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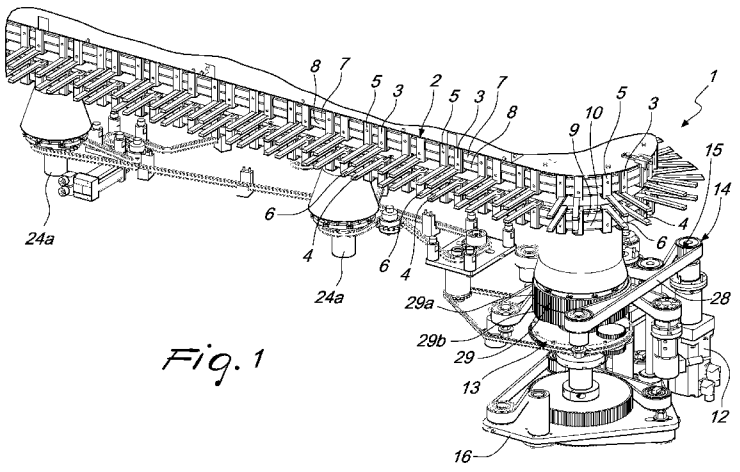


Fig. 1

(57) **Abstract**: An assembly (1) for format changing in a casing machine, comprising a conveyance line (2), provided with at least one pusher element (5, 6) and at least one contrast element (3, 4) between which the product to be conveyed is to be interposed. The pusher elements (5, 6) and the contrast elements (3, 4) are arranged in mutually opposite pairs, each comprising respective upper elements (3, 5) and lower elements (4, 6). The upper pusher elements (5) and contrast elements (3) are integral with at least one upper apparatus (7, 8) of the type preferably chosen among a belt, a chain and the like, and the lower pusher elements (6) and contrast elements (4) are integral with at least one lower apparatus (9, 10), of the type preferably chosen among a belt, a chain and the like. Each apparatus (7, 8, 9, 10) is controlled by a respective motor (12) with the interposition of respective driving elements. The driving elements of at least one of the apparatuses (7, 8, 9, 10) comprise a three-way differential (13) for the height variation of the at least one apparatus (7, 8, 9, 10).

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ASSEMBLY FOR FORMAT CHANGING IN A CASING MACHINE

The present invention relates to an assembly for format changing in a casing machine.

During casing it is necessary to provide means for moving the casings in order to allow the casings to receive the products and undergo various operations, such as for example the closure of the flaps.

Normally it is necessary to provide that the movement means comprise a pusher element and a contrast element in order to ensure that positioning is precise in every step of conveyance.

At casings that have a large vertical extension, moreover, there is the need to contain the casing also proximate to its apex, so as to prevent a sudden movement from making it fall.

At the same time, it may be necessary to process casings of various widths, i.e., in which the distance between the pusher elements and the contrast elements is different.

It is possible to act to vary the distance between the pusher elements and the contrast elements by virtue of manual adjustments of the conveyance means: however, these operations require considerable time and entail the intervention of specialized technicians.

Likewise, it is possible to act manually in order to vary the vertical distance between the elements (pusher and contrast elements) arranged in a lower region (proximate to the base of the casing) and the ones arranged in an upper region (proximate to the apex of the casing), with similar problems of time and need for specialist interventions.

In some specific cases, it is known to resort to adapted actuators for the automatic adjustment of the horizontal or vertical distance between the (pusher and/or contrast) elements, but at least one of the two adjustments is in any case generally performed manually, thwarting (at least partially) the economic and time advantages introduced with partial automation.

Furthermore, the format changing operations entail a machine

downtime that becomes longer as the number of modifications to be made increases.

The aim of the present invention is to solve the problems described above, by proposing an assembly for format changing in a casing machine by means of which it is possible to adjust the format in width and in height in order to allow the conveyance of products of substantially any shape and dimensions.

Within this aim, an object of the invention is to propose an assembly for format changing in a casing machine of a completely automatic type, which therefore does not require the direct intervention of an operator.

Another object of the invention is to propose an assembly for format changing in a casing machine that does not require machine downtime and indeed can be used while the conveyance line defined by it is in motion.

A further object of the present invention is to provide an assembly for format changing in a casing machine that has modest costs, is relatively simple to provide in practice and is safe in application.

This aim and these and other objects which will become better apparent hereinafter are achieved by an assembly for format changing in a casing machine of the type comprising a conveyance line for casings, provided with at least one pusher element and at least one contrast element between which the casing to be conveyed is to be interposed, characterized in that said pusher elements and said contrast elements are arranged in mutually opposite pairs, each comprising respective upper elements and lower elements, said upper pusher elements and contrast elements being integral with at least one upper apparatus of the type of a belt, a chain and the like, and said lower pusher elements and contrast elements being integral with at least one lower apparatus, of the type of a belt, a chain and the like, each apparatus being controlled by a respective motor with the interposition of respective driving elements, the driving elements of at least one of said apparatuses comprising a three-way differential for the height

variation of said at least one apparatus.

Further characteristics and advantages of the invention will become better apparent from the description of a preferred but not exclusive embodiment of the assembly for format changing in a casing machine according to the invention, illustrated by way of nonlimiting example in the accompanying drawings, wherein:

Figure 1 is a simplified perspective view of an assembly for format changing in a casing machine according to the invention;

Figure 2 is a sectional view of the assembly of Figure 1;

Figure 3 is a partially sectional perspective view of the differential of an assembly for format changing in a casing machine according to the invention;

Figure 4 is a sectional perspective view, taken along a vertical axial plane, of the differential of Figure 3;

Figure 5 is a sectional front view, taken along a vertical axial plane, of the assembly of Figure 1;

Figure 6 is a front view of the assembly of Figure 1;

Figure 7 is a sectional front view, taken along a vertical axial plane, of the differential of Figure 3.

With reference to the figures, the reference numeral 1 generally designates an assembly for format changing in a casing machine.

The casing machine designed to comprise the assembly 1 comprises a conveyance line 2 for casings.

The line 2 is provided with at least one contrast element 3, 4 and at least one pusher element 5, 6, between which the product to be conveyed is to be interposed.

The pusher elements 5, 6 and the contrast elements 3, 4 are distributed in mutually opposite pairs along the line 2: each pair comprises respective upper elements 3 and 5 and lower elements 4 and 6.

The upper pusher elements 5 and contrast elements 3 are integral with

at least one upper apparatus 7, 8 (upper apparatus of the type of a belt, a chain and the like), while the lower pusher elements 6 and contrast elements 4 are integral with at least one lower apparatus 9, 10 (lower apparatus of the type of a belt, a chain and the like).

Each apparatus 7, 8 and 9, 10 (preferably, as will become better apparent hereinafter, each pair of apparatuses) is controlled by a respective motor 12 (the other motor is not visible in the accompanying figures) with the interposition of respective driving elements.

According to the invention, the driving elements of at least one of the apparatuses 7, 8 comprise a three-way differential 13 for varying the height of the at least one apparatus 7, 8 (in particular, as mentioned earlier, it may be preferably a pair of apparatuses).

With particular reference to an embodiment of unquestionable interest in application (mentions of which have been already made earlier), the upper apparatuses 7 and 8 are two and the lower apparatuses 9 and 10 also are two.

A first upper apparatus 7 (therefore, for example, a belt or a chain) is integral with the upper pusher elements 5 and a second upper apparatus 8 (also constituted by a chain, a belt or the like) is integral with the upper contrast elements 3.

Likewise, a first lower apparatus 10 (for example a belt or a chain or the like) is integral with the lower pusher elements 6 and a second lower apparatus 9 (also constituted by a belt, a chain or the like) is integral with the lower contrast elements 4.

With particular reference to this constructive solution, the upper apparatus 7 comprising the pusher elements 5 and the lower apparatus 10 comprising the pusher elements 6 are controlled by a same first motor 12 which is coupled to a first driving element 14 which comprises a pulley 15.

The pulley 15 is keyed to the shaft of the first motor 12, which is preset for the actuation of a first transmission device associated with an

upper pusher apparatus 7 (of the type of a belt, a chain and the like) and of a second transmission device associated with the lower pusher apparatus 10 (of the type of a belt, a chain and the like).

At the same time, the upper apparatus 8 (of the type of a belt, a chain and the like) comprising the contrast elements 3 and the lower apparatus 9 (of the type of a belt, a chain and the like) comprising the contrast elements 4 are controlled by a same second motor (not visible in the accompanying figures) coupled to a second driving element which comprises a pulley, which is keyed to the shaft of said second motor. Said pulley is preset for the actuation of a third transmission device which is associated with the upper contrast apparatus 8 (of the type of a belt, a chain and the like) and of a fourth transmission device associated with the lower contrast apparatus 9 (of the type of a belt, a chain and the like).

Furthermore, it is necessary to point out that the upper pusher apparatus 7 (of the type of a belt, a chain and the like) and the upper contrast apparatus 8 (of the type of a belt, a chain and the like) can translate integrally away/toward the lower pusher apparatus 10 (of the type of a belt, a chain and the like) and the lower contrast apparatus 9 (of the type of a belt, a chain and the like).

The first transmission device associated with the upper pusher apparatus 7 (of the type of a belt, a chain and the like) and the third transmission device associated with the upper contrast apparatus 8 (of the type of a belt, a chain and the like) are integral with a support 16, which can move with respect to a fixed frame 17, supporting the second transmission device associated with the lower pusher apparatus 10 (of the type of a belt, a chain and the like) and the fourth transmission device associated with the lower contrast apparatus 9 (of the type of a belt, a chain and the like).

The three-way differential 13 is positively integral with the fixed frame 17 and functionally associated with the movable support 16.

According to the invention, the three-way differential 13 comprises a

first way which is constituted by a first gearwheel 18 which is associated with the fourth transmission device associated with the lower contrast belt 9, a second way constituted by a lower coupling body 19 which is associated with the third transmission device associated with the upper contrast belt 8, and a third way, which is constituted by a ring gear 20 which is associated with a respective actuation unit.

Upon a movement of the respective actuation unit, the ring gear 20 is subjected to an angular rotation, with respect to the frame 17, which causes a relative rotation of the first way with respect to the second way: this relative rotation causes a height variation of the movable support 16.

It is necessary to point out that the differential 13 comprises an upper gearwheel 18 which constitutes the first way, a lower coupling body 19, which constitutes the second way, a planet carrier flange 21 which can rotate coaxially with the upper gearwheel 18 and the lower coupling body 19, at least one gearwheel 22 the axis of rotation of which is coupled to the frame 17. The gearwheel 22 is constituted by two mutually coupled coaxial wheels: the idle gearwheel 22b meshes with the gearwheel 18, while the idle gearwheel 22a meshes with the intermediate gearwheel 18a (which also is idle). The substantially central ring gear 20, which constitutes the third way, is coupled to the planet carrier flange 21.

The lower coupling body 19, which constitutes the second way, comprises an internal thread 23 which is complementary to a corresponding external thread of the movement shaft 24 of the transmission device associated with the upper contrast apparatus 8 (of the type of a belt, a chain and the like).

In order to provide an exhaustive description suitable to define the concrete structural and operating aspects of the three-way differential 13, it is specified that if "n" designates the number of teeth of the idle gearwheel 22b, for the differential 13 to operate correctly the gearwheel 22a that is integral with the gearwheel 22b must have a number of teeth that is at least

equal to "n-1" or "n+1", i.e., a number of teeth that differs from the number of teeth of the gearwheel 22b by at least one unit (one tooth). As an example, in the case being considered, the gearwheel 22a that is integral with the gearwheel 22b (provided with "n" teeth) has "n +1" teeth.

This difference between the number of teeth is equally proposed, but in reverse, between the (planet) gearwheel 40b and the gearwheel 40a that is integral therewith. The gearwheel 40a has at least "n+1" teeth, while the gearwheel 40 has "n" teeth.

When the ring gear 20 is stationary with respect to the frame 17, the overall transmission ratio of the differential mechanism is equal to 1 (therefore the upper gearwheel 18 and the lower coupling body 19 move synchronously).

More correctly, a rotation through an angle α of the upper gearwheel 18 is matched by an identical rotation through the same angle α of the lower coupling body 19.

When the ring gear 20 is instead turned with respect to the frame 17, the lower coupling body 19 undergoes a relative rotation with respect to the upper gearwheel 18, rotating through an angle ($\alpha \pm \Delta\alpha$). Said relative rotation between the upper gearwheel 18 and the lower coupling body 19 leads to a relative rotation between the internal thread 23 and the movement shaft 24 (the latter being linked mechanically to the shaft 39) and, by using this helical pair, into a height variation of the movable support 16.

This relative rotation of the upper gearwheel 18 with respect to the coupling body 19 does not depend on the kinematic condition of the gearwheel 18 (which can be equally stationary, i.e., nonrotating, or in motion).

The relative rotation of the upper gearwheel 18 with respect to the coupling body 19 depends in fact exclusively on the rotation of the ring gear 20 with respect to the frame 17 (which is fixed) and on the meshing ratios of the differential mechanism 13 described previously.

In other words, a rotation of the lower coupling body 19 that causes an angular offset with respect to the shaft 24 causes a translation of the shaft 24, as a consequence of a progressive unscrewing/screwing thereof with respect to the internal thread 23 of the lower coupling body 19, with consequent translation of the movable support 16.

It is noted that the assembly 1 comprises transmission means 25a, which are controlled by the ring gear 20, for respective vertical translation stations 25 distributed along the conveyance line 2 for products to be inserted within casings (each station being able to translate with respect to a corresponding shaft 24a).

The actuation of the stations 25, following a movement of the ring gear 20, causes a simultaneous vertical translation of a movable element of the stations 25 and of the movable support 16, with consequent translation of the upper pusher apparatus 7 (of the type of a belt, a chain and the like) and of the upper contrast apparatus 8 (of the type of a belt, a chain and the like) along successive planes of arrangement, which are arranged so as to be substantially mutually parallel.

It is necessary to point out that each pusher element 5, 6 and each contrast element 3, 4 is constituted by a coupling plate 26 and by a band 27 which is perpendicular to the plate 26.

The plate 26 of a pusher element 5, 6 is coupled rigidly to the respective pusher apparatus 7, 10 (of the type of a belt, a chain and the like) and can slide with respect to the contiguous contrast apparatus 8, 9 (of the type of a belt, a chain and the like), while the plate 26 of a contrast element 3, 4 is coupled rigidly to the respective contrast apparatus 8, 9 (of the type of a belt, a chain and the like) and can slide with respect to the contiguous pusher apparatus 7, 10 (of the type of a belt, a chain and the like).

In order to perform a more detailed description of the constructive solution shown in the accompanying figures, in the assembly 1 it has been decided to use four identical toothed belts 7, 8, 9 and 10 as elements for

motion transmission (i.e., as upper and lower apparatuses, preferring them for the specific application shown with respect to chains or other equivalent components). The need to use four belts 7, 8, 9 and 10 derives from the dual need to move correctly the product along the production flow and to be able to adjust the assembly 1 along a vertical elevation so as to be able to meet the entire height format range of the product.

With reference to the first problem, it can be noted that, since there is the need to process even products of considerable height (for example 140 mm or more), it is logical that two pusher elements 5, 6 and two contrast elements 3, 4 are necessary in order to convey the product correctly without the risk of tipping it. With reference to the second requirement described above, it is necessary to state that the product is formed and guided correctly along the flow of the assembly 1 when the elements 3, 4, 5, 6 that contain it work close to the bottom and mouth of the casing. Since the height of the product can vary within the format range, the need arises to be able to move along a vertical elevation the upper elements 3 and 5, so as to follow this height variation of the product. Every operating means, therefore every element 3, 4, 5 and 6 of the conveyance line 2, draws its motion from one of the four belts 7, 8, 9 and 10 being considered. The elements 3, 4, 5 and 6 can be validly made of metallic material or polymeric material or composite material, in turn coupled to the belts of the conveyance system 7, 8, 9 and 10 by using plates 26 which are conveniently accommodated in slots provided on the teeth of the respective belt 7, 8, 9 and 10. Each element 3, 4, 5 and 6 is functionally associated with two distinct belts 7, 8, 9 and 10: with respect to one of them, it is rigidly coupled, while with respect to the other one it can slide, allowing to follow the adjustment of the format in terms of width.

As regards the control logic of the four belts 7, 8, 9 and 10, the two pusher elements 5, 6 (and likewise the two contrast elements 3, 4) must travel aligned and synchronously, in order to ensure a correct conveyance of the casing along the work flow of the conveyance line 2. In order to meet

this requirement, it is necessary to associate (electrically or mechanically) the two belts 7, 10 that move the pusher elements 5, 6 (and likewise the two belts 8 and 9 that move the contrast elements 3, 4). All this while always remembering that it is necessary to be able to perform the vertical height adjustment of the operating means in order to be able to follow the height variation of the product. Therefore, all four elements 3, 4, 5 and 6 (two pusher elements 5, 6 and two contrast elements 3, 4) must be able to move integrally with their own belt 7, 8, 9 and 10, but the elements 3 and 5, which act on the mouth of the casing (i.e., proximate to its upper end), must be adjustable also in terms of vertical elevation.

In the embodiments shown in the accompanying figures, the link between the belts 7, 10 that move the pusher elements 5, 6 (and likewise for the belts 8, 9 that move the contrast elements 3, 4) is of the mechanical type. In fact, by analyzing in the accompanying figures the characteristics of the assembly 1, one notices the following.

The belts 8 and 9 give motion to the contrast elements 3 and 4, while the belts 7, 10 move the pusher elements 5 and 6. Therefore, the belts 8 and 9 must be linked mechanically, and likewise the belts 7, 10. In order to comply with this goal, two independent servomotors are used (only the motor 12 is visible in the figure), one for actuating the pusher elements 5 and 6 and another for actuating the contrast elements 3, 4.

The transmission of the motion of the pusher elements 5 and 6 is actuated by the servomotor 12, which acts by using a toothed pulley 15 on a service belt 28, which gives motion both to the pulley 29a and to the slotted shaft 30. In turn, the pulley 29a is keyed to the shaft 31 (which is coaxial to the shaft 24 mentioned earlier in the description of a generic embodiment of the assembly 1), which gives motion to the belt 10. The servomotor 12, by means of the belt 28 in addition to the shaft 31, transmits the torque also to the region of the movable support 16 where motion is picked up by a second toothed pulley and, with the aid of a second toothed belt 32, is transmitted

to the toothed pulley 33, which is linked to the shaft 34 and therefore to the belt 7.

The presence is noted of an additional transmission element which is constituted by a second pulley 29b, which is coaxial to the first toothed pulley 29a and is suitable to perform substantially the same purpose: in particular, the pulley 29b is keyed to the shaft 39 and gives motion to the belt 9 linked to the lower contrast teeth; the pulley 29b is part of the transmission of the contrast teeth and functionally has the same role that the pulley 29a has for the pusher teeth.

The pulley 29a is keyed on the shaft 31, which turns the toothed belt 10, which is thus linked mechanically to the belt 7. The same can be said for the two contrast elements 3, 4 moved by the belts 8 and 9. By using two motors it is thus possible to actuate the pusher elements 5 and 6 and the contrast elements 3 and 4 separately and independently and, by means of their software-based management, to maintain the phase and relative distance between them. The use of two distinct motors, however, also and above all allows to change the relative distance between the pusher elements 5, 6 and the contrast elements 3, 4; in other words, it allows adjustment to the format as the width of the casing varies. This entails that the intervention of an operator is no longer necessary in order to modify manually the relative phase of the actuation pulleys: format adjustment occurs in an automated manner by setting the parameters in the respective control and management apparatus (for example a computer, a PLC and the like).

Now, as already mentioned earlier, the two belts 7 and 8 and the corresponding elements 3 and 5 that are integral with them must also be able to move along a vertical elevation, so as to be able to follow the height format adjustment of the product. For this purpose, the support 16 floats with respect to the two fixed columns 35 and 36. The vertical translation of the support 16 with respect to the columns 35 and 36 entails the movement

also of all the elements of the assembly 1 that are connected thereto, not least of the two central shafts 24 and 34 and of all the components connected thereto. The translation of the two shafts 24 and 34 therefore entails, as can be deduced from the accompanying figures, the translation also of the entire upper movable portion 37 by using the bilateral coupling constituted by the bearing 38. By acting therefore on the only independent variable that controls the vertical position of the movable support 16 it is possible to know the position of all the components of the assembly 1 (belts 7 and 8, upper pusher elements 5 and contrast elements 3 and functional closure means accommodated in the movable upper portion 37). Now the adjustment of the height of all the components that must follow an adjustment in vertical elevation occurs by using a three-way differential mechanism 13. The use of this mechanism allows to vary the dependent output parameter (this parameter is a relative rotation of the lower coupling body 19, with respect to the gearwheel 18). Bearing in mind that the toothed belts 8 and 9 are linked mechanically, since they drive the contrast elements 3 and 4, consequently the shafts 24 and 39 also are mechanically linked from the rotational standpoint. In other words, the shafts 24 and 39 rotate with the same angular velocity. From the point of view of translation, instead, the two shafts 24 and 39 are free to slide with respect to each other, ensuring the possibility to adjust the height of the movable upper portion 37. However, this type of link is not direct but is provided by means of the intermediation of the differential mechanism 13 cited above.

In detail, the differential 13 ensures that, for a nil value on the third input of the mechanism (i.e., when the ring gear 20 is stationary with respect to the frame 17), the performed rotation of the upper gearwheel 18 and of the lower coupling body 19 is the same. On the lower coupling body 19 there is in fact provided internally a female thread with a thread 23, which engages an external thread, which has the same profile, provided on the shaft 24. In the operating condition in which the lower coupling body 19

and the shaft 24 perform a rotation that has the same angular extent, a consequence is that between the two components there is no relative motion, i.e., considering the type of kinematic pair, there is no vertical translation of the shaft 24. When instead one wishes to vary the height of the shaft 24, in order to adjust the assembly 1 on a format having a different height, one acts on the third input of the differential mechanism 13. In the specific case, the third way of the differential 13 is constituted by the ring gear 20. By acting thereon, thus generating a rotation thereof with respect to the fixed frame 17 as already described previously, the planet carrier plate 21 undergoes a rotation through a certain angle: as a consequence of the transmission ratios described previously, this leads to a relative rotation between the lower coupling element 19 and the shaft 24.

By virtue of the helical kinematic pair (between the thread 23 and the corresponding external thread provided on the shaft 24), the relative rotation leads to a vertical translation of the shaft 24 or to a height variation of the movable upper portion 37. As already mentioned earlier, it is now necessary to note that this adjustment operates when the conveyance line 2 is stationary and also when it is in motion.

It is in fact sufficient to ensure an angular offset between the upper gearwheel 18 and the lower coupling body 19, by acting on the third input of the differential 13 (i.e., a motion of the ring gear 20 with respect to the fixed frame 17), in order to obtain a translation in height and therefore the desired format adjustment. The system studied therefore allows to uncouple the problem related to motion transition from the problem related to the height of the movable elements. In other words, it is possible to maintain the mechanical link between the elements 3, 4, 5 and 6 and motion transmission, despite adjusting the height of the movable upper portion 37 in a mutually independent manner. From the geometric standpoint, it should be noted that in view of the length of the assembly 1, multiple vertical translation stations 25 distributed along the conveyance line 2 are needed in

order to be able to lift correctly the movable portion 37. These elements need to be moved simultaneously in order to ensure the correct orientation of the movable portion 37. For this purpose, the actuation, provided by using a servomotor, is used, with an appropriate ratio, also to actuate the translation of the other two vertical translation stations 25 (again by using a helical pair). This ensures a mechanical link between the components designed to actuate the vertical translation of the portion 37 and therefore the retention of the phase during the operations for adjusting the format in terms of height.

Advantageously, the present invention solves the problems described previously, proposing an assembly 1 for format changing in a casing machine by means of which it is possible to adjust the format in width and height in order to allow the conveyance of products having substantially any shape and size.

Efficiently, the assembly 1 according to the invention is fully automatic, and therefore does not require the direct intervention of an operator but can be completely controlled via software.

Conveniently, the assembly 1 according to the invention does not require machine downtime in order to perform format adjustments and indeed can be used while the conveyance line 2 that it forms is in motion.

Validly, the assembly 1 for format changing in a casing machine according to the invention is, within the limits of the need to solve an extremely complex technical problem (such as format adjustment according to two different directions without requiring the intervention of an operator), relatively simple to provide in practice and therefore can be performed by bearing substantially modest costs; these characteristics ensure its valid industrial application.

The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other

technically equivalent elements.

In the exemplary embodiments that follow, individual characteristics, given in relation to specific examples, may actually be interchanged with other different characteristics that exist in other exemplary embodiments.

In practice, the materials used, as well as the dimensions, may be any according to the requirements and the state of the art.

The disclosures in Italian Patent Application No. 102015000088917 (UB2015A009797) from which this application claims priority are incorporated herein by reference.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

CLAIMS

1. An assembly for format changing in a casing machine of the type comprising a conveyance line (2) for casings, provided with at least one pusher element (5, 6) and at least one contrast element (3, 4) between which the casing to be conveyed is to be interposed, characterized in that said pusher elements (5, 6) and said contrast elements (3, 4) are arranged in mutually opposite pairs, each comprising respective upper elements (3, 5) and lower elements (4, 6), said upper pusher elements (5) and contrast elements (3) being integral with at least one upper apparatus (7, 8) of the type preferably chosen among a belt, a chain and the like, and said lower pusher elements (6) and contrast elements (4) being integral with at least one lower apparatus (9, 10), of the type preferably chosen among a belt, a chain and the like, each apparatus (7, 8, 9, 10) being controlled by a respective motor (12) with the interposition of respective driving elements, the driving elements of at least one of said apparatuses (7, 8, 9, 10) comprising a three-way differential (13) for the height variation of said at least one apparatus (7, 8, 9, 10).

2. The assembly according to claim 1, characterized in that said upper apparatuses (7, 8) are two and said lower apparatuses (9, 10) are two, a first upper apparatus (7) being integral with said upper pusher elements (5) and a second upper apparatus (8) being integral with said upper contrast elements (3), a first lower apparatus (10) being integral with said lower pusher elements (6) and a second lower apparatus (9) being integral with said lower contrast elements (4).

3. The assembly according to claim 2, characterized in that said upper apparatus (7) comprising said pusher elements (5) and said lower apparatus (10) comprising said pusher elements (6) are controlled by a same first motor (12) coupled to a first driving element (14) comprising a pulley (15), keyed on the shaft of said first motor (12), designed to actuate a first transmission device associated with said upper pusher apparatus (7) and a

second transmission device associated with said lower pusher apparatus (10).

4. The assembly according to claim 2, characterized in that said upper apparatus (8) comprising said contrast elements (3) and said lower apparatus (9) comprising said contrast elements (4) are controlled by a same second motor coupled to a second transmission element comprising a pulley, keyed on the shaft of said second motor, preset to actuate a third transmission device associated with said upper contrast apparatus (8) and a fourth transmission device associated with said lower contrast apparatus (9).

5. The assembly according to one or more of the preceding claims, characterized in that said upper pusher apparatus (7) and said upper contrast apparatus (8) can translate integrally away from/toward said lower pusher apparatus (9) and said lower contrast apparatus (10), said first transmission device associated with said upper pusher apparatus (7) and said third transmission device associated with said upper contrast apparatus (8) being integral with a support (16) which is movable, with respect to a fixed frame (17), which in turn supports said second transmission device associated with said lower pusher apparatus (10) and said fourth transmission device associated with said lower contrast apparatus (9), said three-way differential (13) being integral with said fixed frame (17) and functionally associated with said movable support (16).

6. The assembly according to claim 5, characterized in that said three-way differential (13) comprises a first way constituted by a gearwheel (18) to said fourth transmission device associated with said lower contrast apparatus (9), a second way constituted by a coupling body (19) associated with said second transmission device associated with said upper contrast apparatus (8), and a third way constituted by a ring gear (20) associated with a respective actuation unit, upon a movement of said actuation unit, said ring gear (20) determining a relative rotation of said first way with respect to said second way, with consequent height variation of said movable

support (16).

7. The assembly according to one or more of the preceding claims, characterized in that said differential (13) comprises an upper gearwheel (18) constituting said first way, a lower coupling element (19) constituting said second way, a planet carrier flange (21) that can rotate coaxially to the upper gearwheel (18) and to the lower coupling element (19), at least one idle gearwheel (22) having a rotation axis that is coupled to the frame (17) and is constituted by two mutually coupled coaxial gearwheels, respectively the gearwheel (22b) that meshes with the gearwheel (18) and the gearwheel (22a) that meshes with an intermediate gearwheel (18a), said substantially central ring gear (20), which constitutes said third way, being coupled to said planet carrier flange (21).

8. The assembly according to one or more of the preceding claims, characterized in that said lower coupling element (19), which constitutes said second way, comprises an internal thread (23) that is complementary to a corresponding external thread of the movement shaft (24) of the transmission device associated with said upper contrast apparatus (8), a relative rotation of said lower coupling element (19) with respect to the shaft (24) causing a translation of said shaft (24), as a consequence of a progressive screwing/unscrewing thereof with respect to said internal thread (23) of said lower coupling element (19), with consequent translation of said movable support (16).

9. The assembly according to one or more of the preceding claims, characterized in that it comprises transmission means (25a), controlled by said ring gear (20), for respective vertical translation stations (25) distributed along said conveyance line (2) for products to be inserted into casings, the actuation of said stations (25), following a movement of said ring gear (20), causing a simultaneous vertical translation of a movable member of said stations (25) and of said movable support (16), with consequent translation of said upper pusher apparatus (7) and said upper

contrast apparatus (8) along successive planes of arrangement arranged substantially parallel to each other.

10. The assembly according to one or more of the preceding claims, characterized in that each said pusher element (5, 6) and each said contrast element (3, 4) is constituted by a coupling plate (26) and by a band (27) that is perpendicular with respect to said plate (26), said plate (26) of a pusher element (5, 6) being rigidly coupled to the respective pusher apparatus (7, 10) and being able to slide with respect to the contiguous contrast apparatus (8, 9), said plate (26) of a contrast element (3, 4) being rigidly coupled to the respective contrast apparatus (8, 9) and being able to slide with respect to the contiguous pusher apparatus (7, 10).

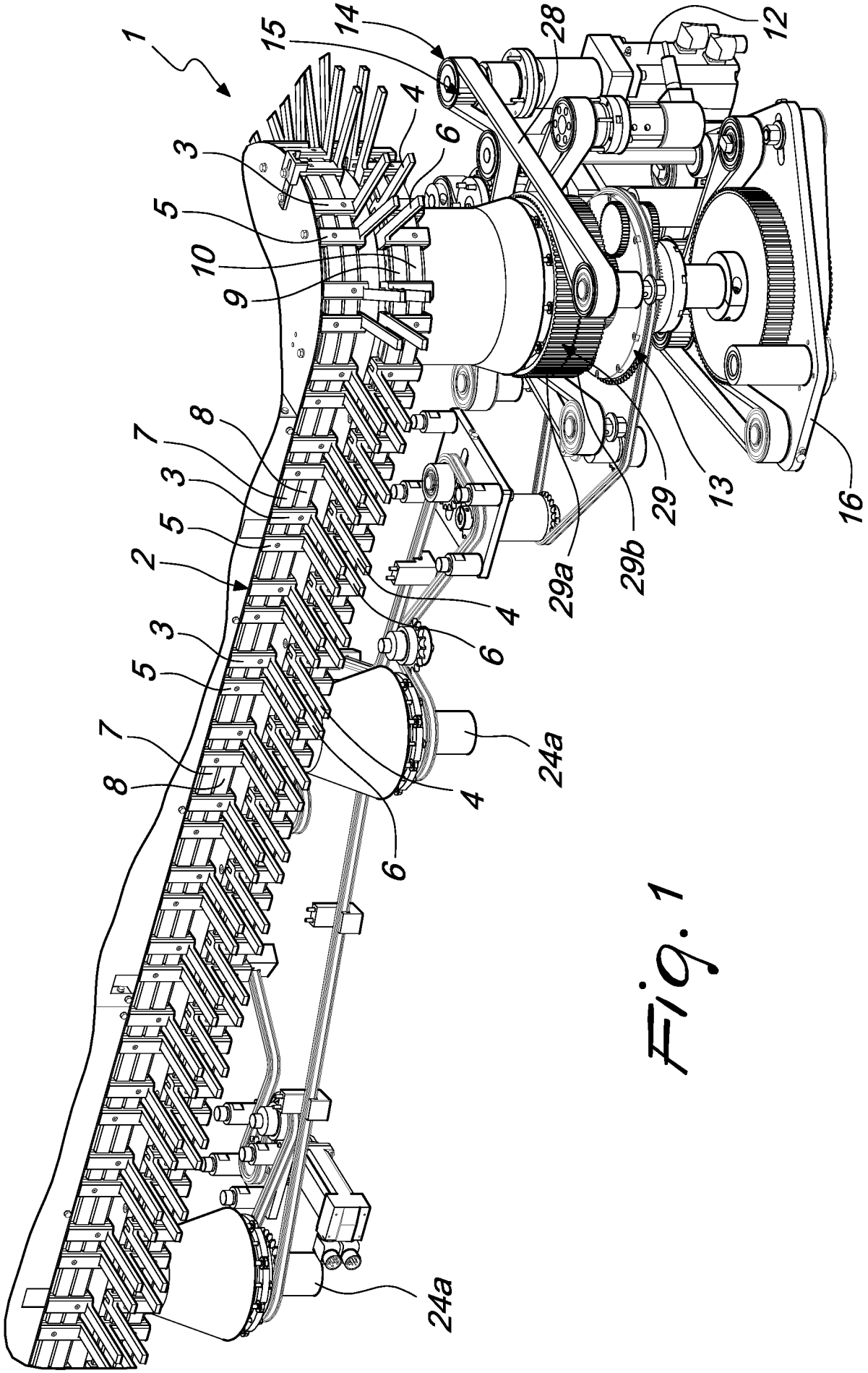


Fig. 1

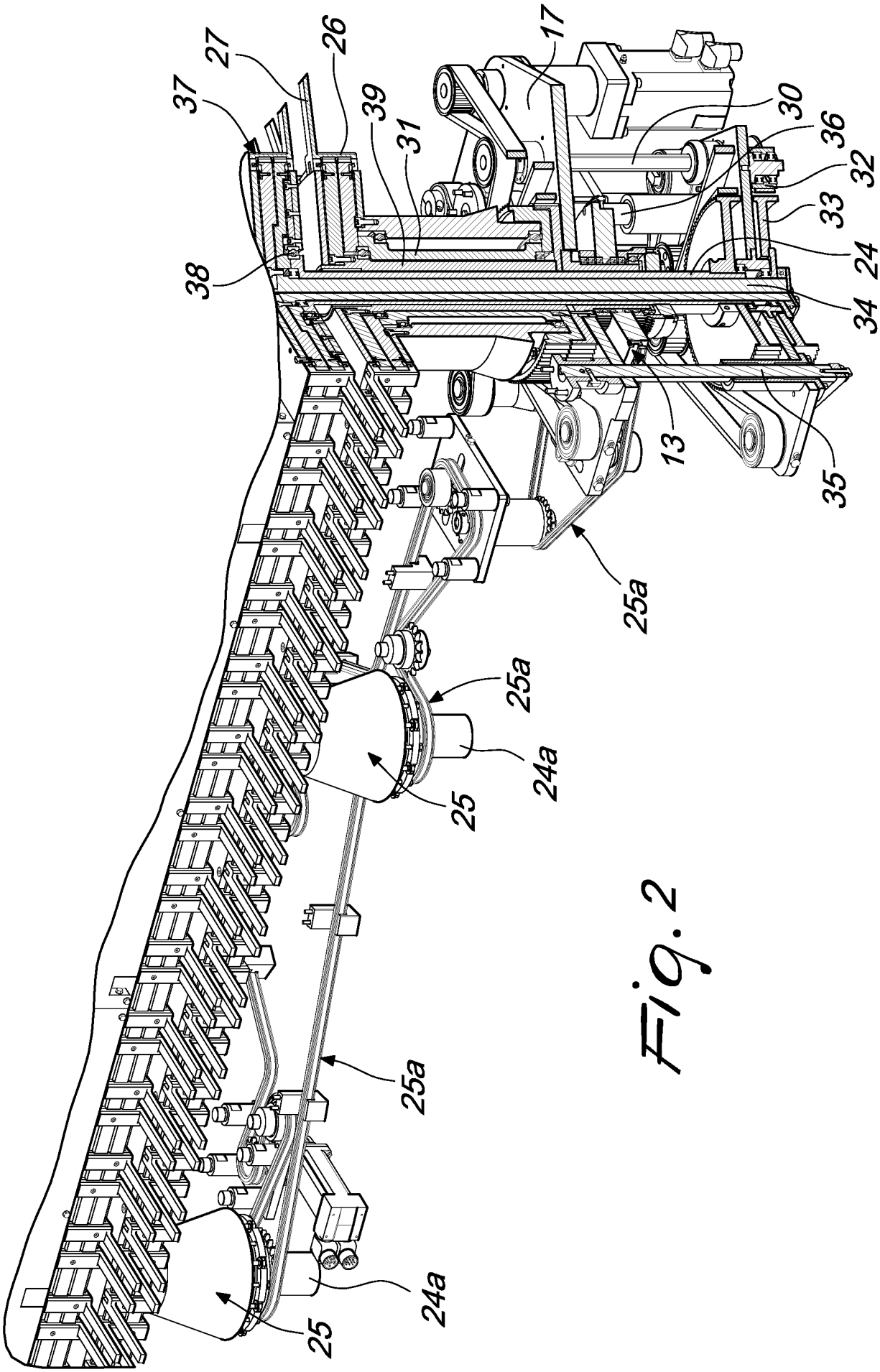


Fig. 2

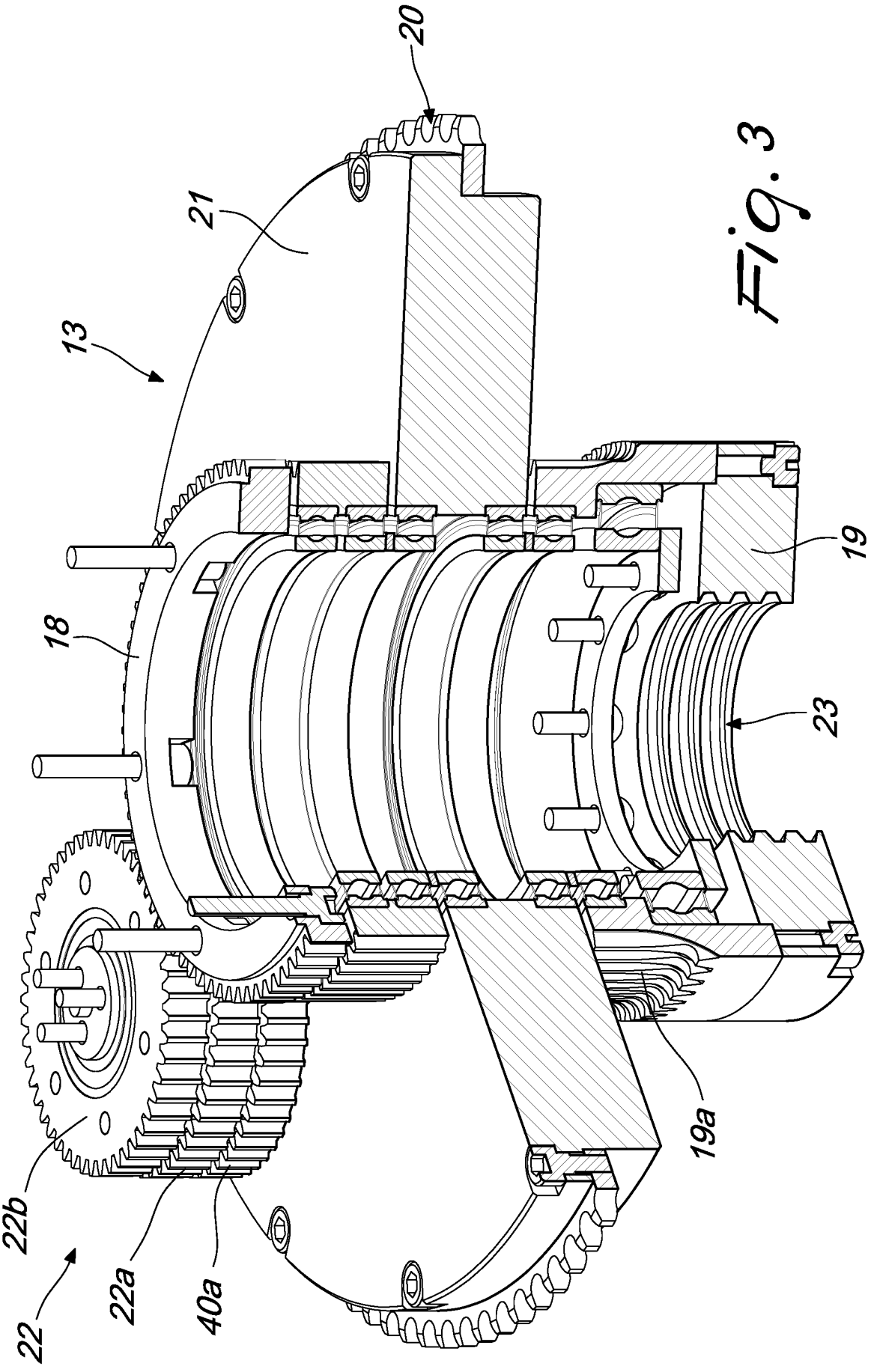


Fig. 3

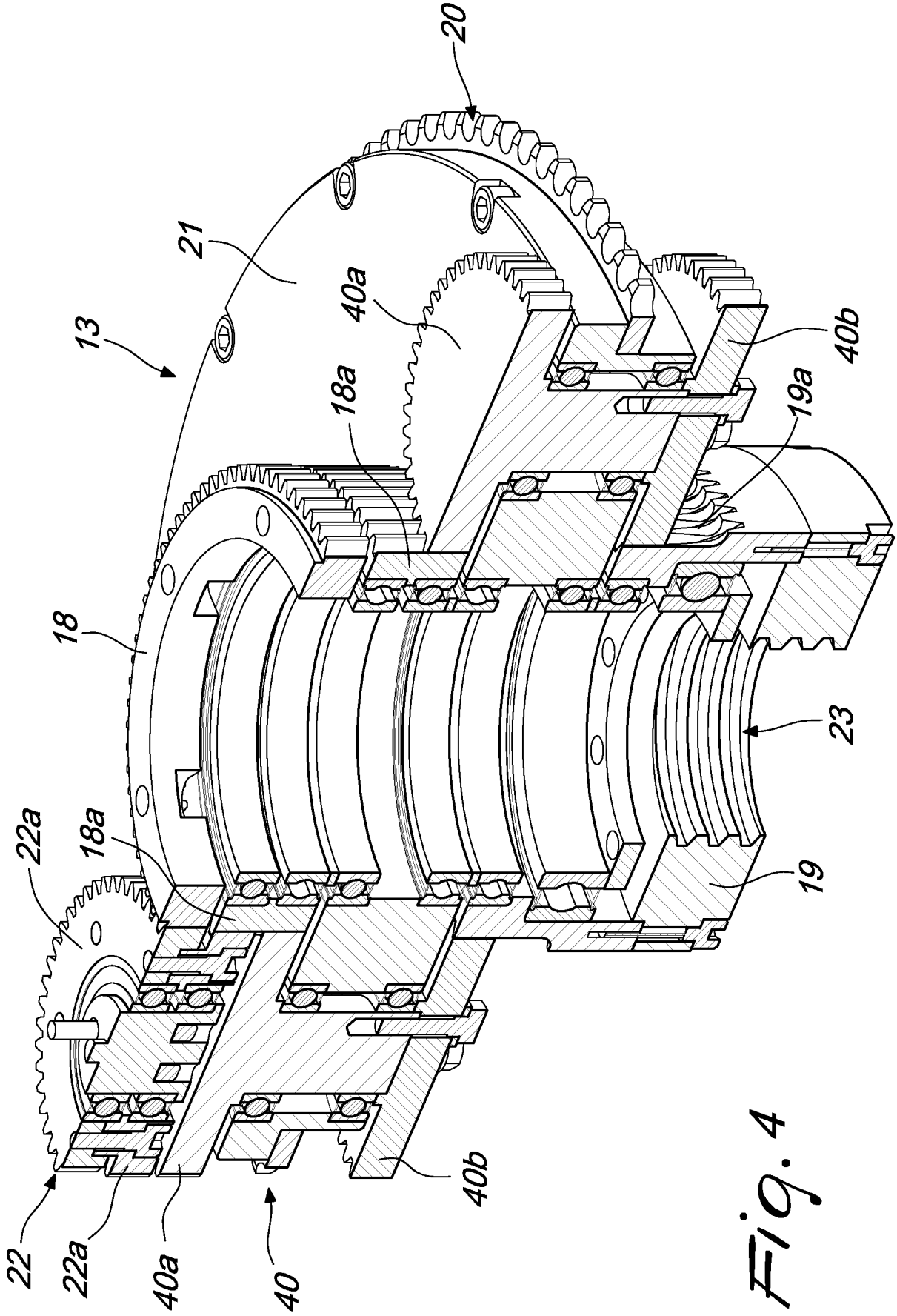


Fig. 4

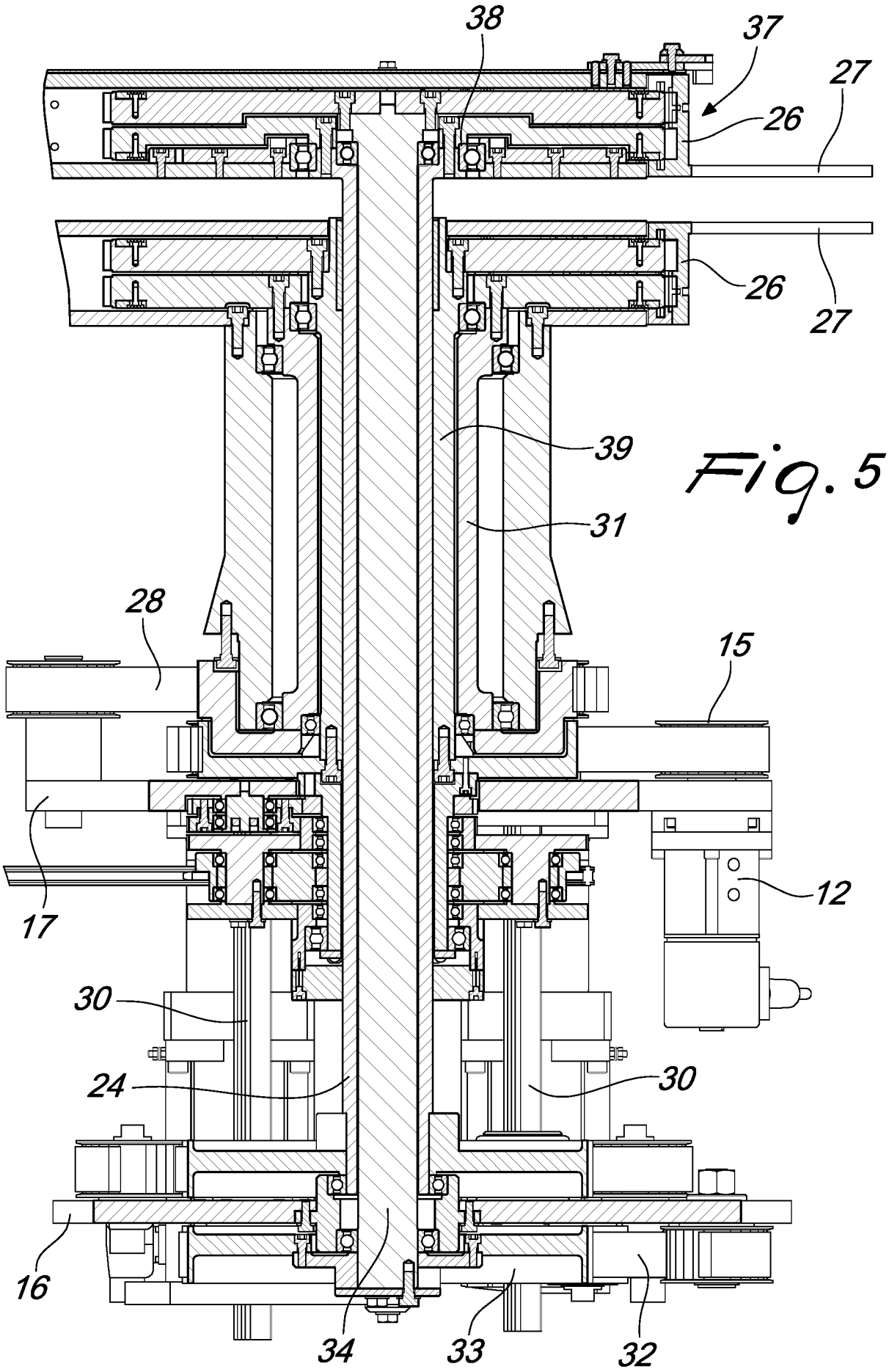


Fig. 5

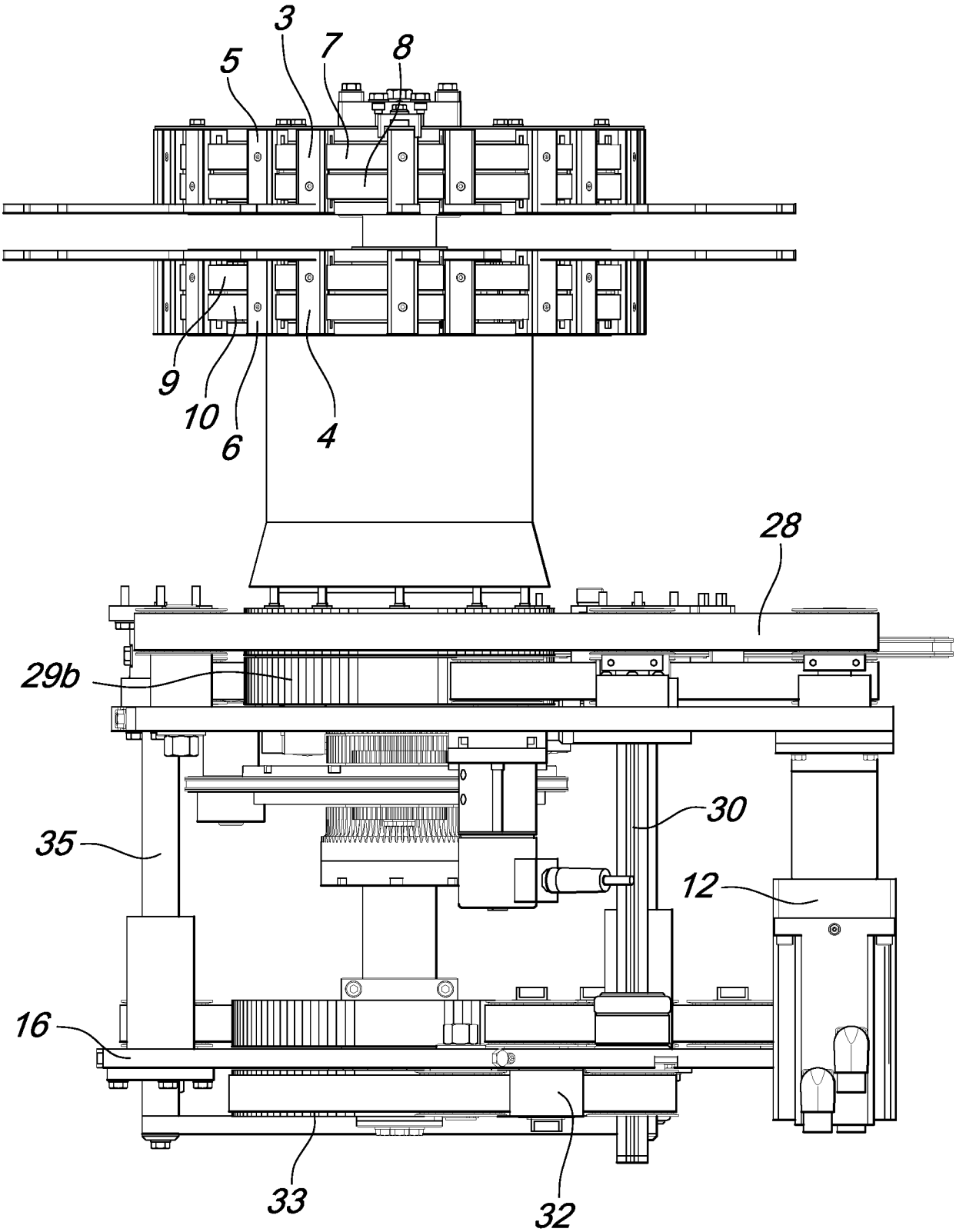


Fig. 6

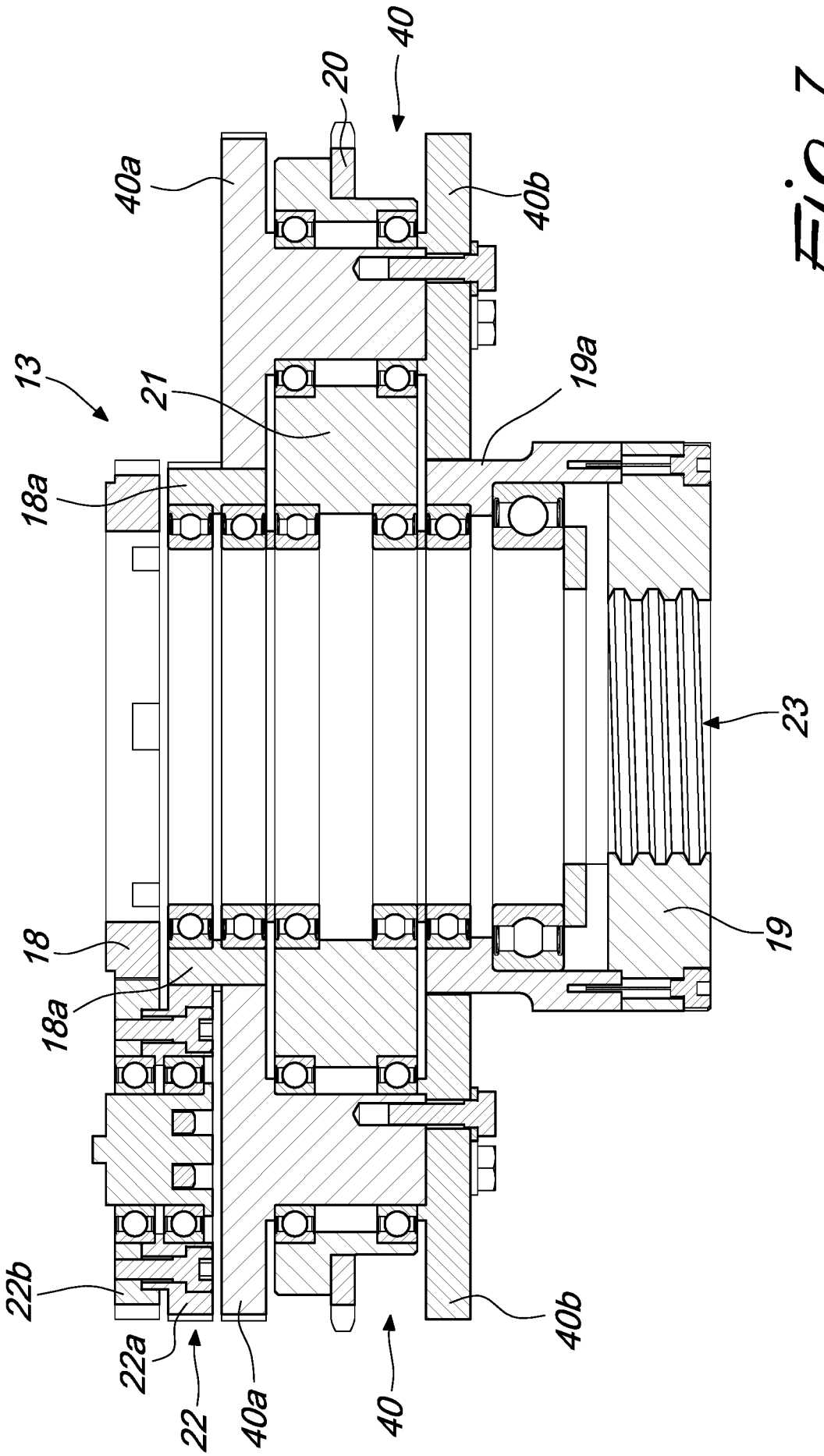


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/082726

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65B59/02 B65B65/02 B65G47/84
ADD. B65B19/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65B B65G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 9 181 043 B1 (GOUDY ERIC SHAWN [US] ET AL) 10 November 2015 (2015-11-10)	1,2
A	column 4, line 9 - column 11, line 64; figures 1-6 column 21, line 8 - column 26, line 20; figures 14-21	3-10
A	WO 96/07592 A2 (UNILEVER PLC [GB]; UNILEVER NV [NL]) 14 March 1996 (1996-03-14) the whole document	1-10
A	DE 27 14 584 A1 (HIRT EDMUND) 5 October 1978 (1978-10-05) the whole document	1-10
A	US 1 981 641 A (BENOIT JOSEPH P) 20 November 1934 (1934-11-20) the whole document	1-10

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 February 2017	22/02/2017

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Cardoso, Victor

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2016/082726

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US 1981641 A	20-11-1934	NONE	