movement beneath the unloading mouths of the counting machines, as illustrated in the sequence of figures from 4 to 9.

[0033] With reference to the accompanying tables of drawings, reference numeral (100) denotes the apparatus of the present invention in its entirety.

[0034] The apparatus (100) is realised to carry out the movement of containers, for example bottles, to be filled with a predetermined number of articles, such as, for example pharmaceutical articles, which have been counted by counting machines having one or more unloading mouths (M), with the unloading mouths (M) of the counting machines being arranged flanked to one another in an unloading area (Z) in order for the articles to be released and unloaded, once they have been counted into the predetermined number in order to be inserted in respective containers. The apparatus (100) of the invention is preferably and advantageously applied, in case where the unloading mouths (M) of the counting machines are arranged flanked to one another, and aligned along a common alignment direction, with each comprising a lower opening (M1) (as for example schematically illustrated in figure 12A) for releasing and unloading the counted articles in the predetermined number.

[0035] The apparatus (100) is in any case also utilisable in various situations and cases, in which the unloading mouths of the counting machines are not aligned along a common alignment direction, but may even be arranged offset to one another. The apparatus (100) comprises (see for example figures 2 and 3):

infeeding means (90), which are predisposed and configured for infeeding empty containers (E) to be filled with a predetermined number of articles;

a movement station (80) of containers, comprising a support plane (81) positioned at the unloading area (Z) and beneath the unloading mouths (M) of the counting machines;

positioning means (91) of the empty containers (E), to be filled with a predetermined number of articles, which positionin means are predisposed and configured for infeeding empty containers (E), infed by the infeeding means (90) in a first stop position (P1) wherein the empty containers (E) are each arranged on the support plane (81) by a side and in front of a respective unloading mouth (M) of the unloading mouths (M) of the counting machines.

[0036] The movement station (80) is made in such a way as to comprise a series of translation units (1, 2) of containers (for example, in the preferred embodiment illustrated in the figures of the drawings, they are two in number, and visible schematically in figure 2) for translating the containers onto the support plane (81), wherein the translation units (1, 2) are arranged and configured to be activatable independently of one another, in order each to translate respective containers onto the support plane (81) and with respect to a respective unloading mouth (M) of the counting machines.

[0037] In greater detail, each translation unit (1, 2) (illustrated in a preferred embodiment in figures from 4 to 9) of the series of translation units (1, 2) is configured and activatable to translate a respective empty container (E), which has been positioned in the first stop position (P1) by the positioning means (91), from the first stop position (P1) to a second stop position (P2) on the support plane (81) in which the empty container (E) is positioned and arranged with a respective opening beneath a respective unloading mouth (M) of the unloading mouths (M) of the counting machines in such a way as to be able to receive internally thereof articles unloaded from the unloading mouth (M) once they have been counted into the predetermined number (see for example figure 2, figure 3 or the sequence illustrated in figures 4 and 5, or the sequence illustrated in figures 12A and 12B). Further, each translation unit (1, 2), as soon as the empty container (E) has been filled with the predetermined number of articles unloaded from the respective unloading mouth (M), becoming thus a full container (T) containing the predetermined number of articles, is configured in such a way as to carry out successive activation cycles wherein in each activation cycle the translation unit is activatable (see for example the sequence illustrated in figures from 6 to 9, or figures 12C, 12D):

to translate the full container (T) from the second stop position (P2) into a third position (P3) on the support plane (81) on another side of the unloading mouth (M) with respect to the first stop position (P1), so as to make available, in this third position (P3), a full container (T) containing the predetermined number of articles for a successive transfer,

and, at the same time, translate a successive empty container (E1), positioned in the meantime in the first stop position (P1) by the positioning means (91), from the first stop position (P1) to the second stop position (P2) beneath the unloading mouth (M) freed from the presence of the preceding full container (T), in such a way as to be able to receive internally thereof articles unloaded from the unloading mouth (M) once they have been counted into the predetermined number, thus becoming a successive full container, to be transferred into the third position (P3) on the successive activation cycle of the translation unit (1, 2).

[0038] Therefore, owing to the fact that the apparatus, in the movement station located in the unloading area of the articles, is provided with a series of translation units, each activatable independently of one another, and each of which is predisposed and configured to translate respective containers, positioning them, time by time, beneath a respective single unloading mouth of the unloading mouths of the counting machines in order to permit filling thereof, it is possible to immediately free up the unloading mouths that have already carried out the count and unloading of the articles, positioning beneath them successive empty containers to be filled, without having to wait for all the remaining counting machines to have also completed the counting and unloading thereof, as occurs in the prior art, as evidenced in the foregoing.

[0039] In this way, with the apparatus of the invention it is possible to further increase productivity with respect to the prior art, substantially reducing the possible drawbacks that can occur in the filling of the containers caused by the irregularity of the supply of the articles to the counting machines by conveyors.

[0040] Other advantageous characteristics of the apparatus of the invention are described in the following.

[0041] Each translation unit (1, 2) of the series of translation units (1, 2) is realised in such a way as to comprise (see for example figures 4, 5, 6, 7, 8, 9):

a first pusher wall (10) and a second pusher wall (20), which are distanced from one another by a distance that is equal to or greater than the transversal dimensions of the base of the containers so as to be able to receive a respective container between them;

a first kinematism (11), with the first pusher wall (10) and the second pusher wall (20) being connected to the first kinematism (11);

a first activating lever (12) for the movement of the first kinematism (11) and thus of the first pusher wall (10) and the second pusher wall (20);

a first drive shaft (13) which is mounted rotatably about a first rotation axis (A1) with respect to a frame (U) (illustrated schematically by dotted lines) present in the movement station (80),

wherein the first activating lever (12) is connected to the first drive shaft (13) in such a way as to be

activatable in rotation with respect to the first rotation axis (A1) for the movement of the first kinematism (11) when the first drive shaft (13) is driven in rotation;
a second kinematism (21), connected to the first kinematism (11) and hinged to the frame (U) present in the movement station (80);
a second activating lever (22) for the movement of the second kinematism (21);
a second drive shaft (23) mounted rotatably about a second rotation axis (A2) with respect to the frame (U) present in the movement station (80),
wherein the second activating lever (22) is connected to the second drive shaft (23) in such a way as to be activatable in rotation with respect to the second rotation axis (A2) for the movement of the second kinematism (21), and thus also of the first kinematism (11) and of the first pusher wall (10) and the second pusher wall (20), when the second drive shaft (23) is driven in rotation.

[0042] The first kinematism (11) and the second kinematism (21) are configured and reciprocally arranged, and the first drive shaft (13) and the second drive shaft (23) are reciprocally arranged in respective first angular positions (z1, z2), with respect to the frame (U) present in the movement station (80), in such a way that (see for example figure 4):
the first pusher wall (10) and the second pusher wall (20) are positioned in a first raised position (S1) with respect to the support plane (81), with the first pusher wall (10) arranged upstream of the first stop position (P1) of the empty containers (E) with respect to the respective unloading mouth (M) of the unloading mouths (M) of the counting machines and with the second pusher wall (20) arranged between the first stop position (P1) and the second stop position (P2), to enable the positioning means (91) to position empty containers (E) in the first stop position (P1), between the first pusher wall (10) and the second pusher wall (20).

[0043] Further, and cyclically, for each activation cycle of the translation unit (1, 2):

when the first drive shaft (13) is driven in rotation about the first rotation axis (A1), in a first rotation direction (R1) so as to be brought into a respective second angular position (z3), with the second drive shaft (23) being maintained stationary in the respective first angular position (z2) (see figure 5 or figure 9), the first activating lever (12) moves the first kinematism (11) in order to translate the first pusher wall (10) and the second pusher wall (20) in a first translation direction (D1) with respect to the support plane (81) in such a way that the first pusher wall (10) translates an empty container (E) from the first stop position (P1) to the second stop position (P2) and the second pusher wall (20) translates a full container (T), if present in the second stop position (P2) and filled with a predetermined number of articles unloaded from the respective unloading mouth (M), from the second stop position (P2) to the third position (P3);
and, thereafter:
when the second drive shaft (23) is driven in rotation, about the second rotation axis (A2), in a respective first rotation direction (R3) so as to be brought into a respective second angular position (z4), with the first drive shaft (13) being maintained stationary in the respective second angular position (z3) (see figure 6), the second activating lever (22) moves the second kinematism (21) and therefore also the first kinematism (11), the first pusher wall (10) and the second pusher wall (20), in order to move the first pusher wall (10) and the second pusher wall (20) into a second lowered position (S2) with respect to the support plane (81);
when the first drive shaft (13) is driven in rotation about the first rotation axis (A1), in a second rotation direction (R2) in order to be returned into the respective first angular position (z1), with the second drive shaft (23) being maintained stationary in the respective second angular position (z4) (see figure 7), the first activating lever (12) moves the first kinematism (11) in order to translate the first pusher wall (10) and the second pusher wall (20) in a second translation direction (D2), opposite the first translation direction (D1), with the first pusher wall (10) and the second pusher wall (20) remaining beneath the support plane (81),
and when the second drive shaft (23) is driven in rotation about the second rotation axis (A2), in a respective second rotation direction (R4) in order to be returned into the respective first angular position (z2), with the first drive shaft (13) being maintained stationary in the respective first angular position (z1) (see figure 8), the second activating lever (22) moves the second kinematism (21) and therefore also the first kinematism (11), the first pusher wall (10) and the second pusher wall (20), to raise the first pusher wall (10) and the second pusher wall (20) and to reposition them in the first raised position (S1) with respect to the support plane (81), with the first pusher wall (10) arranged upstream of the first stop position (P1) of the empty containers (E) with respect to the respective unloading mouth (M) of the unloading mouths (M) of the counting machines and the second pusher wall (20) arranged between the first stop position (P1) and the second stop position (P2), so that the positioning means (91) can position successive empty containers (E1) in the first stop position (P1), between the first pusher wall (10) and the second pusher wall (20).

[0044] Therefore, for each activation cycle, the steps of which are illustrated in the sequence of figures from 4 (start of cycle) to 8 (end of cycle), with figure 9 representing the start of the following cycle, each translation unit (1,

2) is able to transfer a container from the second stop position (P2) to the third position (P3), as soon as the empty container (E) has been filled with the predetermined number of articles unloaded from the respective unloading mouth, therefore becoming a full container, and, at the same time, transferring an empty container from the first stop position (P1) to the second stop position (P2) beneath the unloading mouth, for the successive filling thereof.

[0045] In a further preferred aspect, the apparatus (100) can be made in such a way that each translation unit (1, 2) of the series of translation units (1, 2) comprises:

a third kinematism (31), which is connected to the second kinematism (21) and hinged to the frame (U) present in the movement station (80);
abutment elements (32), which are connected to the third kinematism (31) and which are arranged and configured to be able to abut the outer walls of a container.

[0046] In particular, the third kinematism (31) is configured and arranged with respect to the second kinematism (21) and to the frame (U) of the movement station (80) in such a way that:

with the second drive shaft (23) arranged in the respective first angular position (z2), with respect to the frame (U) present in the movement station (80) (see figures 4 and 5), the third kinematism (31) is maintained by the second kinematism (21) in a configuration wherein the third kinematism (31) positions, and maintains, the abutment elements (32) in a first lowered configuration (O1) beneath the second stop position (P2), to which an empty container (E) to be filled with a respective predetermined number of articles unloaded from a respective unloading mouth (M) of the counting machines is to be transferred,
when the second drive shaft (23) is activated in rotation, about the second rotation axis (A2), in a respective first rotation direction (R3) so as to be brought into the respective second angular position (z4) (see figures 6 and 7), the second kinematism (21) moves the third kinematism (31) in such a way that the third kinematism (31) translates the abutment elements (32) vertically upwards, positioning the abutment elements (32) in a second raised configuration (O2) wherein the abutment elements (32) abut the lateral wall of a container positioned in the second stop position (P2) and maintain the container stationary during the filling thereof with articles unloaded by a respective unloading mouth (M),
and when the second drive shaft (23) is activated in rotation, about the second rotation axis (A2), in the respective second rotation direction (R4) in order to be returned into the respective first angular position (z2) (see figures 8 and 9), the second kinematism (21) moves the third kinematism (31) in such a way that the third kinematism (31) translates the abutment elements (32) vertically downwards and newly positions the abutment elements (32) in the first lowered configuration (O1), thus enabling translation of the full container (T) from the second stop position (P2) to the third position (P3).

[0047] In a further preferred aspect, to enable the movement of the first pusher wall (10) and the second pusher wall (20) of each translation unit (1, 2), the support plane (81) of the movement station (80) comprises, for each translation unit (1, 2), a respective groove (82) (see for example figure 2).

[0048] Further, the support plane (81) of the movement station (80) further comprises, for each translation unit (1, 2), respective through-slots (not illustrated in detail) for enabling passage of the abutment elements (32) when translated from the lowered configuration (O1) to the raised configuration (O2), and vice versa.

[0049] According to the preferred but not exclusive embodiment illustrated in the appended figures, the first kinematism (11), the second kinematism (12) and the third kinematism (31) of each translation unit (1, 2) can be realised as described in the following, as is illustrated in detail in figures from 4 to 9.

[0050] The first kinematism (11) comprises:

a first lever (111), on which the first pusher wall (10) and the second pusher wall (20) are mounted;
a second lever (112), hinged at a respective first end thereof to the first lever (111),
a third lever (113), hinged at a respective first end thereof to the first lever (111) and arranged parallel to the second lever (112),
a fourth lever (114), hinged, at a respective first end thereof, to the first activating lever (12) and, at a respective second end thereof, to the second lever (112).

[0051] The second kinematism (21) in turn comprises:

a fifth lever (115), hinged, at a respective first end thereof, to the second activating lever (22) and, at a respective second end thereof, to the second lever (112) of the first kinematism (11);
a first rocker arm (25) having an L-shape, hinged to a first rocker axis (250) concentric to the first rotation axis (A1) of the first drive shaft (13) and having a first lever arm (251), hinged at the hinge point between the second lever (112) of the first kinematism (11) and the fifth lever (115) of the second kinematism (21), and a second lever arm (252) hinged to a first end of a sixth lever (116) of the second kinematism (21);
a second rocker arm (26) having an L-shape, hinged to the frame (U) present in the movement station (80)

in a respective hinge axis (x), having a first lever arm (261) hinged to a second end of the sixth lever (116) of the second kinematism (21), and a second lever arm (262) hinged to a second end of the third lever (113) of the first kinematism (11).

[0052] The levers making up the first kinematism (11) and the levers making up the second kinematism (21), as described above and listed, are configured, dimensioned and reciprocally arranged, as is illustrated in figures from 4 to 9, in such a way as to enable the positioning of the first kinematism (11) and of the second kinematism (12), with the first drive shaft (13) arranged in the respective first angular position (z1) and with the second drive shaft (23) arranged in the respective second angular position (z2), in such a way that the first pusher wall (10) and the second pusher wall (20) are arranged and positioned in the first raised position (S1), as previously described and as illustrated in figure 4.

[0053] The levers making up the first kinematism (11) and the levers making up the second kinematism (21), as described above and listed, are further configured, dimensioned and reciprocally arranged in such a way as to enable, following the cyclical driving in rotation of the first drive shaft (13) and the second drive shaft (23), with respect to the respective rotation axes (A1) and (A2), between the respective first (z1, z2) and second (z3, z4) angular positions, the movement of the first kinematism (11) and the second kinematism (21) for the movement of the first pusher wall (10) and the second pusher wall (20) as described in the foregoing, and as is illustrated in figures from 5 to 9, for the translation of the empty containers from the first stop position (P1) to the second stop position (P2) and the full containers (T) from the second stop position (P2) to the third position (P3).

[0054] The third kinematism (31) in turn comprises:

a seventh lever (117), centrally hinged to the frame (U) present in the movement station (80) with a respective hinge axis (w),
an eighth lever (118), hinged, at a respective first side, to a first end of the seventh lever (117), and, at a respective second side, at the hinge point between the second lever arm (262) of the second rocker arm (26) having an L-shape and the second end of the third lever (113) of the first kinematism (11);
a ninth lever (119), hinged, at a respective first side, to a second end of the seventh lever (117), and, at a respective second side, to a tenth lever (120) which is arranged slidably in vertical guides (121) and which supports a support member (320) of the abutting elements (32).

[0055] The levers making up the third kinematism (31), as described above and listed, are further configured, dimensioned and reciprocally arranged in such a way as to enable, following the cyclical driving in rotation of the second drive shaft (23), with respect to the respective rotation axis (A2), between the respective first (z2) and second (z4) angular position, the movement of the third kinematism (31) for the movement of the abutting elements (32) as previously mentioned, from the respective first lowered configuration (O1) to the second raised configuration (O2), and vice versa, as is illustrated in figures from 5 to 9.

[0056] According to other preferred and advantageous aspects, the apparatus (100) can be made in such a way as to comprise, for each translation unit (1, 2) of the movement station (80), a first loading cell (51) arranged beneath the first stop position (P1) in which the empty containers (E) are positioned, a second loading cell (52) arranged beneath the second stop position (P2) in which the empty containers (E) to be filled are positioned with a predetermined number of articles unloaded by a respective unloading mouth (M) of the counting machines (see for example figure 10).

[0057] In particular, the first loading cell (51) is vertically translatable between a respective lowered station (PA) and a respective raised station (PS) with respect to the support plane (81), wherein the first loading cell (51) is positioned beneath, and is in contact with, each empty container (E) which, time by time, is positioned by the positioning means (91) in the first stop position (P1), so as to detect the weight of the empty containers.

[0058] In turn, the second loading cell (52) is vertically translatable between a respective lowered station (TA) and a respective raised station (PS) with respect to the support plane (81), wherein the second loading cell (52) is positioned beneath, and in contact with, each full container (T), so as to detect the weight of the full containers.

[0059] In this way, having available the weight of the full containers (i.e. gross weight) and the weight of the empty containers (i.e. the tare) the net weight can be calculated, i.e. the weight of the articles unloaded internally of the containers and a verification thus made of whether the number corresponds effectively to the predetermined number of articles which were to be unloaded and inserted into each container.

[0060] To achieve the vertical translation of the two loading cells independent actuators or further kinematisms connected to the first and/or second kinematism of each translation units can be provided.

[0061] Alternatively, in a further possible embodiment (see figures 11A and 11B), the apparatus (100) can comprise, for each translation unit (1, 2) of the movement station (80), a single loading cell (61) positioned beneath the second stop position (P2) in which the empty containers (E) to be filled are positioned with a predetermined number of articles unloaded by a respective unloading mouth (M) of the counting machines to become full containers (T).

[0062] The single loading cell (61) is translatable vertically from a respective first lowered station (VA) to a respective second raised station (VS) each time an empty container (E) is positioned in the second stop

position (P2) in order to be positioned in contact with the empty container (E) so as to detect the weight of the empty container (E), and then to detect the weight of the container when it has received internally thereof a predetermined number of unloaded articles from a respective unloading mouth (M), becoming a full container (T), so as to detect the weight of the full container (T).

[0063] In this case too, to achieve the vertical translation of the single loading cell, independent actuators can be provided, or further kinematisms connected to the first and/or second kinematism of each translation unit can be provided.

[0064] The infeeding means (90), as for example illustrated in figure 3, can comprise a conveying line (92) having a transport branch for the transport of the empty containers (E) in an advancement direction (90L) which extends towards an edge of the support plane (81) of the infeeding station (80).

[0065] The positioning means (91) of the empty containers (E) in the first stop position (P1) can be made in such a way as to comprise a screw conveyor (93), arranged consecutively to the conveying line (92), having a series of seats, for receiving internally thereof the empty containers (E) infed from the conveying line (92), distanced from one another by a pitch corresponding to the distance existing between the unloading mouths (M) of the counting machines in such a way as to position single empty containers (E) on the support plane (81) in front of and aligned with a respective unloading mouth (M).

[0066] The apparatus (100) can also comprise a transfer line (95) (see figure 3 once more) arranged on the opposite side, and parallel, to the conveying line (92), with respect to the support plane (81), having a transport branch for the transport of the full containers (T) translated into the third position (P3) towards successive work stations.

Claims

1. An apparatus (100) for moving containers to be filled with a predetermined number of articles, in particular pharmaceutical articles, counted by counting machines having one or more unloading mouths (M) for unloading the articles once counted into a predetermined number which is to be inserted in respective containers, wherein the unloading mouths (M) of the counting machines are arranged flanked to one another in an unloading area (Z) and comprise a lower opening (M1) for releasing and unloading the counted articles in the predetermined number, the apparatus (100) being **characterised in that** it comprises:

   infeeding means (90), for infeeding empty containers (E) to be filled with a predetermined number of articles;
   a movement station (80) of containers, comprising a support plane (81) positioned at the unloading area (Z) and beneath the unloading mouths (M) of the counting machines;
   positioning means (91) of the empty containers to be filled with a predetermined number of articles, in order to position the empty containers (E) infed by the infeeding means (90) in a first stop position (P1) wherein the empty containers (E) are each arranged on the support plane (81) by a side and in front of a respective unloading mouth (M) of a respective unloading mouth (M) of the counting machines;
   wherein the movement station (80) comprises a series of translation units (1, 2) of containers for translating the containers onto the support plane (81),
   wherein the translation units (1, 2) are arranged and configured to be activatable independently of one another, in order each to translate respective containers onto the support plane (81) and with respect to a respective unloading mouth (M) of the counting machines,
   wherein each translation unit (1, 2) of the series of translation units (1, 2) is configured and activatable to translate a respective empty container (E), which has been positioned in the first stop position (P1) by the positioning means (91), from the first stop position (P1) to a second stop position (P2) on the support plane (81) in which the empty container (E) is positioned and arranged with a respective opening beneath a respective unloading mouth (M) of the unloading mouths (M) of the counting machines in such a way as to be able to receive internally thereof articles unloaded from the unloading mouth (M) once they have been counted into the predetermined number;
   wherein each translation unit (1, 2), as soon as the empty container (E) has been filled with the predetermined number of articles unloaded from the respective unloading mouth (M), becoming thus a full container (T) containing the predetermined number of articles, is configured in such a way as to carry out successive activation cycles wherein in each activation cycle the translation unit is activatable to:

      translate the full container (T) from the second stop position (P2) into a third position (P3) on the support plane (81) on another side of the unloading mouth (M) with respect to the first stop position (P1), so as to make available, in this third position (P3), a full container (T) containing the predetermined number of articles for a successive transfer, and, at the same time, translate a successive empty container (E1), positioned in the meantime in the first stop position (P1) by

the positioning means (91), from the first stop position (P1) to the second stop position (P2) beneath the unloading mouth (M) freed from the presence of the preceding full container (T), in such a way as to be able to receive internally thereof articles unloaded from the unloading mouth (M) once they have been counted into the predetermined number thus becoming a successive full container to be transferred into the third position (P3) on the successive activation cycle of the translation unit (1, 2).

2. The apparatus (100) as claimed in claim 1, wherein each translation unit (1, 2) of the series of translation units (1, 2) comprises:

a first pusher wall (10) and a second pusher wall (20), distanced from one another by a distance that is equal to or greater than the transversal dimensions of the base of the containers so as to be able to receive a respective container between them;
a first kinematism (11), wherein the first pusher wall (10) and a second pusher wall (20) are connected to the first kinematism (11);
a first activating lever (12) for the movement of the first kinematism (11) and thus of the first pusher wall (10) and the second pusher wall (20);
a first drive shaft (13) mounted rotatably about a first rotation axis (A1) with respect to a frame (U) present in the movement station (80),
wherein the first activating lever (12) is connected to the first drive shaft (13) in such a way as to be activatable in rotation with respect to the first rotation axis (A1) for the movement of the first kinematism (11) when the first drive shaft (13) is driven in rotation,
a second kinematism (21), connected to the first kinematism (11) and hinged to the frame (U) present in the movement station (80);
a second activating lever (22) for the movement of the second kinematism (21);
a second drive shaft (23) mounted rotatably about a second rotation axis (A2) with respect to the frame (U) present in the movement station (80),
wherein the second activating lever (22) is connected to the second drive shaft (23) in such a way as to be activatable in rotation with respect to the second rotation axis (A2) for the movement of the second kinematism (21), and thus of the first kinematism (11) and of the first pusher wall (10) and the second pusher wall (20), when the second drive shaft (23) is driven in rotation,
wherein the first kinematism (11) and the second kinematism (21) are configured and reciprocally arranged, and wherein the first drive shaft (13) and the second drive shaft (23) are reciprocally arranged, in respective first angular positions (z1, z2), with respect to the frame (U) present in the movement station (80):

in such a way that the first pusher wall (10) and the second pusher wall (20) are positioned in a first raised position (S1) with respect to the support plane (81), with the first pusher wall (10) arranged upstream of the first stop position (P1) of the empty containers (E) with respect to the respective unloading mouth (M) of the unloading mouths (M) of the counting machines and with the second pusher wall (20) arranged between the first stop position (P1) and the second stop position (P2), to enable the positioning means (91) to position empty containers (E) in the first stop position (P1), between the first pusher wall (10) and the second pusher wall (20),
and in such a way that, cyclically, for each activation cycle:
when the first drive shaft (13) is driven in rotation about the first rotation axis (A1), in a first rotation direction (R1) so as to be brought into a respective second angular position (z3), with the second drive shaft (23) being maintained stationary in the respective first angular position (z2), the first activating lever (12) moves the first kinematism (11) in order to translate the first pusher wall (10) and the second pusher wall (20) in a first translation direction (D1) with respect to the support plane (81) in such a way that the first pusher wall (10) translates an empty container (E) from the first stop position (P1) to the second stop position (P2) and the second pusher wall (20) translates a full container (T), if present in the second stop position (P2) and filled with a predetermined number of articles unloaded from the respective unloading mouth (M), from the second stop position (P2) to the third position (P3);
and, thereafter:

when the second drive shaft (23) is driven in rotation, about the second rotation axis (A2), in a respective first rotation direction (R3) so as to be brought into a respective second angular position (z4), with the first drive shaft (13) being maintained stationary in the respective second angular position (z3), the second activating lever (22) moves the second kinematism (21) and

therefore also the first kinematism (11), the first pusher wall (10) and the second pusher wall (20), in order to move the first pusher wall (10) and the second pusher wall (20) into a second lowered position (S2) with respect to the support plane (81);
when the first drive shaft (13) is driven in rotation about the first rotation axis (A1), in a second rotation direction (R2) in order to be returned into the respective first angular position (z1), with the second drive shaft (23) being maintained stationary in the respective second angular position (z4), the first activating lever (12) moves the first kinematism (11) in order to translate the first pusher wall (10) and the second pusher wall (20) into a second translation direction (D2), opposite the first translation direction (D1), with the first pusher wall (10) and the second pusher wall (20) remaining beneath the support plane (81),
and when the second drive shaft (23) is driven in rotation about the second rotation axis (A2), in a respective second rotation direction (R4) in order to be returned into the respective first angular position (z2), with the first drive shaft (13) being maintained stationary in the respective first angular position (z1), the second activating lever (22) moves the second kinematism (21) and therefore also the first kinematism (11), the first pusher wall (10) and the second pusher wall (20), to raise the first pusher wall (10) and the second pusher wall (20) and to reposition them in the first raised position (S1) with respect to the support plane (81), with the first pusher wall (10) arranged upstream of the first stop position (P1) of the empty containers (E) with respect to the respective unloading mouth (M) of the unloading mouths (M) of the counting machines and the second pusher wall (20) arranged between the first stop position (P1) and the second stop position (P2), so that the positioning means (91) can position successive empty containers (E1) in the first stop position (P1), between the first pusher wall (10) and the second pusher wall (20).

3. The apparatus (100) as claimed in claim 2, wherein each translation unit (1, 2) of the series of translation units (1, 2) comprises:

a third kinematism (31), connected to the second kinematism (21) and hinged to the frame (U) present in the movement station (80);
abutment elements (32), connected to the third kinematism (31) and configured to be able to abut the outer walls of a container,
wherein the third kinematism (31) is configured and arranged with respect to the second kinematism (21) and to the frame (U) of the movement station (80) in such a way that:

with the second drive shaft (23) arranged in the respective first angular position (z2), with respect to the frame (U) present in the movement station (80), the third kinematism (31) is maintained by the second kinematism (21) in a configuration wherein the third kinematism (31) positions, and maintains, the abutment elements (32) in a first lowered configuration (O1) beneath the second stop position (P2), to which an empty container (E) to be filled with a respective predetermined number of articles unloaded from a respective unloading mouth (M) of the counting machines is to be transferred,
when the second drive shaft (23) is activated in rotation, about the second rotation axis (A2), in the respective first rotation direction (R3) so as to be brought into the respective second angular position (z4), the second kinematism (21) moves the third kinematism (31) in such a way that the third kinematism (31) translates the abutment elements (32) vertically upwards positioning the abutment elements (32) in a second raised configuration (O2) wherein the abutment elements (32) abut the lateral wall of a container positioned in the second stop position (P2) and maintain the container stationary during the filling thereof with articles unloaded by a respective unloading mouth (M),
and when the second drive shaft (23) is activated in rotation, about the second rotation axis (A2), in the respective second rotation direction (R4) in order to be returned into the respective first angular position (z2), the second kinematism (21) moves the third kinematism (31) in such a way that the third kinematism (31) translates the abutment elements (32) vertically downwards and newly positions the abutment elements (32) in the first lowered configuration (O1), thus enabling translation of the full container (T) from the second stop position

(P2) to the third position (P3).

4. The apparatus (100) as claimed in claim 3, wherein the support plane (81) of the movement station (80) comprises, for each translation unit (1, 2), a respective groove (82) for enabling the movement of the first pusher wall (10) and the second pusher wall (20).

5. The apparatus (100) as claimed in claim 3, wherein the support plane (81) of the movement station (80) comprises, for each translation unit (1, 2), respective slots for enabling passage of the abutment elements (32) when translated from the lowered configuration (O1) to the raised configuration (O2), and vice versa.

6. The apparatus (100) as claimed in claim 3, wherein each translation unit (1, 2) is made in such a way that:

the first kinematism (11) comprises:

a first lever (111), on which the first pusher wall (10) and the second pusher wall (20) are mounted;
a second lever (112), hinged at a respective first end thereof to the first lever (111),
a third lever (113), hinged at a respective first end thereof to the first lever (111) and arranged parallel to the second lever (112),
a fourth lever (114), hinged, at a respective first end thereof, to the first activating lever (12) and, at a respective second end thereof, to the second lever (112);

the second kinematism (21) comprises:

a fifth lever (115), hinged, at a respective first end thereof, to the second activating lever (22) and, at a respective second end thereof, to the second lever (112) of the first kinematism (11);
a first rocker arm (25) having an L-shape, hinged to a first rocker axis (250) concentric to the first rotation axis (A1) of the first drive shaft (13) and having a first lever arm (251), hinged at the hinge point between the second lever (112) of the first kinematism (11) and the fifth lever (115) of the second kinematism (21), and a second lever arm (252) hinged to a first end of a sixth lever (116) of the second kinematism (21);
a second rocker arm (26) having an L-shape, hinged to the frame (U) present in the movement station (80), and having a first lever arm (261) hinged to a second end of the sixth lever (116) of the second kinematism (21), and a second lever arm (262) hinged to a second end of the third lever (113) of the first kinematism (11).

7. The apparatus (100) as claimed in claim 6, wherein each translation unit (1, 2) is made in such a way that: the third kinematism (31) comprises:

a seventh lever (117), centrally hinged to the frame (U) present in the movement station (80), an eighth lever (118), hinged, at a respective first side, to a first end of the seventh lever (117), and, at a respective second side, at the hinge point between the second lever arm (262) of the second rocker arm (26) having an L-shape and the second end of the third lever (113) of the first kinematism (11);
a ninth lever (119), hinged, at a respective first side, to a second end of the seventh lever (117), and, at a respective second side, to a tenth lever (120) which is arranged slidably in vertical guides (121) and which supports a support member (320) of the abutting elements (32).

8. The apparatus (100) as claimed in any one of the preceding claims, comprising, for each translation unit (1, 2) of the movement station (80):

a first loading cell (51) arranged beneath the first stop position (P1) in which the empty containers (E) are positioned, vertically translatable between a respective lowered station (PA) and a respective raised station (PS) with respect to the support plane (81), wherein the first loading cell (51) is positioned beneath, and is in contact with, each empty container (E) which, time by time, is positioned by the positioning means (91) in the first stop position (P1), so as to detect the weight of the empty containers,
a second loading cell (52) arranged beneath the second stop position (P2) in which the empty containers (E) to be filled are positioned with a predetermined number of articles unloaded by a respective unloading mouth (M) of the counting machines, vertically translatable between a respective lowered station (TA) and a respective raised station (PS) with respect to the support plane (81), wherein the second loading cell (52) is positioned beneath, and in contact with, each full container (T), so as to detect the weight of the full containers.

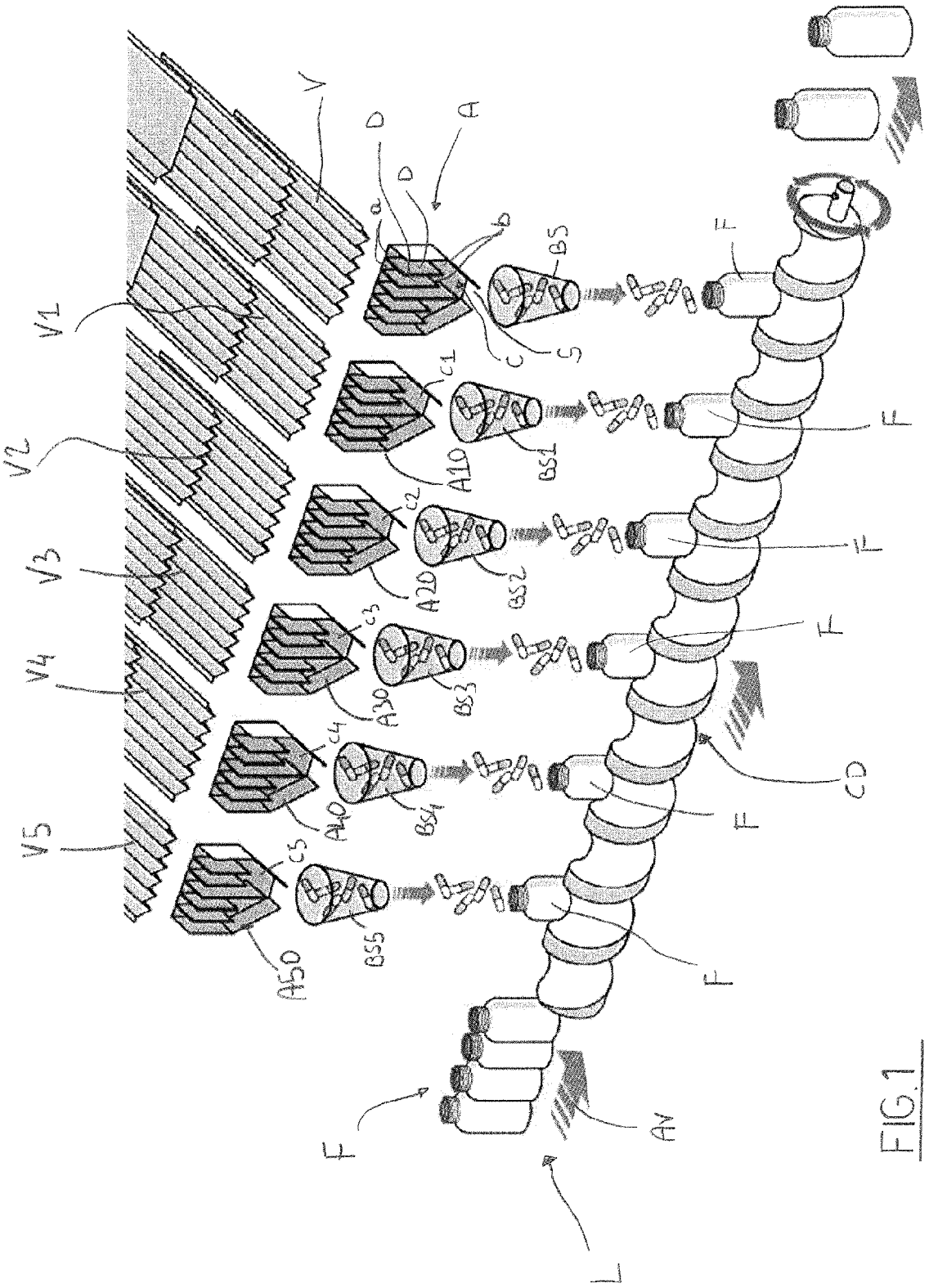
9. The apparatus (100) as claimed in any one of claims from 1 to 7, comprising, for each translation unit (1, 2) of the movement station (80):

a single loading cell (61), positioned beneath the second stop position (P2) in which the empty containers (E) to be filled are positioned with a predetermined number of articles unloaded by a respective unloading mouth (M) of the counting machines in order to become full containers (T),

wherein the single loading cell (61) is translatable vertically from a respective first lowered station (VA) to a respective second raised station (VS) each time an empty container (E) is positioned in the second stop position (P2) in order to be positioned in contact with the empty container (E) so as to detect the weight of the empty container (E), and
then to detect the weight of the container when it has received internally thereof a predetermined number of unloaded articles from a respective unloading mouth (M), becoming a full container (T), so as to detect the weight of the full container (T).

10. The apparatus (100) as claimed in any one of claims from 1 to 9, wherein the infeeding means (90) comprise a conveying line (92) having a transport branch for transport of the empty containers (E) according to an advancement direction (90L) which extends towards an edge of the support plane (81) of the movement station (80) and wherein the positioning means (91) comprise a screw conveyor (93), arranged consecutively to the conveying line (92), having a series of seats, for receiving internally thereof the empty containers (E) infed from the conveying line (92), distanced from one another by a pitch corresponding to the distance existing between the unloading mouths (M) of the counting machines in such a way as to position single empty containers (E) on the support plane (81) in front of and aligned with a respective unloading mouth (M).

11. The apparatus (100) as claimed in claim 10, comprising a transfer line (95) arranged on the opposite side, and parallel, to the conveying line (92), with respect to the support plane (81), having a transport branch for the transport of the full containers (T) translated into the third position (P3) towards successive work stations.



PRIOR ART

FIG.1

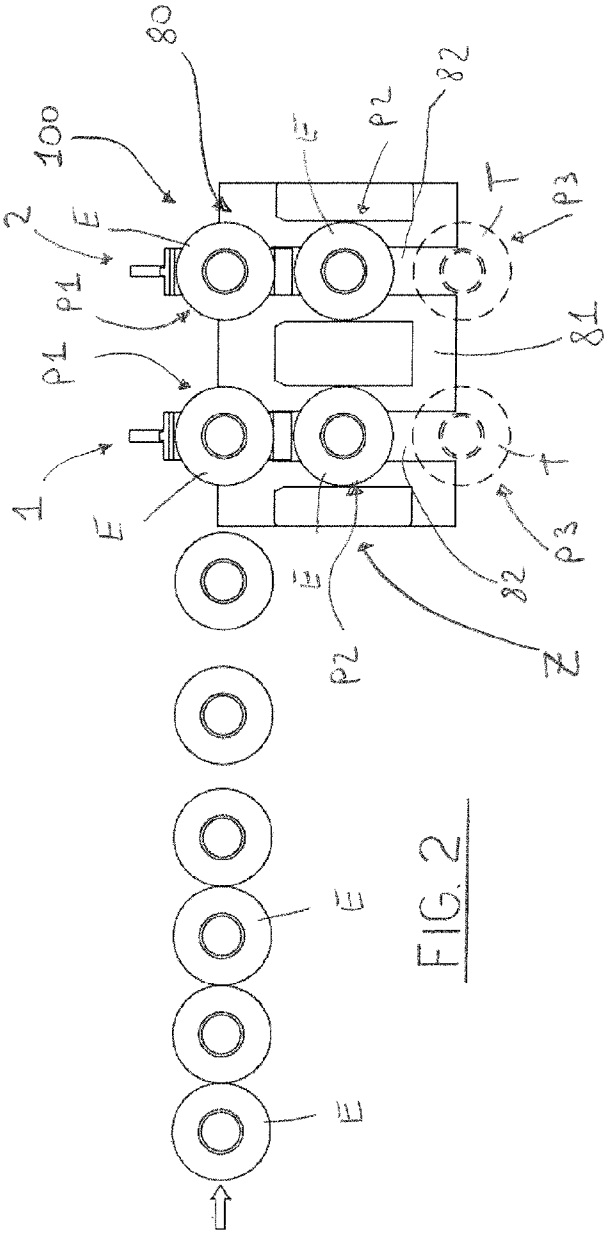

80
100
2
E
P1
P1
1
E
E
P2
82
T
P3
81
P2
Z
82
P3
T
E
E
E
E

FIG. 2

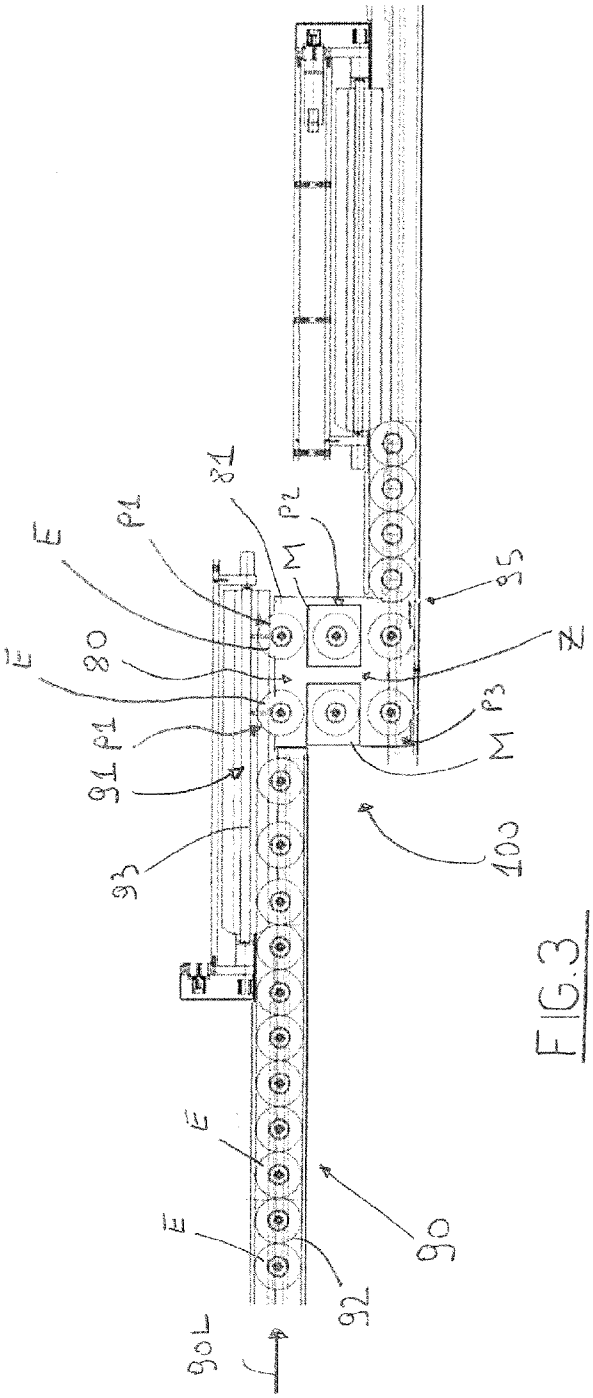

E
P1
81
P2
M
95
E
80
Z
91
P1
M
P3
93
100
E
E
90
92
90L

FIG.3

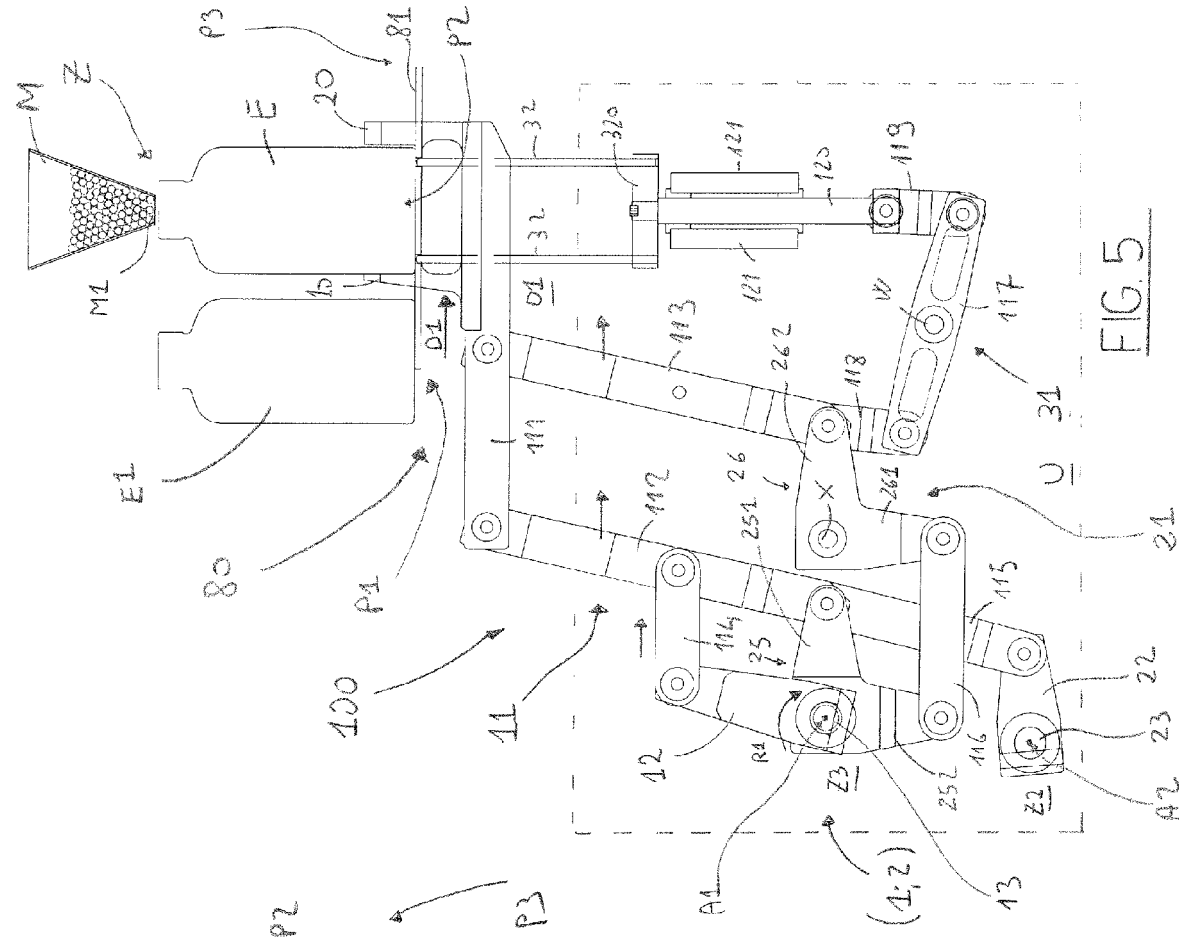

P3
81
P2
M
Z
E
20
32
320
121
123
119
M1
4b
D1
113
262
118
117
W
E1
80
P1
111
26
X
261
U
31
112
251
21
100
11
114
25
115
22
12
R4
Z3
116
252
23
Z2
A2
A1
(1,2)
13

FIG.5

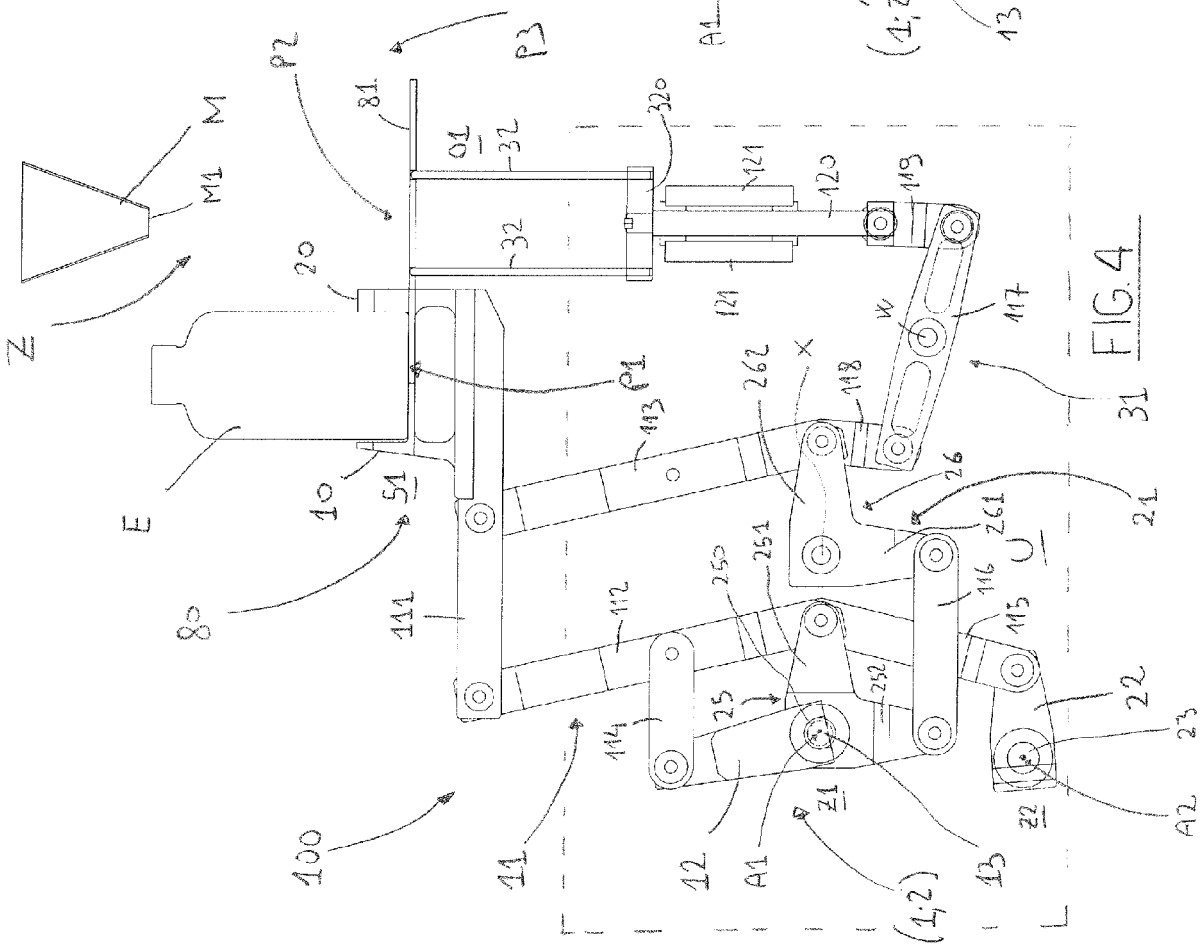

P2
81
P3
M
M1
Z
20
32
320
121
120
119
E
D1
113
262
X
118
117
W
31
10
51
26
21
261
U
80
111
112
250
251
116
115
252
25
22
23
114
Z1
A2
100
11
12
A1
13
(1,2)

FIG.4

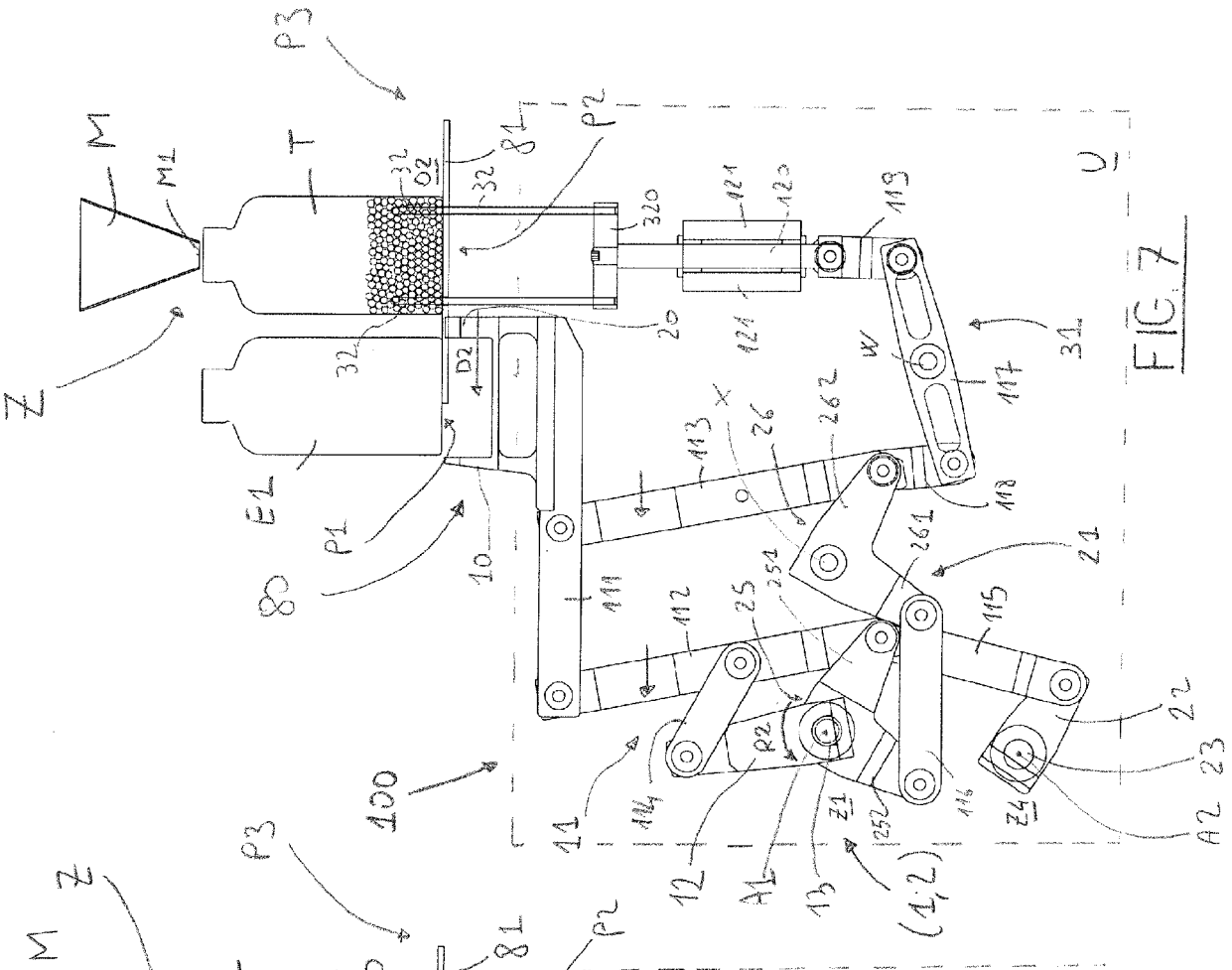


FIG. 7

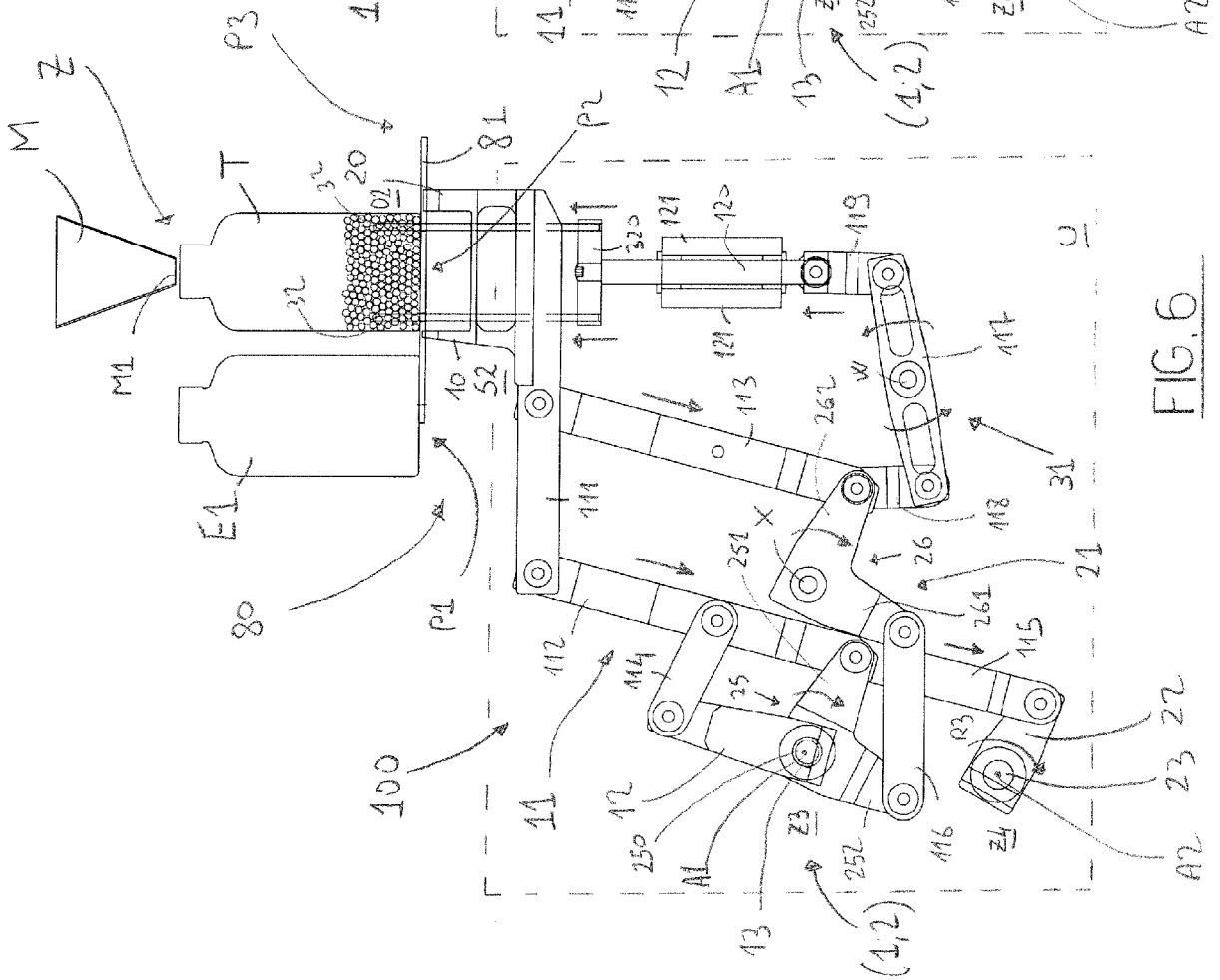


FIG. 6

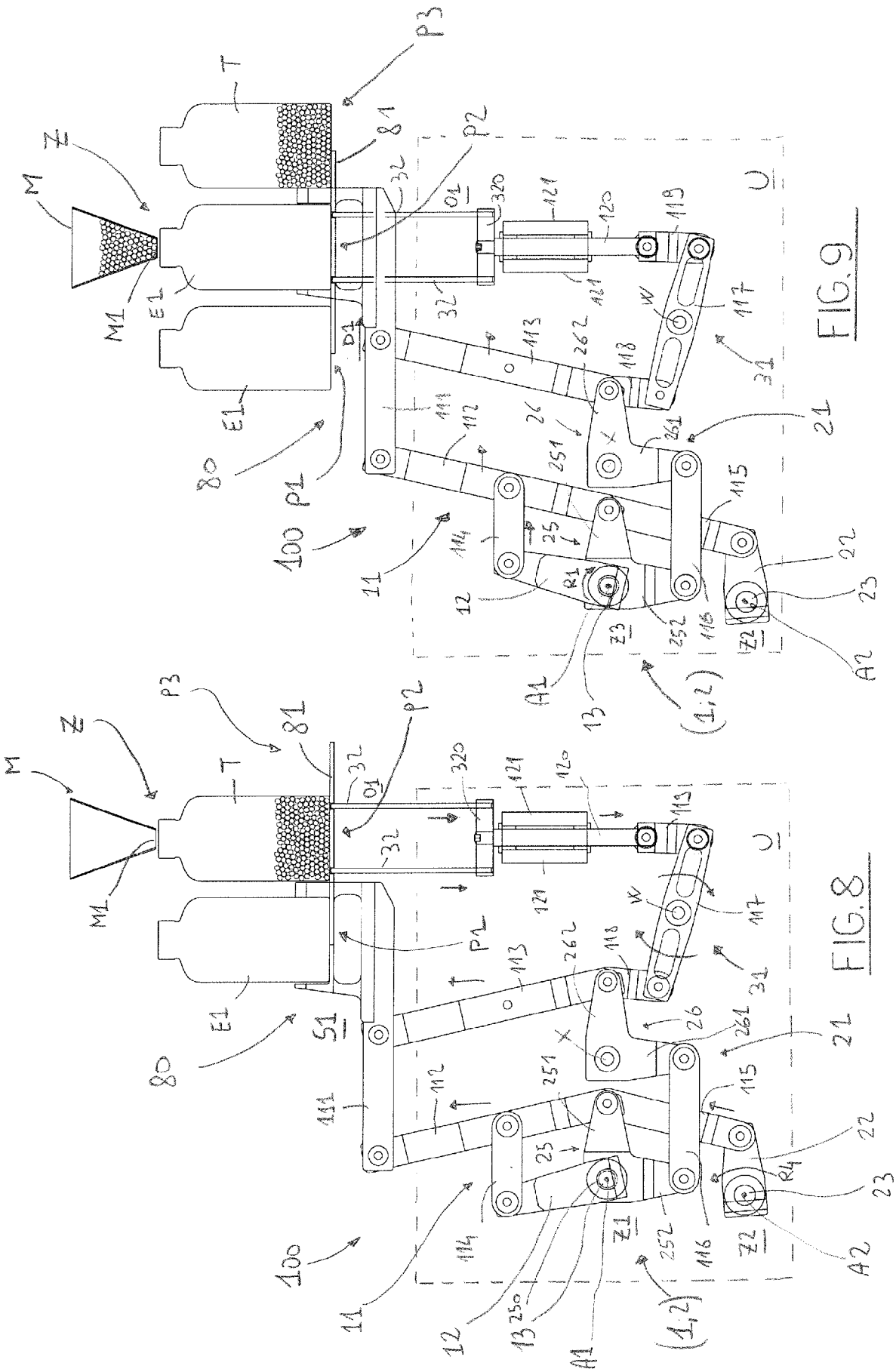

P3
T
81
P2
M
Z
32
01
320
121
120
119
U
M1
E1
D1
32
W
117
113
262
118
31
80
E1
112
26
21
P1
261
251
115
100
11
114
25
22
12
R1
23
252
116
Z3
Z2
A2
A1
13
(1,2)

FIG.9

M
Z
P3
81
P2
T
32
01
320
121
120
113
U
M1
32
W
117
P1
113
262
118
31
E1
80
51
26
21
261
251
115
112
111
25
22
R4
23
100
114
Z1
252
116
Z2
A2
11
12
13
250
A1
(1,2)

FIG.8

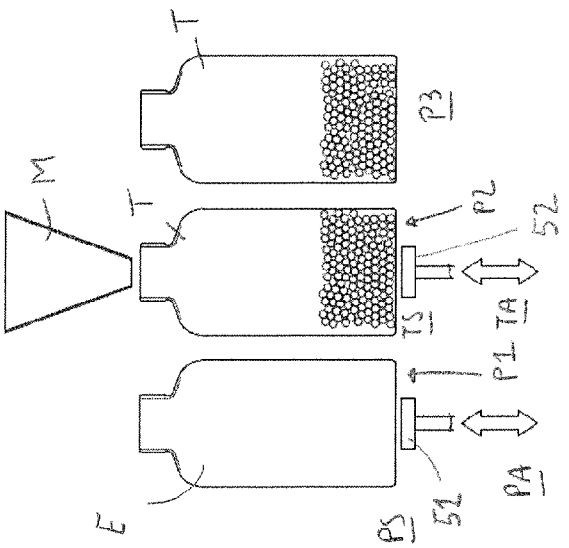


FIG.10

FIG.11A

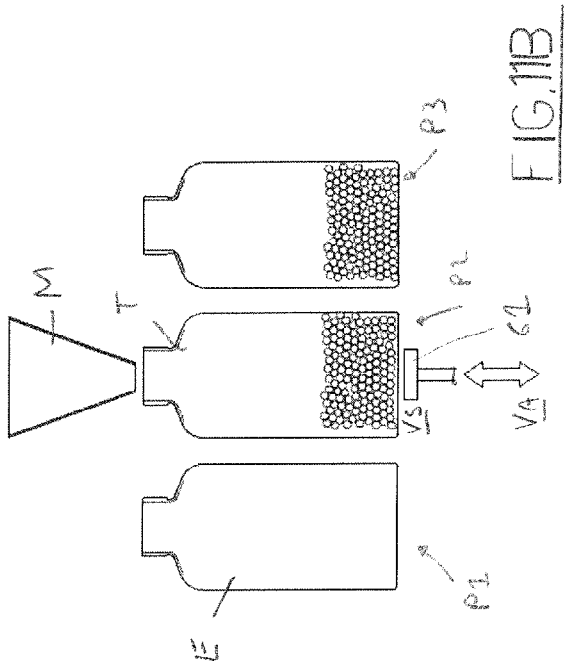


FIG.11B

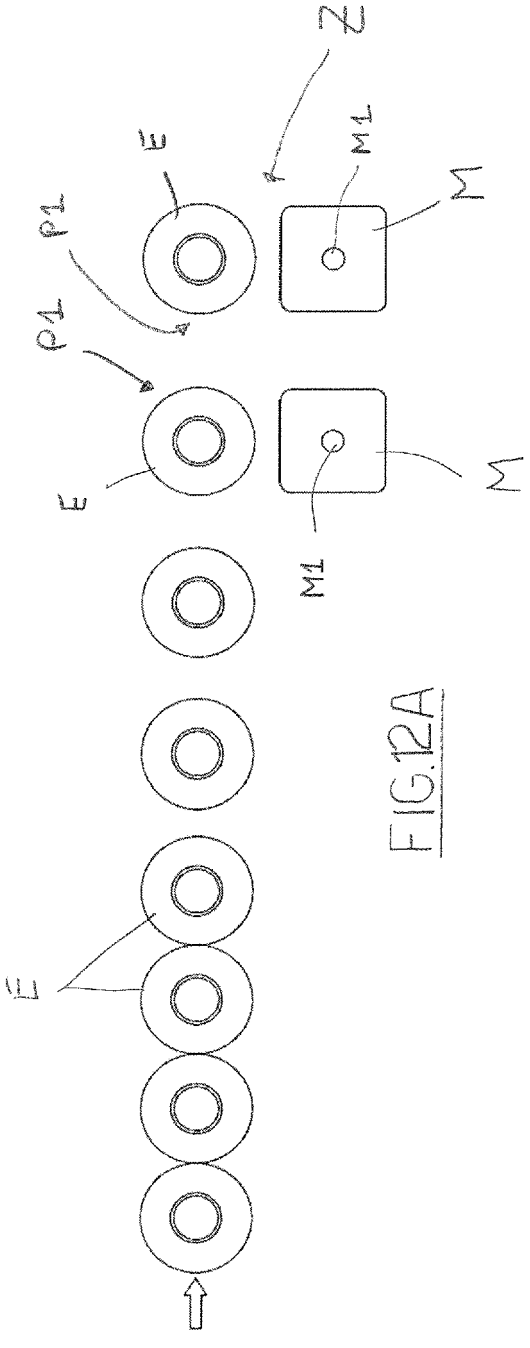


FIG.12A

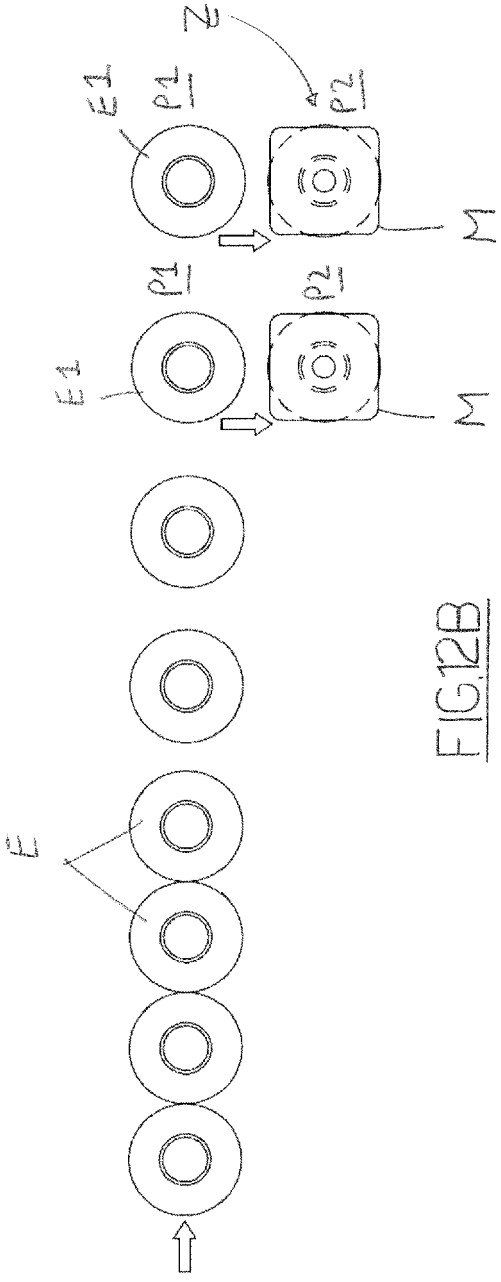


FIG.12B

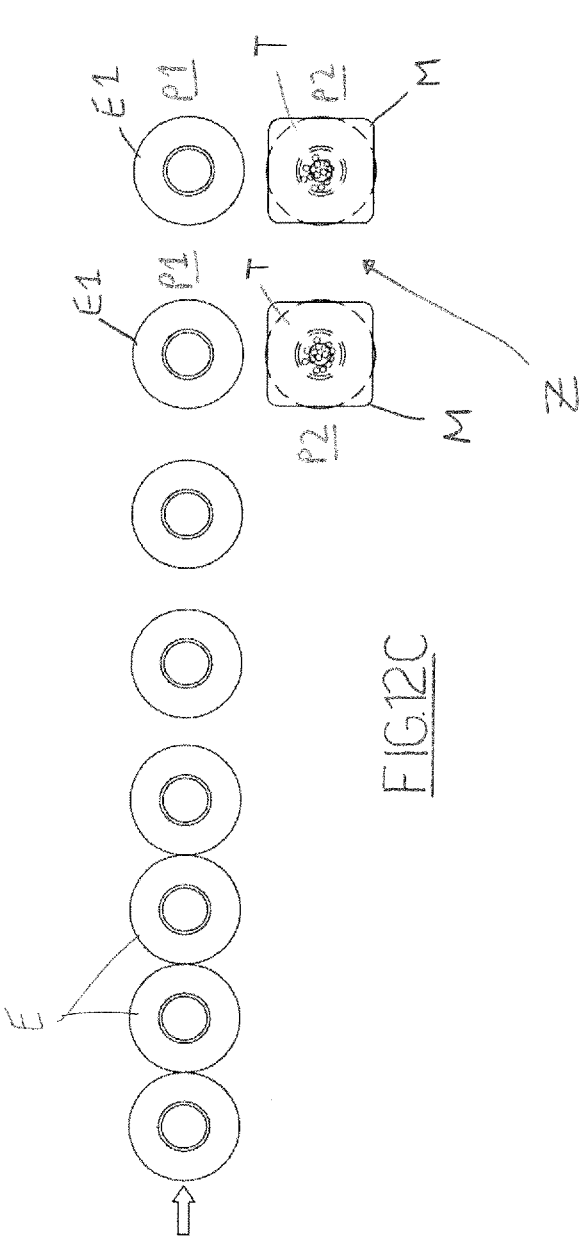


FIG.12C

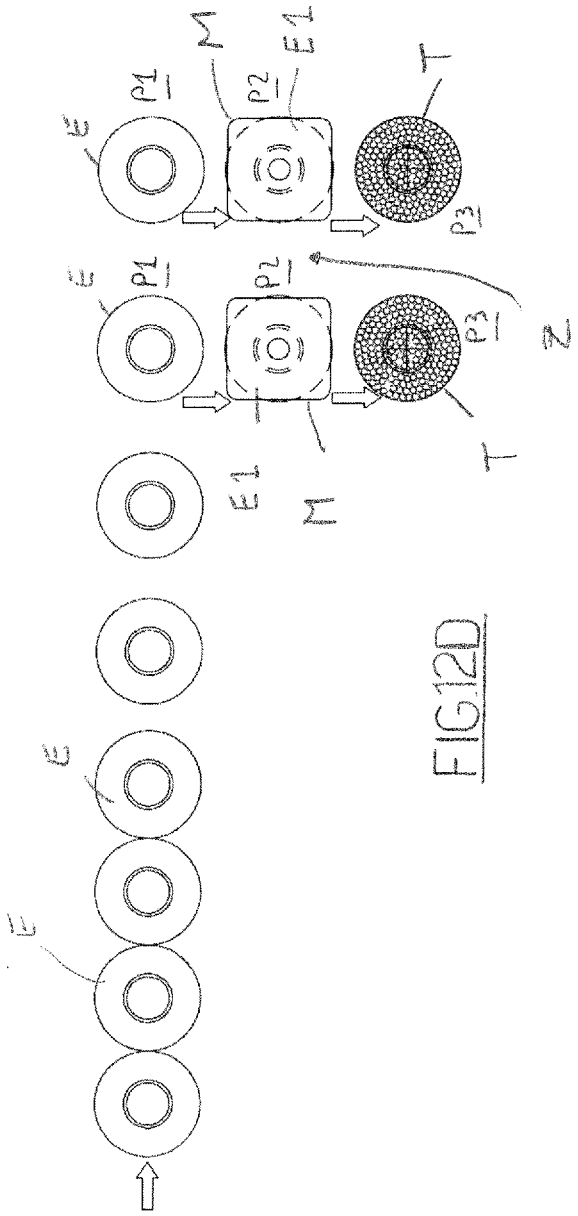


FIG.12D