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(54) **Machine for packaging products in mesh casings**

(57) A machine for packaging products in mesh casings, comprising a packaging station (3) of products in casings made from a first section (4) of predetermined length of a tubular mesh (5) inserted and compacted along a first tubular support (6), an automatic insertion and compacting station (8) of a second section (9) of predetermined length of the tubular mesh (5) along a second support (10), to replace the first support (6) when the first section (4) of tubular mesh (5) has run out, said insertion and compacting station (8) comprising a head (23) that is mobile between an upper position and a lower position respectively corresponding to the upper portion (12) and to the lower portion (11) of said second support (10). The aforementioned head (23) comprises fastening means (26) for the free end (7) of the tubular mesh (5).

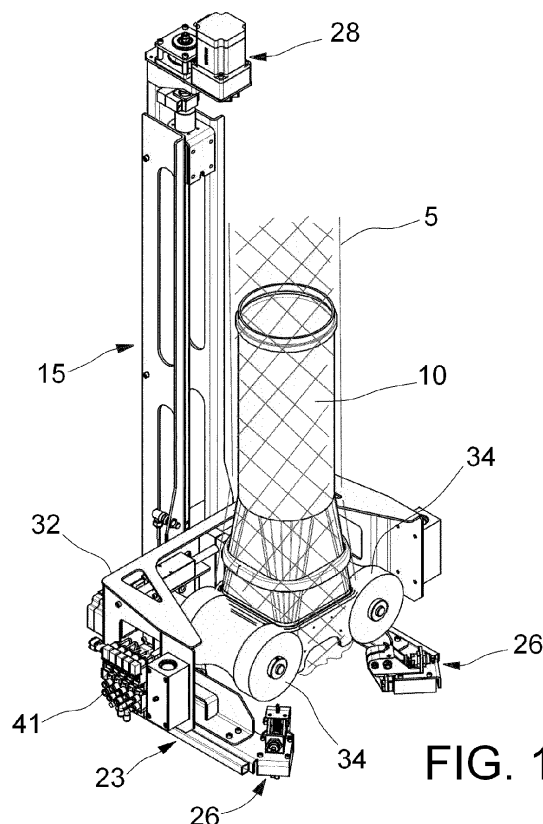


FIG. 10

Description

[0001] The present invention concerns a machine for packaging products in mesh casings.

[0002] More specifically, the present invention concerns a machine for packaging products in casings made from a section of predetermined length of a tubular mesh inserted and compacted along a removable and interchangeable tubular support mounted on the machine.

STATE OF THE ART

[0003] In the field of the packaging of products, for example fruit and vegetable products and the like, there is widespread use of packages consisting of bags or packets in the form of mesh, for example made from natural or synthetic material, in which a certain number of products to be put on sale, for example fruit, vegetables, but also others, are contained.

[0004] As known, the use of packages in mesh form promotes better conservation of products of this type, since the optimal aeration and natural transpiration thereof are ensured.

[0005] The aforementioned packages of products are made on packaging machines comprising locking means for one or more feeding supports of the tubular mesh with which the casings of the products must be made. In greater detail, such supports consist of substantially tubular elements along which a section of predetermined length of the mesh is inserted.

[0006] Once inserted along the support, for every filling cycle the tubular mesh is closed at the lower end and filled with products through the cavity of the tubular support itself; after each filling step, the tubular mesh is closed at the upper end, for example by welding, and cut. Otherwise, the mesh can be closed with other means such as metallic, plastic or similar clips. The package thus made is then deposited on transportation means for example with a belt.

[0007] Of course, in order to carry out the highest possible number of filling cycles without stopping the machine, a section of tubular mesh sufficiently long to ensure a certain autonomy is usually compacted on a single tubular support.

[0008] For example, on a support of length of the order of a metre a few hundreds of metres of tubular mesh can be compacted, so that a single support can allow the uninterrupted operation of the machine for a certain period.

[0009] Once the section of tubular mesh present on the support loaded on the packaging machine has run out, in order to limit the stop times of the machine itself to the minimum, the aforementioned support must be rapidly replaced by another on which the section of tubular mesh of predetermined length necessary to continue production has already been preliminarily inserted.

[0010] The insertion operation of a section of tubular mesh of predetermined length on each support thus con-

stitutes a crucial step in the packaging cycle of products. Indeed, the speed and efficiency of performance of this operation has a decisive influence on the operativity of the packaging line.

[0011] The insertion operation of a section of predetermined length of a tubular mesh on a support is usually carried out on an apparatus specifically intended for this purpose.

[0012] The tubular mesh is normally made available for example in rolls, or in containers in which it is stored folded upon itself.

[0013] The insertion apparatus of the tubular mesh generally comprises a frame with a base on which the tubular support is manually rested with vertical axis, and compacting means, supported by the frame, which take care of inserting the section of predetermined length of mesh along the tubular support.

[0014] The compacting means typically consist of two rollers or brushes with axes parallel and perpendicular to that of the tubular support, having the side surfaces substantially in contact, on opposite sides, with the side surface of the tubular support.

[0015] Once a first section of tubular mesh has been inserted along the support, the rotation of the rollers or of the brushes according to opposite directions causes the continuous unwinding of the tubular mesh from the roller or from the container and its progressive compacting along the support.

[0016] As stated, the loading of the tubular support on the insertion machine is currently carried out on semiautomatic machines. Indeed, the operator must load the empty tubular support on the machine, place a suitable cone on top, manually insert the first section of mesh, and start the brushes that begin to insert the mesh. Periodically, moreover, the operator must manually lower the mesh along the tube, since the brushes alone are not able to push the mesh downwards.

[0017] Finally, at the end, the operator must cut the mesh and extract the tubular support.

[0018] In fact, the presence of the operator is almost continuous.

[0019] Clearly, this causes an interruption in the production of the packaging machine that can also last a long time in the case in which there are problems in carrying out the operations.

[0020] Moreover, the insertion of the free end of the tubular mesh along the support is also carried out manually each time by the operator.

[0021] The consequence of this is a further lengthening of the waiting times of the packaging machine, and also continuous effort from the operator, with a clear waste of resources.

PURPOSES OF THE INVENTION

[0022] The technical task of the present invention is therefore to improve the state of the art.

[0023] In this technical task, a purpose of the present

invention is to devise a machine for packaging products in mesh casings in which the waiting times due to the depletion of the section of mesh inserted along the support are very limited.

[0024] Yet another purpose of the present invention is to make a machine for packaging products in mesh casings that limits to the minimum the need for interventions by specialised workers.

[0025] This task and these purposes are accomplished by the machine for packaging products in mesh casings according to the attached claim 1.

[0026] The machine according to the invention comprises a packaging station of products in casings made from a first section of predetermined length of a tubular mesh inserted and compacted along a first tubular support, and also an automatic insertion and compacting station of a second section of predetermined length of the tubular mesh along a second support, to replace the first support when the first section of tubular mesh has run out.

[0027] The insertion and compacting of the second section of mesh along the second tubular section takes place while the packaging station is operative, in a suitably dedicated station. Moreover, the replacement of the first support for the second support takes place in an automated manner, limiting the stop times of the machine to the minimum.

[0028] According to an aspect of the present invention, the aforementioned insertion and compacting station comprises a mobile head between an upper position and a lower position respectively corresponding to the upper portion and to the lower portion of the second support. According to another aspect of the present invention, the head of the machine comprises fastening means for the free end of the tubular mesh.

[0029] Further advantageous characteristics are described in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS.

[0030] The characteristics of the invention will become clearer to any man skilled in the art from the following description and from the attached tables of drawings, given as a non-limiting example, in which:

figure 1 is an axonometric view of a machine according to the invention;

figure 2 is a detail of figure 1, with some parts of the machine removed for greater clarity;

figure 3 is a detail of figure 1, with some parts removed for greater clarity, in another step of the operation of the machine;

figure 4 is a detailed axonometric view of the machine from another angle;

figure 5 is a detailed axonometric view of the machine, according to yet another angle;

figures 6,7 are detailed axonometric views of some parts of the automatic insertion and compacting station of the machine, in different operating situations;

figure 8 is a detailed axonometric view of the feeding group of the tubular mesh from an external store; figure 9 is a detailed axonometric view of the automatic insertion and compacting station in an initial operating step, in which the tubular mesh is slotted at the top of the support;

figure 10 is a detailed axonometric view of the automatic insertion and compacting station in a subsequent operating step, in which the first section of the tubular mesh is completely slotted along the support; figure 11 is a detailed axonometric view of the automatic insertion and compacting station, in a compacting step of the tubular mesh along the support; figure 12 is a detailed axonometric view of the automatic insertion and compacting station, at the end of the compacting step of the tubular mesh along the support;

figure 13 is a detailed axonometric view of the head of the automatic insertion and compacting station;

figure 14 is a detailed axonometric view of the feeding group of the tubular mesh from an external store; figure 15 is an axonometric view of the fastening means of the head of the machine according to the invention;

figure 16 is an axonometric view of another embodiment of the machine according to the invention;

figure 17 is a side view of the machine of figure 16.

EMBODIMENTS OF THE INVENTION.

[0031] With reference to the attached figure 1, a machine for packaging products in mesh casings according to the present invention is wholly indicated with 1.

[0032] The machine according to the invention as described hereafter has particular, but not exclusive, application in the field of the packaging of fruit and vegetable products and the like in casings made in mesh form, for example natural or synthetic, either woven or extruded.

[0033] The machine 1 comprises a base block 2, which supports the various groups, as illustrated in figure 1.

[0034] In particular, the machine comprises a packaging station, wholly indicated with 3, of products in casings made from a first section 4 of predetermined length of a tubular mesh 5 inserted and compacted along a first tubular support 6.

[0035] Through the cavity of the first support 6 the products to be packaged - for example units of fruit, vegetable, or possibly other type of product - are fed by falling so as to collect in single casings, not represented in the figures, made by closing the lower free end 7 of the tubular mesh 5, and then by subsequently closing the top of the casing itself, in a way that is *per sé* known in the field.

[0036] The machine according to the invention also comprises an automatic insertion and compacting station, wholly indicated with 8, of a second section 9 of predetermined length of the tubular mesh 5 along a second support 10, to replace the first support 6 when the first section 4 of tubular mesh 5 runs out, as made clearer

in the rest of the description.

[0037] The automatic insertion and compacting station 8 thus makes it possible to prepare, completely on-board the machine and without the manual intervention of any workers, a second support 10 with a respective second section 9 of predetermined length of tubular mesh 5, already ready to immediately replace the first support 6 when it runs out its first section 4 of tubular mesh 5, so as to minimise the stop times of the machine.

[0038] As made clearer hereafter, the first support 6 and the second support 10 alternate between the packaging station 3 and the insertion and compacting station 8, so that, at any moment, apart from the very brief replacement steps, there is always one of the two supports 6,10 with a respective section 4,9 of tubular mesh 5 inserted at the packaging station 3, and the other of the two supports 6,10 at the insertion and compacting station 8.

[0039] In the rest of the present description, therefore, by first support 6 we indicate the one of the two supports 6,10 that, during the operation of the machine 1, is located in the packaging station 3, whereas by second support 10 we indicate the one of the two supports 6,10 that, at the same moment, is located in the insertion and compacting station 8 of the tubular mesh 5.

[0040] The same specifications also apply for the first section 4 and the second section 9 of tubular mesh 5. The first and the second support 6,10, along which the respective sections 4,9 of tubular mesh 5 must be inserted, are of course completely identical. Each of them comprises a substantially tubular frusto-conical lower portion 11, and a cylindrical upper portion 12. Going back to the detailed characteristics of the machine 1, the base block 2 comprises a flat support structure 13, resting on adjustable feet 14.

[0041] The flat structure 13 supports the various groups of the machine 1, as described hereafter.

[0042] The insertion and compacting station 8 of the machine comprises a frame 15 provided with a base 16 for positioning the second support 10 with vertical axis, along which the respective second section 9 of predetermined length of the tubular mesh 5 must be inserted.

[0043] The base 16 for the second support 10, represented in particular in figures 6,7 in two different operating situations, comprises, in detail, a tubular element 17 that on top defines a support surface 18 for the lower portion 11 of the second support 10.

[0044] Inside the tubular element 17 an expanding mandrel is housed, wholly indicated with 19.

[0045] The expanding mandrel 19 comprises a plurality of expandable elements 20, each mobile, by pneumatic actuation through actuators 21, from an inactive position - illustrated in figure 6 - in which they are housed inside the tubular element 17, to a locking position of the second support 10 in which they extend outwards and are opened wide, as illustrated in figure 7.

[0046] In greater detail, the expandable elements 20 comprise respective flat surfaces 22 that are suitable, in

the aforementioned locking position of the expandable elements 20 themselves, for abutting against the inner surface of the second support 10, so as to hold the latter stably on the supporting surface 18.

[0047] The insertion and compacting station 8 comprises a mobile head 23.

[0048] The head 23 is mobile between an upper position and a lower position respectively corresponding to the upper portion 12 and to the lower portion 11 of the second support 10.

[0049] The head 23 is mobile along a sliding guide 24 foreseen in the frame 15, between the aforementioned upper and lower positions.

[0050] The head 23 comprises compacting means, wholly indicated with 25, of the second section 9 of predetermined length of the tubular mesh 5 respectively along the second support 10.

[0051] Such lower and upper positions of the head 23 are respectively illustrated, in detail, in figures 9 and 10.

[0052] The head 23 of the insertion and compacting station 8 comprises fastening means, wholly indicated with 26, for the free end 7 of the tubular mesh 5.

[0053] As will be described more clearly hereafter, the mobile head 23 makes it possible, by carrying out a downward stroke from the upper position to the lower position, to insert an initial portion of the first section 4 of the tubular mesh 5 along the second support 10 thanks to the fastening means 26 that engage the free end 7 thereof and suitably open it out.

[0054] Moreover, in carrying out an upward stroke from the lower position to the upper position, the head 23 makes it possible, thanks to the simultaneous actuation of the compacting means 25 during said upward stroke, to insert a second section 9 of tubular mesh 5 of predetermined length along the second support 10.

[0055] For example, the section 4,9 of tubular mesh 5 inserted along each support 6,10 can have a length even of a few hundred metres.

[0056] The insertion of the second section 9 along the second support 10 takes place in a totally automated manner without the manual intervention of any workers, in a quick and efficient manner.

[0057] Other advantages will become clearer from the rest of the description.

[0058] The sliding guide 24 of the frame 15 comprises profiles, fixed to one another and to the flat structure 13 of the base block 2.

[0059] The frame 15 of the insertion and compacting station 8 also comprises two uprights 27, foreseen at the sides of the sliding guide 24, for example consisting of cylindrical bars with vertical axis.

[0060] The insertion and compacting station 8 comprises translation means, wholly indicated with 28, of the head 23 along the frame 15, from the lower position to the upper position and vice-versa.

[0061] The translation means 28 of the head 23 comprise a first motor 29.

[0062] The first motor 29 is preferably an electric motor,

for example of the brushless type, or of another type.

[0063] The first motor 29 is fixed to the top of the frame 17. The first motor 29 is associated with a respective first reducer 30.

[0064] The translation means 28 of the head 23 also comprise an actuation screw 31, associated with the first motor 29 and supported in the frame 15 with vertical axis.

[0065] The actuation screw 31 is coupled with a respective mother screw foreseen in the head 23, not illustrated in the figures.

[0066] The coupling between screw 31 and mother screw of the head 23 thus makes it possible to obtain the translation of the head 23 itself upwards and downwards in relation to the distinct operative steps of the machine.

[0067] The head 23 comprises a framework 32, shaped substantially like a "C", which surrounds the second support 10 during the operative steps of the insertion and compacting station 3 of the mesh 5.

[0068] The framework 32 is guided along the sliding guide 24. For this purpose, the framework 32 comprises side bushings 33 in which the uprights 27 engage, as illustrated in figure 1.

[0069] As can be seen in the detail of figure 13, at the centre of the framework 32 of the head 23 there are the compacting means 25 of the tubular mesh 5 along the second support 10.

[0070] The compacting means 25 comprise, in greater detail, a pair of compacting rollers - or brushes - 34.

[0071] The compacting rollers 34 are rotatably supported with parallel axes in the head 23.

[0072] The compacting rollers 34 are preferably of the self-regulating type, so as to possibly adapt to supports 10 of different shapes or sizes.

[0073] The compacting rollers 34 are associated with respective second motors 35, supported in the rear part of the head 23, as illustrated in figures 1 and 2.

[0074] On the axes of the compacting rollers 34 respective second reducers 36 are mounted.

[0075] The coupling between the second motors 35 and the respective second reducers 36 is obtained through transmission belts 37.

[0076] The compacting rollers 34 have the respective side surfaces suitably shaped so as to couple with the side surface of the second support 10, to obtain the best effects described hereafter.

[0077] The fastening means 26, in greater detail, are of the positively actuated type.

[0078] The fastening means 26 comprise retractable hooks 38, associated with respective actuators 40,40A.

[0079] The fastening means 26 of the free end 7 of the tubular mesh 5 are foreseen at the vertices of the C-shaped framework 32 of the head 23, as can be seen for example in figure 13.

[0080] The retractable hooks 38 are fixed to the vertices of the C-shaped framework 32 of the head 23.

[0081] The retractable hooks 38 are housed in respective seats 39 fixedly connected to the framework 32, and are associated with the respective actuators 40,40A.

[0082] The actuators 40,40A, in the described embodiment, are of the pneumatic type.

[0083] In other embodiments of the invention, the actuators 40,40A could be of another type, for example electrical, electromagnetic or others.

[0084] In order to actuate the aforementioned actuators 40,40A - and also possible other devices installed on the head 23, for example for adjusting the distance between the compacting rollers 34, or others - an island of pneumatic electrovalves 41, or other equivalent pneumatic control means, connected to compressed air generating means not represented in the figures, is installed on the head 23.

[0085] The retractable hooks 38 are each mobile from an inactive position - illustrated for example in figure 13 - in which they are inserted in the respective seats 39 and are apart from the tubular mesh 5, to an extended position - illustrated in particular in figure 9 - of engagement in the grids of the tubular mesh 5 at its free end 7, and of opening out of such an end 7 to allow the insertion along the second support 10.

[0086] The fastening means 26 could also be of the non-positively actuated type.

[0087] The fastening means 26 could also be of another equivalent type.

[0088] For example, the fastening means 26 could comprise positively actuated pincers.

[0089] We will return to the detailed characteristics of the fastening means 26 later in the description.

[0090] The insertion and compacting station 8 of the machine 1 at the top comprises a feeding group, wholly indicated with 42, of the tubular mesh 5 from an external store. The external store of the tubular mesh 5 - not represented in the figures - can consist, for example, of a roll, or of a container inside which the tubular mesh 5 is folded on itself.

[0091] The feeding group 42 of the tubular mesh 5 is supported at the top of the insertion and compacting station 8 by a structure 43 fixed onto the sliding guide 24.

[0092] The feeding group 42 of the tubular mesh 5 comprises a tubular body 44, having at least one upper frusto-conical portion for opening out the free end 7 of the tubular mesh 5.

[0093] Above the tubular body 44 a deviating roller 45 is rotatably supported on the structure 43. The deviating roller 45, as illustrated in particular in figure 8, allows the correct pulling of the tubular mesh 5, coming from the external store, towards the tubular body 44 without twisting or other drawbacks.

[0094] The feeding group 42 also comprises traction means, wholly indicated with 46, operating along the side surface of the tubular body 44 to pull the tubular mesh 5 downwards, i.e. towards the second support 10.

[0095] The aforementioned traction means 46 comprise two opposite pulling belts 47, positioned at at least two sides of the tubular body 44.

[0096] The pulling belts 47 are wound on respective pulleys 48, rotatably supported in the structure 43 of the

frame 15.

[0097] The belts 47 and the pulleys 48 are for example of the toothed type, but they could also be of another type. The pulleys 48 are actuated by a single third motor 49, as illustrated in figure 14, fixed to the structure 43. In order to obtain the effective pulling of the tubular mesh 5 along the tubular body 44, the pulling belts 47 are placed in contact, through respective windows 50 foreseen in the side surface of the tubular body 44 itself, with respective idle rollers 51 rotatably supported inside the tubular body 44.

[0098] Moreover, the traction means 46 comprise a plurality of further idle rollers 52 that roll on the outer surface of the tubular body 44.

[0099] The idle rollers 52 are supported, along the edges of the windows 50, by plates 53 fixedly connected to the structure 43.

[0100] In other embodiments that are not represented, the idle rollers 52 could be absent.

[0101] The traction means 46 also comprise two actuation rods 54 of the pulleys 48.

[0102] The actuation rods 54 are both connected to the same third motor 49 through a cardan joint 55.

[0103] The third motor 49 can for example be an electric motor, or even another type.

[0104] The cardan joint 55 makes it possible to obtain the transmission of the motion between the pulleys 48 also by varying the distance between them, for example in the case of variation of the size of the tubular body 44.

[0105] The feeding group 42 carries out the important function of opening out the mesh 5 before insertion into the support 6, 10, and makes it loose and free to slide before being pulled by the retractable hooks 38.

[0106] The insertion and compacting station 8 of the machine comprises a cutting group 56 of the tubular mesh 5 inserted and compacted at the top of the second support 10, illustrated in figures 5 and 12.

[0107] The cutting group 56, therefore, is suitable for separating the second section 9 of predetermined length necessary to feed a packaging machine, or other type of machine, from the tubular mesh 5.

[0108] The cutting group 56 comprises, for example, a heated blade 57 associated with pneumatic actuation means 58 that cause its rotation around a vertical axis parallel to that of the second support 10.

[0109] In such rotation, the heated blade 57 cuts the tubular mesh 5 separating the second section 9 already compacted along the second support 10 from the remaining portion of mesh 5 fed from the external store.

[0110] The packaging station 3 of the machine 1 comprises a hopper 59 for feeding the products to be packaged into the casings. Both the products and the casings are not represented in the figures.

[0111] The hopper 59 is suitable for making a predetermined amount of units of product fall through the cavity of the first support 6 for each filling cycle.

[0112] For example, the hopper 59 can be equipped with a gate valve - not visible in the figures, but of the *per*

sé known type - that opens and closes according to predetermined time periods so as to allow the aforementioned amount of units of product to pass.

[0113] The packaging station 3 also comprises, at the lower portion 11 of the first support 6, unwinding rollers 60 of the lower end of the first section 4 of tubular mesh 5.

[0114] In particular, the unwinding rollers 60 take care of unwinding, in every filling cycle, a portion of the first section 4 of tubular mesh 5 of length corresponding to that of each casing to be filled with the products.

[0115] The unwinding rollers 60 are controlled by respective intermittent rotary actuation means, not represented in the figures, but of the *per sé* known type in this type of machine.

[0116] The packaging station 3 also comprises, at the lower portion 11 of the first support 6, two welding heads 61 of the first section 4 of tubular mesh 5.

[0117] The welding heads 61 take care, in every filling cycle, of welding a portion of the first section 4 of tubular mesh 5 so as to carry out, in a single welding step, the upper closing of the casing already filled with products and the bottom of the next casing still to be filled. At the same time, the same welding heads 61 carry out the cutting of the tubular mesh 5 at the welded area thus isolating the two parts belonging to two distinct casings, in a *per sé* known way in this type of machine.

[0118] The welding heads 61 are positioned opposite one another, actuated, for example pneumatically, to translate towards one another, from an inactive position in which they are apart, as illustrated in figure 1, to a welding position in which they are substantially in contact with one another.

[0119] The welding heads 61 are also provided with cutting members of the mesh at the welded area, not visible in the figures but of the *per sé* known type.

[0120] Between the welding heads 61 there is, in the flat structure 15 of the base block 2, an opening 62 that allows the discharging of the filled and closed casings in an underlying transportation line towards other stations of the production line, not represented in the figures but of the type known in the field.

[0121] According to another aspect of the present invention, the machine 1 comprises automatic replacement means, wholly indicated with 63, of the first support 6 with the second support 10, and vice-versa.

[0122] The automatic replacement means 63 are suitable, as described earlier, for alternatively putting the second support 10, along which the second section 9 of tubular mesh 5 has been inserted and compacted in the filling and compacting station 8, in place of the first support 6 in which the first section 4 of tubular mesh 5 has run out, and vice-versa, so as to minimise the periods of inactivity of the machine.

[0123] The automatic replacement means 63 of the first support 6 with the second support 10 and vice-versa comprise, more specifically, a first pair of jaws 64 and a second pair of jaws 65, articulated together and each provided with respective opening and closing means 66

between an inactive open position and a closed locking position of the first support 6 and of the second support 10 themselves.

[0124] Each of the jaws of the first pair 64 and of the second pair 65, as can be seen in figure 5, comprises a respective groove 67 for locking the supports 6, 10.

[0125] The jaws of the first pair 64 and of the second pair 65 are fixed to a common lower plate 68.

[0126] The jaws of the first pair 64 and of the second pair 65 are also mechanically coupled together through respective first and second pairs of cylindrical gears 69, 70, as illustrated in figure 4.

[0127] The opening and closing means 66 comprise, for each pair 64, 65, for example a respective double-acting pneumatic actuator having the respective ends articulated to the jaws of each of the pairs 64, 65, as illustrated in the view from below of figure 5.

[0128] However, it is possible to use opening and closing means 66 of another type.

[0129] The automatic replacement means 63 also comprise an alternative rotation member 71 of the first pair of jaws 64 and of the second pair of jaws 65, fixedly connected to one another, around a central vertical axis of the machine 1.

[0130] The alternative rotation member 71 is suitable for alternatively positioning the first pair of jaws 64, carrying the first support 6, and the second pair of jaws 65, carrying the second support 10, respectively at the packaging station 3 and the insertion and compacting station 8.

[0131] In other words, the alternative rotation member 71 imparts on the first pair of jaws 64 and on the second pair of jaws 65, fixedly connected together, an alternative rotation of 180° in one direction and in the other so as to continuously vary the position of the first support 6 and of the second support 10, i.e. in relation to which of the two to use in the packaging station 3 and which in the insertion and compacting station 8 of the tubular mesh 5.

[0132] The alternative rotation member 71 consists, in the described embodiment, of a double-acting pneumatic actuator having a first end articulated to parts of the base block 2 of the machine 1, and a second end articulated to the lower plate 68 that carries the first pair of jaws 64 and the second pair of jaws 65.

[0133] It is possible to use alternative rotation members 71 of any other type, in relation to the specific application requirements.

[0134] The machine 1 comprises a control unit, not represented in the figures, to which all of the actuators of the various stations and groups are slaved.

[0135] The control unit can for example consist of a programmable logic controller, or other similar devices known in the field.

[0136] As stated earlier, the fastening means 26 comprise retractable hooks 38, associated with respective actuators 40, 40A.

[0137] Moreover, the retractable hooks 38 are housed in respective seats 39 fixedly connected to the framework

32, and are associated with the respective actuators 40, 40A.

[0138] In greater detail, and now referring to figure 15, the fastening means 26 comprise, for each of the vertices of the C-shaped framework 32 of the head 23, a first actuator 40 responsible for a first movement carried out by the respective hook 38, and a second actuator 40A responsible for a second movement of the respective hook 38.

[0139] As made clearer hereafter, the composition of such first and second movements generates the engagement action of each of the hooks 38 in the free end 7 of the tubular mesh 5 and the opening out of the latter for the easy insertion along the second support 10.

[0140] The second actuator 40A consists of a double-acting pneumatic actuator, for example of the type with two parallel stems, or even of another equivalent type, for example single-acting with a return spring.

[0141] The second actuator 40A is mounted directly on the C-shaped framework 32 of the head 23.

[0142] Mobile equipment, wholly indicated with 80, is rigidly connected to the stems of the second actuator 40A.

[0143] The mobile equipment 80 comprises a bracket 81 provided with an upper appendage 82 and a lower appendage 83.

[0144] The lower appendage 83 is fixed to the stems of the second actuator 40A, whereas the upper appendage 82 has the first actuator 40 fixed to it.

[0145] The first actuator 40 can also be of the double-acting pneumatic type, or of another type, for example single-acting with return spring.

[0146] The mobile equipment 80 also comprises the aforementioned seat 39 for the respective hook 38, fixedly connected to the bracket 81.

[0147] The mobile equipment 80 also comprises a guide 84 fixed to the upper surface of the bracket 81.

[0148] Along the guide 84 a rack 85 fixed to the stem of the first actuator 40 is able to slide.

[0149] The seat 39 also rotatably supports a first gear wheel 86 and a second gear wheel 87, engaged together.

[0150] The second gear wheel 87 has a smaller diameter and number of teeth with respect to the first gear wheel 86.

[0151] The first gear wheel 86 engages on the rack 85.

[0152] The second gear wheel 87 has the respective hook 38 rigidly fixed to it.

[0153] The seat 39 comprises, in particular, a longitudinal slit 88 from which the respective hook 38 projects.

[0154] The first actuator 40 thus generates a first rotation movement of the hook 38, around the axis of the second gear wheel 87, between an inactive position - the one illustrated in figure 15 - and an engaged position in the tubular mesh 5.

[0155] The second actuator 40a, on the other hand, generates a second translation movement of the mobile equipment 80.

[0156] In particular, in order to grip the end 7 of the

tubular mesh 5, a translation movement of the mobile equipment 80 towards the mesh 5 itself must first be applied, obtained through the outward stroke of the stems of the second actuator 40A.

[0157] At the end of this, the rotation movement of the hook 38 around the axis of the second gear wheel 87 is imparted - through the outward stroke of the first actuator 40 - so that the hook 38 itself can engage between the grids of the tubular mesh 5.

[0158] Thereafter, the re-entry motion of the mobile equipment 80 is controlled - through re-entry stroke of the second actuator 40A - so as to open out the end 7 of the tubular mesh 5.

[0159] Thus the combination of the first and second movement of the fastening means 26 generates the engagement of the hooks 38 in the end 7 of the tubular mesh 5, and its subsequent opening out to promote the insertion into the second support 10.

[0160] The operation of the machine according to the invention is, in light of what has been described, totally intuitive.

[0161] In the packaging station 3 the first support 6 is locked by the first pair of jaws 64, as illustrated in figure 1.

[0162] On the first support 6 a first section 4 of tubular mesh 5 is inserted and compacted, with which the casings for the products must be made.

[0163] The products drop, in discrete and predetermined quantities, from the hopper 59 and are made to fall through the cavity of the first support 6; meanwhile, the unwinding rollers 60 and the welding heads 61 have taken care of unwinding a certain portion of the first section 4 and of welding its bottom, so as to make the casing that collects the aforementioned products.

[0164] The casing is thus filled with products, and is closed on top again by the welding heads 61, which at the same time also make the bottom of the next casing and separate the closed casing from the tubular mesh 5.

[0165] The casing is then deposited, through the opening 62, on a transportation line below.

[0166] This filling cycle proceeds, thus using successive fractions of the first section, until the first section 4 itself of tubular mesh 5 has run out.

[0167] Meanwhile, the second support 10 is in the insertion and compacting station 8, i.e. on the base 16 of the frame 2 of the machine, where it is locked by the expanding mandrel 19.

[0168] The jaws of the second pair 65 are open, i.e. in inactive position as illustrated in figures 3,4,5.

[0169] The tubular mesh 5, coming from an external store, is supplied at the feeding group 42.

[0170] In greater detail, with reference also to figure 8, the tubular mesh 5, inserted in the tubular body 44 of the feeding group 42, is pulled by the traction means 46 until its free end 7 is at the head 23.

[0171] In this step of the operation of the machine, indeed, the head 23 is already at the top of the second support 10.

[0172] The actuators 40,40A of the retractable hooks

38 are then actuated according to the methods described earlier, which thus engage in the grids of the free end 7 of the tubular mesh 5, according to figure 9.

[0173] The free end 7 of the tubular mesh 5 is then fastened and then opened out, according to the methods already described earlier.

[0174] At this point, the head 23 is lowered, actuating the translation means 28, until its lower position corresponding to the lower portion of the second support 10 is reached. In this downward stroke, the head 23 pulls the tubular mesh 5 with it, which is thus inserted, for its first section, along the second support 10 itself, as illustrated in figure 10.

[0175] At this point, the head 23 is lifted from the lower position to the upper position, according to figure 11. During this upward stroke of the head 23, the compacting means 25 are actuated simultaneously, to insert the first section 4 of predetermined length of the tubular mesh 5 along the first support 10.

[0176] The upward stroke of the head 23 obtains the double effect of carrying out a better and more uniform compacting of the mesh 5 along the support with respect to what occurs in known devices, and also such a stroke brings the head 23 back into the upper position of figure 9 at which a subsequent operative cycle of insertion and compacting can begin.

[0177] Once the upward stroke of the head 23 has ended, the machine takes care of cutting the tubular mesh 5 at the top of the second support 10 through the cutting group 56, thus separating the second section 9 of predetermined length from the remaining portion of tubular mesh 5, according to figure 12.

[0178] The second support 10 thus arranged is then ready to replace the first support 6 in the packaging station 3. Therefore, when the first section 4 of tubular mesh 5 along the first support 6 has run out, the opening and closing means 66 of the second pair of jaws 65 are firstly actuated, which thus close at the upper portion 12 of the second support 10 so as to lock it. Thereafter, the expanding mandrel 19 of the base 16 is actuated so that its expandable elements 20 go back into the inactive position of figure 6, thus freeing the lower portion 11 of the second support 10.

[0179] Then the automatic replacement means 63 are actuated, which carry out a rotation of 180° of the first and second pair of jaws 64,65, both in the respective locked positions. Such a rotation causes the positioning of the second support 10, with the second section 9 of tubular mesh 5, in the packaging station 3, and of the first support 6, without mesh, in the insertion and compacting station 8.

[0180] At this point, the expanding mandrel 19 is again actuated to lock the first support 6, and the jaws of the first pair 64 are opened.

[0181] A first section 4 of tubular mesh 5 is thus inserted in the first support 6, whereas the second support 10 provides the tubular mesh 5 necessary for the packaging station 3.

[0182] The operative cycle thus proceeds in the described way, i.e. with the first support 6 and the second support 10 that respectively alternate in the packaging station 3 and in the insertion and compacting station 8.

[0183] As stated, the invention, thus conceived, allows important technical advantages to be obtained.

[0184] Thanks to the simultaneous presence of two supports 6, 10 in the machine, one of which supplies the mesh for the packaging of the products whereas the other undergoes the insertion and compacting operation of the mesh, it is possible to reduce to the minimum the inactive waiting times, which actually are reduced to the automatic replacement of the support in which the mesh has run out with that in which the mesh has just been inserted and compacted.

[0185] The machine operates totally automatically, and does not require manual interventions by workers.

[0186] Moreover, given the total self-sufficiency of the machine thanks to the presence of the two supports 6, 10, manual removal interventions of the supports and the replacement with other ones prepared by other separate devices, positioned in other areas of the building are no longer necessary.

[0187] As regards the insertion and compacting station 8, the insertion operation of the tubular mesh 5 along one or other of the supports 6, 10 is carried out in a totally automated manner, without the need for manual intervention by workers, in a very quick and effective manner.

[0188] The insertion of a section of predetermined length of tubular mesh 5 along one or other of the supports 6, 10 is carried out in a more uniform and ordered manner thanks to the compacting means 25 that rise along the support together with the head 23.

[0189] Another embodiment of the machine according to the invention is illustrated in figures 15, 16.

[0190] The machine according to the present embodiment differs from the previous one in that it operates according to a horizontal axis instead of vertical.

[0191] For example, this embodiment can be used for packaging trays of fruit and vegetable products, but also of loose products.

[0192] The packaging station 3, in this embodiment, comprises horizontal advancing means 72 of the products inside the first support 6, which are for example of the thrusting crank mechanism type, or of another equivalent type.

[0193] The automatic replacement means 63, in this embodiment, comprise a disc 73 able to rotate around a horizontal axis 74, and actuated by a gearmotor group 75 supported by the base block 2.

[0194] The disc 73 comprises two diametrically opposite holes 76 that house the ends of the first support 6 and of the second support 10, respectively.

[0195] The remaining parts of the machine are totally analogous to those described in the previous embodiment.

[0196] It has thus been seen how the invention achieves the proposed purposes.

[0197] The present invention has been described according to preferred embodiments, but equivalent variants can be devised without departing from the scope of protection offered by the following claims.

Claims

1. Machine for packaging products in mesh casings, comprising a packaging station (3) of the products in casings made from a first section (4) of predetermined length of a tubular mesh (5) inserted and compacted along a first tubular support (6), an automatic insertion and compacting station (8) of a second section (9) of predetermined length of the tubular mesh (5) along a second support (10), to replace the first support (6) when the first section (4) of tubular mesh (5) has run out, said insertion and compacting station (8) comprising a head (23) that is mobile between an upper position and a lower position respectively corresponding to the upper portion (12) and to the lower portion (11) of said second support (10), **characterised in that** said head (23) comprises fastening means (26) for the free end (7) of the tubular mesh (5).
2. Machine according to claim 1, wherein said fastening means (26) are of the positively actuated type.
3. Machine according to claim 1 or 2, wherein said insertion and compacting station (8) comprises a frame (15), provided with a base (16) for positioning the second support (10), said head (23) being mobile, along a sliding guide (24) foreseen in said frame (15), between said upper and lower positions.
4. Machine according to one of the previous claims, wherein said head (23) comprises compacting means (25) of the tubular mesh (5) along said second support (10).
5. Machine according to the previous claim, wherein said insertion and compacting station (8) comprises translation means (28) of said head (23) along said sliding guide (24) comprising a first motor (29).
6. Machine according to the previous claim, wherein said translation means (28) of said head (23) comprise an actuation screw (31) associated with said first motor (29) and supported in said frame (15), said actuation screw (31) being coupled with a respective mother screw foreseen in said head (23).
7. Machine according to one of claims 4-6, wherein said compacting means (25) comprise a pair of rollers or compacting brushes (34), rotatably supported with parallel axes in said head (23), associated with respective second motors (35).

8. Machine according to one of the previous claims, wherein said fastening means (26) comprise retractable hooks (38) associated with respective actuators (40,40A). 5
9. Machine according to one of claims 4-8, wherein said head (23) comprises a framework (32) shaped substantially like a "C" that surrounds the second support (10), at the centre of which there are said compacting means (25), slidably guided along vertical uprights (27) of said frame (15). 10
10. Machine according to the previous claim, wherein said fastening means (26) are foreseen at the vertices of said C-shaped framework (32). 15
11. Machine according to one of claims 8-10, wherein each of said retractable hooks (38) is associated with a respective first actuator (40) for carrying out a rotation movement of said hook (38) from an inactive position in which it is away from the tubular mesh (5) to an extended position engaged in the grids of the tubular mesh (5) at its free end (7). 20
12. Machine according to the previous claim, wherein each of said retractable hooks (38) is associated with a respective second actuator (40A) for carrying out a translation movement suitable for carrying out the widening of said free end (7) of the tubular mesh so as to allow the insertion along the second support (10). 25 30
13. Machine according to one of the previous claims, comprising automatic replacement means (63) of the first support (6) with the second support (10) and vice-versa. 35
14. Machine according to the previous claim, wherein said automatic replacement means (63) of the first support (6) with the second support (10) and vice-versa comprise a first pair of jaws (64) and a second pair of jaws (65), articulated together and provided with respective opening and closing means (66) between an inactive open position and a closed locking position of the first support (6) and of the second support (10). 40 45
15. Machine according to the previous claim, wherein said automatic replacement means (63) comprise an alternative rotation member (71) of said first pair of jaws (64) and of said second pair of jaws (65) around a vertical axis, and suitable for alternately positioning said first pair of jaws (64) and said second pair of jaws (65) at said packaging station (3) and at said insertion and compacting station (8). 50 55
16. Machine according to the previous claim, wherein said alternative rotation member (71) comprises a double-acting pneumatic actuator having a first end articulated to the base (2) of the machine and a second end articulated to a lower support plate (68) of said prima pair of jaws (64) and of said second pair of jaws (65).
17. Machine according to one of claims 15,16, wherein said jaws of said first pair (64) and of said second pair (65) are mechanically coupled together through respective pairs of cylindrical gears (69,70), said opening and closing means (66) comprising, for each pair of jaws (64,65), a respective double-acting pneumatic actuator having the respective ends articulated to said jaws of said first pair and second pair (64,65).
18. Machine according to one of the previous claims, wherein said insertion and compacting station (8) comprises a feeding group (42) of the tubular mesh (5) from an external store, supported on said insertion and compacting station (8), comprises a tubular body (44) having at least one frusto-conical portion for widening the free end of the mesh (5), and traction means (46) operating along the side surface of said tubular body (44).
19. Machine according to the previous claim, wherein said traction means (46) comprise, on at least two sides of said tubular body (44), two opposite pulling belts (47), wound on respective pulleys (48), actuated by a third motor (49), said pulling belts (47) being coupled, through respective windows (50) foreseen in the side surface of said tubular body (44), with respective idle rollers (51) rotatably supported inside said tubular body (44).
20. Method for packaging products in mesh casings, comprising the steps of:
- providing a first tubular support (6),
 - after the previous step, providing a first section (4) of predetermined length of a tubular mesh (5),
 - after the previous step, inserting said first section (4) of tubular mesh (5) along said first tubular support (6),
 - after the previous step, compacting said first section (4) of tubular mesh (5) along said first tubular support (6),
 - after the previous step, packaging the products in casings obtained from fractions of said first section (4),
 - after the previous step, exhausting said first section (4),
 - providing a second tubular support (10),
 - after the previous step, providing a second section (9) of predetermined length of tubular mesh (5),

after the previous step, inserting said second section (9) of tubular mesh (5) along said second tubular support (10),
after the previous step, compacting said second section (9) of tubular mesh (5) along said second tubular support (10), 5
after the previous steps, replacing said second tubular support (10) for said first tubular support (6),
said steps of inserting and compacting said second section (9) on said second tubular support (10) being carried out through a head (23) that is mobile between an upper position and a lower position respectively corresponding to the upper portion (12) and to the lower portion (11) of said second support (10), 10 15
characterised in that said step of inserting said second section (9) on said second tubular support (10) comprises fastening the free end (7) of the tubular mesh (5). 20

21. Method according to the previous claim, wherein said step of compacting said second section (9) on said second tubular support (10) comprises lifting said head (23) from said lower position to said upper position. 25

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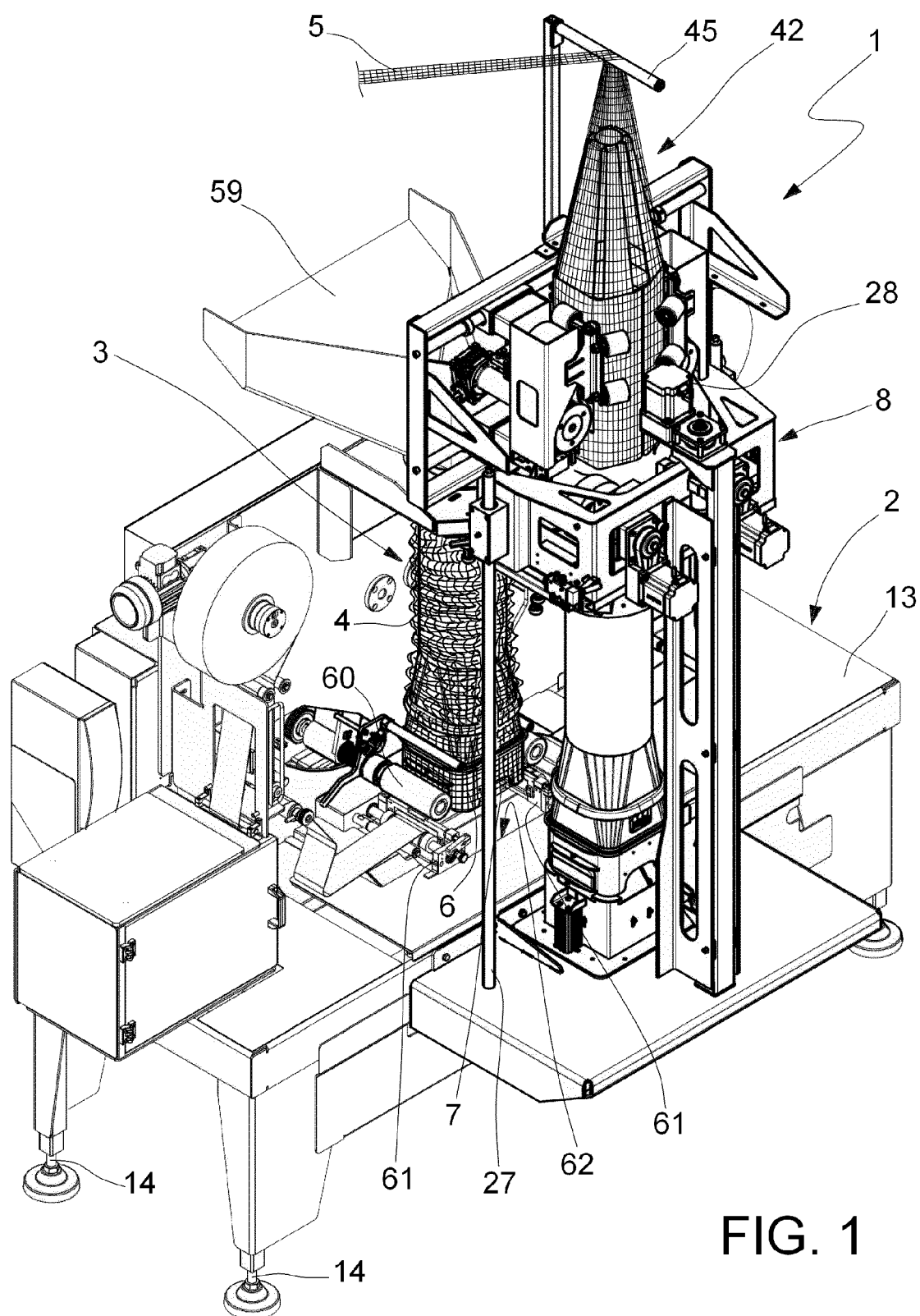
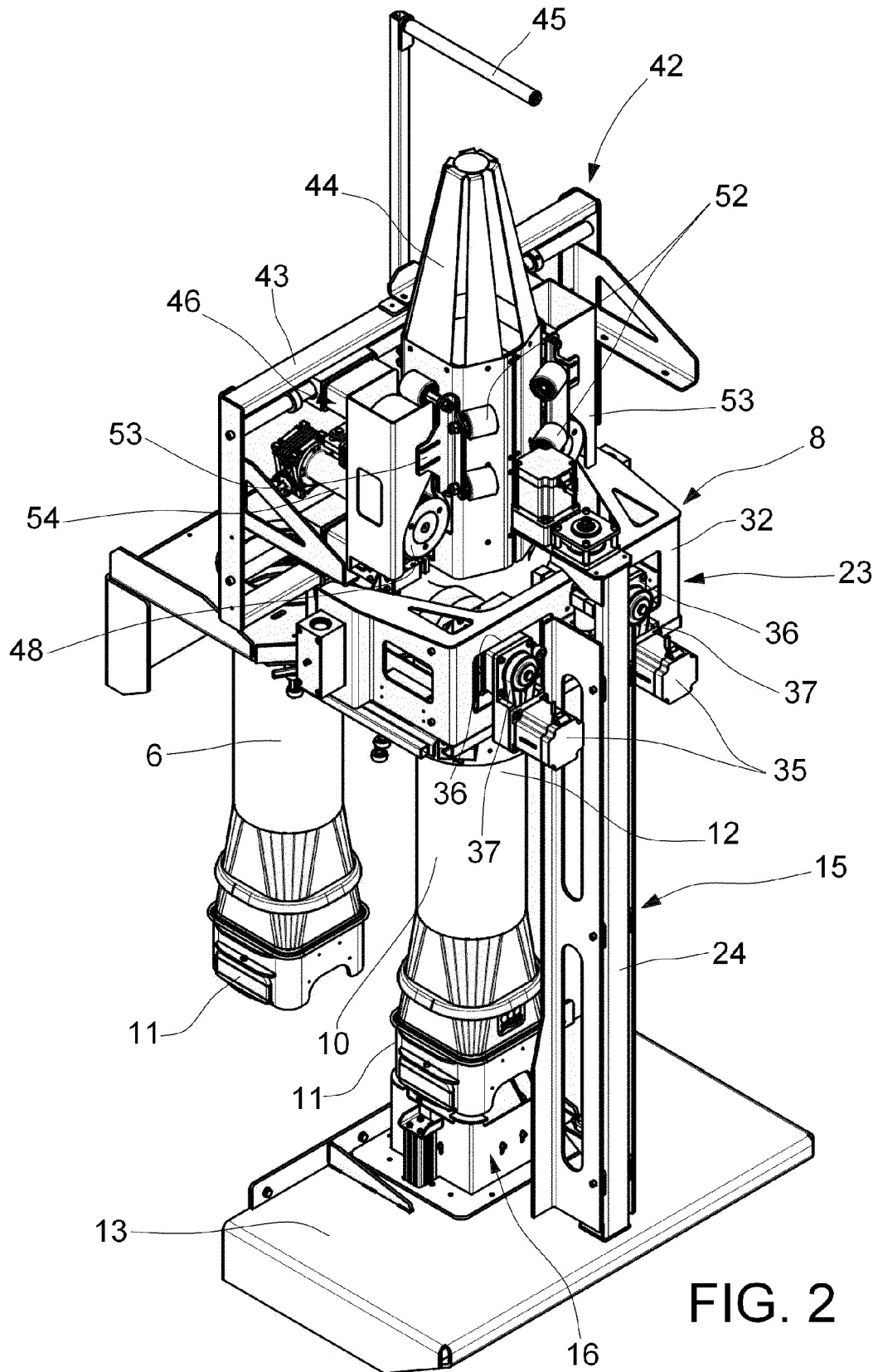
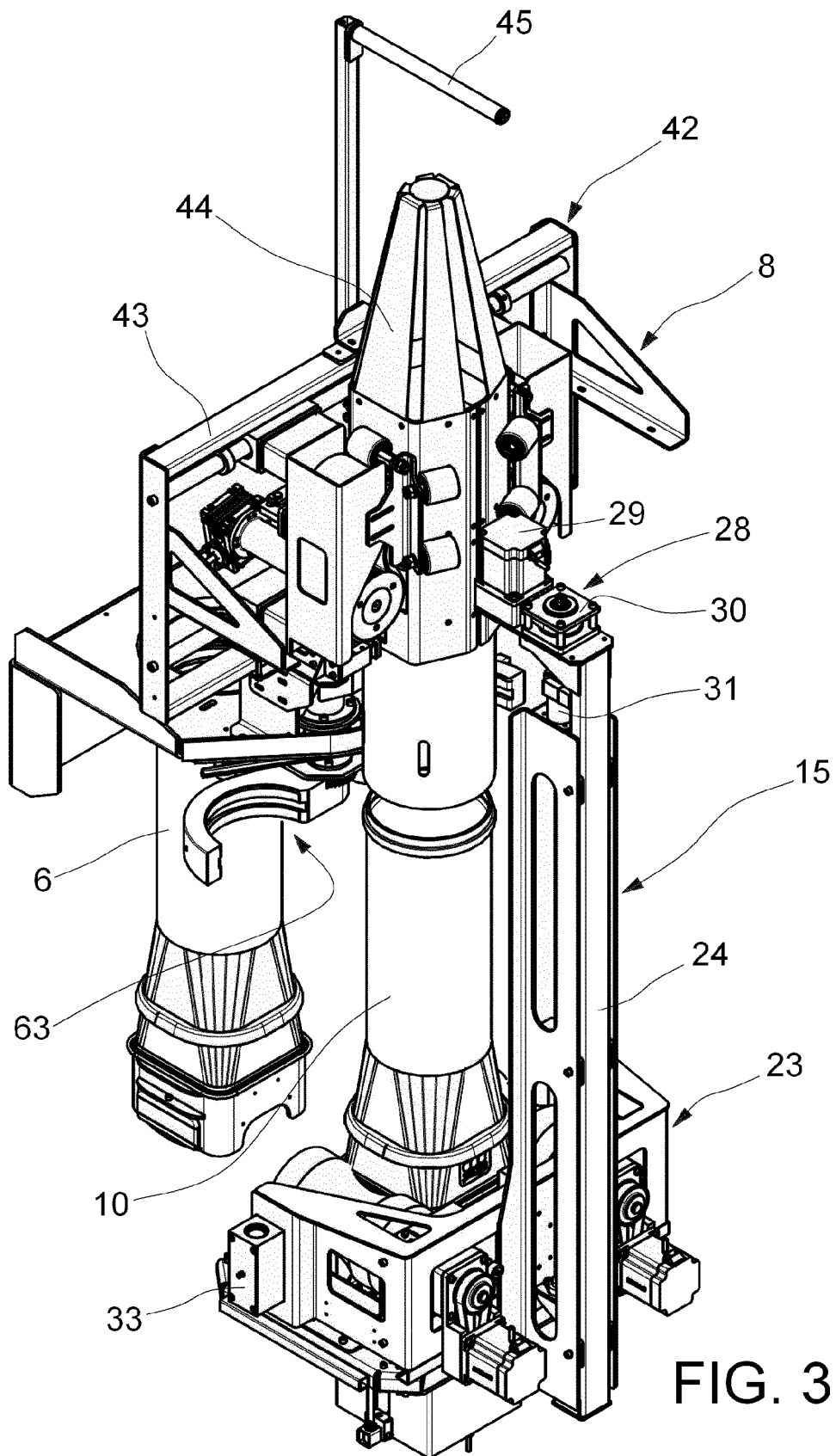


FIG. 1





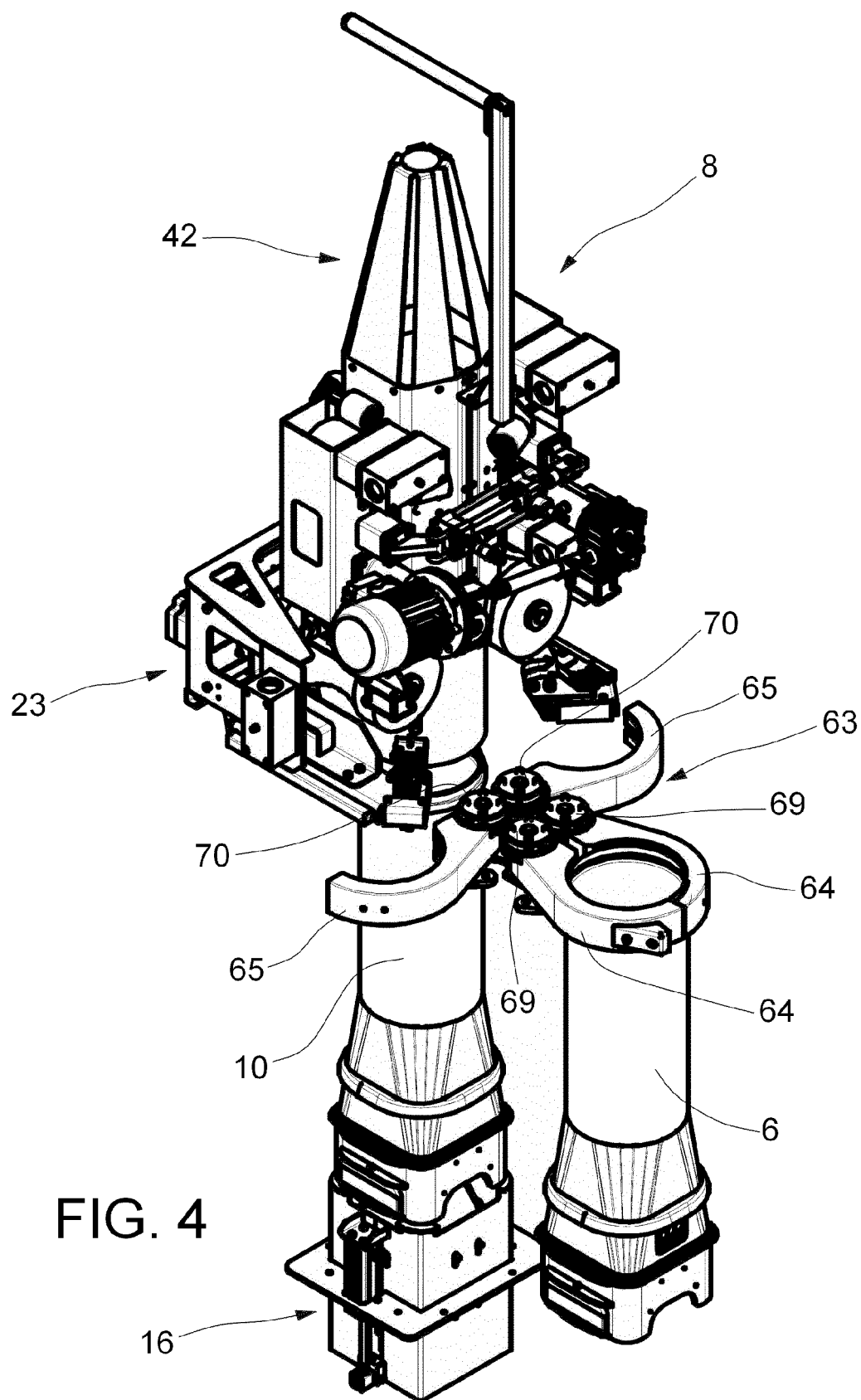
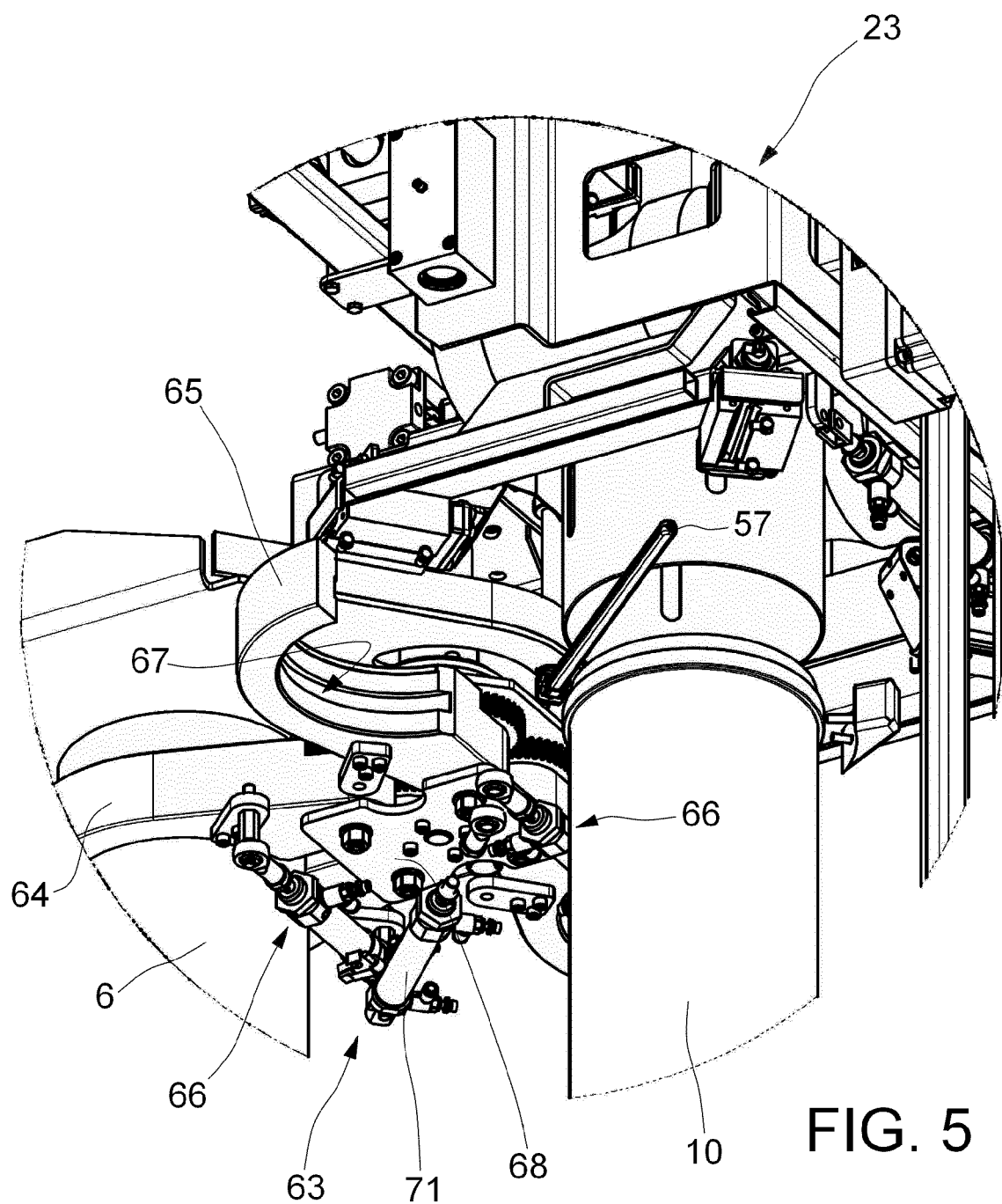
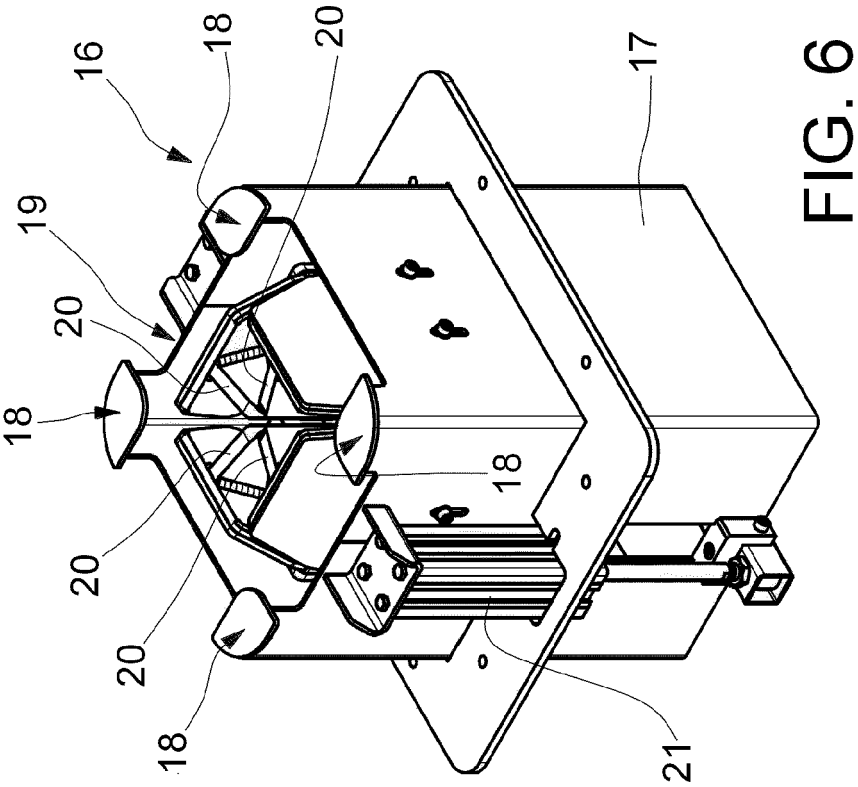
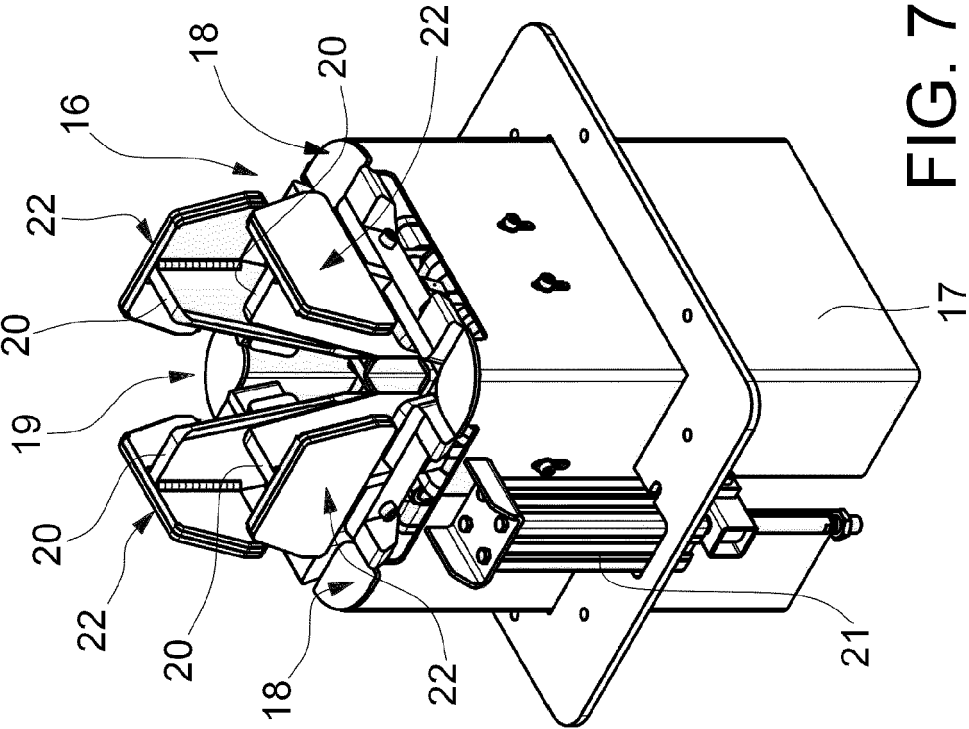
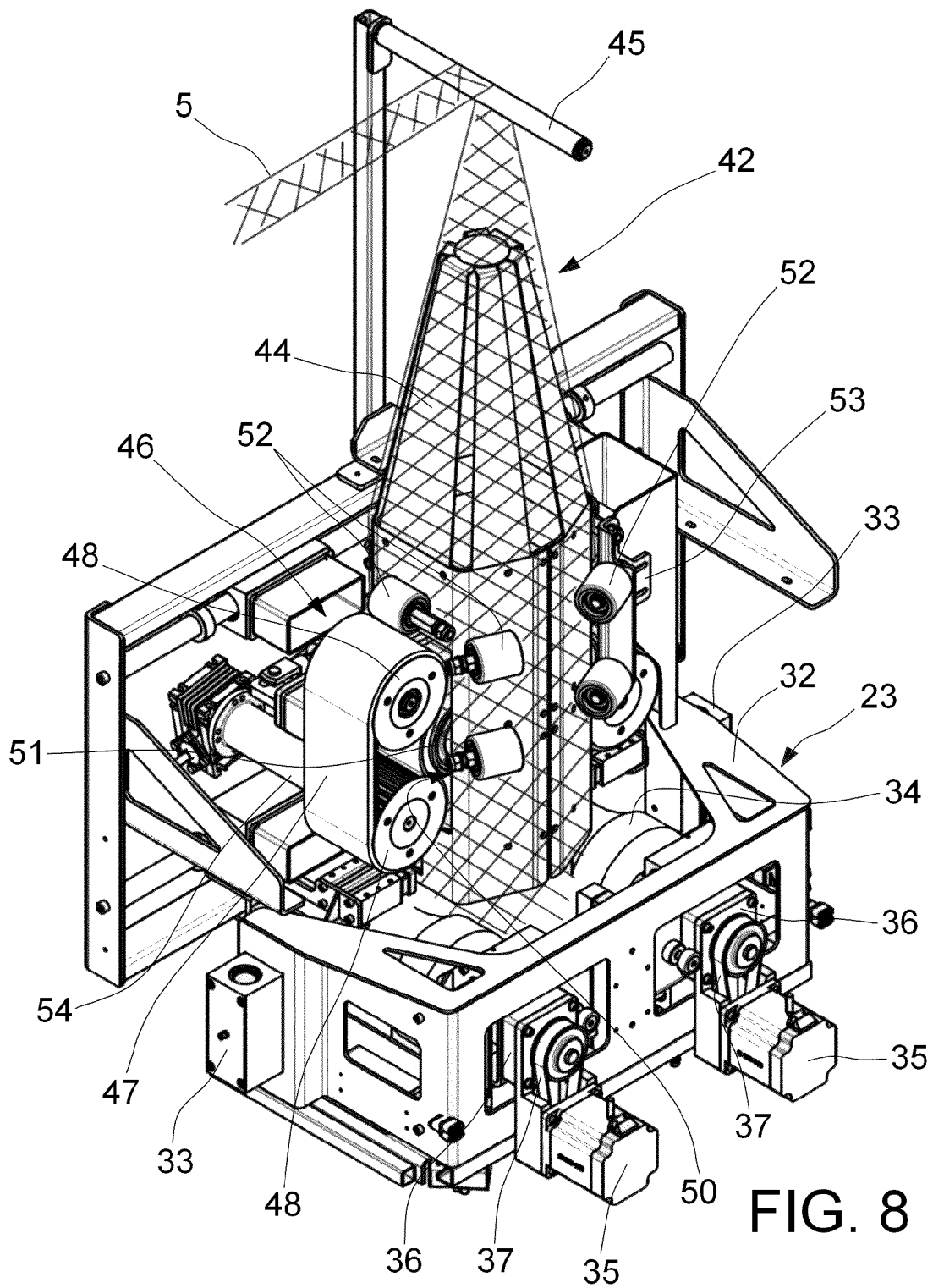


FIG. 4







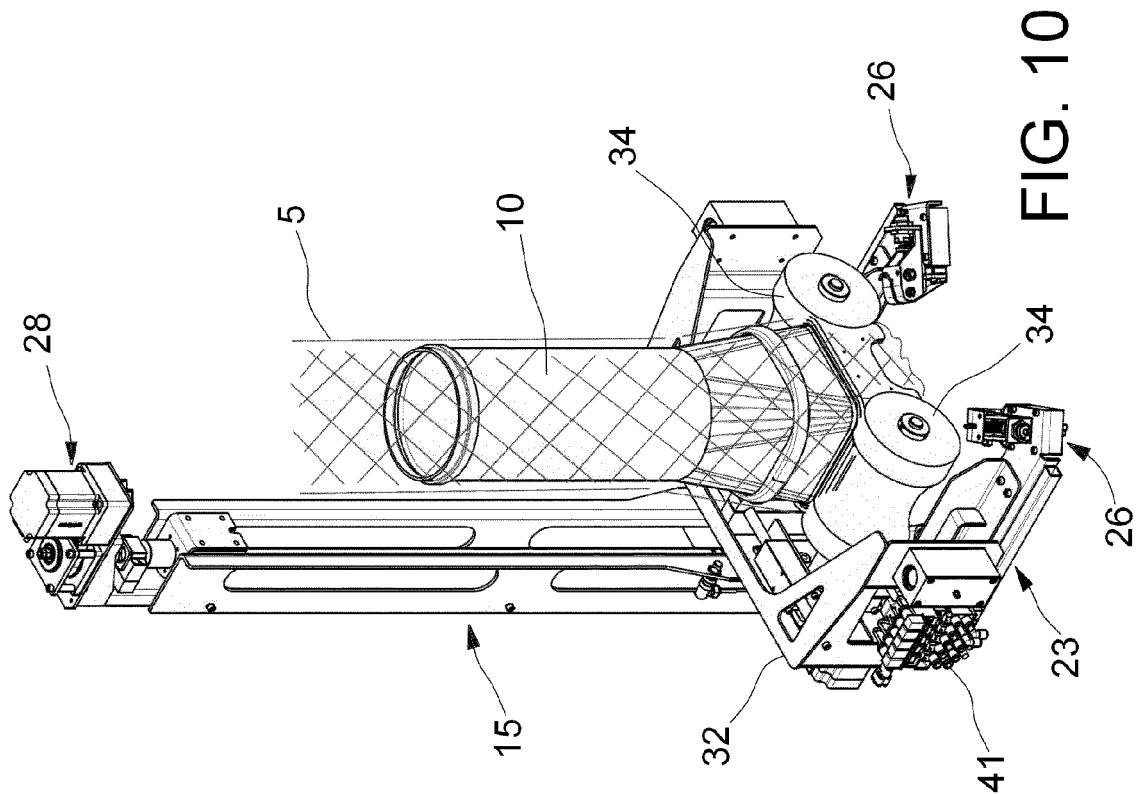


FIG. 10

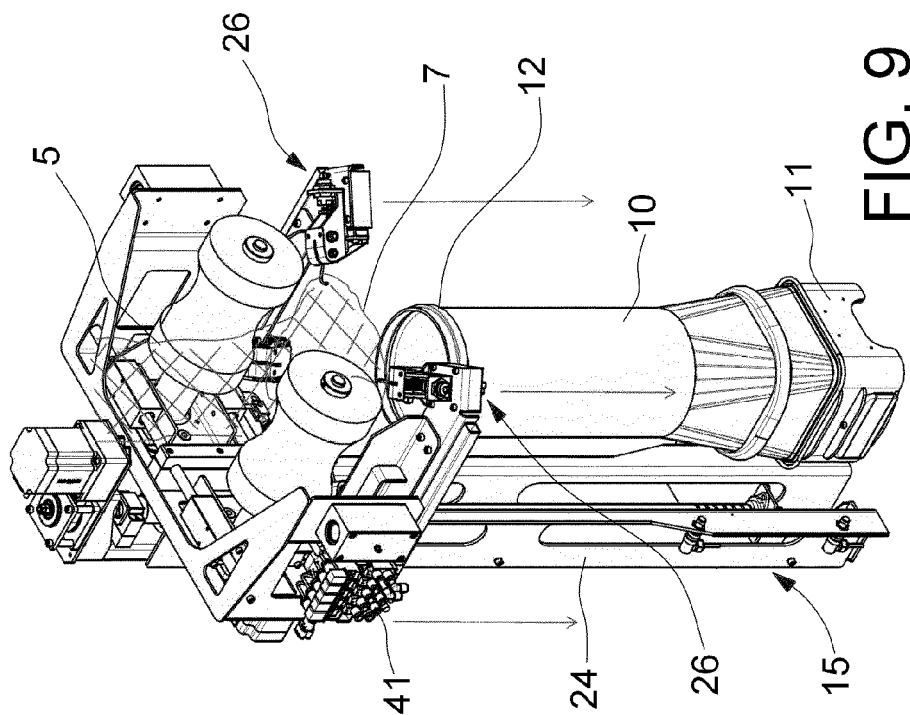


FIG. 9

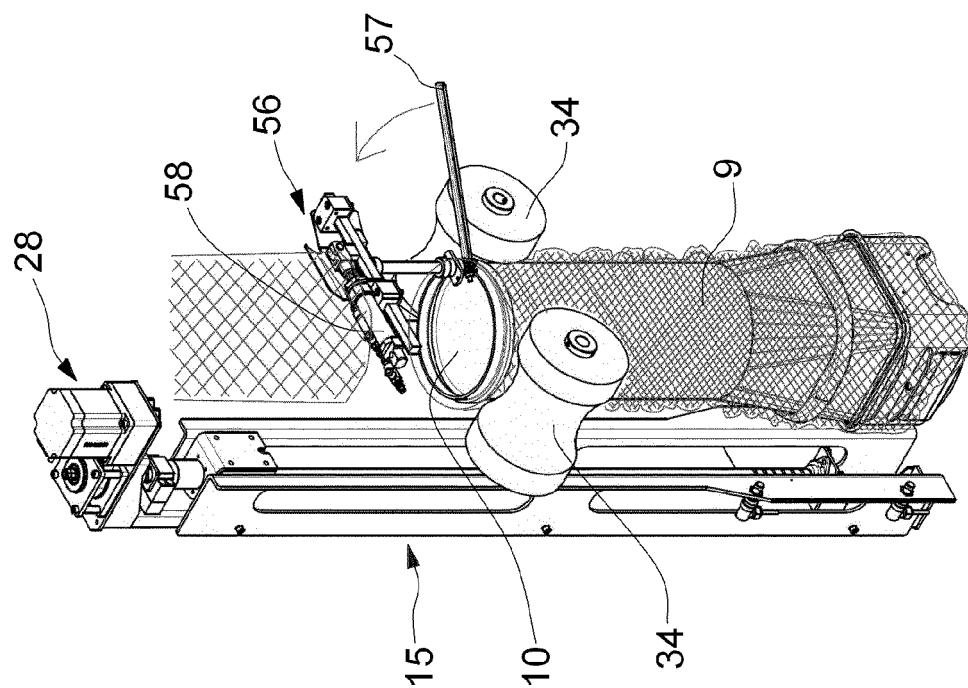


FIG. 12

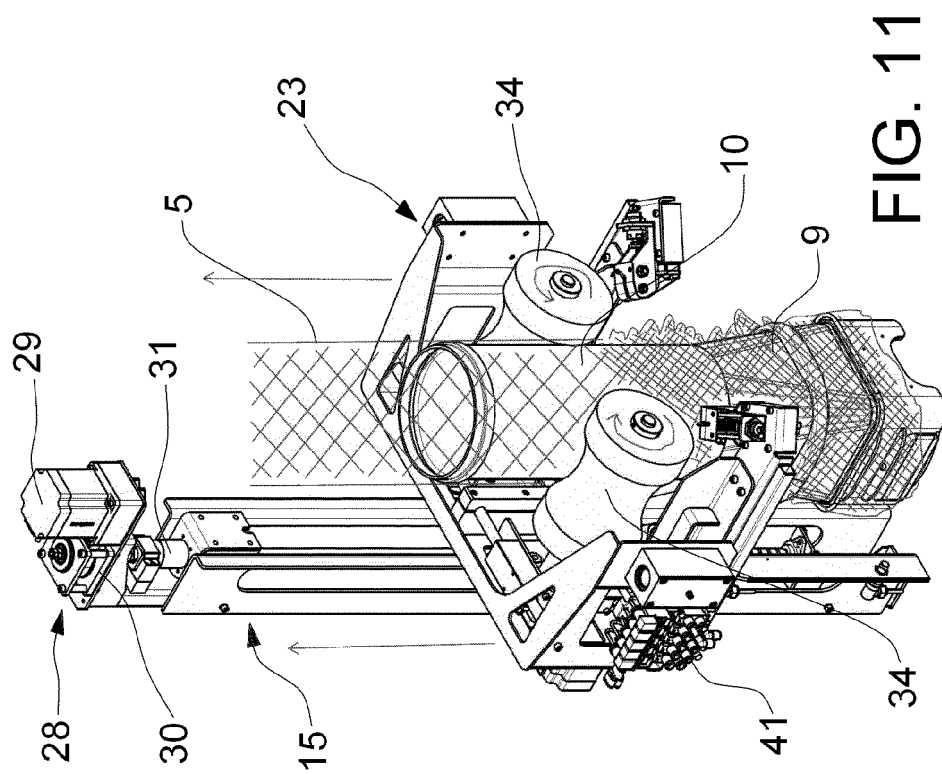
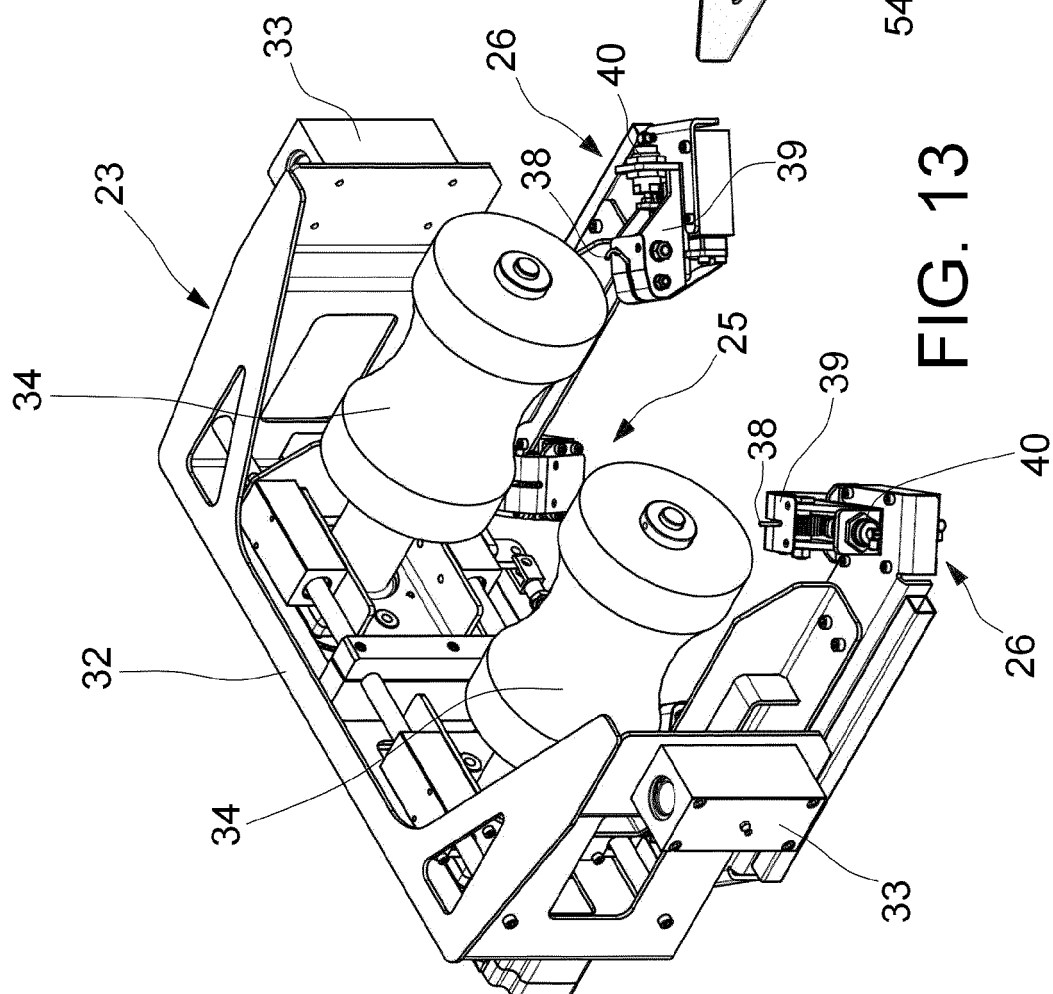
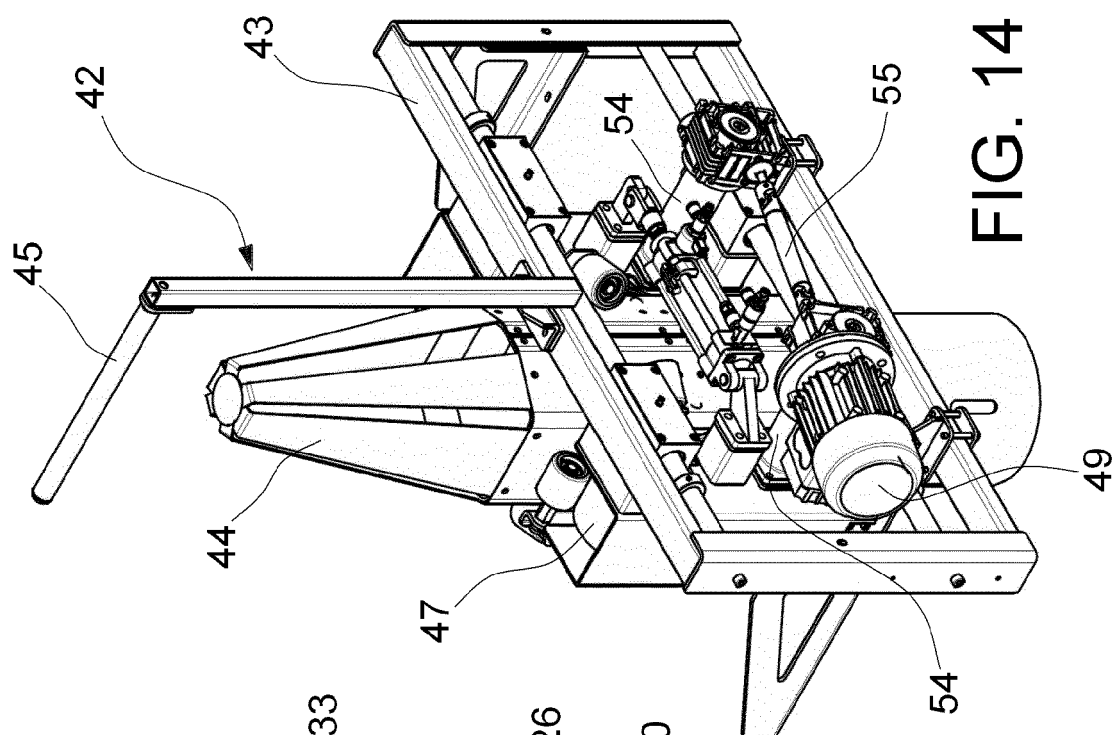
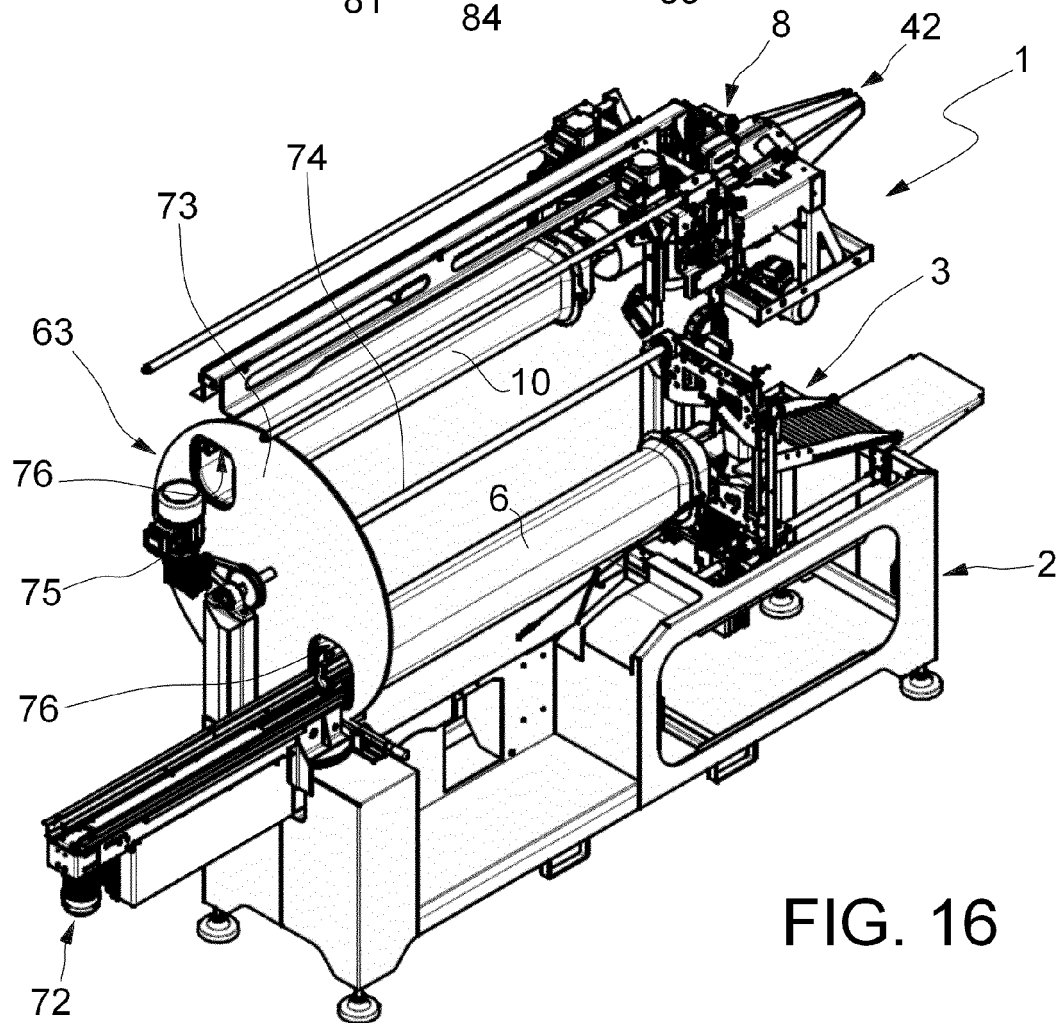
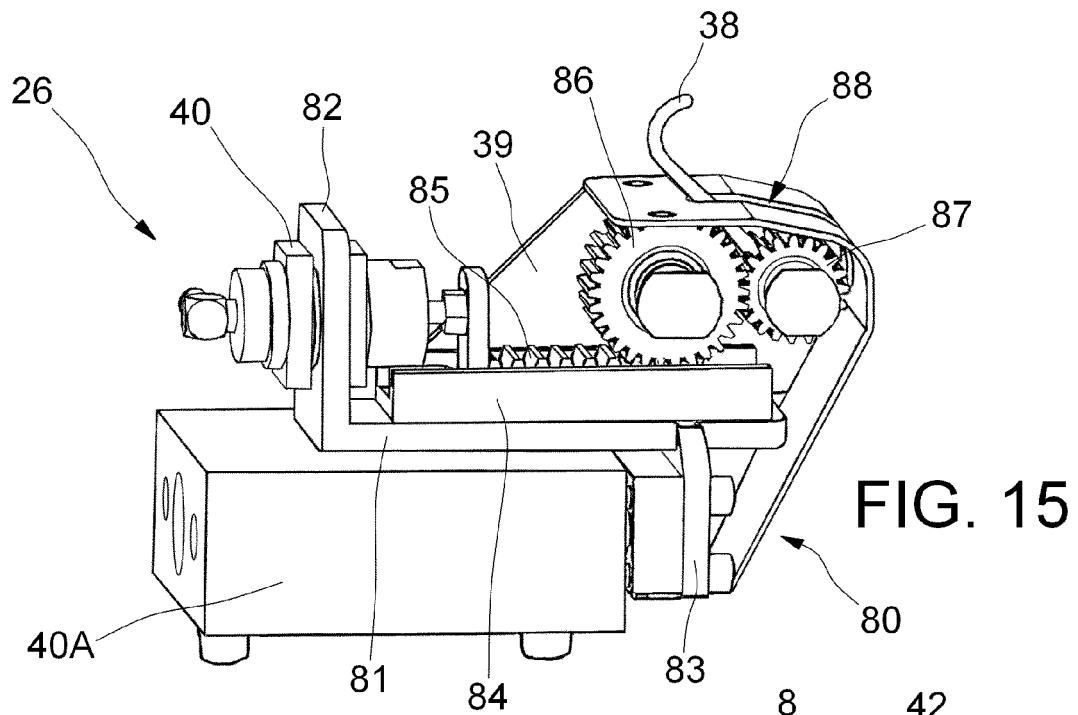


FIG. 11





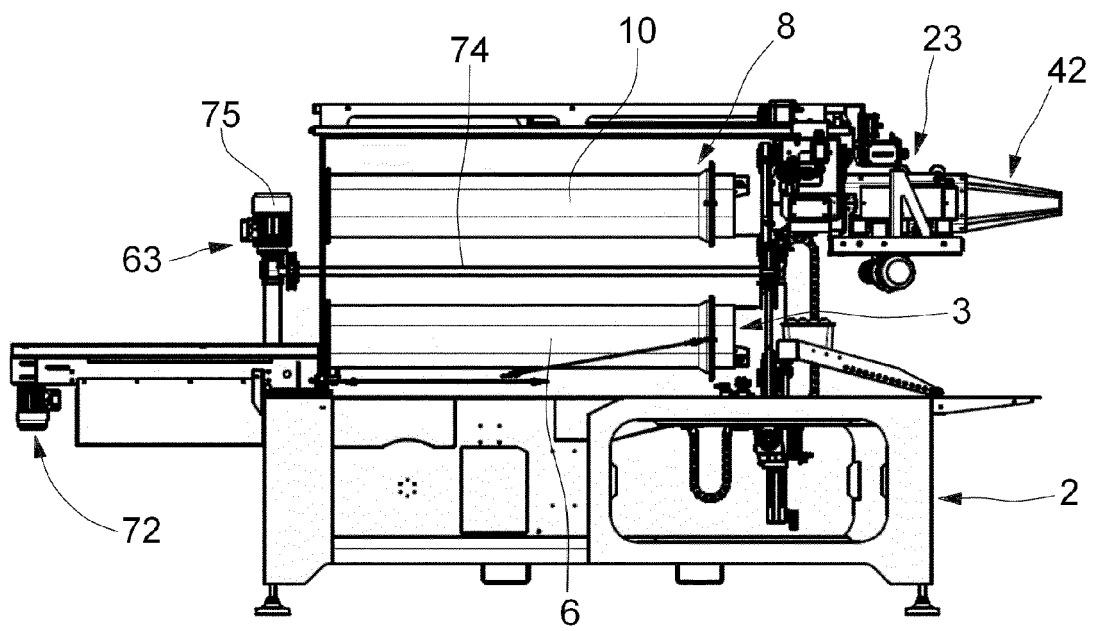


FIG. 17



EUROPEAN SEARCH REPORT

Application Number
EP 12 19 7365

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 34 23 641 A1 (NAT RES DEV [GB]) 3 January 1985 (1985-01-03) * page 14, line 26 - page 17, line 7; figures 6,7 *	1-21	INV. B65B25/04 B65B9/15
A	US 5 257 494 A (PARRIER JEAN [FR] ET AL) 2 November 1993 (1993-11-02) * column 1, line 56 - column 3, line 56; figure 1 *	1-21	
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A	EP 1 053 939 A1 (SORMA S P A [IT]) 22 November 2000 (2000-11-22) * paragraphs [0027] - [0034]; figures 1-4 *	1-21	
			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 15 April 2013	Examiner Kulhanek, Peter
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 12 19 7365

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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15-04-2013

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