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(54) **An apparatus for boxing bottles**

(57) An apparatus for boxing bottles (4), comprising at least a support structure (2); feeding means (6) for feeding a plurality of bottles (4) in upright position to a boxing station (5), at least an insertion head (12) movable cyclically between a position for picking up bottles (4) and a position for releasing bottles (4): The head supports at least first boxing means (11) for picking up from supply means (6) one or more upright bottles (4) and insert them into a box (3) in upside down position, alternating with upright bottles (4) already inserted into the box (3) itself. Said first boxing means (11) have at least a gripping organ (22) which is able to move, relative to the head (12), from a pick-up position in which it can pick up an upright bottle (4) in proximity to a bottom thereof, to a release position in which it is upside down relative to the pick-up position and in which it can let said bottle (4) fall upside down into the box. Said gripping organ (22) is in pick-up position when the head (12) is in the pick-up position and in release position when the head (12) is in the release position.

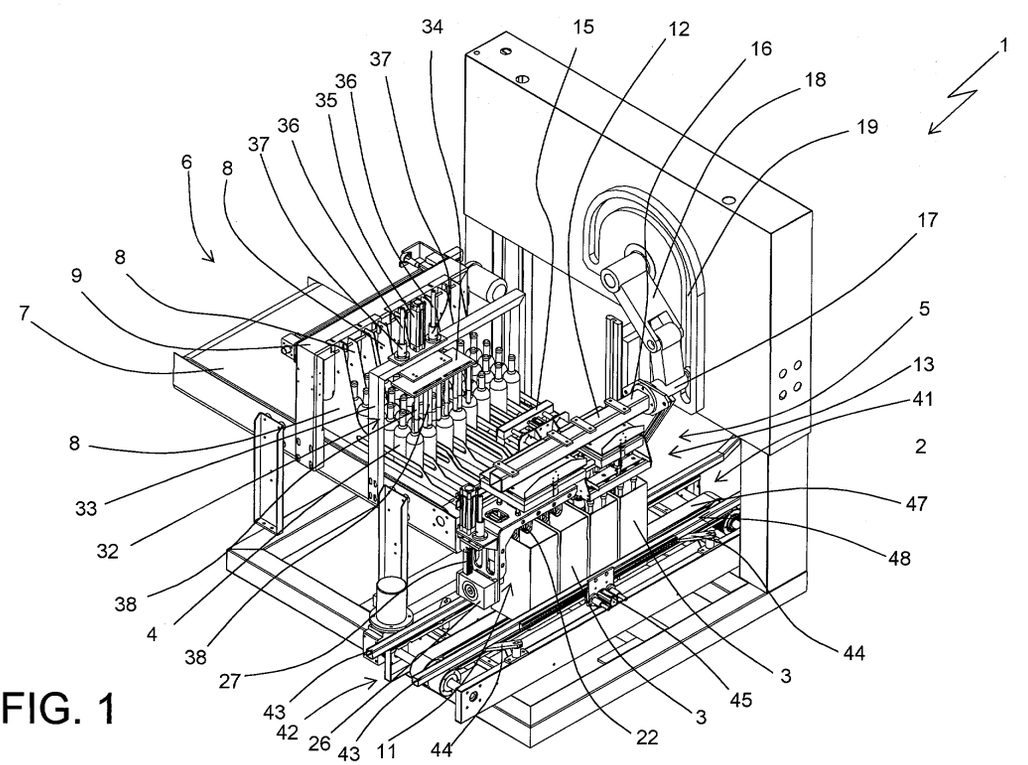

FIG. 1

EP 1 533 234 A1

Description

[0001] The present invention relates to an apparatus for boxing bottles of the kind that alternates bottles positioned upright with bottles positioned upside down, inserting them into the box from the top.

[0002] This arrangement has the purpose of limiting the total size of the box, and it finds its most typical application in the sector of sparkling wine bottles which are subsequently preserved lying on a side.

[0003] Several known apparatuses currently allow to insert bottles into boxes in the manner described above.

[0004] A first apparatus is described for example in the patent FR 2 534 877.

[0005] In this apparatus, the bottles are inserted into a box in two successive steps. Initially, the upright bottles are inserted; they are all picked up at the same time by the neck by a feeding device. Subsequently, the upside down bottles are inserted; they are up by the bottom after an upsetting device has upset them upwards.

[0006] A second type of boxing apparatus is described in the patent FR 2 528 008. This apparatus is similar to the one described above, in which the insertion of the upset bottles occurs after they are first upset by a dedicated device and then picked up by the bottom by the inserting head which inserts them into the box.

[0007] Lastly, an additional variation of known machine is described in the patent IT 1 236 203. In this case, too, the bottles are first upset by a dedicated device and then picked up and inserted into the box.

[0008] Also known from the patent US 3 702 524 is an apparatus for inserting upset bottles into a box, in which the bottles are fed straight to a plane provided with appropriate means for holding the bottles. The plane is subsequently upset and the bottles are allowed to fall into a box which is raised underneath the plane.

[0009] However, all known apparatuses have some drawbacks.

[0010] On one hand, boxing time is relatively long because the upset bottles must be placed upside down before being introduced into the box.

[0011] Moreover, said apparatuses have a certain complexity of construction, resulting from the need to synchronise the upsetting device with the inserting device.

[0012] Additionally, the presence of the upsetting device negatively affects the total size of the apparatus.

[0013] In this situation, the technical task constituting the basis of the present invention is to provide an apparatus for boxing bottles which overcomes the aforementioned drawbacks.

[0014] In particular, a technical task of the present invention is to provide an apparatus for boxing bottles which allows to box the upset bottles within a limited time.

[0015] Yet another technical task of the present invention is to provide an apparatus for boxing bottles which is relatively simple to manufacture and has limited size.

[0016] The specified technical task and the indicated aims are substantially achieved by an apparatus for boxing bottles as described in the accompanying claims.

[0017] Further features and advantages of the invention shall become more readily apparent from the detailed description that follows of a preferred, but not exclusive embodiment, illustrated in the accompanying drawings, in which:

- Figure 1 shows a three-quarter axonometric view of a boxing machine according to the present invention;
- Figures 2, 3, 5, 7, 8, 10, 12, 13 and 15 show in sequence a complete operating cycle of the machine of Figure 1;
- Figure 4, 6, 9, 11 and 14 show an enlarged detail with some parts removed the better to highlight others, respectively of Figures 3, 5, 8, 10 and 13;
- Figure 16 shows a three-quarter axonometric view of a detail of the boxing machine of Figures 1 through 15; and
- Figure 17 shows an axonometric view from the opposite side of the detail of Figure 16.

[0018] With reference to the accompanying drawings, the reference number 1 globally designates an apparatus for boxing bottles according to the present invention, which comprises first of all at least a support structure 2 which supports the various parts. Although the present invention relates mainly to a boxing apparatus 1 able to insert upset bottles 4 into boxes 3, the accompanying figures show a boxing machine able to fill boxes 3 with bottles 4 standing upright alternated with upside down bottles 4.

[0019] The bottles 4 are transported, standing upright, in correspondence with a boxing station 5 by feeding means 6 which, in the illustrated embodiment, are constituted by a plane 7 for advancing the bottles 4 (constituted by a conveyor belt) whereon are positioned appropriate dividers 8 supported by a first portal 9. Said dividers 8 arrange the bottles 4 into a plurality of parallel rows, coplanar to the final position which the bottles 4 are to assume within the box 3.

[0020] As shown for example in Figure 1, in the illustrated embodiment there are eight channels 10 for the advance of the bottles 4, corresponding to four boxes 3 to be filled, with six bottles 4 each. The dividers 8 which separate the rows of bottles 4 destined to different boxes 3 have greater thickness than the dividers 8 that separate two rows of bottles 4 destined to be inserted into the same box 3.

[0021] The apparatus 1 further comprises first boxing means 11 mounted on the support structure 2 in correspondence with the boxing station 5; the function of said boxing means 11 is to pick up from the feeding means 6 one or more bottles 4, positioned upright, and to insert them into the box 3 in upside down position, after upsetting them, alternating them to upright bottles 4 already

inserted in the box 3.

[0022] In the illustrated embodiment, the first boxing means 11 are dimensioned in such a way as to pick up, at each cycle, four bottles 4 from four side-by-side channels 10, and to insert them, two by two, into two distinct boxes 3.

[0023] Said first boxing means 11 are mounted on the support structure 2 by means of an insertion head 12 movable cyclically between a position for picking up bottles 4, in which it is in correspondence with the feeding means 6 (Figure 5), and a position for releasing bottles 4 in which it is in correspondence with the box 3 (Figure 15). In the illustrated embodiment, to the insertion head 12 are also associated second boxing means 13 whose purpose is to pick up from the feeding means 6 a plurality of bottles 4 and to insert them in upright position into one or more empty boxes 3 (two in the accompanying figures), before the upset bottles 4 are inserted into them by the first boxing means 11.

[0024] In regard to the second boxing means 13, they are known means in which each bottle 4 is picked up from above with gripping cups 14 (Figures 1 and 6) obviously, the second boxing means 13 can take on any form suitable for the purpose.

[0025] To the second boxing means 13 is also associated a thrust remover element 15 (known in itself) mounted on the feeding means 6, against which stop the bottles 4 which are to be picked up from the second boxing means 13 (Figures 1, 8 and 9). The insertion head 12 is constituted by a horizontal cross member 16 connected, at least at one end 17, to an actuating motor (not shown herein) by means of an articulated elbow join 18. The motion of the insertion head 12 is guided, on one side, by a guiding groove 19 in the shape of a reverse J, into which is slidably inserted the aforementioned end 17 of the cross member 16, and which serves the purpose of guiding the movement from the pick-up position to the release position, on the other side by a first slide 20 able to slide vertically, connected by means of an articulated parallelogram 21 to the cross member 16 itself and which serves the purpose of always keeping it parallel to itself.

[0026] Returning the first boxing means 11, they have, for each bottle 4 they have to pick up, a gripping organ 22 which in the illustrated embodiment is constituted by a pneumatically activated suction cup, which is shaped in such a way as to adhere to the lateral surface of the bottle 4 in proximity of the bottom (Figures 16 and 17).

[0027] In other embodiments, the gripping organ 22 has a different shape and it is for example constituted by a pair of pliers, although it will always be such as to be able to secure the bottle 4 in correspondence with the related lateral surface.

[0028] The gripping organ 22 is also movable, relative to the head 12, from a pick-up position in which it can grip an upright bottle 4 from the feeding means 6 (Figure 5), to a release position in which it is upside down relative to the pick-up position and in which it can let the bottle 4 fall upside down into a box 3 (Figure 15).

[0029] The movement of the insertion head 12 and of the gripping organ 22 is synchronised in such a way that the gripping organ 22 is in pick-up position when the head 12 is in the related pick-up position, and in the release position when the head 12 is in the related release position.

[0030] In general, the gripping organ 22 is pivotally associated to the head 12 according to a substantially horizontal axis of rotation, and it rotates from the pick-up position to the release position, simultaneously with the movement of the head 12 from the related pick-up position to the release position.

[0031] Preferably, the gripping organ 22 is also able to translate vertically relative to the head 12, from a lower position to an upper position. In particular, when it is in the pick-up position it is also in the lower position (Figure 5), whilst when it is in the release position it is also in the upper position.

[0032] As stated, in the illustrated embodiment, there are four gripping organs 22, associated to a single support arm 23 mounted on the head 12. Said arm 23 is movable, relative to the head 12, in such a way as to determine the movement of the gripping organs 22 relative to the head 12 as indicated above.

[0033] In particular the support arm 23 is hinged, at one of its ends, to the free end of the cross member 16 which constitutes the insertion head 12 (Figures 16 and 17). To the hinge pin 24 (Figure 17) is integrally fastened a gear wheel 25 (not shown in Figures 1 through 15 where it is covered by a case 26) enmeshed in a vertical rack 27 fastened to a second slide 28 able to move vertically on the insertion head 12.

[0034] The motion of the second slide 28 is determined by a first actuator 29 and it is guided by a first guide pin 30 slidably inserted in a first bushing 31.

[0035] The rotation of the support arm 23 is thus commanded by the motion of the second slide 28 through the rack 27.

[0036] Since the hinge pin 24 of the support arm 23 to the head 12 is higher than the horizontal plane of lay of the gripping organs 22 in the pick-up position, as a result of the rotation of the arm 23 which bears the gripping organ 22 to the release position, the related plane of lay also rises.

[0037] Consequently, the gripping organ 22 translates from its own lower position to its own higher position simultaneously with the movement of the head 12 from the pick-up position to the release position.

[0038] To facilitate the grip of a bottle 4 by each gripping organ 22, the apparatus 1 further comprises at least a securing element 32 mounted on the support structure 2 underneath a second portal 33.

[0039] Said securing element 32 is movable between a securing position in which at least it prevents the rearward motion of a bottle 4 along the feeding means 6, and a resting position in which it allows the movement of the bottles 4 along the feeding means 6.

[0040] As shown particularly in Figure 7, the locking element 32 is constituted by a shelf 34 connected to the second portal 33 through a second actuator 35, and two second guide pins 36 slidably inserted in two second bushings 37.

[0041] From the lower side of the shelf 34 develop downwards four pairs (one for each gripping organ 22) of pivot pins 38 mutually separated by such a distance as to allow the passage of the neck of a bottle 4 but to prevent the passage of the body of the bottle 4 itself.

[0042] When the shelf 34 is in the securing position, the lower part of the pivot pins 38 is positioned in correspondence with the body of the bottle 4 in such a way as to prevent its rearward motion (Figure 7), whilst when the shelf 34 is in the resting position the lower part of the pivot pins 38 is situated in correspondence with the neck of the bottle 4 and thus allows the movement of the bottle 4 along the channels 10 for their advance (Figure 2).

[0043] Each locking element 32 and the related gripping organ 22 can also be mutually approached, to enclose a bottle 4 between them and thereby assure that it is securely gripped by the gripping organ 22.

[0044] In particular, in the illustrated embodiment (Figures 8 and 9), the terminal part of the gripping organ 22 (substantially the suction cup) is movable relative to the insertion head 12 in the direction of the securing element 32.

[0045] This is achieved by means of two third actuators 39, each associated to two horizontal guides 40 (Figures 9 and 11), which allow the horizontal advancement of the suction cups against the bottles 4 held still by the locking element 32.

[0046] In the preferred embodiment, advancing means 41 are provided which allow to make the boxes 3 advance to the boxing station 5, along the boxing station 5 and beyond the boxing station 5.

[0047] As shown, the advancing means 41 are constituted by a conveyor 42 which can operate intermittently, and by two lateral boards 43 which guide the advance of the boxes 3.

[0048] Advantageously, the two lateral boards 43 are adjustable so they can be adapted to boxes 3 of different formats.

[0049] In particular, in the illustrated embodiment, this is obtained connecting each lateral board 43 to the support structure 2 by means of an additional articulated parallelogram 44, and a fourth actuator 45 which determine its position in the horizontal plane (Figure 1).

[0050] In the preferred embodiment, the apparatus 1 further comprises shock absorbing means 46 (Figure 15) associated to the bottom of the box 3 at least in correspondence with the first boxing means 11, to cushion the fall of the upside down bottle 4, within the box 3 itself.

[0051] In the illustrated embodiment, the shock absorbing means 46 are constituted by the conveyor 42 itself.

[0052] The conveyor 42 is constituted by at least a conveying mat 47 having such an elasticity as to allow it to absorb the impact given to the box 3 by the upside down bottle 4 when it is let fall.

[0053] Preferably, the mat 47 is constituted by a positive drive belt, having in its interior a core made of steel wires, which provides it with greater strength even in the case of breakage of some bottle 4, whose fragments may cut the mat 47, but not the steel core.

[0054] To enhance the shock absorbing action, in the illustrated embodiment, the shock absorbing means 46 comprise two mats 47 positioned side by side and distanced. The bottle 4 released by the first boxing means 11 falls in correspondence with the free area 48 between the two mats 47.

[0055] The operation of the apparatus 1 of the present invention shall now be described with reference to Figures 1 through 15 which represent in sequence an entire operating cycle of the apparatus 1.

[0056] Figure 1 shows the insertion head 12 in the release position after a step in which the first boxing means 11 have completed filling the related boxes 3 (the two on the left in the drawing), whilst the second boxing means 13 have positioned four bottles 4 upright in each of the two related boxes 3 (the two on the right in the drawing).

[0057] The head 12 then starts to return towards the pick-up position (Figure 2). During the return run of the head 12, the bottles 4 are made to advance on the plane of advance 7 to the thrust remover element 15 on one side, and through the pivot pins 38 of the securing element 32, held in resting position, on the other side (Figure 2). Simultaneously, the support arm 23 is made to rotate (Figures 3 and 4) until the gripping organs 22 are brought to the pick-up position.

[0058] When the insertion head 12 reaches the pick-up position, the cups 14 of the second boxing means 13 are inserted on the neck of the bottles 4 held in position by the thrust remover element 15 (Figures 5 and 6).

[0059] Figure 7 (where some parts are removed for the sake of clarity) shows the subsequent descent of the securing element 32 in the securing position, whilst Figures 8 and 9 show the advance of the gripping organs 22 against the bottles 4. In this step the suction cups are activated and the bottles 4 remain attached to the gripping organs 22 which subsequently return to the starting position (Figures 10 and 11).

[0060] At this point the head 12 starts on the path (Figure 12) that will bring it from the pick-up position to the release position.

[0061] During the travel along the path, on one side the support 23 is rotated in such a way as to upset and translate upwards the bottles 4 held by the gripping organs 22, on the other side the two cups 14, corresponding to each channel for feeding the bottles 4, are separated from each other by a distance corresponding to the space required for the subsequent insertion of the upside down bottle 4 (Figures 13 and 14).

[0062] During the steps described heretofore, and be-

fore the head 12 reaches the release position, the advancement means 41 cause the boxes 3 to advance by two positions in such a way as to bring the full boxes 3 outside the boxing station 5, the boxes 3 with only the upright bottles 4 in correspondence with the first boxing means 11, and two new empty boxes in correspondence with the second boxing means 13.

[0063] Once the insertion head 12 has reached the release position (Figure 15), the bottles 4 held by the second boxing means 13 are completely inserted into the box 3, and when the cups 14 are deactivated they remain set down on the bottom.

[0064] On the contrary, the bottles 4 held by the grip organs 22 are necessarily separated from the bottom of the box 3 by a distance that substantially corresponds with the vertical size of the gripping organs 22 (usually in the order of 10-15 cm) which, contrary to the cups 14 which hole the bottles 14 from above, cannot be lowered beyond a certain level without damaging the box 3.

[0065] When the suction cups are deactivated the bottles 4 are then let fall into the boxes 3 and they impact against the bottom of the box 3, but their impact is damped by the shock absorbing means 46. In the case of bottles 4 with a protruding stopper (such as bottles for sparkling wines), the impact is also attenuated by the stopper itself.

[0066] During this latter step, the securing element 32 is brought back to the resting position.

[0067] Although the enclosed figures show the case of an apparatus 1 for boxing bottles, in which the second boxing means 13 insert the upright bottles 4 before the insertion of the upside down bottles 4 by the first boxing means 11, alternative embodiments are provided in which the upside down bottles 4 are first inserted by the first boxing means 11 into appropriate seats defined in the boxes 3, then the upright bottles 4 are inserted by the second boxing means 13.

[0068] This second embodiment can be advantageous for example to limit the flexing moment whereto the cross member 16 is subj ected, in the case of the insertion head 12 shown in the accompanying figures. The cross member 16 is mounted in overhang, and the first boxing means 11 have a greater weight than the second boxing means 13.

[0069] The present invention achieves important advantages.

[0070] In the first place, the apparatus 1 for boxing bottles 4 of the present invention allows to box the upside down bottles 4 in a limited time, substantially corresponding to the time needed to insert upright bottles 4.

[0071] Additionally, said apparatus is relatively simple to manufacture and has limited size. It should also be noted that the cost connected with implementing the invention is not very high.

[0072] The invention thus conceived can be subject to numerous modifications and variations, without thereby departing from the inventive concept that characterises it.

[0073] All components can be replaced by technically equivalent elements and in practice all materials employed, as well as the shapes and dimensions of the various components, may be any depending on requirements.

Claims

1. An apparatus for boxing bottles (4), comprising:

at least a support structure (2);
feeding means (6) for feeding a plurality of bottles (4) in upright position to a boxing station (5), mounted on the support structure (2);
first boxing means (11) mounted on the support structure (2) in correspondence with said boxing station (5), to pick up from said feeding means (6) one or more bottles (4) in upright position and insert them into at least a box (3) in upside down position;
said first boxing means (11) having, for each bottle (4) to be inserted, a gripping organ (22); and
at least an insertion head (12) mounted on the support structure (2) and movable cyclically between a position for picking up bottles (4) in which it is in correspondence with said feeding means (6) and a position for releasing bottles (4) in which it is in correspondence with said box (3);

characterised in that said first boxing means (11) are mounted on the insertion head (12) and **in that** said gripping organ (22) is movable, relative to said head (12), from a pick up position in which it can pick up an upright bottle (4) in proximity to a bottom thereof, to a release position in which it is upside down relative to the pick-up position and in which it can let said bottle (4) in the upside down position, said gripping organ (22) being in pick-up position when said head (12) is in the pick-up position and in said release position when said head (12) is in the release position.

2. An apparatus for boxing bottles as claimed in claim 1, **characterised in that** said gripping organ (22) is pivotally associated to said head (12) according to a substantially horizontal axis of rotation.

3. An apparatus for boxing bottles as claimed in claim 2, **characterised in that** said gripping organ (22) rotates from said pick-up position to said release position simultaneously to the movement of said head (12) from the related pick-up position to the release position.

4. An apparatus for boxing bottles as claimed in claim

2 or 3, **characterised in that** the gripping organ (22) can also translate vertically relative to said head (12), from a lower position to an upper position, and **in that** said gripping organ (22) is in the lower position when it is in the pick-up position and is in the upper position when it is in the release position.

5. An apparatus for boxing bottles as claimed in claim 4, **characterised in that** said gripping organ (22) translates from said lower position to said upper position simultaneously with the movement of said head (12) from the pick-up position to the release position.

6. An apparatus for boxing bottles as claimed in any of the claims from 1 to 5, **characterised in that** said gripping organ (22) is constituted by a pneumatically activated suction cup, and it can act against the lateral surface of the bottle (4).

7. An apparatus for boxing bottles as claimed in claim 6, **characterised in that** it further comprises a securing element (32) mounted on the support structure (2) to facilitate the grip of a bottle (4) by said gripping organ (22), said securing element (32) being movable between a securing position in which it prevents at least the backward motion of a bottle (4) along the feeding means (6), and a resting position in which it allows the movement of the bottles (4) along the feeding means (6), and **in that** said securing element (32) and said gripping organ (22) can also be mutually approached to enclose a bottle (4) between them, assuring that it is securely gripped by the gripping organ (22).

8. An apparatus for boxing bottles as claimed in claim 7, **characterised in that** at least a terminal part of said gripping organ (22) is movable relative to the insertion head (12) in the direction of the securing element (32).

9. An apparatus for boxing bottles as claimed in any of the claims from 1 to 5, **characterised in that** said gripping organ (22) is constituted by a pair of pliers and it can act against the lateral surface of the bottle (4).

10. An apparatus for boxing bottles as claimed in any of the previous claims, **characterised in that** said first boxing means (11) comprise a plurality of gripping organs (22) for simultaneously inserting a plurality of bottles (4) into one or more boxes (3).

11. An apparatus for boxing bottles as claimed in claim 10, **characterised in that** all gripping organs (22) are associated to a support arm (23) mounted on the head (12), movable relative to the head (12) in such a way as to determine the movement of the gripping organs (22) relative to the head (12) itself.

12. An apparatus for boxing bottles as claimed in any of the previous claims, **characterised in that** it further comprises second boxing means (13) mounted on the support structure (2) in correspondence with said boxing station (5), to pick up from said feeding means (6) a plurality of bottles (4) and insert them into a box (3) in the upright position.

13. An apparatus for boxing bottles as claimed in claim 12, **characterised in that** said second boxing means (13) insert said plurality of bottles (4) in the upright position into an empty box (3), before said first boxing means (11) insert said at least an upside down bottle (4).

14. An apparatus for boxing bottles as claimed in claim 12, **characterised in that** said second boxing means (13) insert said plurality of upright bottles (4) into a box (3) where said first boxing means (11) have already inserted at least an upside down bottle (4).

15. An apparatus for boxing bottles as claimed in claim 12, 13 or 14 **characterised in that** said second boxing means (13) are also mounted on said insertion head (12), at each cycle of the head (12) said second boxing means (13) inserting a plurality of upright bottles (4) into one or more boxes (3).

16. An apparatus for boxing bottles as claimed in any of the previous claims, **characterised in that** it further comprises means of advance (41) to cause the boxes (3) to advance along the boxing station (5).

17. An apparatus for boxing bottles as claimed in any of the previous claims, **characterised in that** it further comprises shock absorbing means (46) associated to the box (3) at least in correspondence with the first boxing means (11) to cushion the fall of the upside down bottle (4) into the box (3) itself.

18. An apparatus for boxing bottles as claimed in claim 17, **characterised in that** said shock absorbing means (46) comprise at least a conveying (47) whereon said box (3) bears.

19. An apparatus for boxing bottles as claimed in claim 18 **characterised in that** said mat (47) is constituted by a positive drive belt (47).

20. An apparatus for boxing bottles as claimed in claim 18 or 19 **characterised in that** said shock absorbing means (46) comprise at least two mats (47) arranged side by side and mutually distanced in correspondence with the point of impact of the bottle

(4) released by the first boxing means (11) against the related box (3).

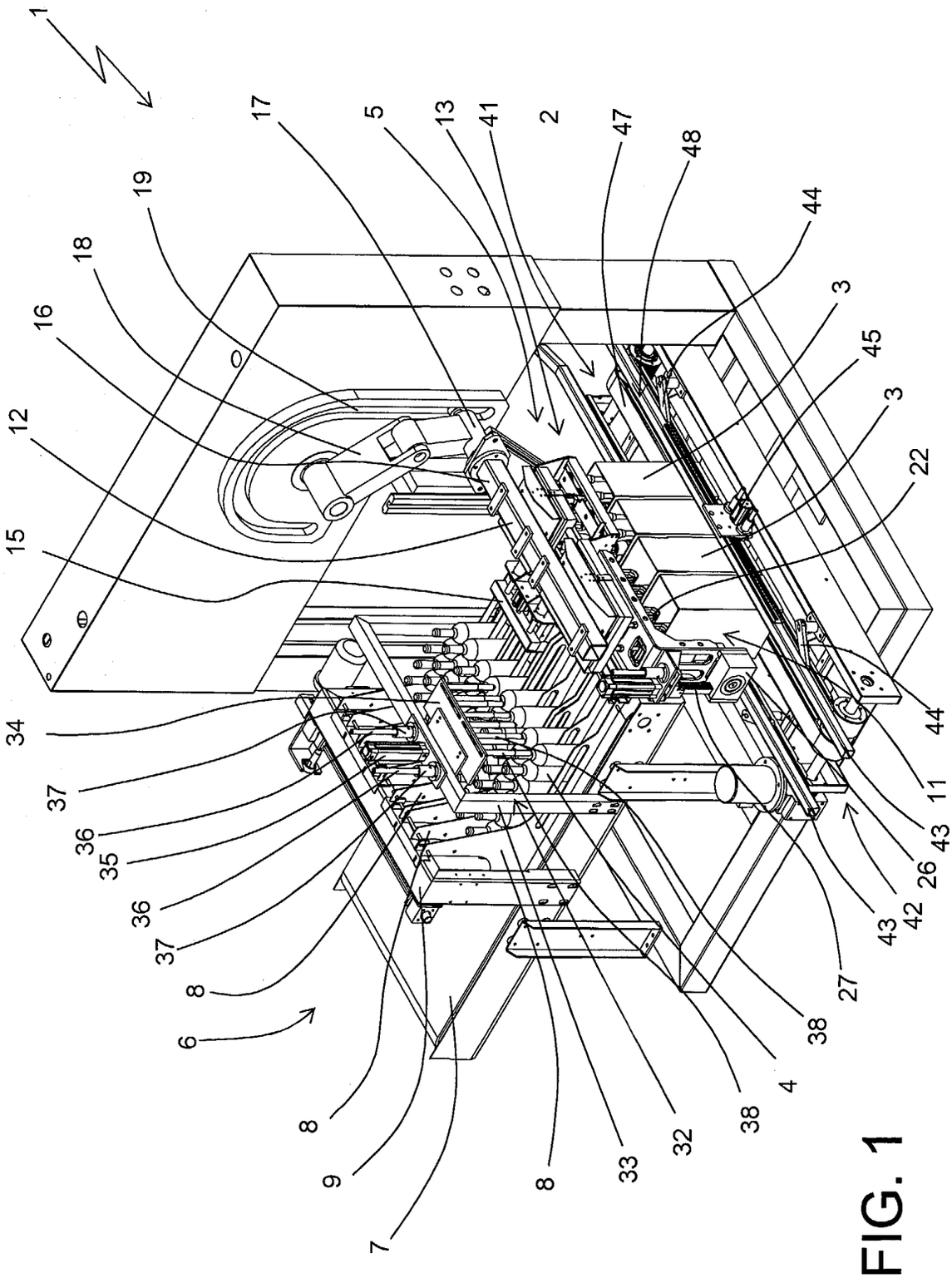
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FIG. 1

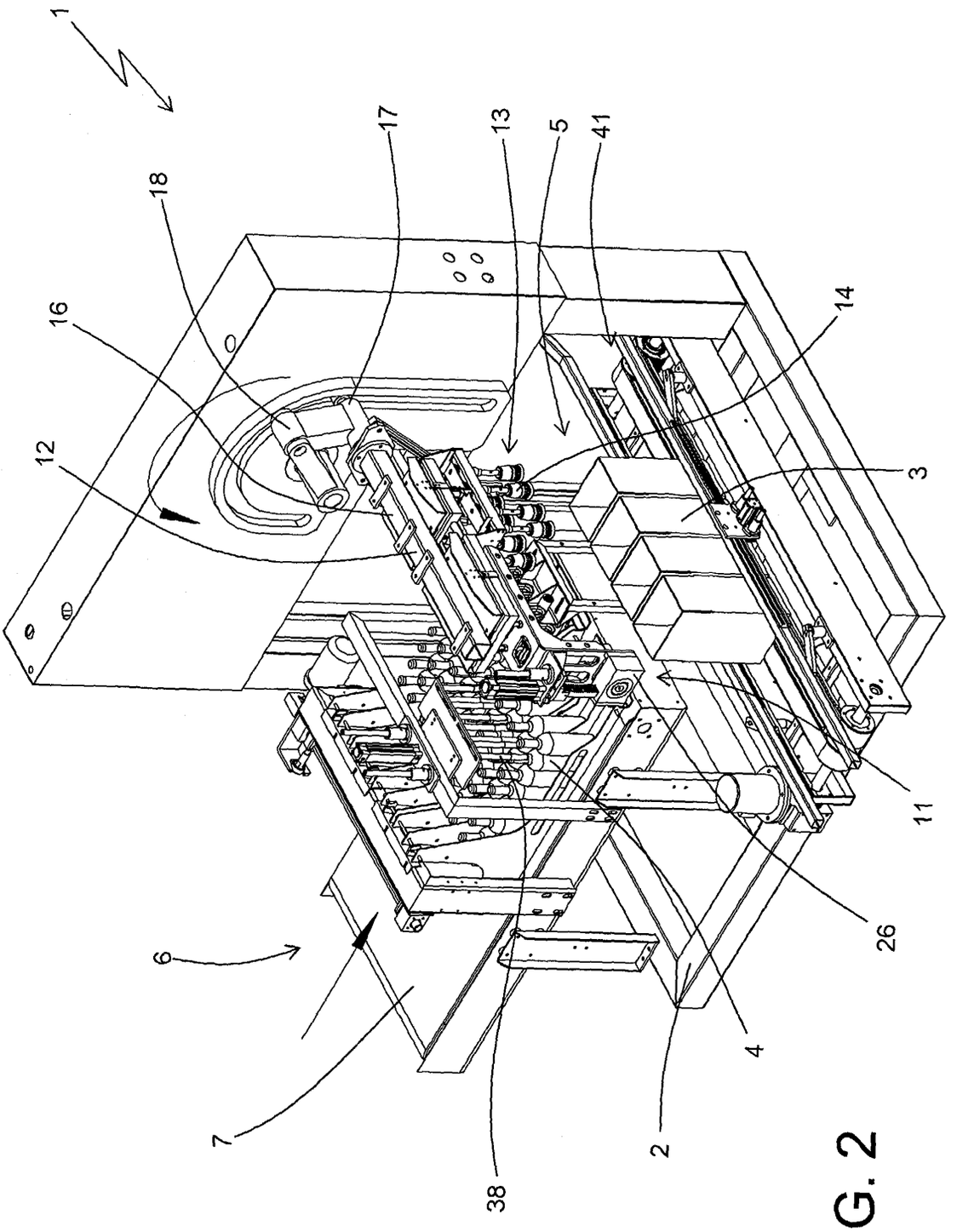

FIG. 2

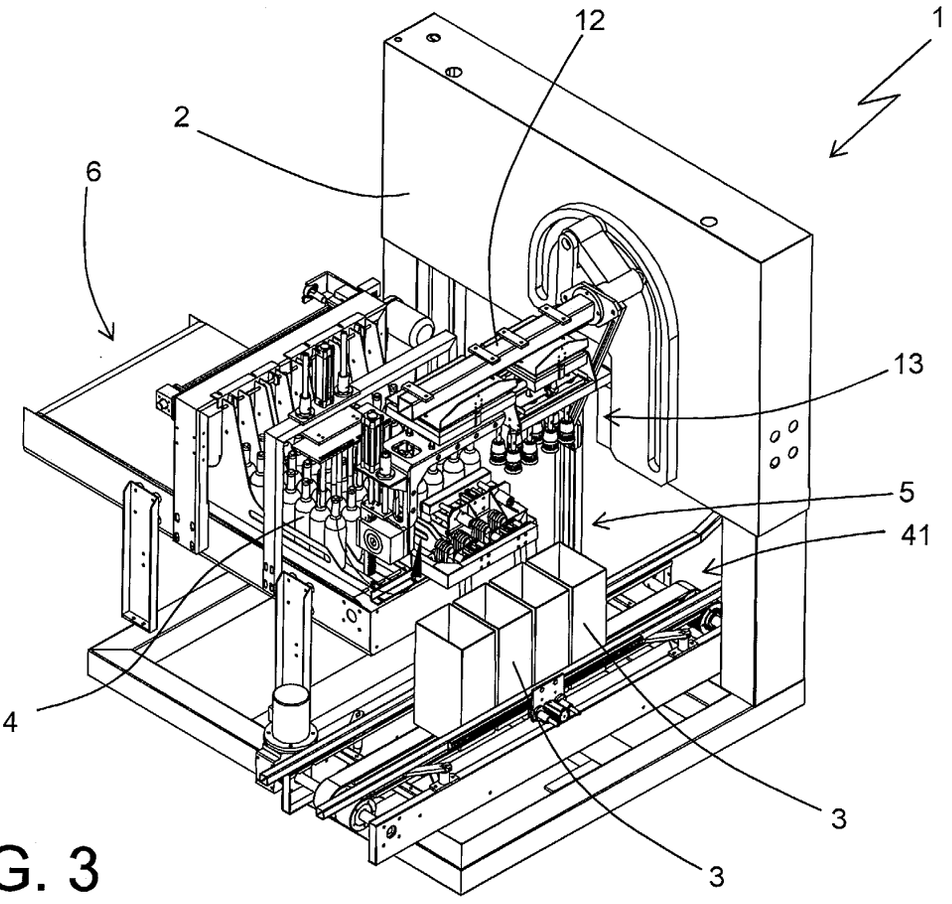

FIG. 3

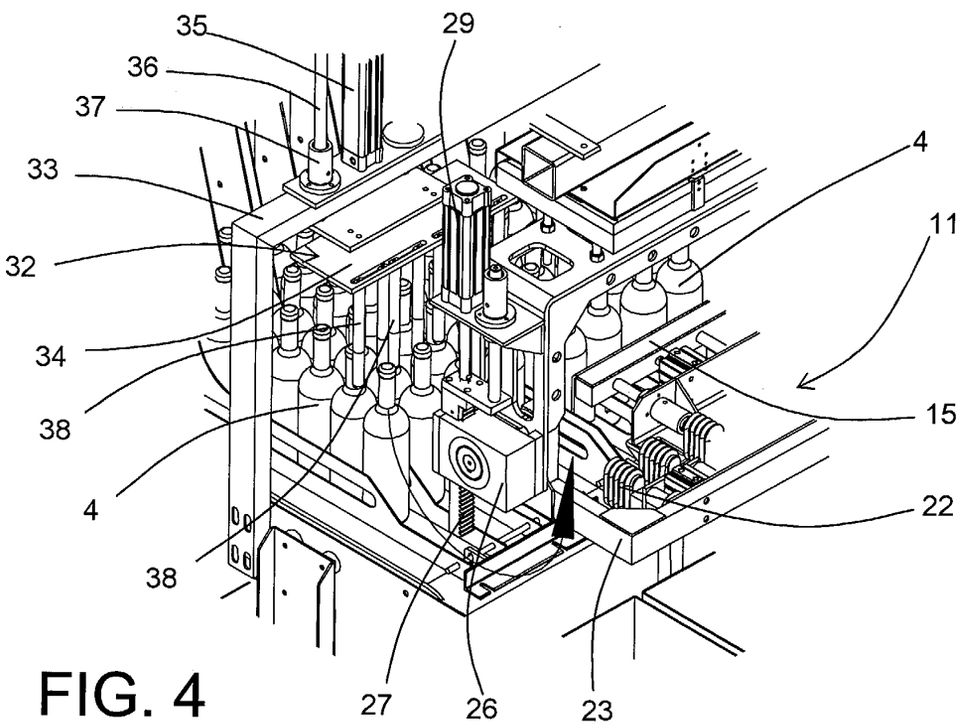

FIG. 4

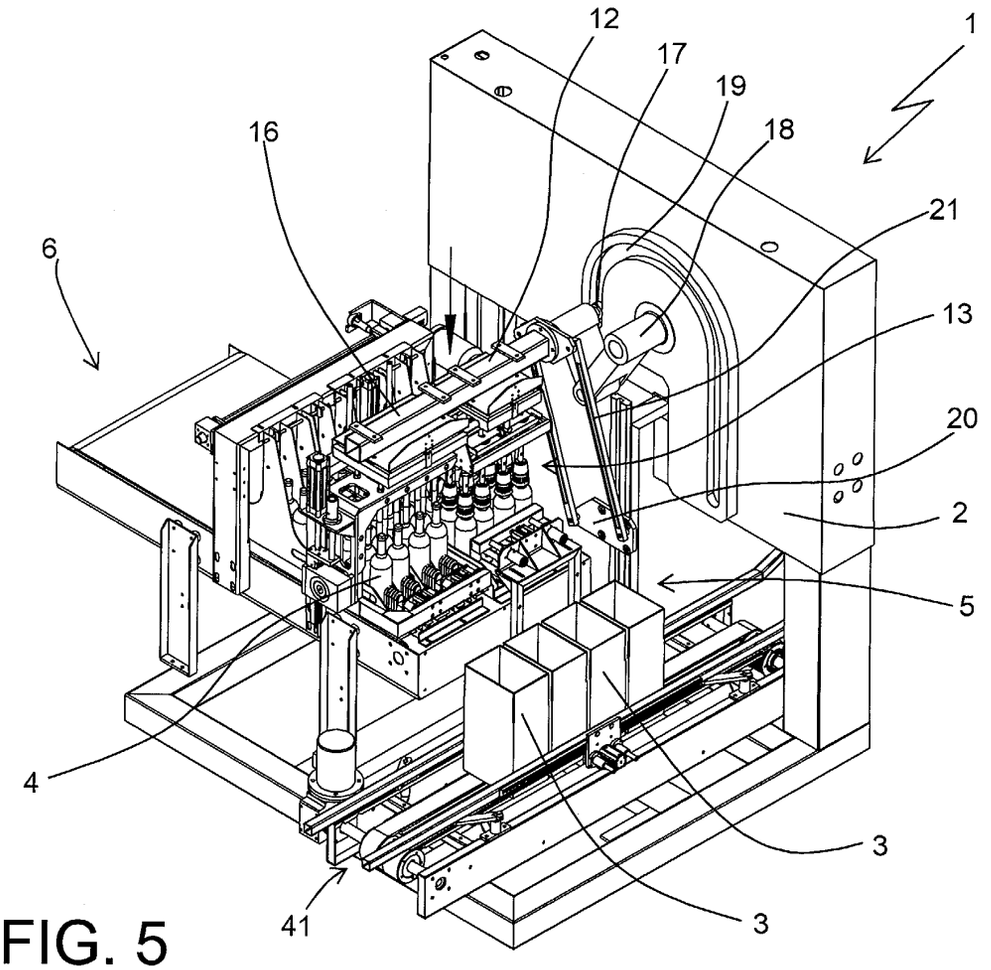
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FIG. 5

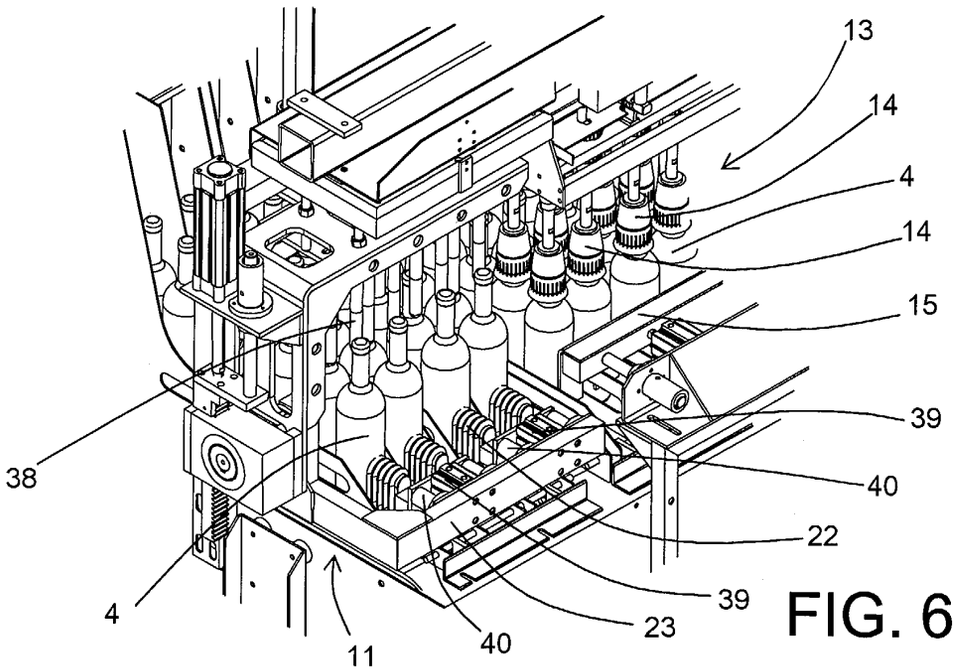
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FIG. 6

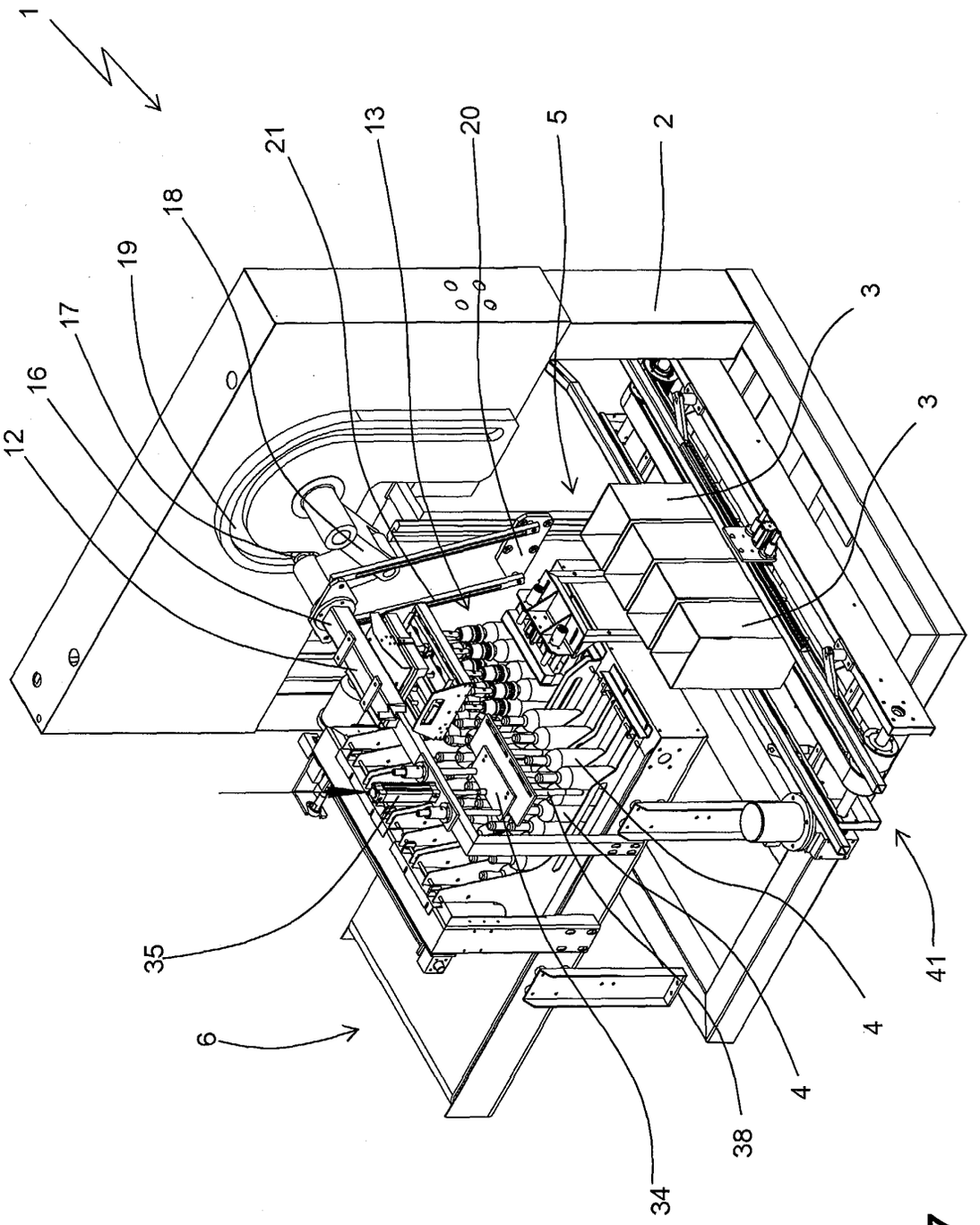

FIG. 7

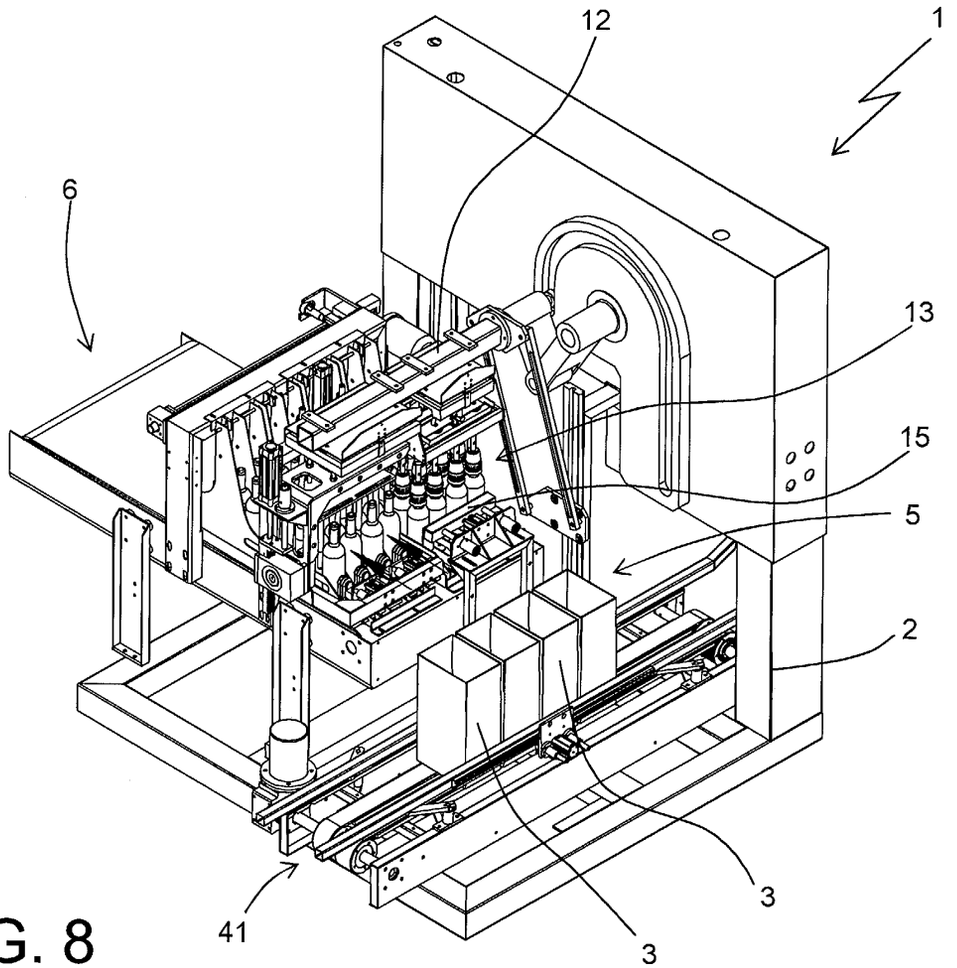

FIG. 8

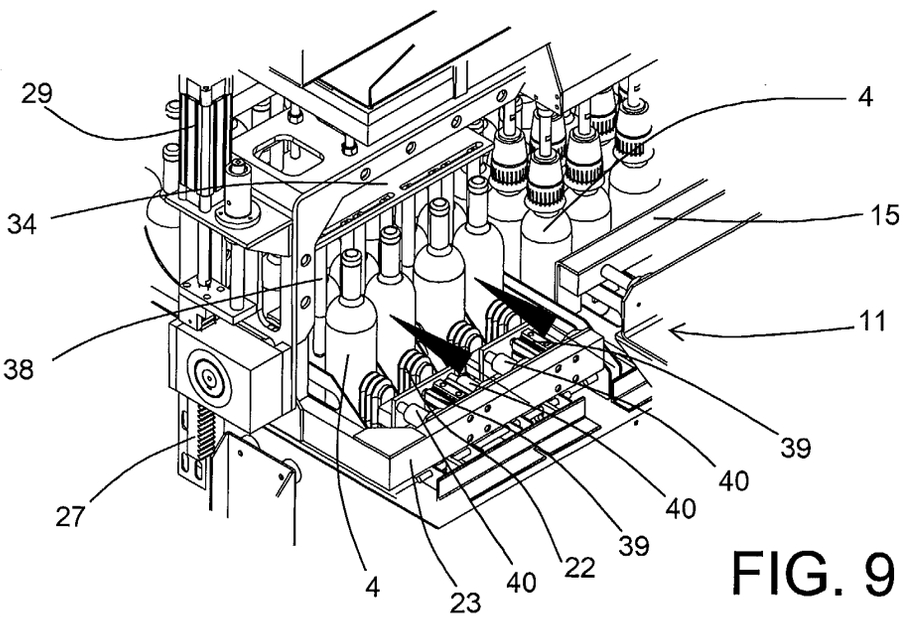

FIG. 9

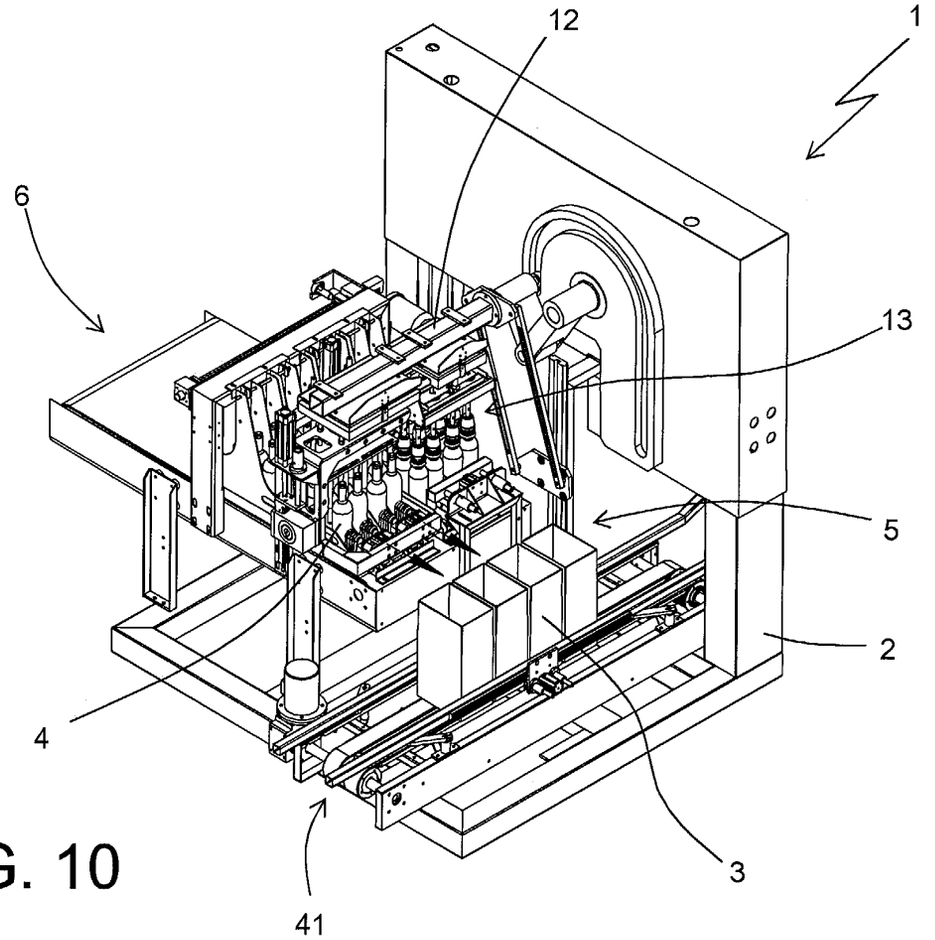

FIG. 10

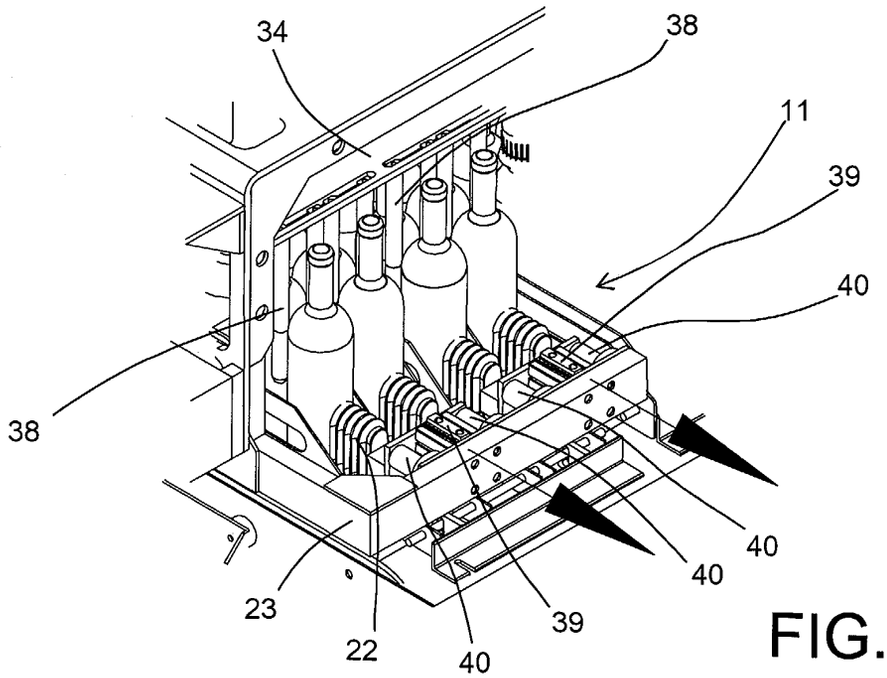

FIG. 11

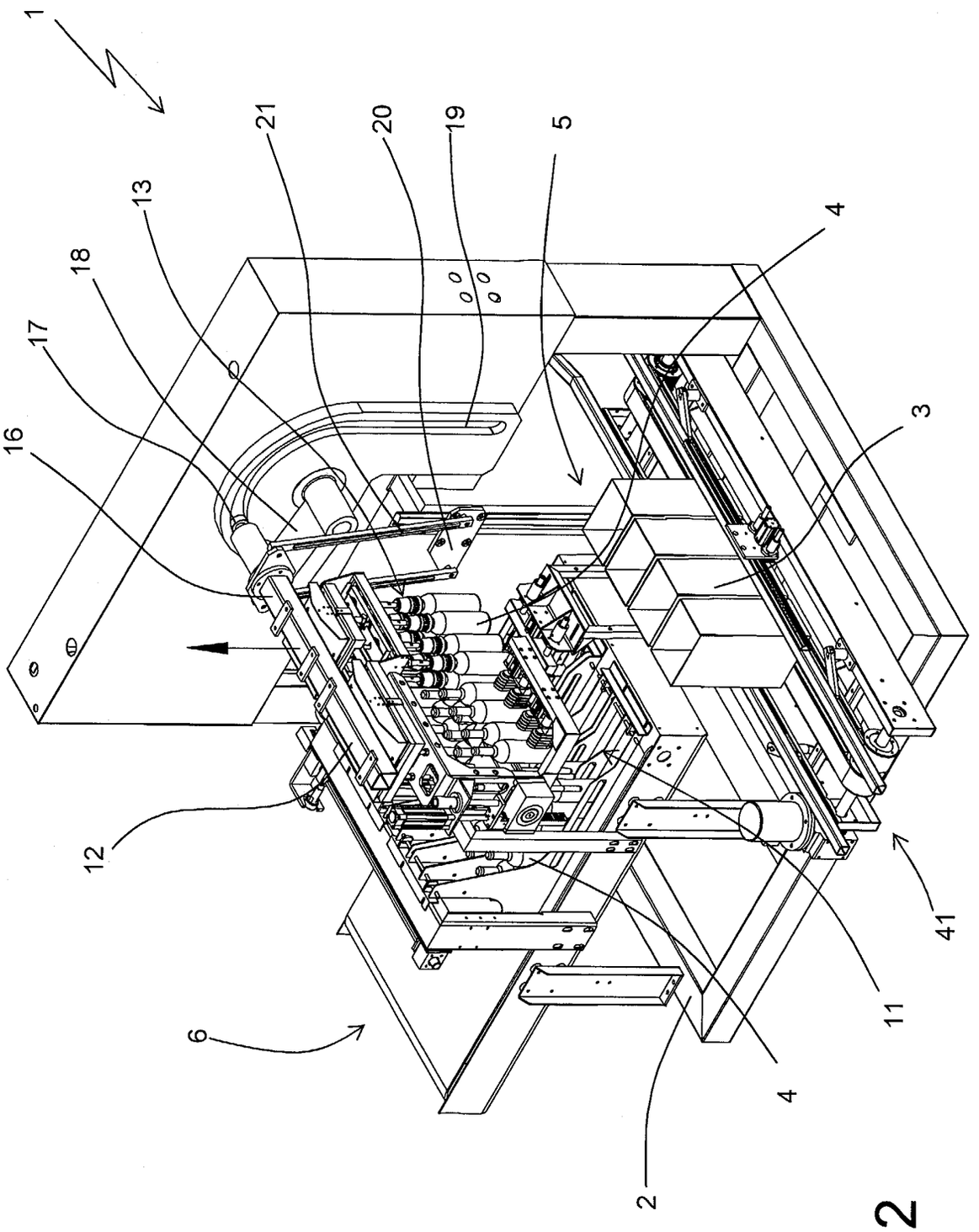

FIG. 12

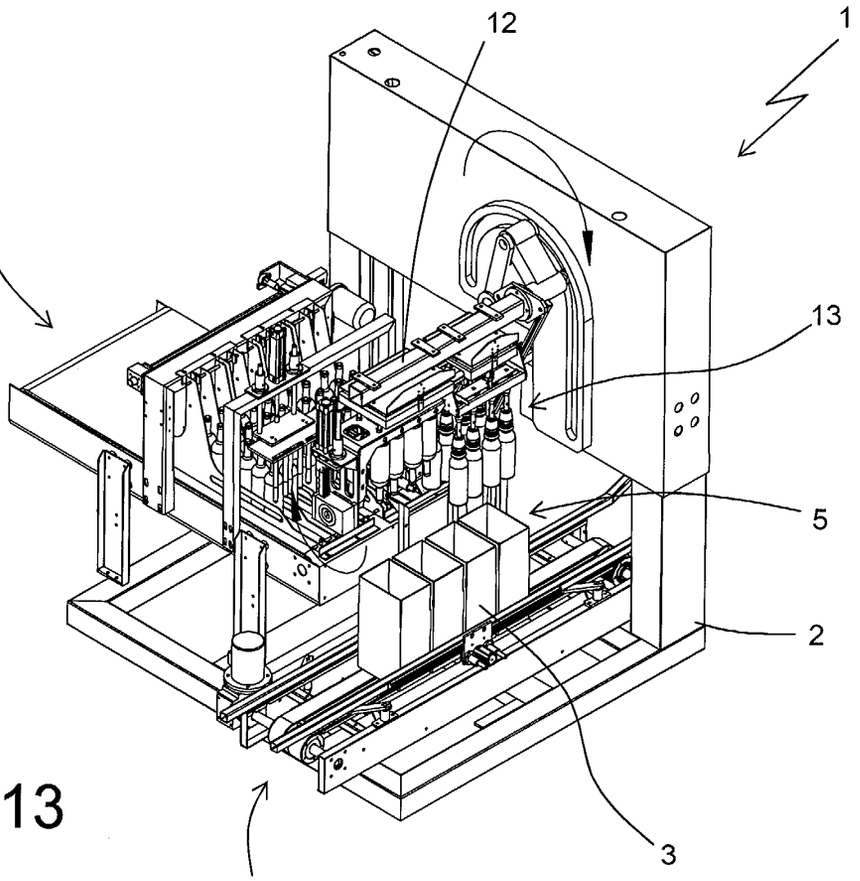

FIG. 13

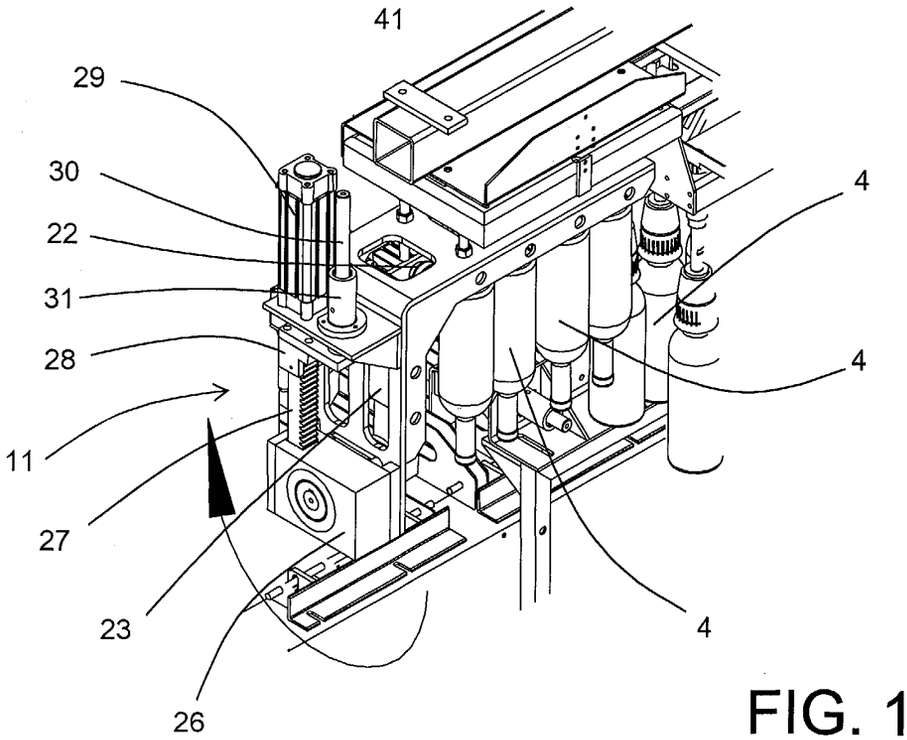

FIG. 14

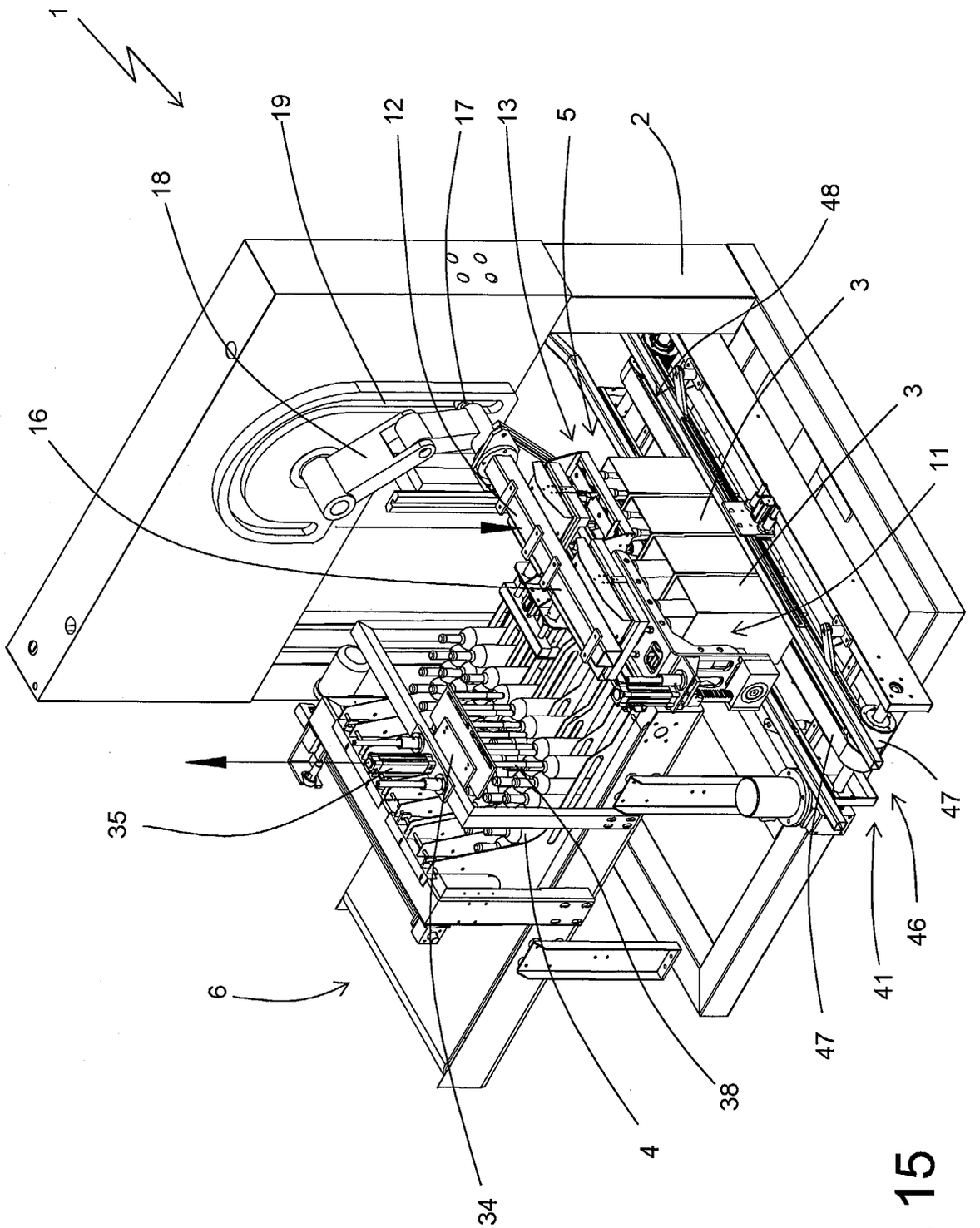

FIG. 15

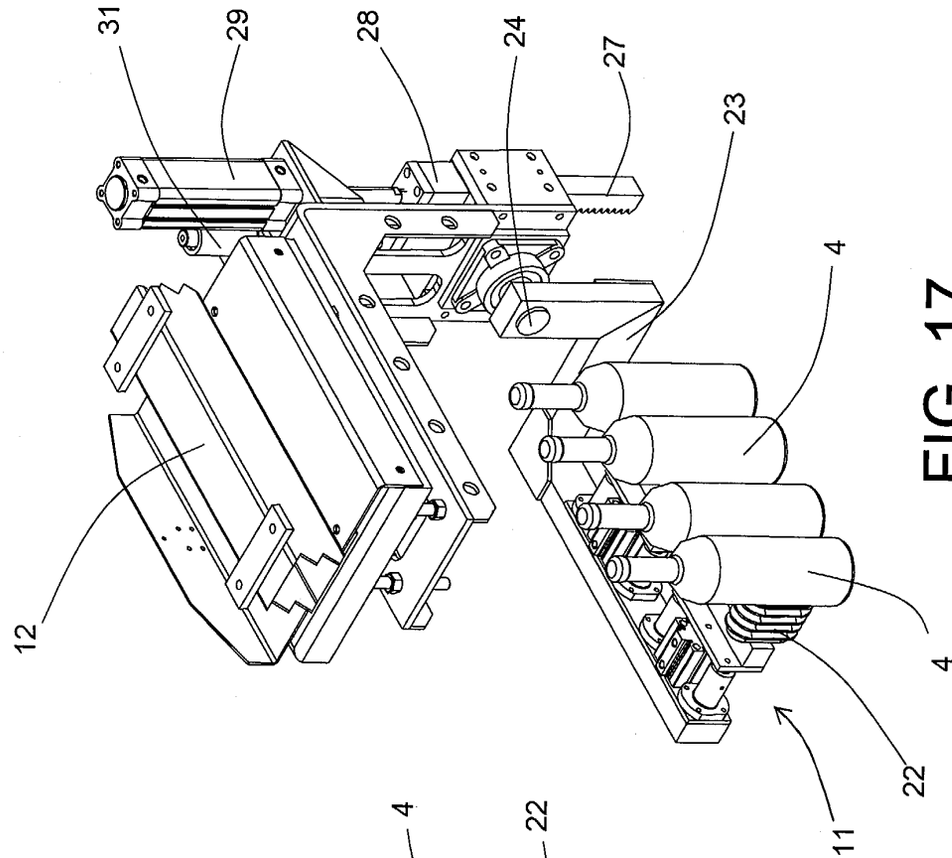

FIG. 17

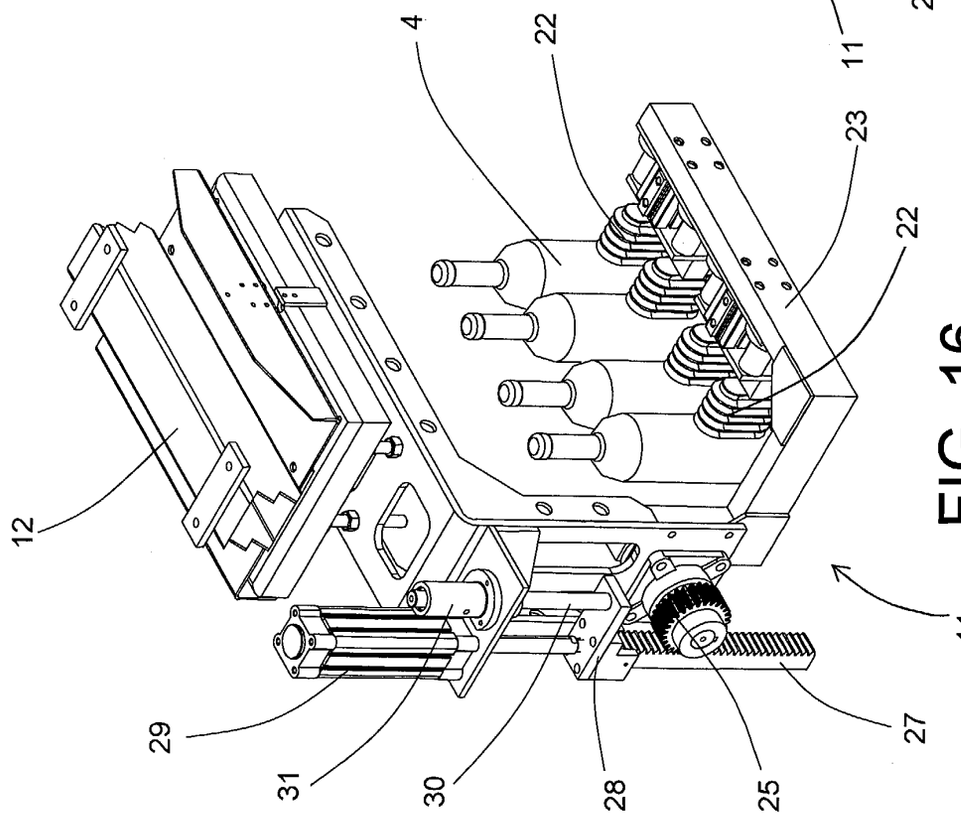

FIG. 16

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Application Number
EP 03 42 5703

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B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	3 June 2004	Grentzius, W

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