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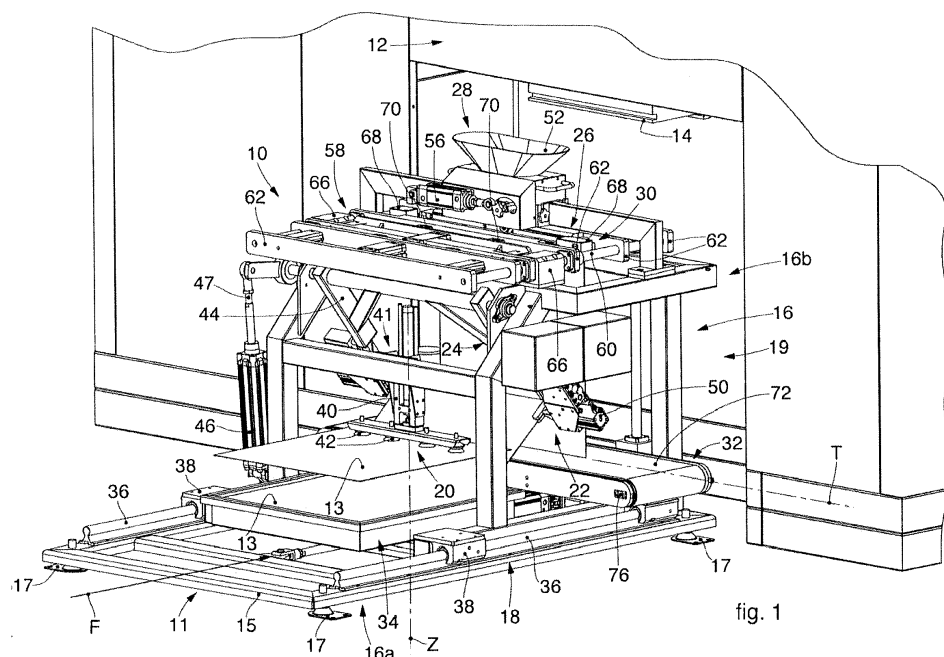
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(54) **APPARATUS AND METHOD FOR WELDING AND DISCHARGING SACS CONTAINING LOOSE PRODUCTS**

(57) Apparatus for welding and discharging sacs (13) containing sterilized loose products, comprising a sac store (34), a discharge device (28) to discharge the sterilized loose products, at least one removal device (20) configured to remove one sac (13) at a time from the sac store (34), a sac-stretching unit (22) configured to stretch in the desired direction a sac (13) removed by the removal

device (20), at least one positioning device (24) configured to take the sac-stretching unit (22) into position and to dispose a respective sac (13) in cooperation with the discharge device (28), at least one sac-opening device (26) configured to selectively open the sac (13) located in cooperation with the discharge device (28) and at least one welding device (30) configured to weld the sac (13).



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Description

FIELD OF THE INVENTION

[0001] Embodiments described here concern an apparatus and the corresponding method for welding and discharging sacs containing sterilized loose products used, for example, in the pharmaceutical, hospital or food field, or in the industrial field in the production of such loose products.

[0002] In particular, embodiments described here concern an apparatus and the corresponding method for welding and discharging sacs containing loose products which can be the most varied depending on the field where they are used.

[0003] In the hospital and/or pharmaceutical field, for example, they can be closing stoppers for test tubes for laboratory analyses, closing stoppers for phials of medicine, or small instruments or objects used in operating theaters or laboratories, or other elements.

BACKGROUND OF THE INVENTION

[0004] It is known, for example in the pharmaceutical or hospital fields, but also in other fields, for example foodstuffs, that it is necessary to package, for example in a sachet, predetermined or aleatory quantities of sterile products, or in any case products that must be protected from possible contamination, in order to transport them or preserve them, preventing contamination or alterations of substances with which they could come into contact, such as: bacteria, germs, other corpuscles, potentially pathogenic or harmful particles or agents.

[0005] Among the sterile products previously cited there are also normally present, in all the fields mentioned above, loose products, even small size.

[0006] In the pharmaceutical, hospital or foodstuff fields, other loose products can be, by way of example, closing stoppers for containers intended to contain substances to be protected, for example to be subjected to laboratory analyses, for containers for medicines, or small instruments or objects used in processing, operating theaters or laboratories.

[0007] The materials of which the products they protect can be made are, by way of example, rubber, plastic, polymer materials, metals or metal alloys.

[0008] The loose products are sterile when produced and are sold in packages which are themselves sterile, but if they are re-usable they must be washed and/or sterilized using suitable washing and/or sterilizing machines before each new use. If not immediate, a new use makes it necessary to preserve the loose products in suitable containers, such as sacs or sachets, thus extending their sterile condition and their life.

[0009] Manual or semi-automatic apparatuses are known, for welding and discharging sacs containing sterilized loose products, arriving from a washing and/or sterilizing machine, which require the presence of a specific

operator to carry out some steps or passes of the packaging process.

[0010] The main disadvantage of known apparatuses is due to the fact that the intervention of the operators, in particular sensitive steps of the packaging process, leads to a lack of sterility and hence a possible contamination of the loose products.

[0011] Document US-A-2014/331603 describes a gas-filling packaging method and a respective packaging machine, applicable to fill a large packaging sac with an article, such as for example from 10 to 20 kg of rice, sugar, animal food or fertilizer and also with an inert gas, and to subsequently weld it.

[0012] Document FR-A-2.804.654 describes a bagging installation comprising a plurality of storage sacs.

[0013] Document DE-A-2032093 describes a device for gripping paper bags or bags in general.

[0014] Document GB-A-1.309.439 describes an apparatus for separating stacked flat articles and for feeding them one at a time to a machine that performs a subsequent operation on them.

[0015] There is therefore a need to perfect an apparatus and a method for welding and discharging sacs containing sterilized loose products that can overcome at least one of the disadvantages of the state of the art.

[0016] In particular, one purpose is to obtain an apparatus and a method for welding and discharging sacs containing sterilized loose products that allow to reduce manual operations or even avoid them so as to guarantee the sterility of the loose products.

[0017] Another purpose is to obtain an apparatus for welding and discharging sacs containing sterilized loose products that allows to reduce the process times and therefore to increase productivity, without having to dedicate a specialized operator for these tasks.

[0018] Another purpose of the present invention is to obtain an apparatus and a method for welding and discharging sacs containing sterilized loose products which are practical and economical.

[0019] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

[0020] Other limitations and disadvantages of conventional solutions and technologies will be clear to a person of skill after reading the remaining part of the present description with reference to the drawings and the description of the embodiments that follow, although it is clear that the description of the state of the art connected to the present description must not be considered an admission that what is described here is already known from the state of the prior art.

SUMMARY OF THE INVENTION

[0021] The present invention is set forth and characterized in the independent claims, while the dependent claims describe other characteristics of the invention or

variants to the main inventive idea.

[0022] In accordance with the above purposes, an apparatus is provided for welding and discharging sacs containing sterilized loose products. The apparatus comprises at least:

- a sac store;
- a discharge device to discharge the sterilized loose products;
- a removal device configured to remove one sac at a time from the sac store;
- a sac-stretching unit configured to grip and stretch from both sides a sac removed by the removal device;
- a positioning device configured to take the sac-stretching unit into position and to dispose a respective sac in cooperation with the discharge device;
- a sac-opening device configured to selectively open the sac located in cooperation with the discharge device;
- a welding device configured to weld the desired part of the sac;
- a transport conveyor configured to discharge the welded sac.

[0023] The apparatus allows to load the sacs from the removal device to the sac-opening device by means of the positioning device and the sac-stretching unit, guaranteeing the sterility of the space inside the sac and therefore of the loose products contained inside the sacs.

[0024] The apparatus can provide an unloading and discharge device of the full sacs by means of a transport conveyor.

[0025] According to one purpose of the present invention a method is provided for welding and discharging sacs containing sterilized loose products. The method comprises at least:

- removing one sac at a time from a sac store;
- gripping and stretching from both sides the sac removed from the sac store;
- taking the sac stretched from both sides into position and disposing it in cooperation with a discharge device of sterilized loose products;
- selectively opening the sac located in cooperation with the discharge device in order to receive the sterilized loose products;
- welding the sac containing the sterilized loose products;
- discharging the welded sac.

[0026] The method can also provide to discharge the welded sac.

[0027] The method is configured to guarantee that the removal and loading of the sacs, the filling of the sacs with sterilized loose products, the welding and the discharge of the sacs occurs in such a way as to guarantee the sterility inside the sac and of the loose products load-

ed inside the sac.

[0028] These and other aspects, characteristics and advantages of the present disclosure will be better understood with reference to the following description, drawings and attached claims. The drawings, which are integrated and form part of the present description, show some forms of embodiment of the present invention, and together with the description, are intended to describe the principles of the disclosure.

[0029] The various aspects and characteristics described in the present description can be applied individually where possible. These individual aspects, for example aspects and characteristics described in the attached dependent claims, can be the object of divisional applications.

[0030] It is understood that any aspect or characteristic that is discovered, during the patenting process, to be already known, shall not be claimed and shall be the object of a disclaimer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] These and other characteristics of the present invention will become apparent from the following description of some embodiments, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a perspective view of an apparatus for welding and discharging sacs containing sterilized loose products associated to a sterilizing machine in accordance with embodiments described here;
- fig. 2 is a perspective view of the apparatus in fig. 1 in a first operating condition;
- fig. 3 is a perspective view of the apparatus in fig. 1 in a second operating condition;
- figs. 4a, 4b 4c are respectively a perspective view, a lateral view and a front view of the apparatus in fig. 1 in a third operating condition;
- fig. 5 is a front view of the apparatus in fig. 1 in a fourth operating condition;
- fig. 6 is a lateral view of the apparatus in fig. 1 in a fifth operating condition;
- figs. 7a, 7b are respectively a perspective view and a lateral view of the apparatus in fig. 1 in a sixth operating condition;
- figs. 8a, 8b are respectively a perspective view and a lateral view of the apparatus in fig. 1 in a seventh operating condition;
- figs. 9a, 9b 9c are respectively a perspective view, a lateral view and a view from above of the apparatus in fig. 1 in an eighth operating condition;
- figs. 10a, 10b are respectively a perspective view and a lateral view of the apparatus in fig. 1 in a ninth operating condition;
- fig. 11 is a perspective view of the apparatus in fig. 1 in a tenth operating condition.

[0032] To facilitate comprehension, the same reference numbers have been used, where possible, to identify identical common elements in the drawings. It is understood that elements and characteristics of one embodiment can conveniently be incorporated into other embodiments without further clarifications.

DETAILED DESCRIPTION OF SOME EMBODIMENTS

[0033] We shall now refer in detail to the various embodiments of the present invention, of which one or more examples are shown in the attached drawing. Each example is supplied by way of illustration of the invention and shall not be understood as a limitation thereof. For example, the characteristics shown or described insofar as they are part of one embodiment can be adopted on, or in association with, other embodiments to produce another embodiment. It is understood that the present invention shall include all such modifications and variants.

[0034] Before describing these embodiments, we must also clarify that the present description is not limited in its application to details of the construction and disposition of the components as described in the following description using the attached drawings. The present description can provide other embodiments and can be obtained or executed in various other ways. We must also clarify that the phraseology and terminology used here is for the purposes of description only, and cannot be considered as limitative.

[0035] Fig. 1 is used to describe example embodiments of an apparatus 10 for welding and discharging sacs 13 cooperating with a sterilizing machine 12 from which it receives the loose products to be packaged.

[0036] The sterilizing machine 12 includes a discharge aperture 14 from which the sterilized loose products are made to exit, conveying them toward the apparatus 10.

[0037] The quantity of loose products that the sterilizing machine 12 discharges during the discharge step can be calculated in advance on the basis of the capacity of the sacs 13 used. The quantity of loose products can indicatively reach a mass comprised between 5 kg and 20 kg.

[0038] In accordance with variant embodiments, the apparatus 10 can include a lower unit 11 and an upper unit 19.

[0039] In accordance with some embodiments, the apparatus 10 for welding and discharging sacs 13 can include a support frame 16.

[0040] In accordance with variant embodiments, the support frame 16 can include a lower frame 16a and an upper frame 16b.

[0041] The lower unit 11 can include the lower frame 16a, which can be configured, for example, to supply stability and support to the whole apparatus 10.

[0042] The upper unit 19 can include the upper frame 16b, which can be configured to move nearer/away from the sterilizing machine 12.

[0043] The apparatus 10 can include at least a removal device 20, at least a sac-stretching unit 22, at least a positioning device 24, at least a sac-opening device 26, at least a discharge device 28, at least a welding device 30 and at least a sac store 34.

[0044] The apparatus 10 can also include a transport conveyor 32 and at least an engagement device 18.

[0045] In accordance with variant embodiments described using figs. 2 and 3, the engagement device 18 can be configured to selectively take the upper unit 19 toward the sterilizing machine 12, in a linear direction of movement F, to a position suitable to receive the loose products and to bring the upper unit 19 back into the inactive position, in the direction opposite the direction of movement F, when the reception of the loose products is finished.

[0046] In accordance with possible embodiments, the movement of the upper unit 19 with respect to the lower unit 11 can occur also by means of a rotation of the former with respect to the latter, obtained by sliding on an arched rather than linear track, not shown in the drawings.

[0047] In accordance with other possible embodiments, not shown, the apparatus 10 can be provided to have a fixed rather than mobile structure, while for the discharge of the sacs 13 a mobile transport conveyor 32 can be provided, such as a rotating table or a deflection device, which as it moves transfers the sacs 13 to the outside of the apparatus 10 taking them, for example, toward another transport member and/or allowing the sacs 13 to be removed by an operator.

[0048] In accordance with variant embodiments described using figs. 3, 4a, 4b, 4c the removal device 20 is configured to remove, one at a time, the sacs 13 contained inside the sac store 34, in which they have been advantageously stacked one on top of the other.

[0049] In accordance with variant embodiments described using figs. 4c and 5, the sac-stretching unit 22 is configured to grip and stretch a sac 13 which has been removed, in particular to go into contact with the sac 13 when it has been removed by the removal device 20 and to cause a distension of the sac 13 in a transverse direction to the direction of movement F as shown by the arrows L1 and L2.

[0050] In accordance with variant embodiments described using figs. 6, 7a, 7b, the positioning device 24 is configured to make the sac 13 rotate when it has been removed by the removal device 20 from a condition in which it is parallel to the horizontal (see fig. 6) to a condition in which it is perpendicular to the horizontal (see fig. 7b).

[0051] In accordance with variant embodiments described using figs. 7a, 7b, 8a, 8b, 9a, 9b, the sac-opening device 26 is configured to move nearer to the sac 13 after the latter has been placed below the discharge device 28 by the positioning device 24 (see figs. 7a, 7b and 8a) and subsequently to open it to allow the entrance of the loose products arriving from the sterilizing machine 12 (see figs. 8b, 9a and 9b).

[0052] In accordance with variant embodiments described using figs. 9a, 9b, 9c, the discharge device 28 is configured to allow the loose products arriving from the discharge aperture 14 of the sterilizing machine 12 to be conveyed inside the sac 13 in a precise and accurate manner without the loose products losing their sterile condition.

[0053] In accordance with variant embodiments described using figs. 10a, 10b, the welding device 30 is configured to allow the hermetical closing of the sac 13 when it has been filled with a desired quantity of loose sterilized products, allowing them to keep their sterile condition over time, until they are reused, keeping them inside the sac 13.

[0054] In accordance with variant embodiments described using fig. 11, the transport conveyor 32 is configured to conduct the sac 13, once it has been hermetically closed, toward the outside of the apparatus 10, for example laterally, in a direction identified by a transport axis T, in order to be collected by an operator and stored in a store or to be directed to an automatic storage path.

[0055] In accordance with variant embodiments, the lower frame 16a can be configured to support the engagement device 18 and the sac store 34.

[0056] In accordance with variant embodiments, the sac store 34 can be located frontally with respect to the apparatus 10, for example disposed symmetrically with respect to the center line.

[0057] Moreover, when the apparatus 10 is in use, the sac store 34 can be located on the opposite side to the sterilizing machine 12

[0058] In accordance with variant embodiments, the upper frame 16b can be configured to support the removal device 20, the sac-stretching unit 22, the positioning device 24, the sac-opening device 26, the discharge device 28, the welding device 30 and the transport conveyor 32.

[0059] In accordance with variant embodiments, the lower unit 11 can be, for example, substantially parallel to the horizontal, and include a base 15 and feet 17 which can be associated below the base 15 to confer stability to the lower frame 16a and allow a stable installation of the apparatus 10.

[0060] In accordance with some embodiments, the engagement device 18 can include a translating guide 36 and an upper frame actuator 38.

[0061] The translating guide 36 can be installed on the base 15 and configured to allow the movement of the upper unit 19 with respect to the lower unit 11, nearer/away from the sterilizing machine 12, in the direction of movement F, by driving the upper frame actuator 38 in one direction or the opposite one.

[0062] Therefore, when the apparatus 10 is in an inactive condition, the upper unit 19 can be in a "non-coupled" position with respect to the sterilizing machine 12, that is, with the discharge device 28 not associated to the discharge aperture 14, while when the apparatus 10 is in a "working" condition, the upper unit 19 can be in a

"coupled" position with respect to the sterilizing machine 12, that is, with the discharge device 28 associated to the discharge aperture 14.

[0063] By "inactive" condition here we mean a condition in which the apparatus 10 is located when the sterilizing machine 12 is not functioning, or is sterilizing the loose products but is not yet ready to discharge them, or after the sterilized loose products have been discharged.

[0064] On the other hand, by "working" condition, here we mean a condition in which the apparatus 10 is located when the sterilizing machine 12 is ready to discharge sterilized loose products inside the sacs 13.

[0065] The sac store 34, in which the sacs 13 available to be removed by the removal device 20 are stacked, can be attached to the upper unit 19.

[0066] The removal device 20 can include a removal arm 40 and a removal arm actuator 41.

[0067] In turn, the removal arm 40 can include at least one removal sucker 42, advantageously more than one removal sucker 42, so as to distribute the removal load of the sac 13 and to support it so that it does not sag during transport, but keeps a certain planarity.

[0068] According to variant embodiments, the removal arm 40 can be disposed in a direction perpendicular to the direction of movement F along a removal axis Z.

[0069] When it is provided to remove a sac 13, the removal arm actuator 41 can be activated, to make the removal arm 40 descend and approach the sac 13, until it takes the removal suckers 42 into contact with the sac 13.

[0070] The removal suckers 42 can be positioned below the removal arm 40, so that they are parallel to the sac 13 at least when they impact with the latter and during the whole of the subsequent removal procedure.

[0071] The sacs 13 can be removed using the removal suckers 42 by means of the Venturi effect, causing a vacuum effect between the removal suckers 42 and the sac 13.

[0072] When a suction force has been reached sufficient to lift the sac 13 into contact with the removal suckers 42, the removal arm actuator 41 can be re-activated in the opposite direction to the previous one, so that the sac 13 is lifted (figs. 4a, 4b, 4c).

[0073] The height to which the sac 13 is lifted is such that it can be gripped by the sac-stretching unit 22.

[0074] The sac-stretching unit 22 can include at least one gripper 48 and at least one gripper actuator 50.

[0075] Advantageously, the sac-stretching unit 22 includes two grippers 48, acting one each side of the sac 13 so as to be able to grip it firmly and stretch it in a direction orthogonal to the direction of movement F.

[0076] According to variant embodiments, the grippers 48 are located in an open position at least until the sac 13 is positioned between them by the removal device 20.

[0077] When the sac 13 is positioned between the grippers 48, at least one of the two grippers 48 can be made to perform a movement toward the sac 13 in a direction transverse to the direction of movement F in accordance

with the sense of the arrows L1 (see fig. 4c) by driving the at least one gripper actuator 50.

[0078] Subsequently, the at least one gripper actuator 50 can be activated so as to command the closure of the grippers 48, taking them close up to the sac 13, on both faces, with a closing force that allows to support it.

[0079] At this point the suction effect of the removal suckers 42 of the removal device 20 can be stopped, since it is the grippers 48 of the sac-stretching unit 22 that support the sacs 13.

[0080] Once the grippers 48 are closed, the closing force must be commensurate so that, when the at least one gripper actuator 50 is again activated, at least one of the two grippers 48, moving away from the sac 13, in a direction transverse to the direction of movement F, according to the sense of the arrows L2 (see fig. 5), causes a distension of the sac 13 without it slipping or disengaging from the grippers 48.

[0081] The distension of the sac 13 is provided so that its edges do not vibrate if subjected to a laminar flow.

[0082] After the distension of the sac 13, the positioning device 24 can be driven.

[0083] The positioning device 24 can include at least one pivoting gate 44 and at least one pivoting gate actuator 46.

[0084] The positioning device 24 can also include positioning levers 47 configured to connect the pivoting gate actuator 46 and the pivoting gate 44.

[0085] According to variant embodiments, the sac-stretching unit 22 can be associated to the positioning device 24 and therefore can be made to move solidly therewith.

[0086] According to other variant embodiments, the positioning device 24 can be rotatably pivoted to the support frame 16 and rotatable with respect to an axis parallel to the transport axis T.

[0087] When a sac 13 has been extended by the grippers 48 of the sac-stretching unit 22, the pivoting gate actuator 46 can be activated so as to make the sac 13 rotate by means of the pivoting gate 44.

[0088] Usually, a pivoting gate actuator 46 as used in association with embodiments described here can be an actuator with an intrinsically circular movement or be configured to convert a linear movement into a circular movement. The conversion can be commonly done by means of types of mechanism selected from a group consisting of: screw actuators, such as a jack screw, ball screw actuators and roll screw actuators, or wheel and axle, for example drum, gears, pulley or shaft, actuators such as a lifting cable, a winch, a rack and a pinion group, a chain transmission, a belt transmission, actuators with a rigid chain and a rigid belt.

[0089] Advantageously, it can be provided to make the sac 13 rotate by an angle substantially equal to 90° in order to take it from a condition substantially parallel to the horizontal to a condition substantially perpendicular, with the aperture facing toward the discharge aperture 14 of the sterilizing machine 12.

[0090] According to some possible embodiments, the entity of the rotation of the pivoting gate 44 can be established by the sizes of the positioning levers 47, so that from a position of compression of the pivoting gate actuator 46 to an extended position, or vice versa, this entity is equal to a desired value.

[0091] The entity of the rotation can possibly be controlled by means of end-of-travel devices or position transducers (not shown in the drawings).

[0092] The position transducer can be for example an angular or rotary position transducer, such as an angular or rotary encoder, in particular for example a tachymetric encoder, a relative or incremental encoder, or an absolute encoder.

[0093] According to variant embodiments described using figs. 6 and 7b, the pivoting gate 44 can be configured to make the sac 13 rotate, in the sense of the arrow R, placing it below the discharge device 28 and between the sac-opening device 26 and the welding device 30.

[0094] According to variant embodiments, a laminar flow can advantageously be provided, acting on the sac 13 when it is in this position in order to prevent unwanted corpuscles from entering into the sac 13, contaminating it and thus causing the desired sterile condition of the loose products to no longer persist.

[0095] The sac-opening device 26 can include at least an opening frame 58 and at least an opening frame actuator 66.

[0096] In turn, the opening frame 58 can include sliding guides 60, connection plates 62 and opening suckers 64.

[0097] According to variant embodiments, the sliding guides 60 can be disposed parallel to the direction of movement F, while the connection plates 62 can be associated transversely with them, in a direction parallel to the transport axis T and configured to move toward/away from the sac 13 which is positioned on each occasion between the connection plates 62.

[0098] Advantageously there are at least two connection plates 62, of which by way of example two are equipped with opening suckers 64 configured to put themselves in coordination with the edges of the sac 13 that is fed, in order to move the opening suckers 64 toward/away from the edges and perform the opening and reclosing of the sac 13.

[0099] Furthermore, the opening suckers 64 can be associated at the lower part with the connection plates 62 and can be configured to perform the opening and closing of the sacs 13 by means of suction.

[0100] According to some embodiments, the sliding guides 60 can be guides of the telescopic type and can be associated to the opening frame actuators 66 to move the connection plates 62.

[0101] When a sac 13 is disposed between the connection plates 62, the at least one opening frame actuator 66 can be driven, to determine the movement of at least one connection plate 62, advantageously both, of those that include the opening suckers 64, toward the sac 13, in a direction parallel to the direction of movement F, in

the sense of the arrows M1 (fig. 7b).

[0102] According to some embodiments, a dedicated opening frame actuator 66 can be provided for each connection plate 62.

[0103] The movement of the connection plates 62 can be performed at a deferred time from each other, or can be preferably simultaneous.

[0104] According to variant embodiments described using figs. 8a and 8b, the opening suckers 64 are preferably provided to go into contact with the sac 13 in its upper and central part, so that the force applied is concentrated in the zone that allows an easier opening of the sac 13, displacing the edges from each other.

[0105] When the opening suckers 64 have arrived in contact with the sac 13 it is possible to cause a vacuum effect between the opening suckers 64 and the sac 13, which is well stretched by the sac-stretching unit 22, by means of the Venturi effect, as previously mentioned with regard to the removal suckers 42.

[0106] According to variant embodiments, at this point the stretching force of the grippers 48 can be released, but in any case keeping their closing force on the sac 13 in order to give it lateral support.

[0107] Subsequently, the at least one opening frame actuator 66 can be driven to determine the movement, in a direction parallel to the direction of movement F in the sense of the arrows M2 (fig. 8b) of at least one connection plate 62, advantageously both, of those that include the opening suckers 64, away from the sac 13, in order to open it.

[0108] Once the sac 13 has been opened, it is possible to drive the discharge device 28 to take it into cooperation with the sac 13.

[0109] At substantially the same time that the discharge device 28 is activated, it is also possible to activate the transport conveyor 32, taking it into contact below with the sac 13 (figs. 8b and 9b), to give it support when the loose products will be inside it.

[0110] The discharge device 28 can include at least a hopper 52, at least a shell 54 and at least a shell actuator 56.

[0111] According to variant embodiments described using figs. 9a, 9b and 9c, the at least one shell 54, advantageously two, can be associated at the lower part with the hopper 52, by pivoting.

[0112] Until the sac 13 is opened, the shells 54 are provided not to interfere with the sac 13, the shells 54 being closed at the lower part against the hopper 52.

[0113] On the contrary, when the sac 13 has been opened by the opening suckers 64, then it is possible to activate the shell actuator 56 to determine the opening of the shells 54, which can stretch the edges of the sac 13.

[0114] The shells 54 can preferably be opened from the center of the hopper 52 toward the bottom, performing a rotation of every shell 54 with respect to one direction, parallel to the direction of movement F, passing through the corresponding pivoting point.

[0115] The effect of the shells 54 is to stretch the edges

of the sac 13 and to create continuity between the hopper 52 and the sac 13 to promote the entrance of the loose products discharged from the sterilizing machine 12.

[0116] Once the opening of the shells 54 is terminated, it is possible to activate the discharge of the loose products from the discharge aperture 14 of the sterilizing machine 12.

[0117] Advantageously the apparatus 10 and the sterilizing machine 12 are temporally coordinated to perform the discharge steps.

[0118] According to variant embodiments described using fig. 9b, once the discharge of the loose products has been completed, the sac 13 contains a desired quantity of sterilized loose products.

[0119] According to variant embodiments, when the discharge of the loose products has been terminated, the shell actuator 56 is activated so as to cause the shells 54 to close again against the hopper 52 and free the sac 13 from their bulk.

[0120] When the reclosing of the shells 54 has been terminated it is possible to drive the at least one opening frame actuator 66 to determine the movement, in a direction parallel to the direction of movement F, in the sense of the arrows M1 (fig. 9b), of at least one connection plate 62, advantageously both, of those that include the opening suckers 64, toward the sac 13.

[0121] At this point, the sac 13, full of loose products, has its edges near each other and the welding device 30 can be activated.

[0122] The welding device 30 can include at least one welding bar 68 and at least one welding actuator 70.

[0123] According to variant embodiments, there are preferably two welding bars 68, one for each side of the sac 13, configured to perform the automatic welding of the sac 13.

[0124] According to other variant embodiments, the welding bars 68 can be associated to the connection plates 62 of the sac-opening device 26 and can be moved solidly with them.

[0125] The welding device 30 can be activated when the opening suckers 64 of the connection plates 62 have reclosed the sac 13, driving the at least one welding actuator 70 which takes the welding bars 68 into contact with the sac 13 in a direction parallel to the direction of movement F, in the sense of the arrows M1 (fig. 9b).

[0126] Advantageously, driving the at least one welding actuator 70 can cause a compression of the edges of the sac 13, with a force greater than that given earlier by the at least one opening frame actuator 66 to the connection plates 62, in order to weld the sac 13.

[0127] According to variant embodiments described using figs. 10a and 10b, once the sac 13 has been welded, it is possible to remove pressure from the opening suckers 64 and to drive the at least one opening frame actuator 66, to free and retract both the connection plates 62 and also the welding bars 68 in a direction parallel to the direction of movement F, in the sense of the arrows M2 (fig. 10b).

[0128] At this point it is possible to drive the gripper actuators 50 as well, so as to open the grippers 48, leaving the sac 13 to rest on the transport conveyor 32 since it is no longer supported.

[0129] The transport conveyor 32 can include a transport belt 72, a drive pulley 74, a driven pulley 76 and a pulley actuator 78.

[0130] Furthermore, a conveyor actuator 80 can also be associated to the transport conveyor 32, configured to lift and/or lower the transport conveyor 32.

[0131] According to variant embodiments described using figs. 1 and 11, the transport belt 72 can be wound in a closed ring around the drive pulley 74 and the driven pulley 76.

[0132] The pulley actuator 78 can be associated to the drive pulley 74 to make it rotate, causing the movement of the sac 13 in the direction identified by the transport axis T, in one sense or the opposite sense.

[0133] According to variant embodiments, in order to store the sacs 13 it is possible to activate the conveyor actuator 80 so as to lower the transport conveyor 32.

[0134] Subsequently it is possible to drive the upper frame actuator 38 so as to allow to move the upper unit 19 with respect to the lower unit 11, away from the sterilizing machine 12 in the direction of movement F.

[0135] Once the transport conveyor 32 no longer interferes with the sterilizing machine 12, it is possible to drive the pulley actuator 78, making the drive pulley 74 rotate and transferring the sac 13 toward the outside of the apparatus 10.

[0136] After the sac 13 has been discharged, it is possible to drive the pivoting gate actuator 46 so as to make the pivoting gate 44 rotate in the opposite sense to that of the arrow R (fig. 6), returning it to its initial position (fig. 2). At the same time, the sac-stretching unit 22 associated to the positioning device 24 can also be returned to the initial position.

[0137] The apparatus 10 can therefore be in its "inactive" condition and wait for the sterilizing machine 12 to be ready to discharge another quantity of loose products in order to return to the "work" condition.

[0138] According to one aspect of the present invention, a method is provided for welding and discharging sacs 13 containing sterilized loose products, which includes at least:

- making an upper unit 19 advance with respect to a lower unit 11 toward a discharge aperture 14 of a sterilizing machine 12 in a direction of movement F;
- removing one sac 13 at a time from a sac store 34 which contains a plurality of sacs 13 using a removal device 20 acting vertically in the direction of a removal axis Z;
- gripping and stretching from both sides the edges of the sac 13 removed, by means of a sac-stretching unit 22, so that the edges of the opening of the sac 13 do not vibrate when subjected to a laminar flow;
- rotating the sac 13, from a condition substantially

parallel to the horizontal to a condition substantially vertical to the horizontal, using a positioning device 24;

- opening the sac 13 using a sac-opening device 26;
- lifting a transport conveyor 32 below the sac 13 so that the latter can rest upon it;
- inserting a discharge device 28 inside the sac 13, spreading the edges thereof and obtaining continuity between the discharge aperture 14 of the sterilizing machine 12 and the sac 13;
- collecting the loose products discharged from the sterilizing machine 12, conveying them through a hopper 52 of the discharge device 28 inside the sac 13;
- extracting the discharge device 28 from the sac 13;
- closing the sac 13 using the sac-opening device 26;
- welding the sac 13 using a welding device 30;
- releasing the sac 13 from the sac-stretching unit 22, leaving it to rest on the transport conveyor 32;
- lowering the transport conveyor 32, returning it to its initial position;
- making the upper unit 19 retreat with respect to the lower unit 11, away from the sterilizing machine 12 in the direction of movement F;
- discharging the sac 13 toward the outside of the upper unit 19 in the direction identified by a transport axis T in one sense or the other;
- returning the positioning device 24 to the "inactive" position.

[0139] It is clear that modifications and/or additions of parts may be made to the apparatus 10 for welding and discharging sacs containing sterilized loose products and the corresponding method as described heretofore, without departing from the field and scope of the present invention.

[0140] It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of apparatus 10 for welding and discharging sacs containing sterilized loose products and the corresponding method, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

[0141] In the following claims, the sole purpose of the references in brackets is to facilitate reading: they must not be considered as restrictive factors with regard to the field of protection claimed in the specific claims.

Claims

1. Apparatus for welding and discharging sacs (13) containing sterilized loose products, **characterized in that** it comprises:
 - a sac store (34);
 - a discharge device (28) to discharge the ster-

- ilized loose products;
 - at least one removal device (20) configured to remove one sac (13) at a time from the sac store (34);
 - a sac-stretching unit (22) comprising two grippers (48) configured to grip and stretch from both sides a sac (13) removed by the removal device (20);
 - at least one positioning device (24) configured to take the sac-stretching unit (22) into position and to dispose a respective sac (13) in cooperation with the discharge device (28);
 - at least one sac-opening device (26) configured to selectively open the sac (13) located in cooperation with the discharge device (28);
 - at least one welding device (30) configured to weld said sac (13);
 - at least one transport conveyor (32) configured to automatically discharge the welded sac (13).
2. Apparatus as in claim 1, **characterized in that** said removal device (20) comprises at least a removal arm (40) comprising at least a removal sucker (42) configured to remove, by suction, at least one sac (13).
3. Apparatus as in claim 2, **characterized in that** said removal device (20) comprises at least one removal arm actuator (41) configured to selectively move said removal arm (40) in a direction identified by a removal axis (Z).
4. Apparatus as in any claim hereinbefore, **characterized in that** said sac-stretching unit (22) comprises at least one gripper (48) configured to firmly grip said sacs (13) and keep them in the desired direction, in a direction orthogonal to a direction of movement (F), in order to support them at least while the loose products are being loaded.
5. Apparatus as in any claim hereinbefore, **characterized in that** said positioning device (24) comprises at least one pivoting gate (44) configured to position said sacs (13) according to a desired angle with respect to an axis parallel to a transport axis (T).
6. Apparatus as in any claim hereinbefore, **characterized in that** said sac-stretching unit (22) is associated to said positioning device (24) so as to be made to rotate solidly therewith.
7. Apparatus as in any claim hereinbefore, **characterized in that** said sac-opening device (26) comprises at least an opening frame (58) and at least an opening frame actuator (66) configured to selectively open and close said opening frame (58).
8. Apparatus as in claim 7, **characterized in that** said opening frame (58) comprises sliding guides (60), connection plates (62) and opening suckers (64) associated to said connection plates (62) and configured to selectively open and close said sacs (13) by means of suction.
9. Apparatus as in claim 8, **characterized in that** said opening suckers (64) are configured to go into contact with said sac (13) in the upper and central part.
10. Apparatus as in any claim hereinbefore, **characterized in that** said discharge device (28) comprises at least a hopper (52) and at least a shell (54) associated to said hopper (52), configured to stretch the edges of said sac (13).
11. Apparatus as in any claim hereinbefore, **characterized in that** said welding device (30) comprises at least one welding bar (68) and at least one welding actuator (70) configured to press said at least one welding bar (68) against said sac (13) and weld it.
12. Apparatus as in claim 11, **characterized in that** said at least one welding bar (68) is associated to said sac-opening device (26).
13. Apparatus as in any claim hereinbefore, **characterized in that** a conveyor actuator (80) is associated to said transport conveyor (32) and is configured to lift and/or lower said transport conveyor (32).
14. Apparatus as in claim 13, **characterized in that** said transport conveyor (32) is configured to support said sac (13) during the discharge of the sterilized loose products.
15. Method for welding and discharging sacs (13) containing sterilized loose products, **characterized in that** it comprises:
- removing one sac (13) at a time from a sac store (34);
 - gripping and stretching from both sides the sac (13) removed from the sac store (34);
 - taking into position the sac (13) stretched from both sides and removed from the sac store (34), and disposing it in cooperation with a discharge device (28) of sterilized loose products;
 - selectively opening the sac (13) located in cooperation with the discharge device (28) in order to receive the sterilized loose products;
 - welding the sac (13) containing the sterilized loose products;
 - discharging the welded sac (13).
16. Method as in claim 15, **characterized in that** it comprises lifting a transport conveyor (32) to give support below said sac (13) during the discharge of the ster-

ilized loose products.

17. Sterilizing machine, **characterized in that** it comprises at least an apparatus (10) for welding and discharging sacs containing sterilized loose products as in any claim from 1 to 14. 5

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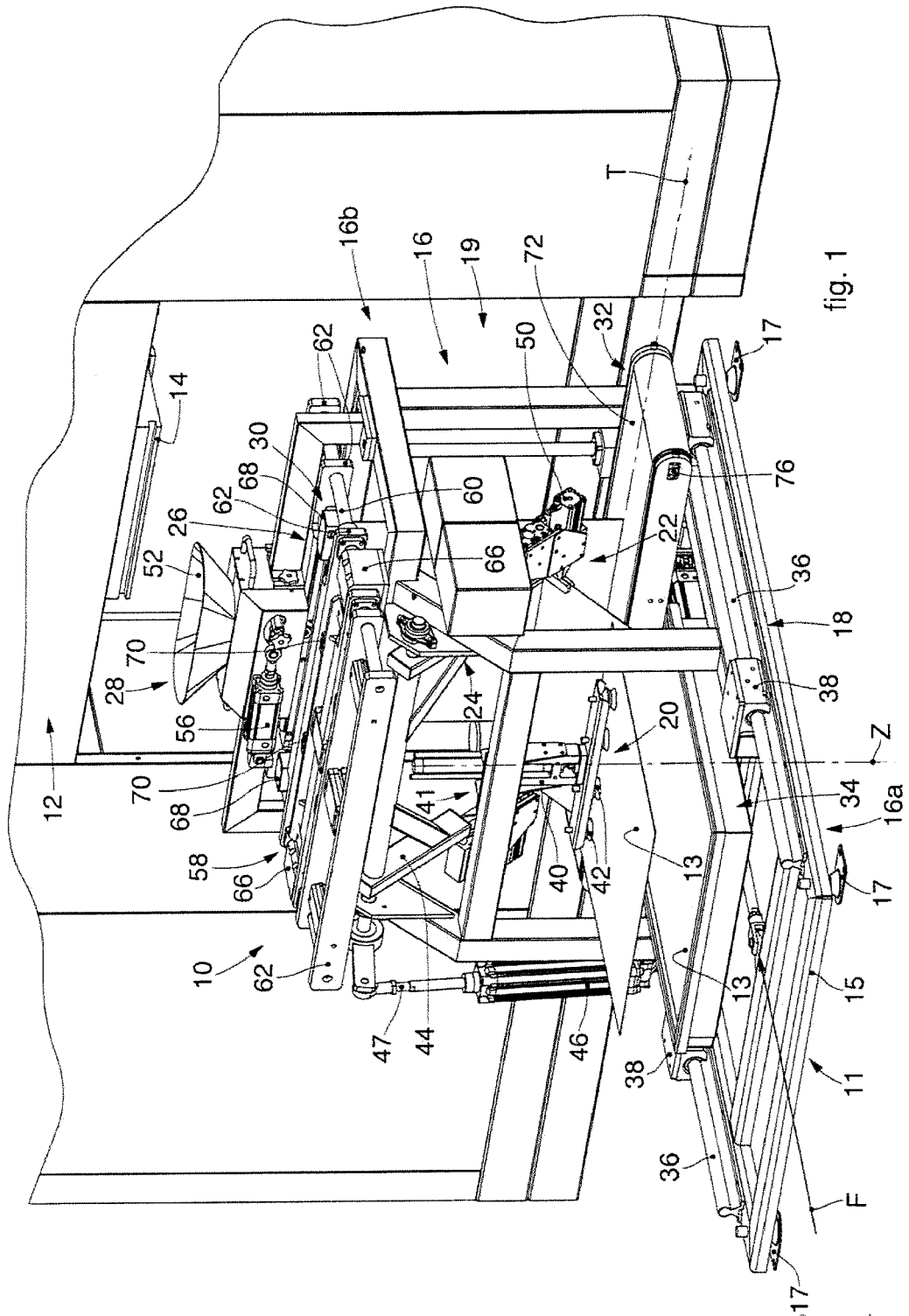
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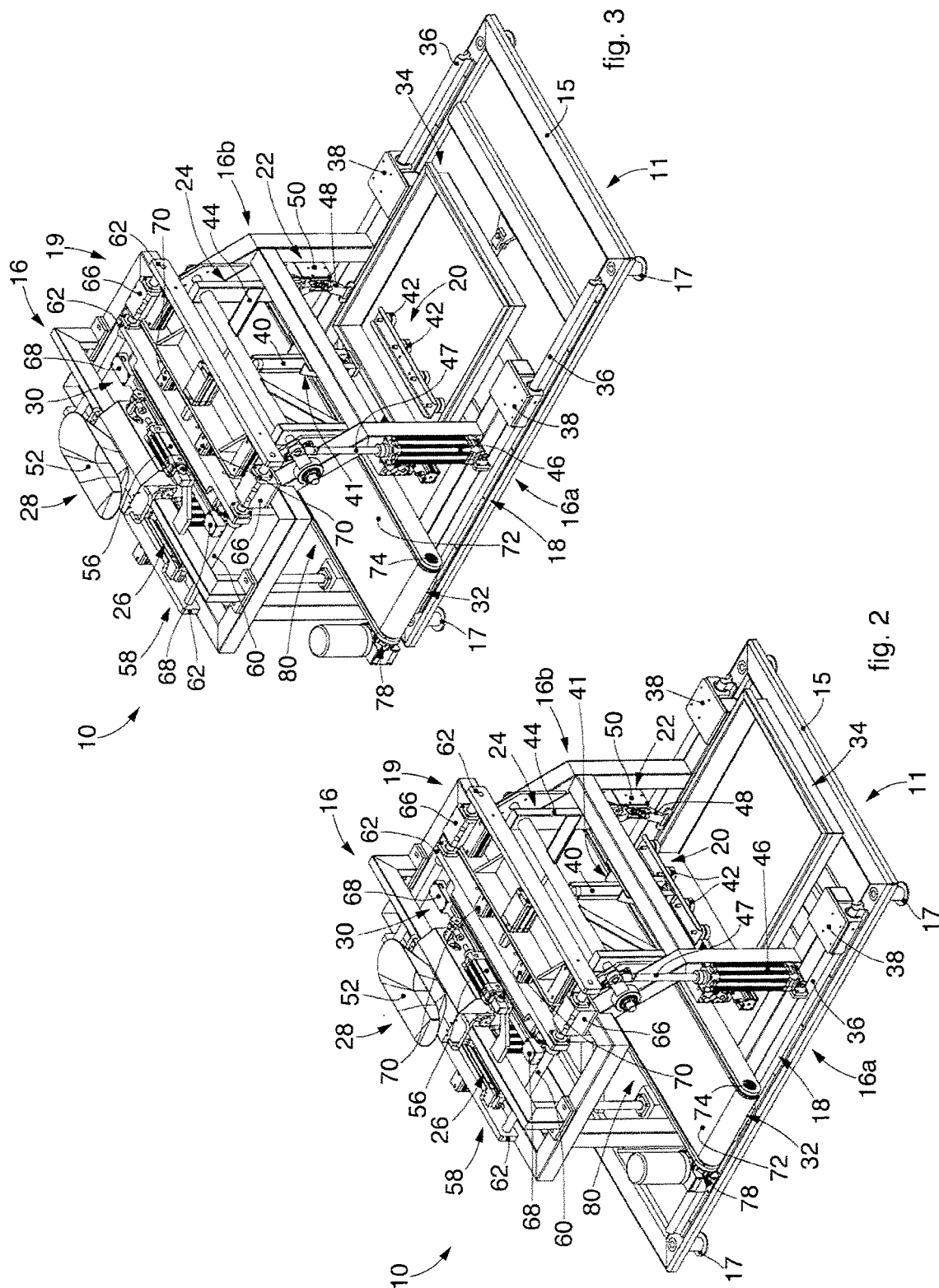
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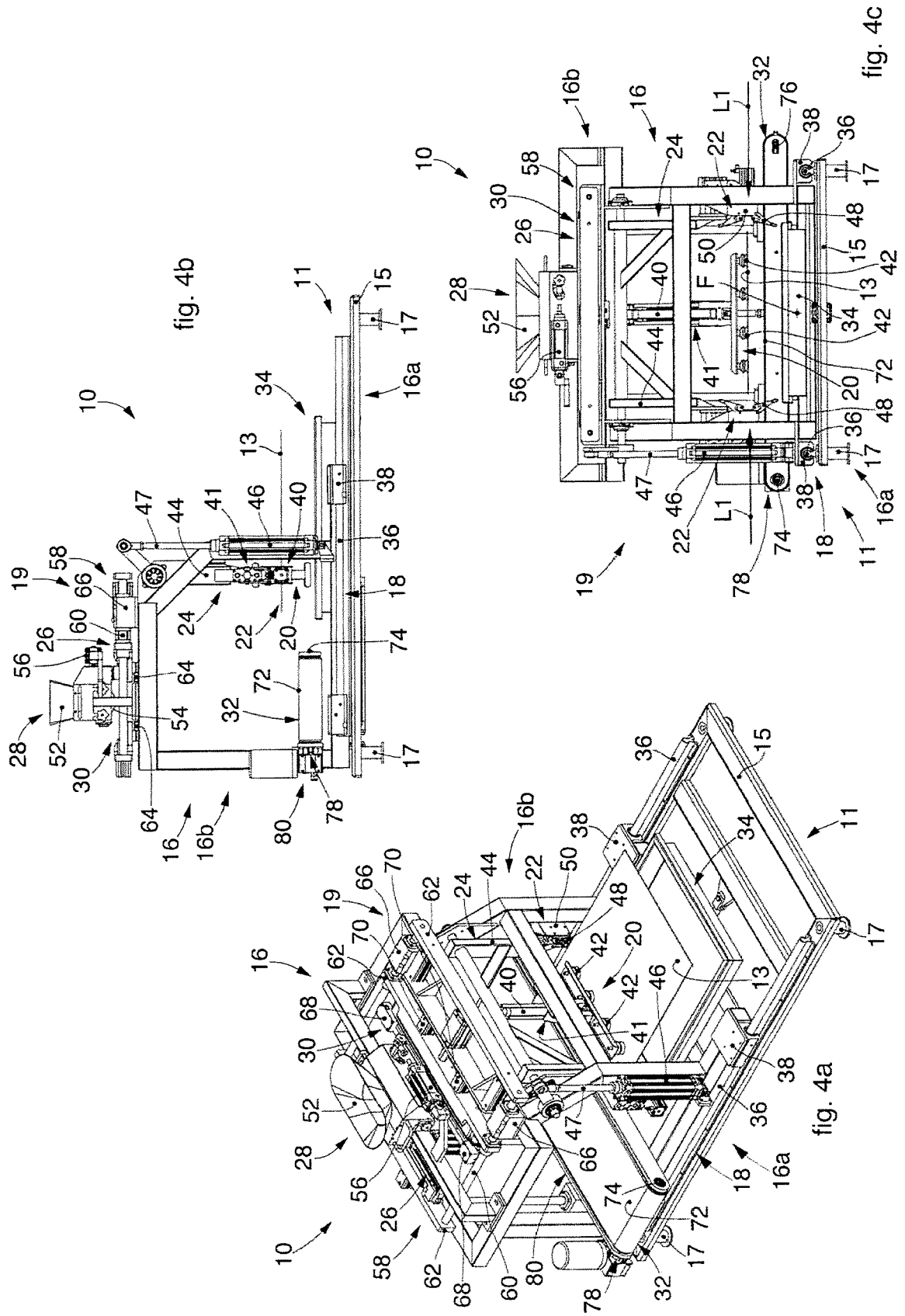
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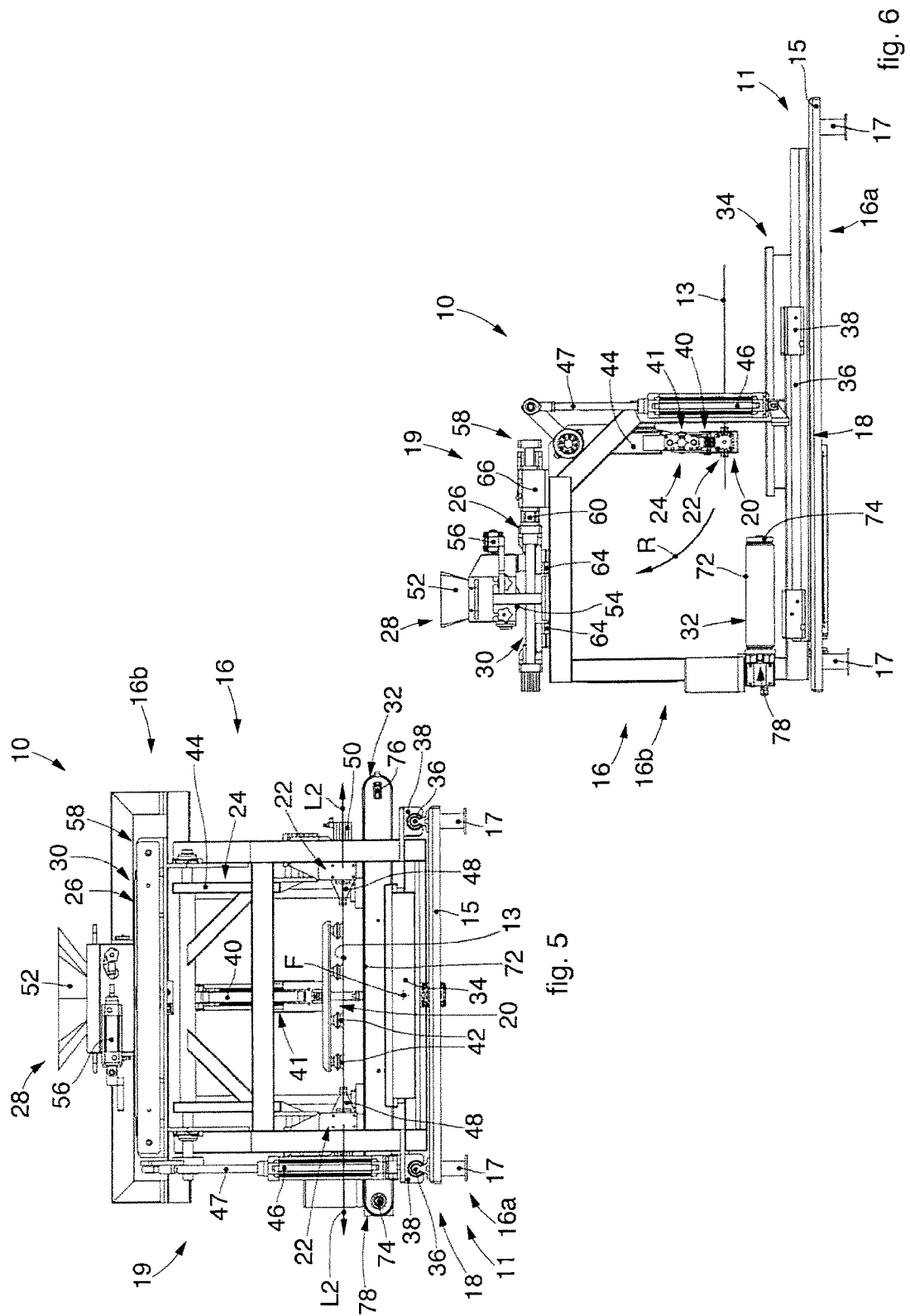
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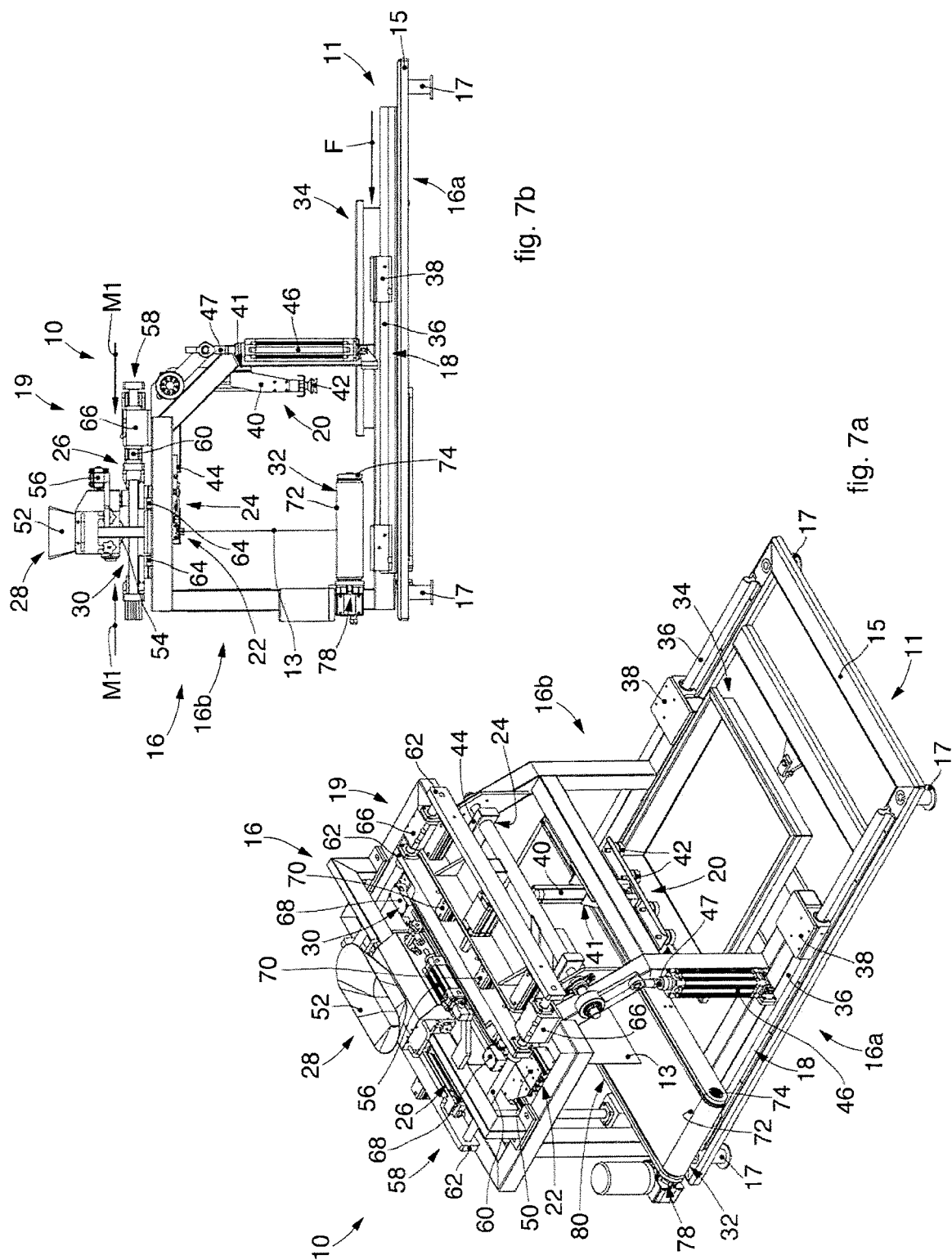
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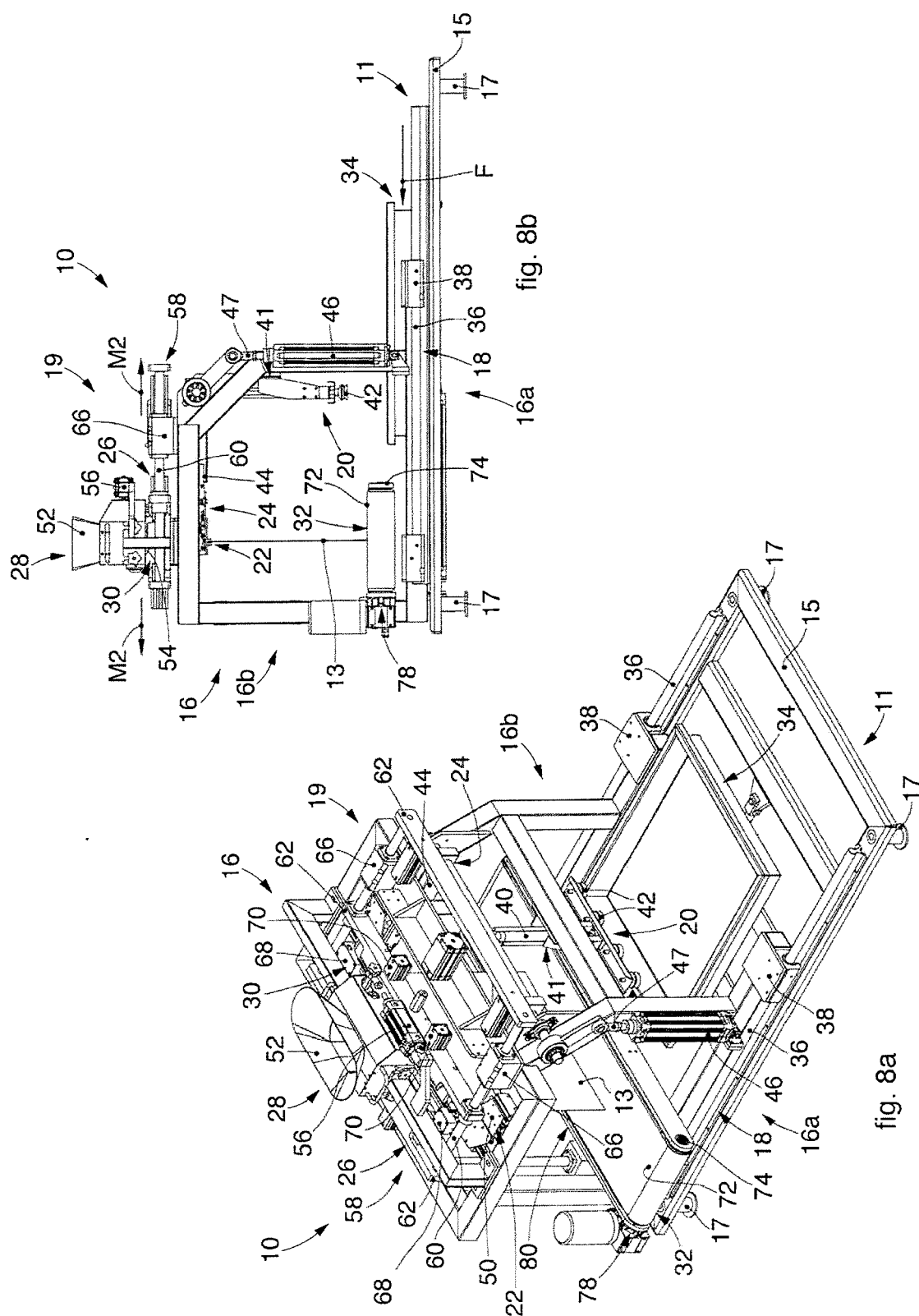


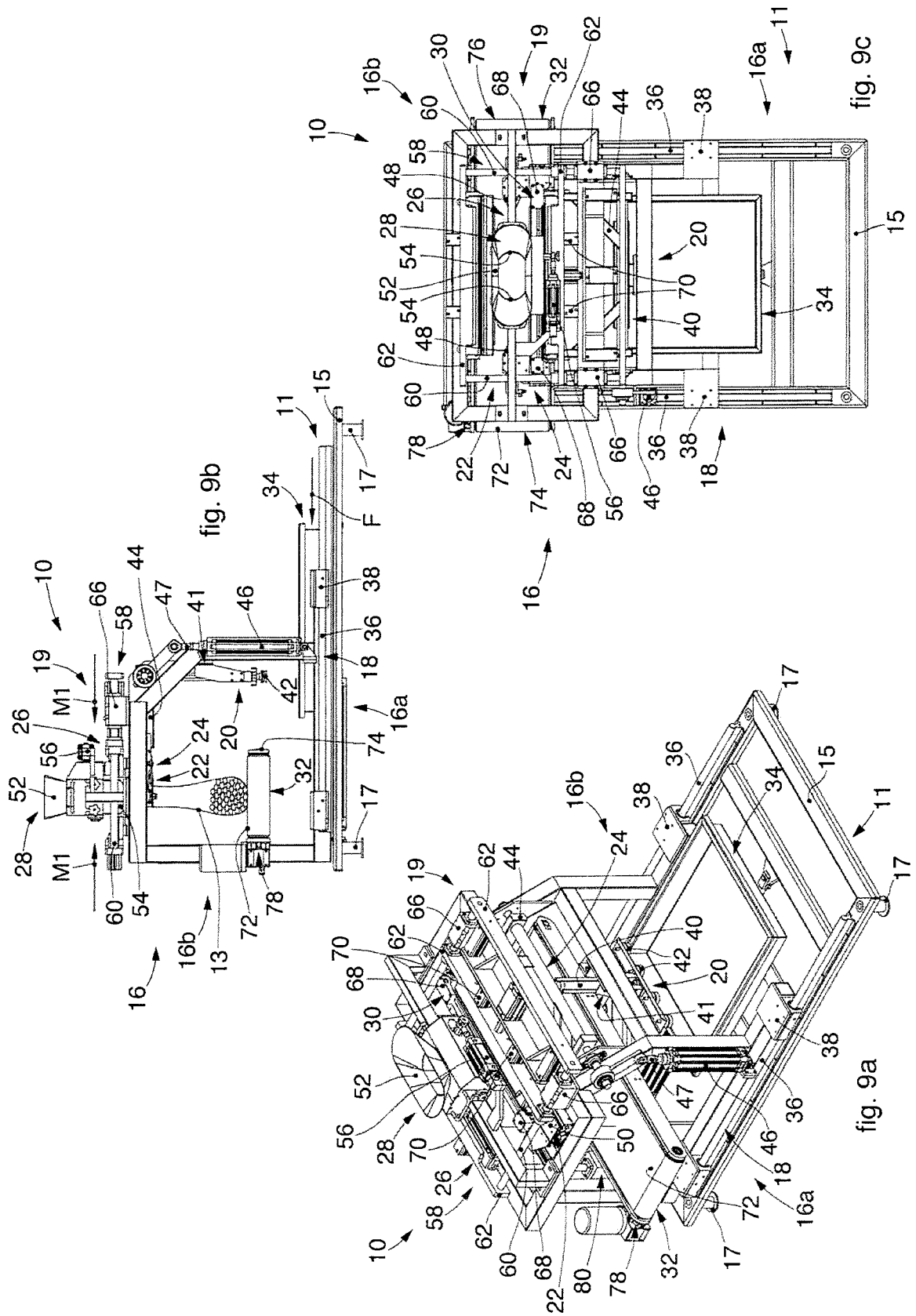


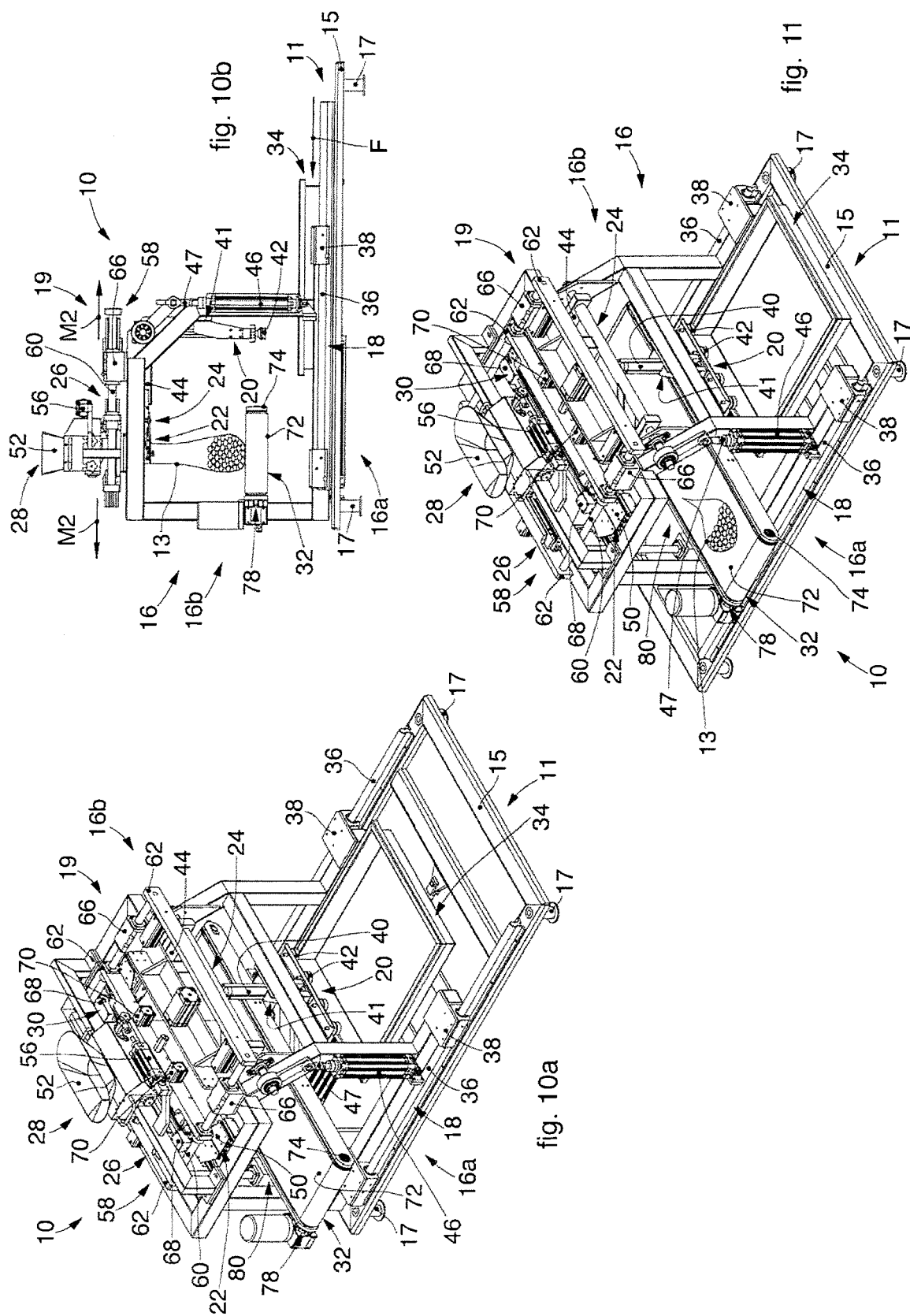














EUROPEAN SEARCH REPORT

Application Number
EP 16 17 4047

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2014/331603 A1 (TAKAHASHI MASAOKI [JP]) 13 November 2014 (2014-11-13)	1-4,6, 11,14-17	INV. B65B37/02
Y	* paragraph [0053] - paragraph [0082]; figures 1-14 *	5,7-10, 12,13	B65B39/00 B65B43/18 B65B43/26
Y	FR 2 804 654 A1 (EUROTECH [FR]) 10 August 2001 (2001-08-10)	5,7-10, 12,13	B65B43/46 B65B1/06
A	* page 7 - page 10; figures 1-3 *	1-4,6, 11,14-17	B65B43/44 B65B43/14 B65B51/14
Y	DE 20 32 093 A1 (TECHNIK-HAUS AUGSBURG ING. JOSEF SCHRECK) 13 January 1972 (1972-01-13)	5,7-10, 12,13	
A	* page 2, line 14 - line 26; figure 1 *	1-4,6, 11,14-17	
Y	GB 1 309 439 A (HAVER & BOECKER) 14 March 1973 (1973-03-14)	5,7-10, 12,13	
A	* the whole document *	1-4,6, 11,14-17	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 7 October 2016	Examiner Paetzke, Uwe
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 17 4047

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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07-10-2016

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2014331603 A1	13-11-2014	CA 2826314 A1	10-11-2014
		FR 3005455 A1	14-11-2014
		JP 2014218282 A	20-11-2014
		KR 20140133439 A	19-11-2014
		US 2014331603 A1	13-11-2014

FR 2804654 A1	10-08-2001	NONE	

DE 2032093 A1	13-01-1972	NONE	

GB 1309439 A	14-03-1973	DE 1948227 A1	01-04-1971
		FR 2062620 A5	25-06-1971
		GB 1309439 A	14-03-1973

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 2014331603 A [0011]
- FR 2804654 A [0012]
- DE 2032093 A [0013]
- GB 1309439 A [0014]