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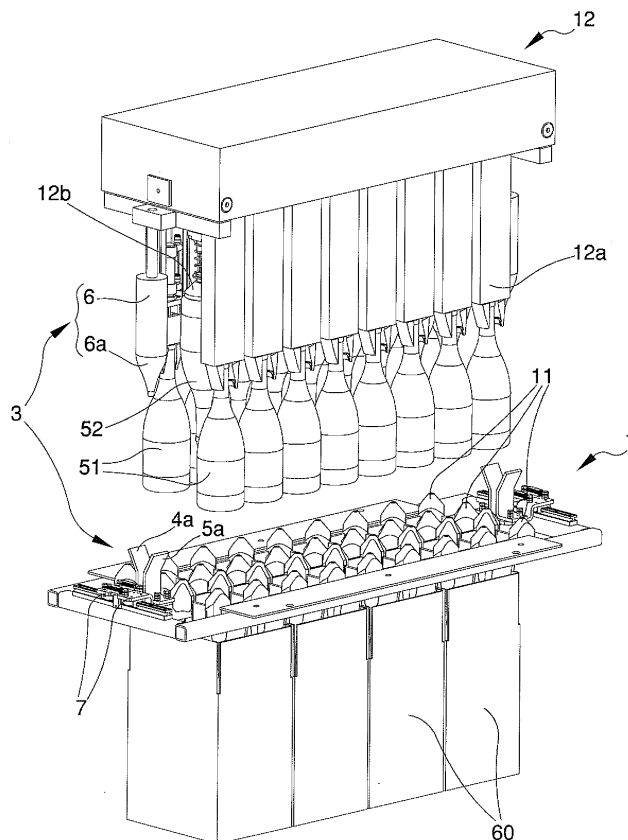
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(54) **A centring device and a bottle-packing machine**

(57) The centring device for bottle-packing, comprising: a cellular structure (2) which defines a plurality of openings (21, 22, 23) predisposed for enabling passage of bottles (51, 52); regulating means (3), predisposed to

determine a change in size and/or conformation of the openings (21, 22, 23) during passage of the bottles (51, 52), such that each opening (21, 22, 23) enables progressive passage of consecutive sections of a bottle (51, 52).

Fig. 1



Description

[0001] The invention relates to a centring device for packing bottles and to a bottle-packing machine.

[0002] Machines for packing bottles generally comprise a movement device predisposed to collect and deposit a determined number of bottles internally of cardboard boxes. The bottles are generally removed from the movement device in an ordered matrix arrangement which contains a certain number of groups of bottles. Each group of bottles is destined to be inserted and contained in a single box.

[0003] Some types of bottles, such as for example sparkling wine or champagne, exhibit a cylindrical bottom portion which extends in height over a more-or-less equivalent tract to the neck portion. To contain box volume, these bottles are normally stacked alternatively top-side up and upside down in the box, i.e. such that an upright bottle is next to an over-turned bottle. This means that the cylindrical bottom portion of a bottle is next to the neck portion of an adjacent bottle, such that the space taken up is about the sum of the diameter of the space occupied by the bottom portion and the diameter of the neck portion. If the two bottles were placed side-by-side and both upright, the overall diameter would be about twice the diameter of the bottom portion.

[0004] The most widely-used packing boxes for this type of bottle contain six bottles, arranged in two rows of three bottles, in which the bottles at the end are straight and the intermediate bottles are over-turned. To prevent the bottles from being in direct contact with one another in the boxes, before introducing the bottles a cellular structure is interposed, made up of at least a larger wall, predisposed to separate the two rows of three bottles, and at least two smaller walls, predisposed to separate the bottles of each row.

[0005] Correct positioning of the bottles internally of the boxes means that each bottle unerringly enters the cell provided therefor. This is obtained by interposing a centring device between the boxes and the movement device, which centring device comprises a cellular structure that defines a plurality of openings predisposed to enable passage of the bottles. The openings of the cellular structure are aligned with the container boxes of the bottles such that when the movement device descends the bottles each enter the right cell, with no error.

[0006] The known centring devices have a predetermined structure in which the cellular structure defines openings of a fixed shape and extension. This necessarily means that the upright bottles and the over-turned bottles have to be introduced into the boxes in two distinct stations, each of which exhibits a centring device suitable for passage of the upright bottles or the overturned bottles. Thus it is necessary to provide two movement devices and two centring devices if packing times are to be kept to a minimum.

[0007] The aim of the present invention is to provide a centring device and a bottle-packing machine which en-

ables contemporaneous introduction of upright and over-turned bottles internally of a box.

[0008] The invention enables a considerable reduction of the times required for packing a carton with bottles without substantially increasing the costs of the apparatus required.

[0009] Further characteristics and advantages of the invention will better emerge from the detailed description that follows, made with reference to the accompanying figures of the drawings, given by way of non-limiting example, in which:

figure 1 is a perspective view of a centring device and of a bottle-packing machine of the present invention;

figure 2 is a plan view of the centring device of the present invention;

figures 3, 5, 6, 7 and 9 show successive stages of the bottle-packing performed by the machine and device of the present invention;

figure 4 is an enlarged perspective view of the stage shown in figure 3;

figure 8 is an enlarged perspective view of the stage shown in figure 7;

figure 10 is an enlarged perspective view of the stage shown in figure 9;

figures 11a, 11b are a schematic representation in plan view of a minimum realisation of the invention for centring a pair of bottles, illustrated in two successive stages of two bottles passing through the centring device;

figures 12a, 12b, 12c are a schematic representation in plan view of a more complex realisation of the invention for centring a set of three bottles, illustrated in three successive stages of the passage of three bottles through the centring device;

figures 13 and 14 schematically show two embodiments of the centring device, suitable for contemporaneous centring of twelve bottles.

[0010] The centring device of the present invention is particularly applicable for use in a machine for packing bottles which comprises a movement device 12, predisposed for moving a certain number of bottles 51, 52 along at least a vertical direction. A determined number of cardboard boxes 60 is arranged below the movement device 12, predisposed to receive the bottles 51, 52 positioned upright and overturned in a determined pattern. After having collected the bottles 51, 52, the movement device 12 is brought into a vertically-aligned position with regard to the boxes 60 and descends until it deposits the bottles 51, 52 internally of the boxes 60. The centring device 1 is arranged in an intermediate position between the movement device 12 and the container boxes 60 for the bottles, and its function is to correctly direct the bottles into the boxes 60.

[0011] The centring device of the present invention comprises a cellular structure 2 (figure 2) which defines

a plurality of openings 21, 22, 23 predisposed to enable passage of bottles 51, 52. As already mentioned, the cellular structure 2 substantially has the function of being a centring template for directly correctly the bottles 51, 52 during the descent thereof towards the packing boxes 60.

[0012] Regulating means 3 are predisposed to cause a variation in the size and/or conformation of the openings 21, 22, 23 during passage of the bottles 51, 52, such that each opening 21, 22, 23 enables progressive passage of consecutive sections of a bottle 51, 52. Thanks to this possibility, the openings 21, 22, 23 can open or close progressively to enable passage of the various sections of the bottles.

[0013] In a minimum embodiment of the invention, illustrated in figures 11a, 11b, the cellular structure 2 comprises at least a first longitudinal wall 4 which separates at least a first and a second opening 21, 22 from one another and which can slide along a transversal direction X, such as to vary the size of the first and the second openings 21, 22 between a maximum extension configuration and a minimum extension configuration. This embodiment of the invention enables centring a pair of bottles 51, 52 of which a first is upright and the other is overturned. Consider for example two bottles 51, 52 adjacent to one another which are translated to pass through two contiguous openings 21, 22. The upright bottle 51 offers the bottom portion to the cellular structure 2, the section of which is greater than the neck section, while the overturned bottle 52 offers the neck portion towards the cellular structure 2. Initially a first opening 21 is in a maximum extension configuration in order to enable passage of the bottom portion of the upright bottle 51, while the second opening 52 is in a minimum extension configuration, which enables passage of the neck portion of the overturned bottle 52. As the bottles advance, the regulating means 3 contemporaneously vary the conformation and the size of the openings 21, 22 such that the first opening 21 reduces in size in order to follow the reduction of the section of the upright bottle 51 which transits from the bottom portion to the neck portion, while the second opening 22 increases in size in order to follow the increase of the section of the overturned bottle 52 which transits from the neck portion to the bottom portion. If it is not possible to vary the size of the two openings 21, 22 during the passage of the bottles 51, 52, the bottles would not be able to transit contemporaneously through the openings 21, 22. The regulating means 3 are predisposed to cause the sliding of the first longitudinal wall 4.

[0014] The minimum embodiment of the embodiment can be repeated several times either in a longitudinal direction Y and in a transversal direction such as to enable contemporaneous centring of several pairs of bottles 51, 52, both upright and overturned. For example, by repeating this embodiment once in a longitudinal direction Y it is possible to centre four bottles, of which two are upright and two overturned. By repeating the mini-

mum structure four more times in a longitudinal direction Y, twelve bottles can be centred, arranged on two rows of six bottles, a row of upright bottles and a row of overturned bottles. In this way it is possible to pack a box of twelve bottles with a single operation.

[0015] In a more complex embodiment, the cell structure 2 comprises a second longitudinal wall 5, arranged parallel to the first longitudinal wall 4 which separates the second opening 22 from a third opening 23 and which can slide along the transversal direction X. In this embodiment the invention enables centring of three aligned bottles, of which the two end bottles are in an upright position and the intermediate bottle is overturned, or vice versa. In this case the regulating means 3 are predisposed to determine a relative sliding between the first and the second longitudinal wall 4, 5 such as to vary the size of the first, second and third openings 21, 22, 23, between a maximum extension configuration and a minimum extension configuration.

[0016] If for example the two end bottles are upright and the intermediate bottle overturned (figures 12a, 12b, 12c), the first and the second longitudinal walls 4, 5 are initially in a position in which they are separated by a minimum distance, such that the intermediate opening 22 is in a minimum extension configuration in order to allow passage of the neck section of the overturned bottle, while the two end openings 21, 23 are in a maximum extension configuration in order to enable passage of the bottom section of the two upright bottles. As the bottles advance, the regulating means 3 distance the first and the second longitudinal walls from one another such that the two end openings 21, 23 reduce in size in order to follow the reducing of the section of the upright bottles 51 transiting from the bottom portion to the neck portions, while the intermediate opening 22 increases in size to follow the increase in section of the overturned bottle 52 transiting from the neck portion to the bottom portion.

[0017] This more complex embodiment of the invention can also be repeated several times, both in the longitudinal direction, as demonstrated in the figures, and in the transversal direction, such as to enable centring of a greater number of sets of three bottles. The packing of a twelve-bottle box can be obtained for example by repeating the centring device three times for sets of three bottles, obtaining a device which enables centring of twelve bottles arranged on three rows of four bottles in which a first row is of upright bottles and a second row is of overturned bottles. This device could therefore be repeated once in the transversal direction X such as to obtain overall a device which enables centring of twelve bottles, arranged in four rows of three bottles each, two rows of upright bottles alternated with two rows of overturned bottles.

[0018] Preferably, though not exclusively, the regulating means 3 comprise a cam 6 (figures from 3 to 10). In the minimum embodiment of the invention the cam 6 is predisposed to push the first longitudinal wall 4 to slide at least in an outward direction. Elastic means 7, for ex-

ample one or more helical springs, are predisposed to maintain the first longitudinal wall 4 in contact with the cam 6 and to push the longitudinal wall to slide in an opposite, return direction. Also possible is a desmodromic, or positive, command in which the cam 6 actively determines both slidings of the longitudinal wall 4, the presence of elastic means no longer being necessary.

[0019] In the embodiment of the invention for sets of three bottles, the cam 6 is predisposed to wedge between the first and the second longitudinal wall 4, 5 such as to distance them from one another. Preferably the cam 6 is in the form of an elongate body provided with a tapered end portion 6a. The longitudinal walls 4, 5 are provided with shaped appendages 4a, 5a which project at an end of the walls are divergent upwardly such as to define an entrance for the cam 6. The elastic means 7 are predisposed to maintain the first and the second longitudinal walls 4, 5 in contact with the cam 6 and to push the first and the second longitudinal wall 4, 5 towards one another. The presence of the elastic means 7 can be omitted if the cam 6 command is desmodromic.

[0020] As already mentioned, the centring device of the invention can be structured such as to enable the centring of a desired number of bottles. In the accompanying figures, for example, the device is structured such as to enable centring of twenty four bottles arranged in three rows of which the two ends are upright bottles 51, while the intermediate row is made up of upturned bottles. Naturally the number of sets of three bottles, which in the illustrated case is eight, can be increased or reduced according to needs. Similarly, the device could be structured for centring of a determined number of pairs of longitudinally-aligned bottles. In this case only the first longitudinal wall 4 would be necessary. Figures 13 and 14 show two possible embodiments of the centring device suitable for centring twelve bottles.

[0021] To enable centring of a plurality of bottles, the cellular structure 2 comprises a plurality of transversal walls 8 (figure 2) arranged perpendicular to the first longitudinal wall 4 and separated by a certain distance. The cellular structure further comprises two external longitudinal walls 9, 10, parallel to the first longitudinal wall 4, between which the first and the second longitudinal wall 4, 5 are positioned. By intersecting them, the various walls delimit a plurality of openings 21, 22, 23 the size of which is modified by the displacing of the first longitudinal wall 4, in the embodiment for pairs of bottles, or by displacement of the first and the second longitudinal wall 4, 5 in the embodiment for sets of three bottles.

[0022] The longitudinal walls 4, 5, 9, 10 and the transversal walls 8 intersect at nodes where conical elements 11 are positioned which are predisposed to facilitate entry of the bottles 51, 52 into the openings 21, 22, 23.

[0023] Figure 1 shows a schematic view of a bottle-packing machine comprising a centring device 1 of the present invention. The machine comprises a movement device 12, predisposed for moving ordered groups of bottles 51, 52 in which the bottles are aligned in at least a

first longitudinal row of upright bottles 51, a second longitudinal row of overturned bottles 52 and a third row of upright bottles 51. A centring device 1 of the present invention is arranged below the movement device 12.

[0024] The movement device 12, in a collecting station which is not illustrated, collects an ordered group of bottles 51, 52 with gripping means 12a, 12b and moves into a position in which the openings 21, 22, 23 of the cellular structure 2 are aligned along a vertical direction with the gripping means 12a, 12b.

[0025] The movement device 12 is mobile vertically between an upper position, in which it is at a greater distance from the centring device 1 and the bottles 51, 52 are above the cellular structure 2, and a lower position, in which it is at a smaller distance from the centring device 1 and the bottles 51, 52 are below the cellular structure 2. During the passage from the upper position to the lower position, the bottles 51, 52 transit through the openings 21, 22, 23 which, by effect of the regulating means 3, vary their size and/or their conformation such as to enable progressive passage of consecutive sections of the bottles 51, 52.

[0026] The cam 6 is preferably associated to the movement device 12 (figures from 3 to 10) such that, at a certain point in the descent of the movement device 12, the cam 6 enters into contact with the shaped appendages 4a, 5a of the first and the second longitudinal wall 4, 5 causing the reciprocal distancing thereof along the transversal direction X. As can be seen in figures from 3 to 10, the cam 6 is arranged, with respect to the gripping means 12a, 12b, such as to enter into contact with the appendages 4a, 5a in order to cause distancing of the first and the second longitudinal walls 4, 5 in the moment at which the transit of the neck sections of the overturned bottles through the cellular structure 2 has terminated and the transit of the larger section has begun. Figure 5 shows the moment at which the transit of the neck portion of the overturned bottles 52 terminates. The cam 6 is shaped such that the first and the second longitudinal section 4, 5 progressively distance from one another as the overturned bottles 52 proceed downwards, increasing the size of the section transiting through the cellular structure 2. Figure 8 shows the moment when the transit of the cylindrical bottom portion of the overturned bottles 52 begins and the cam 6 pushes the first and the second longitudinal wall 4, 5 to the maximum reciprocal distance. In this way, the change in size of the openings 21, 22, 23 of the cellular structure is perfectly synchronised with the descending movement of the movement device 12.

[0027] As illustrated in figure 1, the boxes 60 for containing the bottles are successively positioned below the centring device, in this case four boxes each for containing six bottles. To this end a mobile conveyor plane (not illustrated) can be predisposed, which supplies the boxes 60 to below the centring device 1, and, following the depositing of the bottles, distances them towards the successive work stations.

[0028] The invention offers important advantages. The

centring device enables the upright and the overturned bottles to be introduced contemporaneously into the container boxes. With respect to the centring devices at present available on the market, which allow only separate introduction of the upright and overturned bottles, this enables bottle-packing times to be reduced by half. Further, the greater productivity of the machine using the centring device does not lead to an especially relevant increase in costs.

Claims

1. A centring device for bottle-packing, **characterised in that** it comprises: a cellular structure (2) which defines a plurality of openings (21, 22, 23) predisposed for enabling passage of bottles (51, 52); regulating means (3), predisposed to determine a change in size and/or conformation of the openings (21, 22, 23) during passage of the bottles (51, 52), such that each opening (21, 22, 23) enables progressive passage of consecutive sections of a bottle (51, 52).
2. The device of claim 1, wherein the cellular structure (2) comprises at least a first longitudinal wall (4) which separates at least a first and a second opening (21, 22) from one another, and which can slide along a transversal direction (X), such as to change a size of the first and the second opening (21, 22), between a maximum configuration extension and a minimum configuration extension, the regulating means (3) being predisposed to determine sliding of the first longitudinal wall (4).
3. The device of claim 2, wherein the cellular structure (2) comprises a second longitudinal wall (5), arranged parallel to the first longitudinal wall (4), which separates the second opening (22) from a third opening (23) and which can slide along the transversal direction (X), the regulating means (3) being predisposed to determine a relative sliding between the first and the second longitudinal wall (4, 5) such as to vary the size of the first, second and third opening (21, 22, 23) between a maximum configuration extension and a minimum extension configuration.
4. The device of claim 2 or 3, wherein the regulating means (3) comprise a cam (6), predisposed to push the first longitudinal wall (4) to slide in a direction.
5. The device of claim 4, wherein the regulating means (3) comprise elastic means (7) predisposed to keep the first longitudinal wall (4) in contact with the cam (6).
6. The device of claim 5, wherein the cam (6) is predisposed to wedge between the first and the second longitudinal wall (4, 5) such as to distance them from one another.
7. The device of claim 6, wherein the elastic means (7) are predisposed to keep the first and the second longitudinal wall (4, 5) in contact with the cam (6) and to push the first and the second longitudinal walls (4, 5) towards one another.
8. The device of one of the preceding claims, wherein the cellular structure (2) comprises a plurality of transversal walls (8) arranged perpendicular to the first longitudinal wall (4) and separated by a determined distance.
9. The device of one of the preceding claims, wherein the cellular structure comprises two external longitudinal walls (9, 10), parallel to the first longitudinal wall (4), between which the first longitudinal wall (4) is positioned.
10. The device of claim 8 and 9, wherein the longitudinal walls (4, 5, 9, 10) and the transversal walls (8) intersect at nodes at which conical elements (11) are positioned which are predisposed to facilitate entry of the bottles (51, 52) into the openings (21, 22, 23).
11. A machine for packing bottles, **characterised in that** it comprises: a movement device (12), predisposed for movement of ordered groups of bottles (51, 52), wherein the bottles are aligned in at least a first longitudinal row of upright bottles (51) and at least a second longitudinal row of overturned bottles (52); a centring device (1) as in one of the preceding claims, arranged below the movement device (12).
12. The machine of claim 11, wherein the movement device (12) is predisposed to assume a position in which the openings (21, 22, 23) of the cellular structure (2) are aligned along a vertical direction with gripping means (12a, 12b) of the movement device (12) predisposed for gripping the upright bottles (51) and the overturned bottles (52).
13. The machine of claim 12, wherein: the movement device (12) is mobile vertically between an upper position, in which it is at a greater distance from the centring device (1) and the bottles (51, 52) are above the cellular structure (2), and a lower position, in which the movement device (12) is at a smaller distance from the centring device (1) and the bottles (51, 52) are below the cellular structure (2); during passage from the upper position to the lower position, the bottles (51, 52) transit through the openings (21, 22, 23) which, by effect of the regulating means (3), vary a size thereof and/or a conformation thereof such as to enable progressive passage of consecutive sections of the bottles (51, 52).

14. The machine of claim 13, wherein the cam (6) is associated to the movement device (12) such that, at a certain point during the descent of the movement device (12), the cam (6) interacts with the first longitudinal wall (4), causing a sliding thereof along the transversal direction (x). 5
15. The machine of claim 14, wherein the cam (6) interacts with the second longitudinal wall (5) contemporaneously with the first longitudinal wall (4), causing a distancing between the first and the second longitudinal wall (5, 6). 10

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Fig. 1

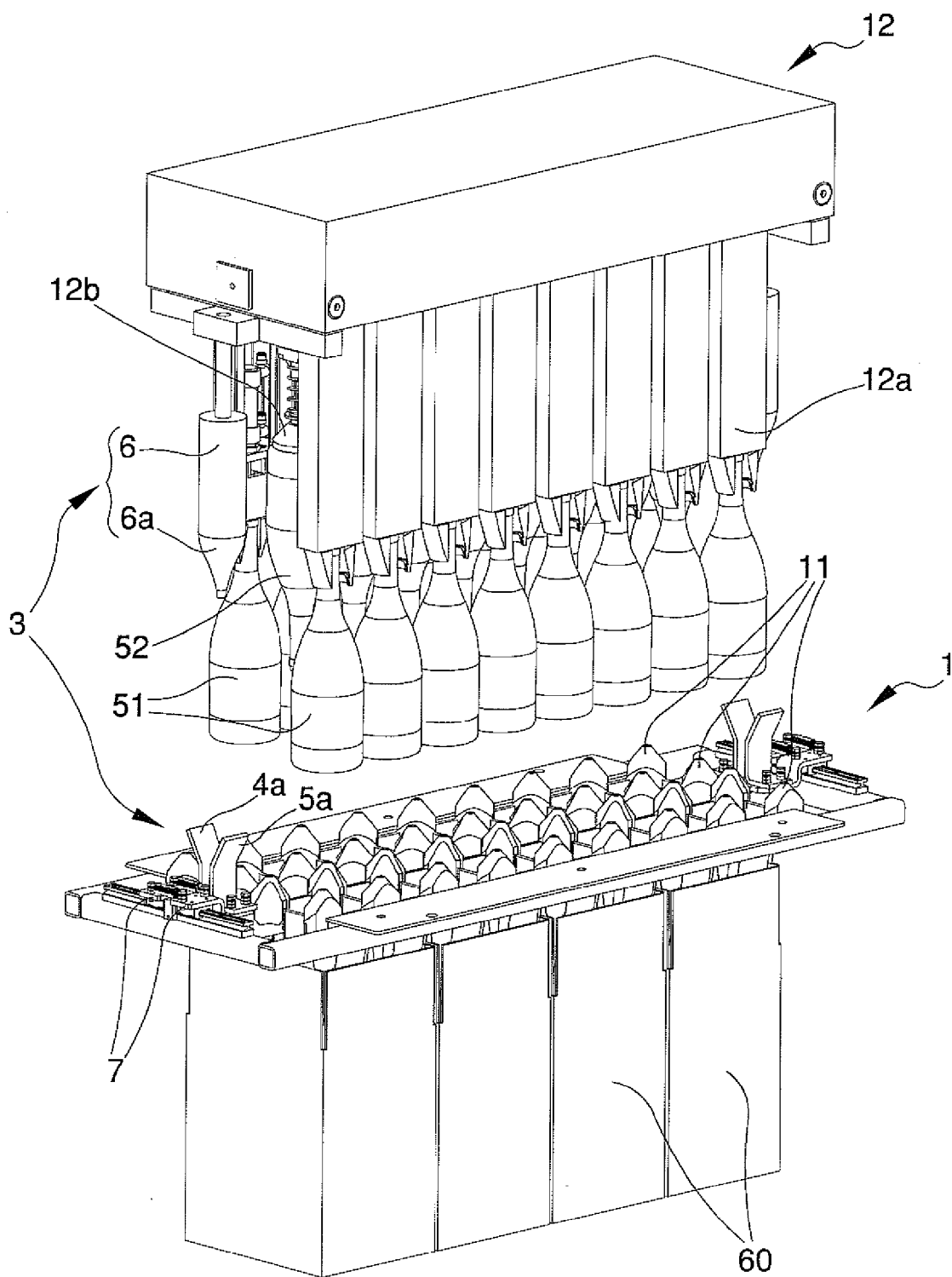


Fig. 2

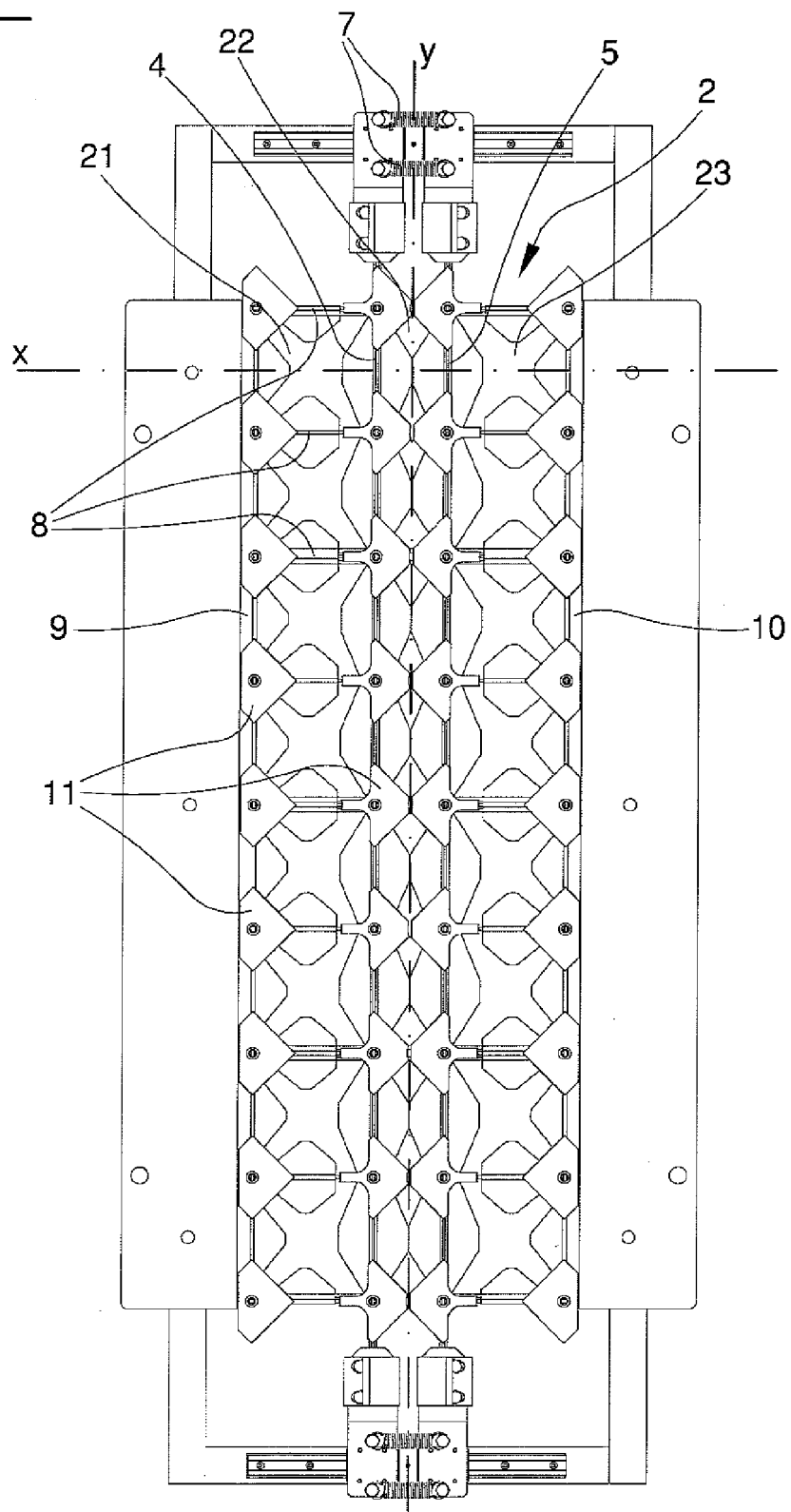


Fig. 3

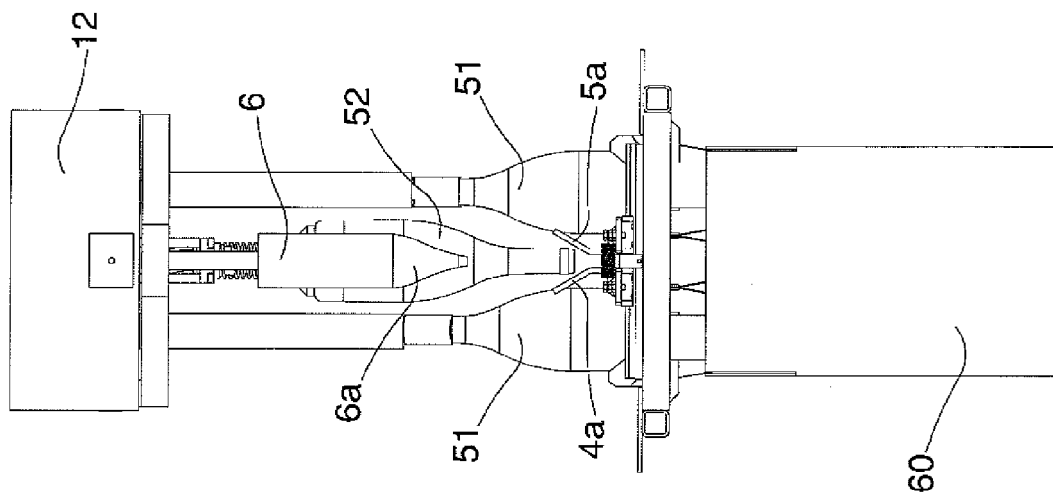


Fig. 4

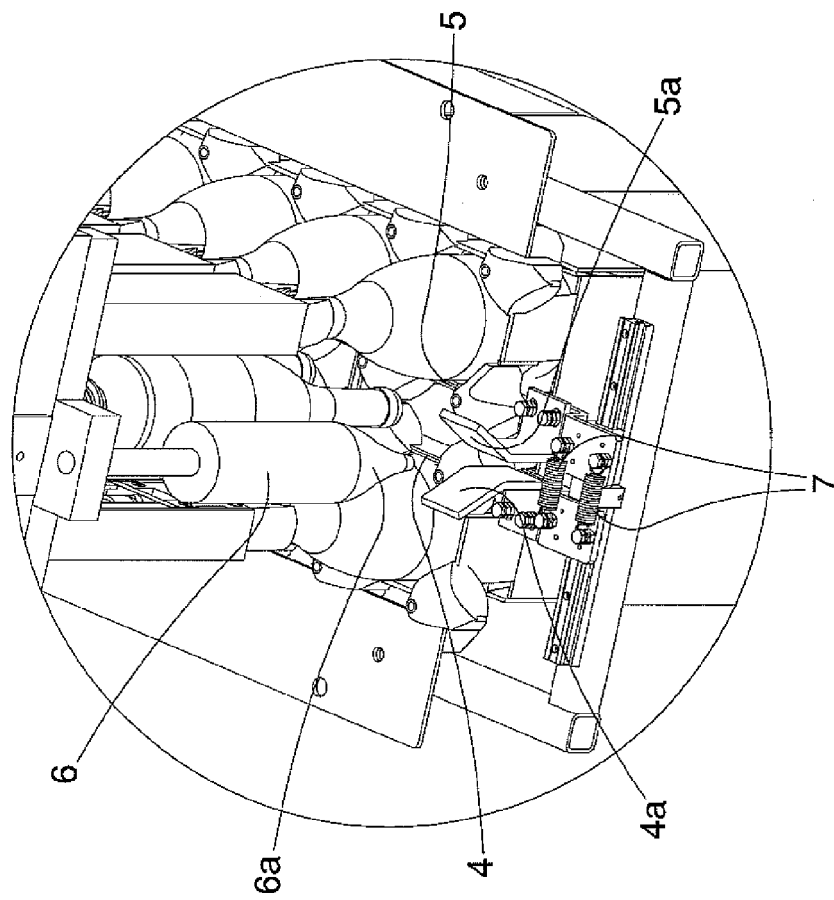


Fig. 5

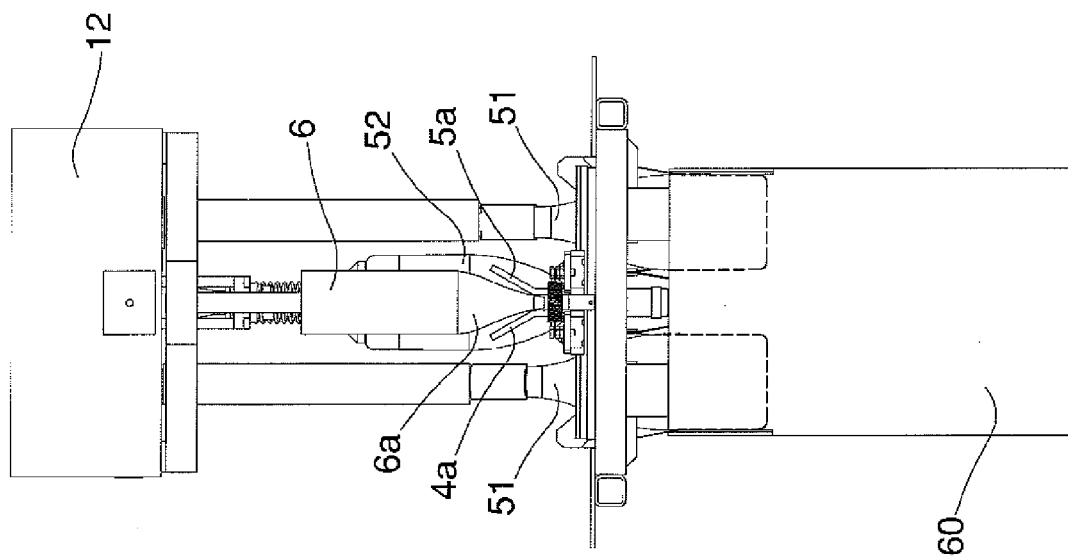


Fig. 6

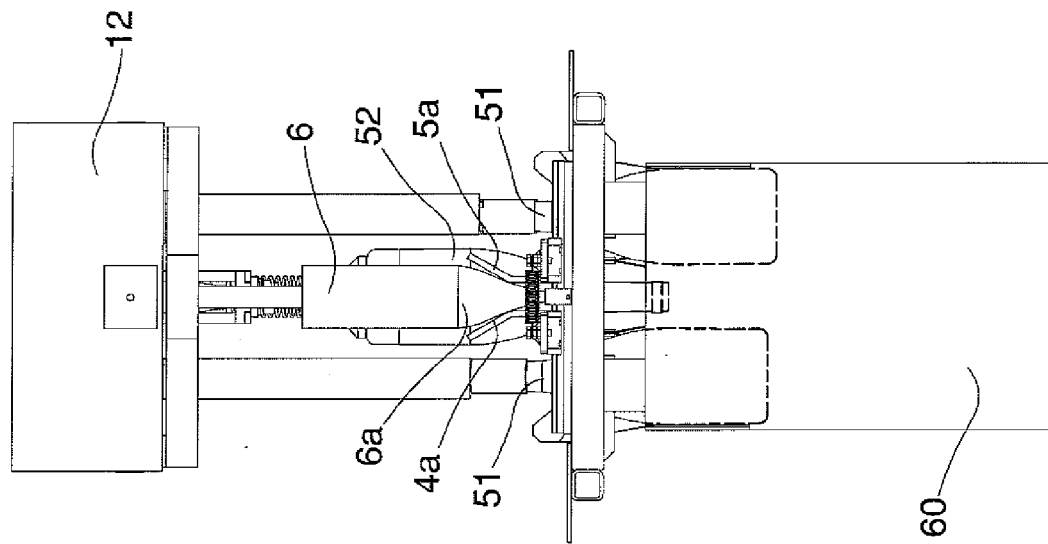


Fig. 7

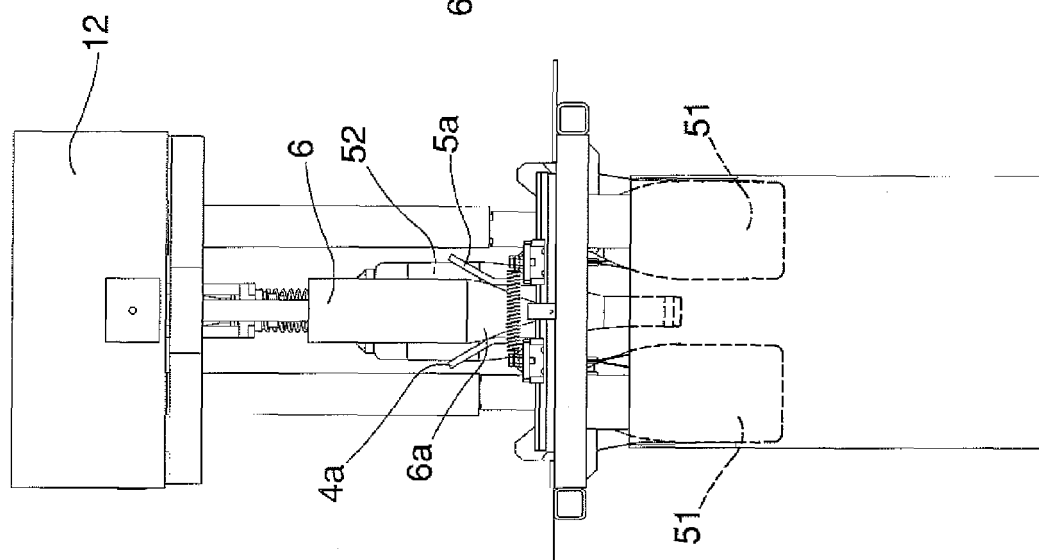


Fig. 8

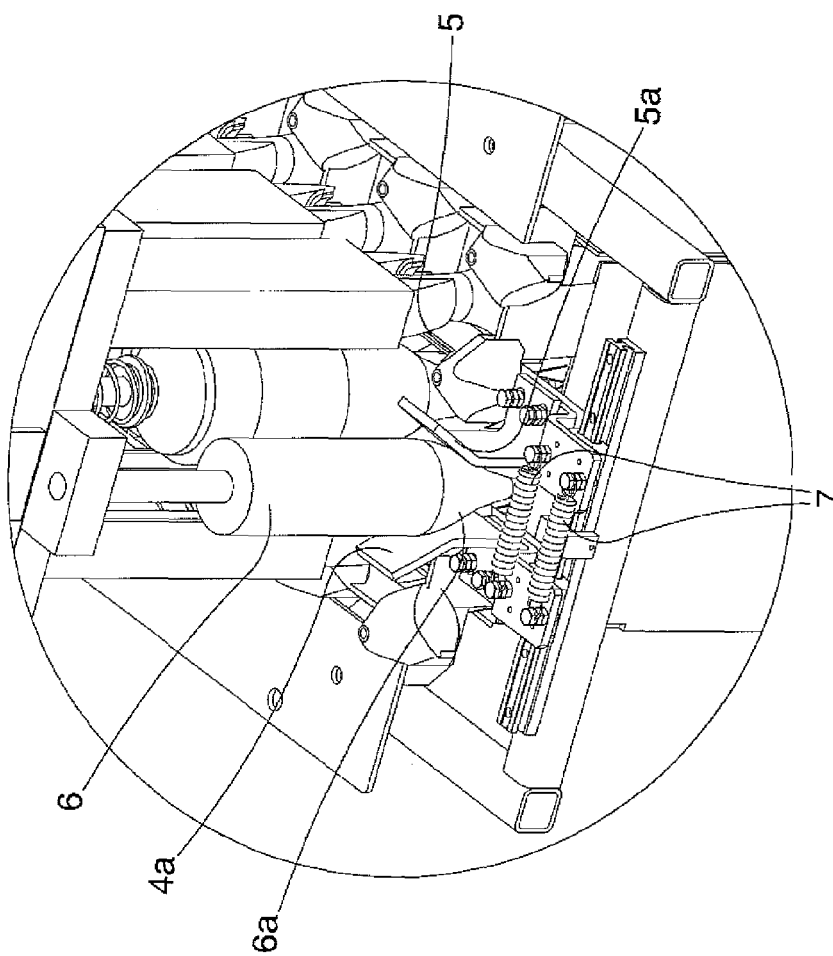


Fig. 9

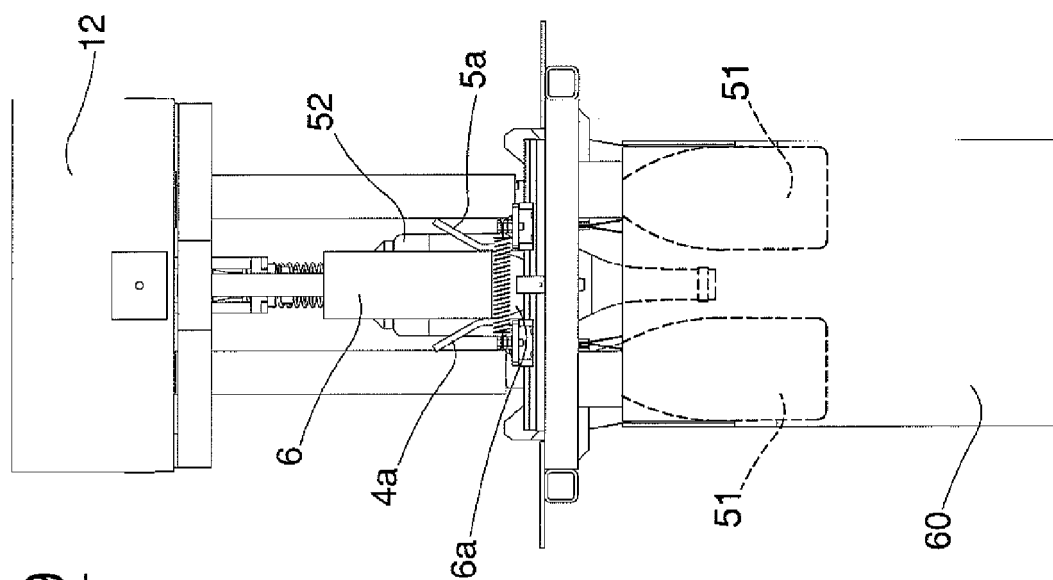


Fig. 10

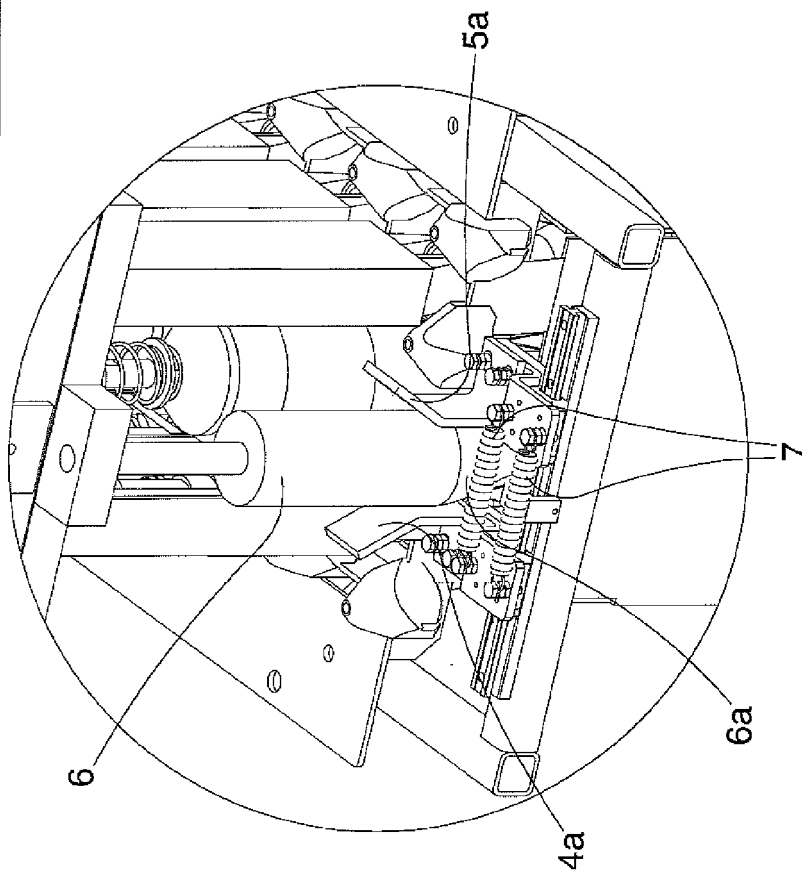


Fig. 11a

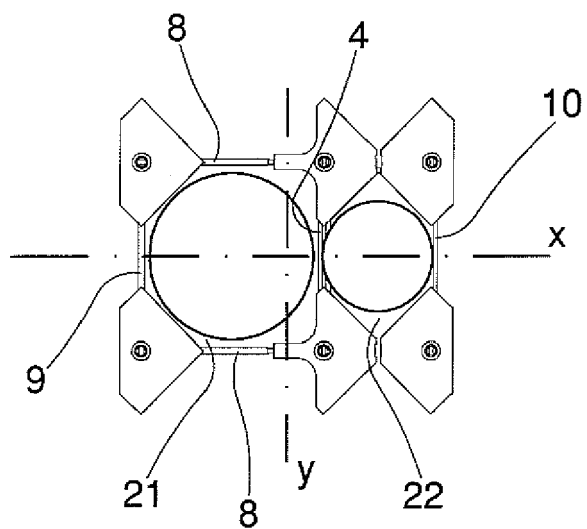


Fig. 11b

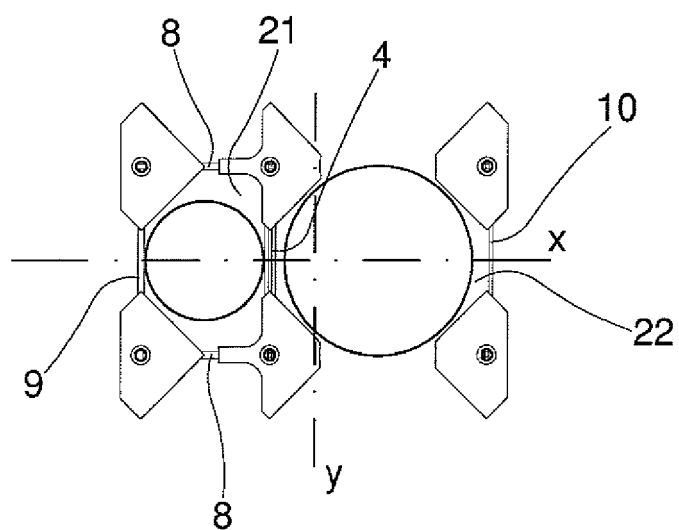


Fig. 12a

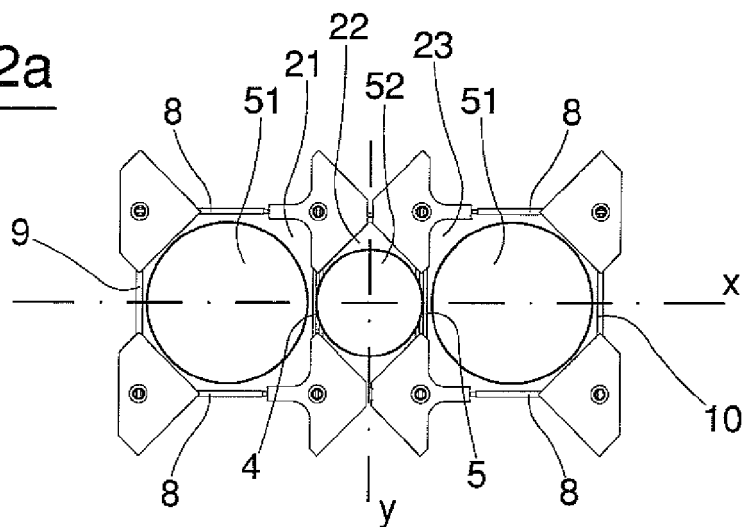


Fig. 12b

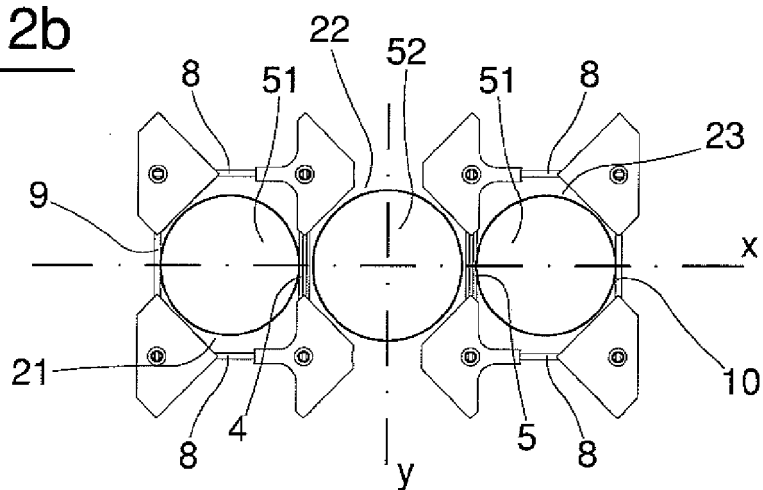


Fig. 12c

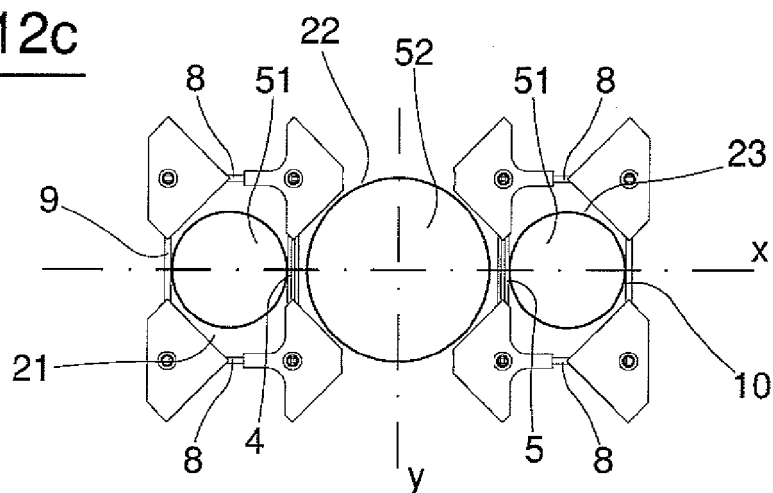


Fig. 13

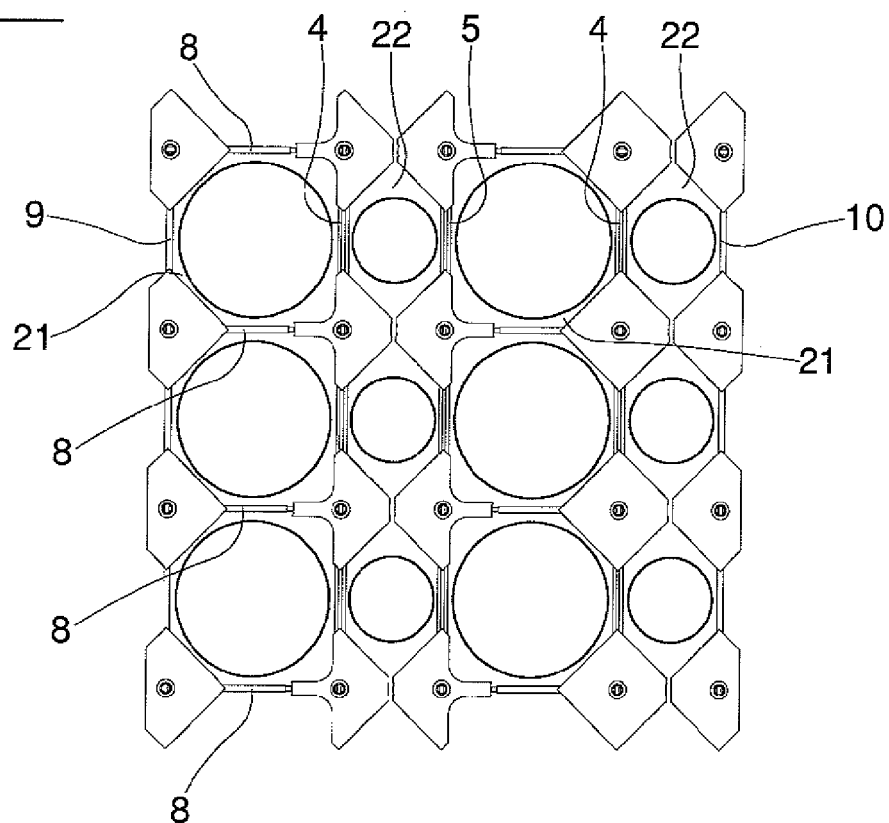


Fig. 14

