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(54) **EQUIPMENT FOR COVERING CARDBOARD BOXES WITH COLD-STICKER SHEET PORTIONS**

(57) The present invention relates to the sector of the production of covered paperboard boxes, such as, in particular but not necessarily, straight or microwave cardboard boxes, and more precisely the object is equipment having novel features as regards to the materials and covering methods, the covering being in particular carried out by the application of shaped portions of cold-sticker sheet.

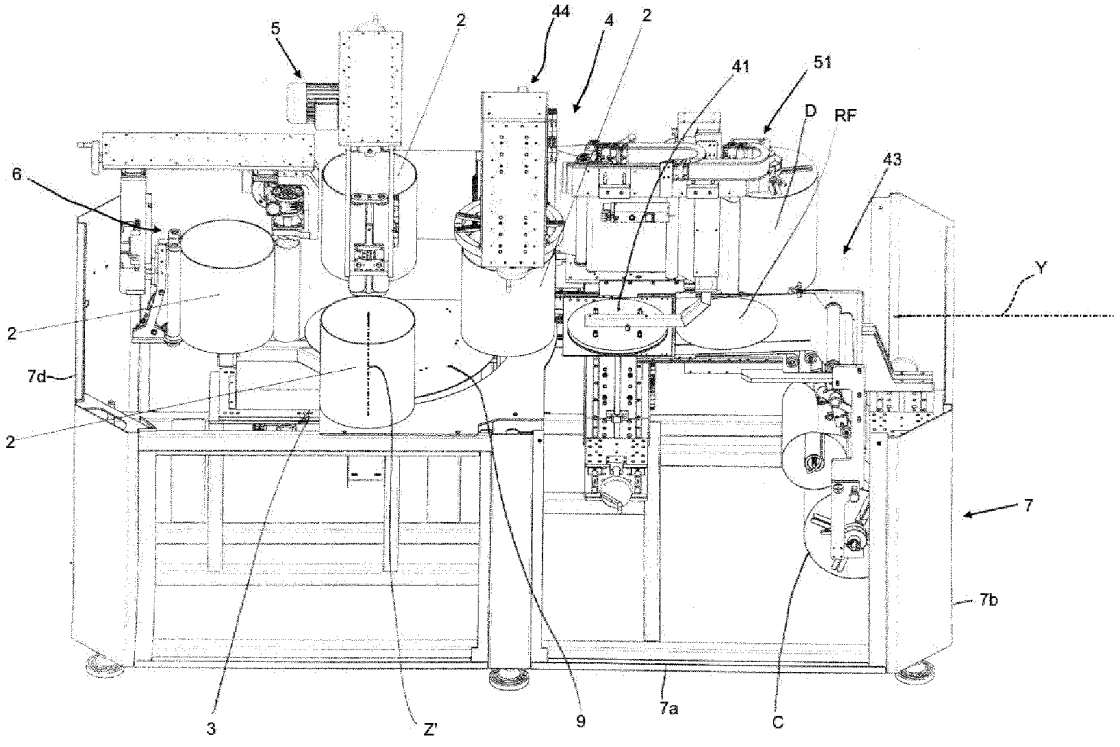

Fig. 1

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Description

[0001] The present invention relates to the field of the production of covered cardboard boxes, such as, in particular but not necessarily, straight or microwave paperboard boxes, and more precisely its object is an equipment provided with novel features as regards to the materials and covering methods.

[0002] Numerous types of apparatuses are known for forming packaging boxes, in which the boxes themselves are obtained by folding flat blanks made of paper-based material, being subjected to the action of a so-called mold or die or pad, vertically movable in a reciprocating fashion and actually consisting of a block having a corresponding shape to the box to be realized.

[0003] The folding of the blank about the die, along both transverse and longitudinal folding lines with respect to a blank feeding direction, therefore takes place by contrast with respect to underlying fixed abutment and guide means, against which the blank abuts when pushed in the top-bottom direction by the die itself.

[0004] At this point, there is a need to mutually unite the open flaps of the box at the edges. This step is commonly known as "joining". The joined box is finally transported to centring and coupling systems with respect to a sheet of covering paper on which a hot adhesive substance was distributed beforehand, and a so-called covering machine which wraps or envelopes the paperboard box with the covering paper.

[0005] With specific regard to the covering phase, the standard technique just mentioned, which makes use of a shaped sheet which is made sticky by a distribution of hot adhesive, requires a careful and expensive management of the adhesive and of the device for dispensing it, that is the gluing machine. In particular, a preparatory and warm-up phase is necessary at the start of processing, which affects the timing and flexibility of production. It is then necessary to accurately identify and maintain/control the correct viscosity over time, within the context of the other operating parameters.

[0006] The gluing device or machine is in itself an additional machine on the line, with all that this entails in terms of installation and management costs, as well as overall dimensions. The same applies to the release mat for the glued sheets (necessary for the glue flash-off phase).

[0007] In search of a possible alternative to this state of the art, solutions have been proposed that have substituted the hot adhesive covering with the cold application of sticker material sheet portions, made available beforehand on a siliconized paper support and detached therefrom to be caused to stick to the formed box. However, for the time being, this production method has been mostly confined to substantially manual processes, at most supported by equipment for supporting the boxes during the covering phase designed for small batches of material and production of a more artisan than industrial nature.

[0008] On the other hand, no fully automated solutions suitable for industrial production, which are based on the cold application of sticker covering sheets and which at the same time are able to ensure an increased processing quality with a configuration having relative structural simplicity and high productivity have been proposed to the Applicant's knowledge.

[0009] A solution that achieves these objectives just mentioned, in addition to other subsidiary ones (including overcoming the problems of the hot adhesive covering systems), is provided by the equipment for covering paperboard boxes with cold-sticker sheet portions according to the present invention, the essential features of which are defined by the first appended claim.

[0010] The features and advantages of the equipment for covering paperboard boxes with cold-sticker sheet portions according to the invention will become apparent from the following description of its embodiments, made by way of non-limiting example with reference to the appended drawings, wherein:

- Figure 1 is a perspective elevation view of a piece of equipment according to the invention, shown from the side of a station of loading box blanks to be covered and unloading the covered boxes;
- Figures 2 through 4 are other perspective elevation views of the equipment of Figure 1, shown aligned with respective corner portions of a base of the equipment;
- Figure 5, with Figure 5a showing an enlargement thereof in the portion highlighted by the small circle V, is an axial section of a support mold of the box blanks to be covered, with the blanks positioned on the mold prior to the covering sequence;
- Figure 6 shows a side view, with parts omitted and enlarged, of the equipment from the opposite side with respect to that of Figure 1;
- Figure 7, with Figure 7a showing an enlargement thereof in the portion highlighted by the small circle VII, is an axial section of the support mold in a tucking station of the covering; and
- Figures 8 to 11 provide an overview scheme of respective phases of the covering procedure conducted with the equipment, with a final tucking phase shown in Figure 11 through an enlargement similar to that of Figure 7a.

[0011] With reference to the above figures, a piece of equipment according to the invention is conceptually structured in a plurality of stations n, typically four stations as in the example, defined by angular positions of a carousel 1 (better shown in Figure 6) rotating about a vertical axis Z. The carousel, which, moved by rotation drive means 11, rotates at angular steps of 360°/n, in this case therefore of 90°, provides four support molds 2 for the box being covered (details are provided shortly), so that at each stop of the carousel 1, a mold is positioned in a respective station for the operations pertaining to the sta-

tion itself to be performed, and all the molds are therefore simultaneously processed in the stations. From this, it follows that one box to be covered enters the cycle and one covered box exits therefrom at each rotation step of the carousel.

[0012] The stations, each specifically equipped as described shortly, comprise: a station 3 for unloading the covered box and loading box blanks to be covered; a bottom covering station 4; a lateral covering station 5; a covering tucking station. Further details are provided hereafter, based on an example that provides making cylindrical boxes, and therefore with molds 2 whose purpose is precisely to be "fit" on the box to provide the appropriate support with respect to the processing to be undergone, which in turn are shaped with cylindrical geometry. It is clear that according to different configuration/format requirements of the box, the molds 2 will be replaced with appropriate molds (and by means of known quick coupling/uncoupling systems in order to minimize the set-up time of the machine), according to what is obvious to the expert in the field, without however the principle of structure and operation of the machine varying substantially with respect to the one described herein. Similarly, the format of the covering material will vary, taking into account in particular the need to cover a bottom which may be elliptical, regularly or irregularly polygonal, etc., rather than circular.

[0013] Entering then into greater detail, in the present embodiment the equipment comprises a quadrilateral top-plan base 7, and in particular a rectangular one, which defines the support infrastructure of all the components of the equipment and which has a first long side 7a that an assigned operator faces, and exposing the loading/unloading station 3. At a distance, on a first short side 7b adjacent to the first long side 7a, there is the bottom covering station 4, then the lateral covering station 5 can be found on a second long side 7c opposite to the first one, and finally the tucking station 6 on the second short side 7d.

[0014] The carousel 1 has radial arms 8 each capable of supporting a mold 2. Each mold, illustrated in particular detail in Figures 5 and 5a, is represented by a drum supported at the base by the arm 8 by means of an idle spindle 8a, with its own axis Z' parallel to the axis of rotation Z of the carousel and provided with a central cavity 2a which gives the mold a cup-shaped configuration. The outer radial dimensions of the drum/mold are such as to be slightly smaller than the inner ones of the box to be made, so that the box, or more precisely the relative blank A, which represents the cylindrical body thereof defining the lateral surface to be covered, can be inserted therein to size. The height extension of the mold is then such as to leave a free edge of the blank A protruding from the mold, an edge that is lower, i.e. at the base of the mold, in the working configuration fitted on the latter but that corresponds to the opening edge - normally to be positioned upwards - of the finished box in use.

[0015] A plate 9 is superimposed on the carousel in the central region and has a shape such that the molds 2, only at the loading/unloading 3 and bottom covering stations 4, are superimposed with their lower end at a peripheral area of the plate, in contact with or in close proximity to it, so that the latter can exert, at those stations, a stop action of the blank A inserted on the mold.

[0016] Looking more specifically at the equipment station by station, and starting from the loading/unloading station 3, in this station the mold 2 is not associated with other equipment, given that, as seen, the mold in this station is intended at the manual insertion of the cylindrical blank A, to precisely cover its lateral surface, as well as at the positioning on the upper part/surface, to shut the aperture of the cavity 2a, of a discoidal blank B representing the bottom of the box. It should be noted here that in principle, there can also be provided to insert directly a previously formed box, i.e. with a bottom already "joined" to the wall or lateral walls using known techniques. In such a case, the covering will not serve also the function of consolidating the structure of the box, as instead in the preferred and advantageous example considered herein, and as will be seen shortly. Obviously, in addition to this example, it is not possible to exclude equipping this station with accessory equipment capable of performing the loading/unloading functions automatically, thus replacing human intervention.

[0017] As far as the bottom covering station 4 is concerned, in this station the mold 2 cooperates with a suction plate 41 which is adapted to affix a sticker sheet portion RF having corresponding shape on the upper face of the bottom of the box (blank B). The suction plate, reciprocated both according to an up-down direction parallel to the axis Z and according to a horizontal direction Y of forward/reverse advancement (parallel to the long sides of the frame) on a plane orthogonal to the axis Z, all by means of an actuation system 42 of an obviously implementable type, has the task of catching the sheet portions RF one by one and releasing them on the bottom of the box. The sheet potions are fed by a first peeling device 43 of known type which unwinds a reel of siliconized paper C on which the portions are stuck, and individually detaches the portions towards an outlet from which the plate can catch them. The adjustment of the suction system allows controlling catching the portion and its release.

[0018] As already mentioned, the first peeling device 43 is structured and operates in a similar way to well-known machines used in the labelling sector, whose basic features may, for example, be the general ones shown in document EP0131852, or of other similar machines manufactured, for example by companies Altech S.r.l. (www.altech.it), Area Etichette Spa (https://www.arcata-beiinamarking.com), Etipack Spa (www.etipack.it). The operating principle of these machines involves the application of a series of sticker paper labels on a given product or packaging, by unwinding a liner or continuous tape made of siliconized paper on which the labels are positioned in regular sequence, by means of a series of drive

rollers, up to an area where the labels are separated from the siliconized support and applied individually on the target product. Basically, this machine supports the label reel, pulls the siliconized liner with the labels on it to a precise point of separation between the liner and the label and applies the label to the target object. Typically, the labelling machine operates in an intermittent step mode, the latter being determined by the positioning distance of the individual labels on the liner.

[0019] The portion RF has a larger diameter than that of the bottom B of the box, so that once released and pressed by the plate 41 so as to make it stick well to the bottom, an excess edge band RFe protrudes beyond the outline of the wall or lateral walls of the box. Once folded over the cylindrical blank A, said edge serves to make it structurally integral with the bottom B, and a bottom covering folding device 44 in turn provided in the station 4, is provided for this folding task. The essential component of said device 44 is a disc-shaped cup die 441 (Figure 9, in particular), which suitably sized in accordance with the bottom of the box and alternatively moved, is capable of being lowered onto the mold 2 coaxially to the axis Z', its peripheral skirt 441a abutting the edge RFe and making it stick to the lateral surface of the blank A, leaving said edge hanging after its lifting to free the box.

[0020] With particular reference to Figure 3 and Figure 4, the station 5 is configured to cover the outer lateral surface of the cylindrical blank A (box body), also in this case with a sticker paper portion RL. To this end, also the station 5 firstly provides a (second) peeling device 51, which like the first device 41, in itself can be assimilated in turn with a known peeling or labelling device such as the one already mentioned above, prepared to unwind a siliconized paper-based reel D supporting the sticker portions RL, which in this case are quadrilateral with sides whose length substantially corresponds to the height and base perimeter of the cylinder, as well as to detach the portions one by one. The device 51 is configured to tangentially extend a side of height of the portion RL (side that corresponds to a generatrix of the cylindrical wall of the box) to the mold, and in particular to the blank A arranged therein, until contact by a head flap thereof so as to make said flap stick thereto.

[0021] The station 5 then comprises a first drive device 52 for the rotation of the mold (clearly shown in particular, in Figure 10) about its own axis (Z'), which in the illustrated embodiment advantageously provides a motorized roller 521 which, when the mold reaches the station, is engaged on the generatrix of the blank/body A, thus bringing it into rotation by tangential friction, a rotation which promotes and assists the unwinding of the covering portion RL all about the blank, being it synchronized with the advancement speed of the covering portion established by the second labelling device 51. Two idle rollers 522 in a position diametrically opposite to that of the motorized roller 521 exert an appropriate radial anvil force, which allows the establishment of the friction necessary for the action of the motorized roller, at an obviously controlled speed. The position of the idle rollers 522 in the radial direction (i.e. approaching and moving away from the mold 2) is variable and controllable through a manually operable linear guide system 523. Both the motorized roller 521 and the anvil rollers 522 comprise at least one surface layer of rubbery material so as to generate a pressure action distributed over the sticky covering portion towards the paperboard box, which evidently also and above all serves the function of making the sticker material stick well to the blank paperboard, material which is used between the rollers and the box paperboard, without creating folds, bubbles or in any case defects.

[0022] The whole perimeter of the box is externally wrapped, including a slight superimposing of the end flaps, in order not to leave uncovered any portion of the cylindrical blank A. It should be noted that the lateral sticker portion RL has dimensions on the side that are slightly higher than the height of the blank A in order to have excess material RLe on the already-mentioned free edge of the box (base of the mold), which is useful for the following tucking phase on the inner surface of the box itself.

[0023] Moving on to the tucking station 6, and with specific reference to Figures 6, 7, 7a and 11, in this station the mold 2 cooperates with a device 61 for tucking the lateral covering, and particularly the above-mentioned excess flap RLe, about the free edge of the box since, as will be seen shortly, the tucking in is performed with a folding operation in a point of the perimeter development of the box; a revolving movement of the box itself is necessary so that it can extend along the entire perimeter of the edge.

[0024] Indeed, cooperating with the tucking device 61 there is a second device 62 for rotating the mold about its own axis, for example completely analogous to the first drive device 51 of the lateral covering station. Said device therefore in turn comprises a motorized roller 621 and two anvil idle rollers 622 which are adjustable in position by means of a guide system 623, whose structure and operation are entirely similar to those of the corresponding components of the first device 51 described above. However, the anvil rollers 622 have, at their base, a conical shaping 622a adapted to push the excess covering flap RLe radially inwards with an incipient folding which assists the subsequent action of the actual tucking element.

[0025] Returning to the actual tucking device 61, it has the task of completing the aforementioned folding so as to arrange the flap RLe in sticking contact on the inner surface of the box. To this end, a shaped skid 611 made of anti-friction material is movable between a lowered or inactive position (Figure 6) and a raised (or active, Figures 7, 7a and 11) position, in which it is inserted into the box thanks to the space left free by the edge that protrudes as said, beyond the base of the mold, and applies a pressure action precisely on the inner surface of the paperboard with the interposition of the sticker paper folded by the skid with its movement. The two skid positions

are controlled by the rotation of a skid support lever 612 about an axis parallel to the plan of the carousel. The movement of the lever 612 is in turn driven by an actuator such as in the example, a linear actuator 613 articulated to the lever and to its own support according to a slotted link mechanism.

[0026] With particular reference to Figures 8 to 10, the operational sequence leading - according to the invention - to obtain a covered box can therefore be summarized as follows. First an operator arranges, in the loading/unloading station 3, the cylindrical blank A and then the bottom blank B, resting on the upper part of the mold itself (figure 8), on the mold 2. The carousel 1 then completes the first rotation step and guides the mold with the blanks loaded to the bottom covering station 4. Due to the rotation of the carousel, a covered box will be positioned in front of the operator at the end of the cycle, to be removed from the mold to load new blanks of the next box to be covered.

[0027] Returning to the first box followed herein in its covering process, in the station 2, the bottom covering sticker portion RF caught from the peeling device is first placed and pressed onto the bottom blank through the suction plate 41. The die 431 of the folding device 43 then folds the perimeter edge RFe of the portion RF over the lateral surface of the box, structurally binding the two parts of the box (bottom B and cylindrical blank A).

[0028] At this point, the carousel 1 rotates by a further step and brings the box to the lateral covering station 5 (Figure 10) where the lateral covering portion RL proposed by the labelling device comes into sticking contact on the box and band due to the effect of the rotation of the mold promoted by the drive device 52 (motorized roller 521 and anvil rollers 522).

[0029] A further rotation step of the carousel 1 guides the box to the last station 6, the bottom tucking one, where the operation in question is carried out as already described and as shown in particular in Figure 11, in which the movement of the excess covering flap is shown in its successive positions until tucking is complete, each corresponding to a degree of rotation of the lever 612 carrying the skid 611. The contribution should also be noted, of the conical-shaped base 622a of the rollers 622 to initially favour the bending of the aforesaid flap, then allowing the skid 611 to engage with the flap. The final rotation of the carousel brings the finished box back to the loading/unloading station, where the operator pulls it out so that a new box can be loaded. Clearly, in each stop of the carousel, the stations work simultaneously on four boxes, so each complete turn of the carousel results in the creation of four boxes, and a finished box exits the loading/unloading station at each rotation step.

[0030] The advantages of the equipment according to the invention as compared to systems making use of hot glue, are apparent from the foregoing. The use of cold sticker paper portions, of a type chosen according to specific needs from among the many types of sticker sheets with cold adhesive available on the market whose features provide a liner or siliconized paper, with typical weights from 40 to 80 g/m^2, various types of paper (coated, embossed, soft touch, etc.) with weights from 80 to 100 g/m^2, and permanent acrylic or rubber-based adhesive glues, makes it possible to eliminate all the phases of hot glue management, which provide:

- preparing and heating the system;
- identifying the correct viscosity of the adhesive;
- maintaining the correct operating parameters.

[0031] Gluing equipment, which results in significant additional space and line complication, is eliminated. The cold technology is safer, provides sticker material that is immediately ready for use, and thus results in significant production advantages in terms of speed, ease of management, energy savings. Moreover, the equipment configured according to the invention allows obtaining high productivity, thanks to the automatic sequence of the operations allocated to the different stations, with a relatively simple structure able to ensure quality results.

[0032] The equipment control system, which is not described in detail, can evidently be implemented in order to achieve the above functionality based on traditional design criteria.

[0033] The present invention has been described herein with reference to preferred embodiments thereof. As mentioned, the single devices described above can be replaced by devices with different construction, within the scope of functionality that is in any case equivalent. In fact, it is to be understood that there can be other embodiments pertaining to the same inventive nucleus, within the scope of protection of the claims below.

Claims

1. Equipment for covering folding straight paperboard or microwave carton boxes by means of cold-sticker sheet portions, each box comprising a bottom (B) and a body (A) which rises from the bottom defining an outer lateral surface and a free edge opposite to said bottom, said cold-sticker sheet portions comprising lateral surface covering portions (RL) and bottom covering portions (RF); the equipment comprising a carousel (1) rotating about a carousel axis of rotation (Z), supporting a plurality n of molds (2) each for the support of a respective box, with said bottom (B) and said free edge in correspondence respectively to an upper surface and to a base of the mold, said molds being equally distanced from said axis of rotation (X) and equally spaced along a periphery of the carousel (1), each mold (2) being pivotally supported by said carousel (1) around a mold axis (Z') parallel to said carousel axis of rotation (Z), the equipment further comprising driving means (11) for driving the rotation of the carousel in angular steps each of 360°/n, in each step said molds (2)

occupying respective stations, said stations comprising at least:

- a loading and unloading station (3), for unloading a covered box and loading a box to be covered, or box blanks corresponding respectively to said body (A) and bottom (B);
- a bottom (B) covering station (4), comprising first peeling means (43) for peeling individual bottom covering portions from a first sticker portion liner feed, and suction means (41) adapted to catch said individual bottom covering portions (RF) from an outlet of said first peeling means (43) and to release them onto sticking contact with said bottom (B);
- a lateral covering station (5) for covering the outer lateral surface of the body (A), comprising first mold rotation drive means (52) adapted to drive the mold (2) into rotation about its mold axis (Z'), and second peeling means (51) for peeling individual lateral covering portions (RL) from a second sticker portion liner feed, adapted to feed the said lateral covering portions (RL) in tangential relationship with the mold (2), until sticking contact is made between a head flap of the lateral covering portion (RL) and said lateral surface of said body (A), whereby as a result effect of a coordinated rotation of the mold said lateral covering portion (RL) is wound in adhesion onto said lateral surface of said body (A);
- and a covering tucking station (6) for tucking the lateral covering portion (RL) around said free edge of said body (A), comprising second mold rotation drive means (62) adapted to drive the mold (2) into rotation about its mold axis (Z'), and a tucking device (61) comprising a movable skid (611), movable towards and away from said mold and adapted to strike an excess flap (RLe) of said lateral covering portion (RL) protruding beyond said free edge of said body (A), whereby as a result of a coordinated rotation of the mold said excess portion (RLe) is tucked into sticking contact around said free edge.

2. The equipment according to claim 1, wherein each mold (2) comprises a drum pivotally supported at its base by the carousel, said drum having a shape corresponding to the shape defined internally by said box, with an extension according to said mold axis of rotation (Z') lower than that of the box, so that said body (A) is adapted to protrude from the mold with said free edge when the box is inserted onto the mold.

3. The equipment according to claim 2, wherein each mold is supported by means of an idle spindle (8a), said first and second rotation drive means (52, 62) comprising each at least one motorized roller (521, 621) capable of cooperating tangentially by friction with the mold (2) when the mold reaches the relevant lateral covering or tucking station, and at least one anvil idle roller (522, 622) in diametrically opposite position to that of the motorized roller.

4. The equipment according to claim 3, wherein at least one idle roller (522, 622) of said rotation drive means (52, 62) is mounted on a linear guide (523, 623) capable of adjusting the distance of said at least one idle roller (522, 622) from the mold.

5. The equipment according to claim 3 or 4, wherein said motorized and idle rollers comprise at least one surface layer of rubbery material, capable of generating a pressure action distributed over the mold and then over the body (A) and its lateral covering sheet (RL).

6. The equipment according to any of the previous claims, wherein said suction means comprise a suction plate (41) and an actuation system (42) adapted to reciprocate said plate (41) both in a direction parallel to said carousel rotation axis (Z), and in a direction of forward/reverse advancement (Y) on a plane orthogonal to said carousel rotation axis (Z).

7. The equipment according to any of the previous claims, wherein said bottom covering station (4) further comprises bending means (44) of said bottom covering (RF), adapted to bend an excess edge band (Rfe) thereof to sticking contact with said outer lateral surface of said body, said bending means (44) comprising a disc-shaped cup die (441) sized in accordance with said bottom (B) and reciprocated with respect to said mold (2) coaxially to its mold axis (Z'), the die (441) comprising a peripheral skirt (441a) adapted to strike said excess edge band (RFa) of said bottom covering (RF) stuck to said bottom (B) further to the displacement of the die (441).

8. The equipment according to any of the previous claims, wherein said tucking device (61) includes a lever (612) supporting said skid (611), rotating around an axis parallel to a plane orthogonal to said carousel rotation axis (Z), between a lowered or inactive position and a raised position wherein said skid (611) is inserted within said body (A) striking said excess flap (RLe) of said lateral covering portion (RL).

9. The equipment according to claim 8, wherein said lever (612) is connected to a linear actuator (613) articulated to the lever and to an external support in the fashion of a slider-crank linkage.

10. The equipment according to claim 8 or 9, wherein in said second rotation drive means (62) of said tucking

station (6) said at least one anvil roller (622) has at the base a conical shaping (622) adapted to push radially inwards said lateral covering excess flap (RLe).

11. The equipment according to any of the previous claims, comprising a plate (9) arranged over said carousel at a central region of it, shaped with a peripheral zone to which said molds (2) become superimposed, in contact or close proximity, only in said loading/unloading (3) and bottom covering (4) stations, so that said peripheral zone of said plate (9) is capable of exerting, in those stations, a stop action of the body (A) inserted on the mold.

12. The equipment according to any of the previous claims, wherein said molds (2) are cylindrical.

13. The equipment according to any of the previous claims, wherein said molds (2) are connected to the said carousel (1) by means of quick locking/release systems.

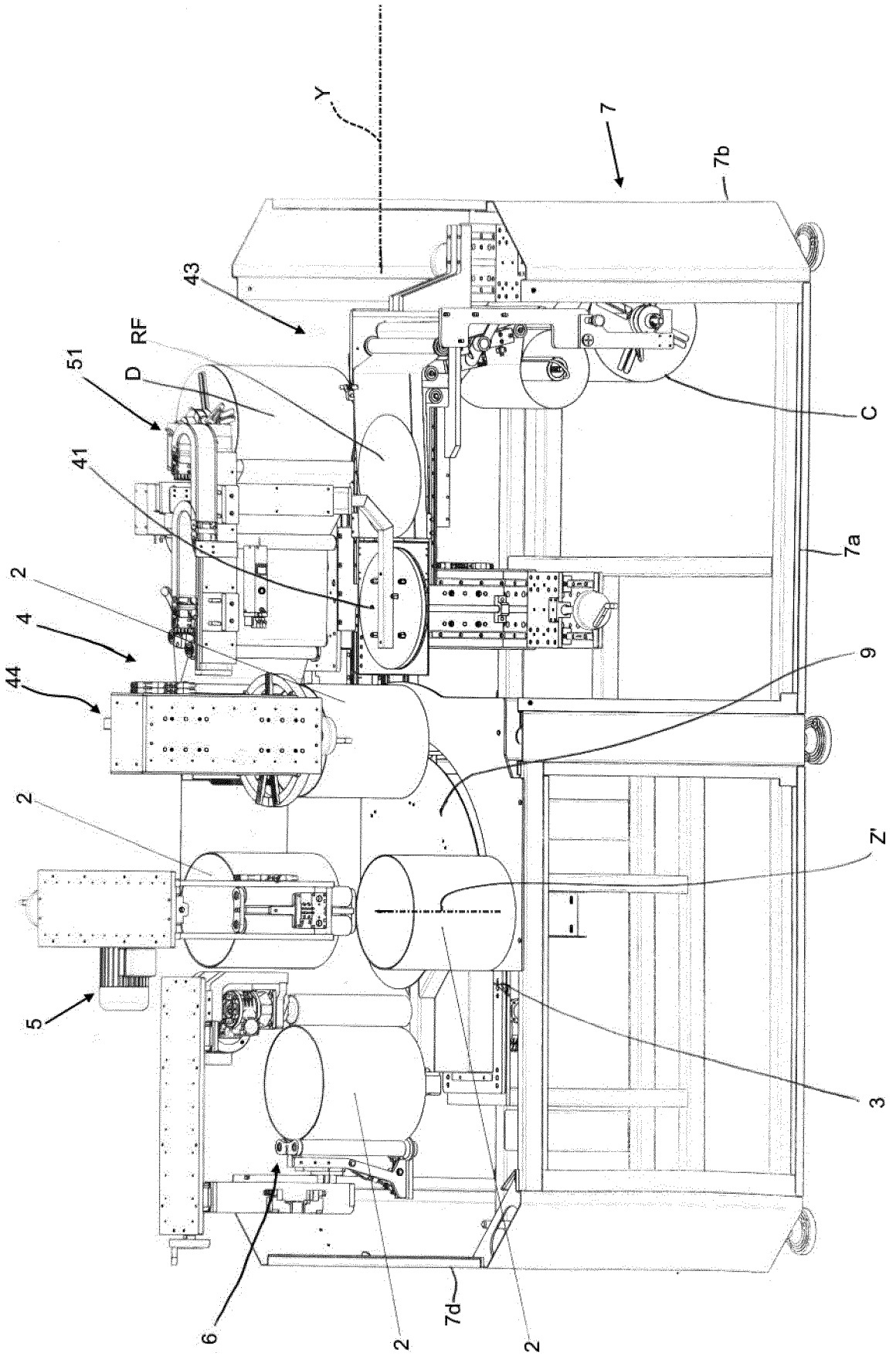

Fig. 1

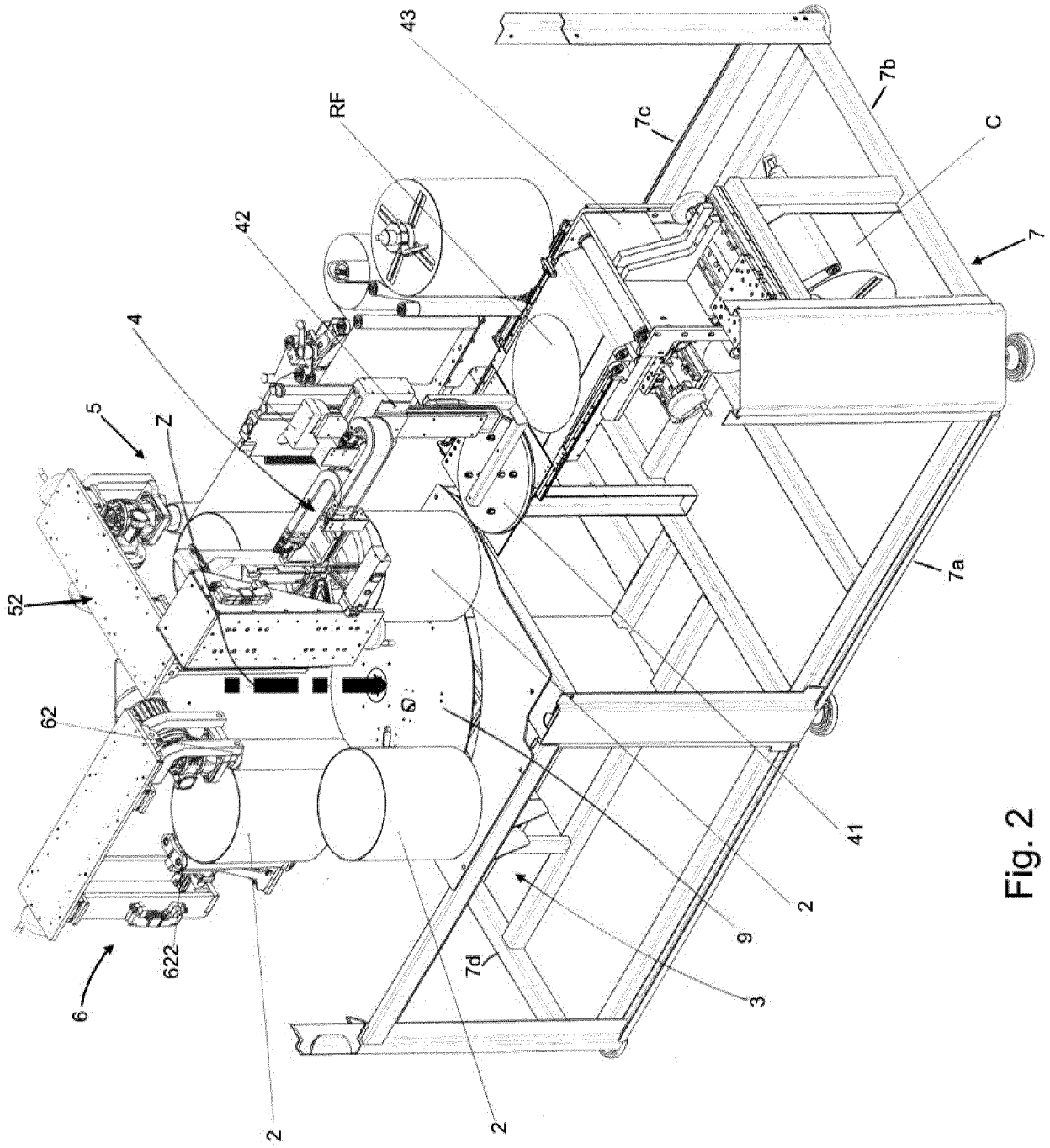

Fig. 2

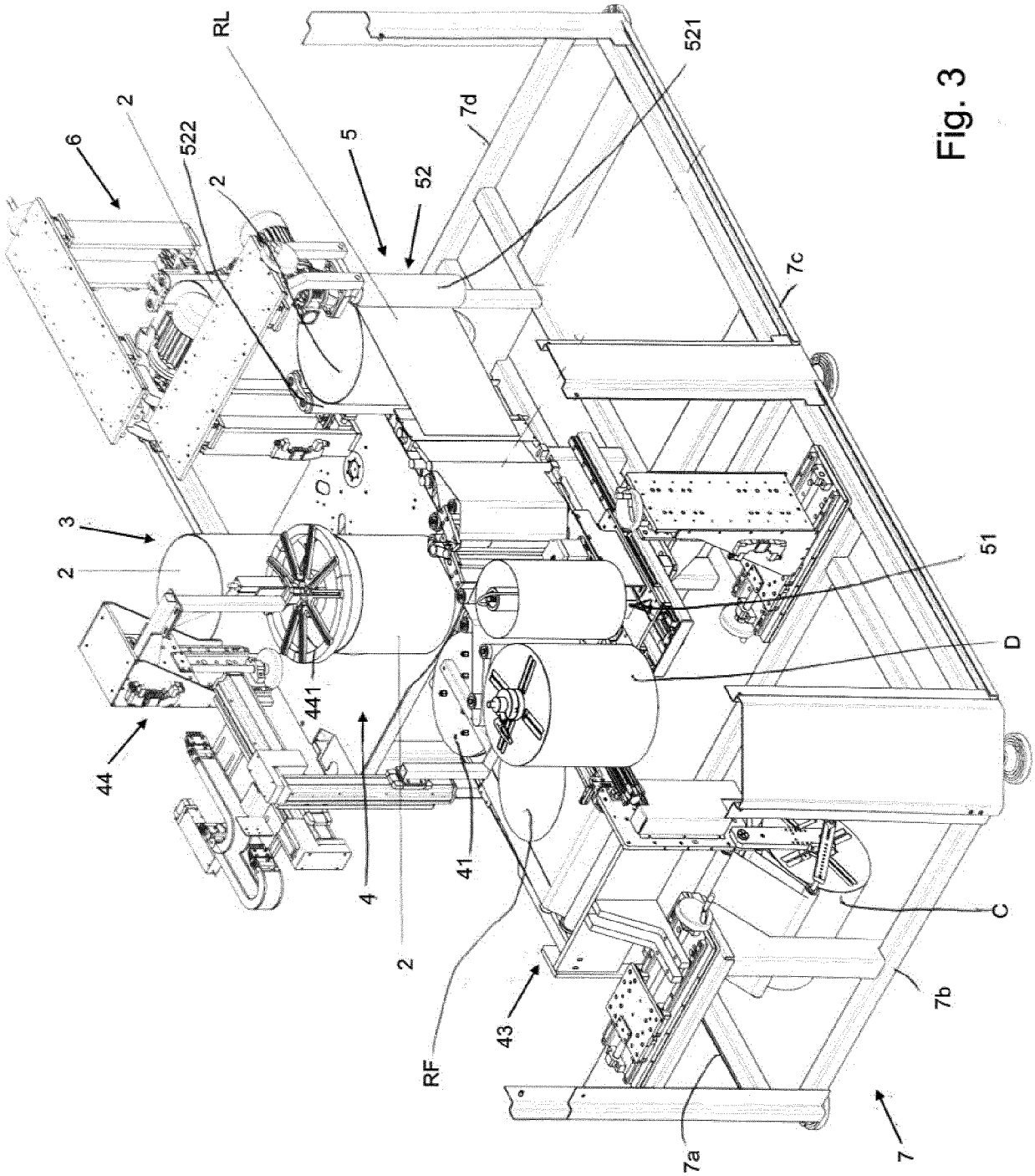

Fig. 3

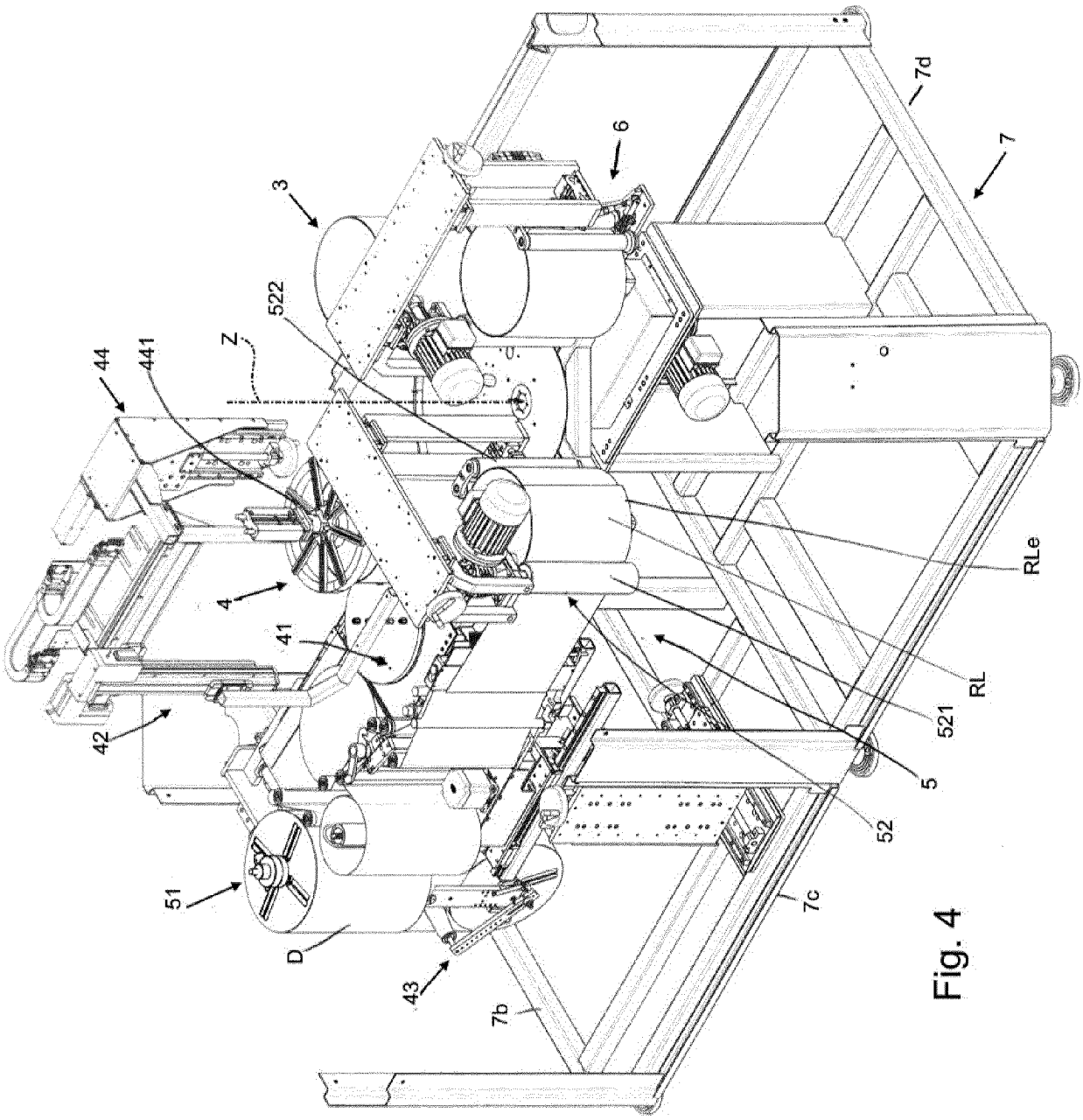

Fig. 4

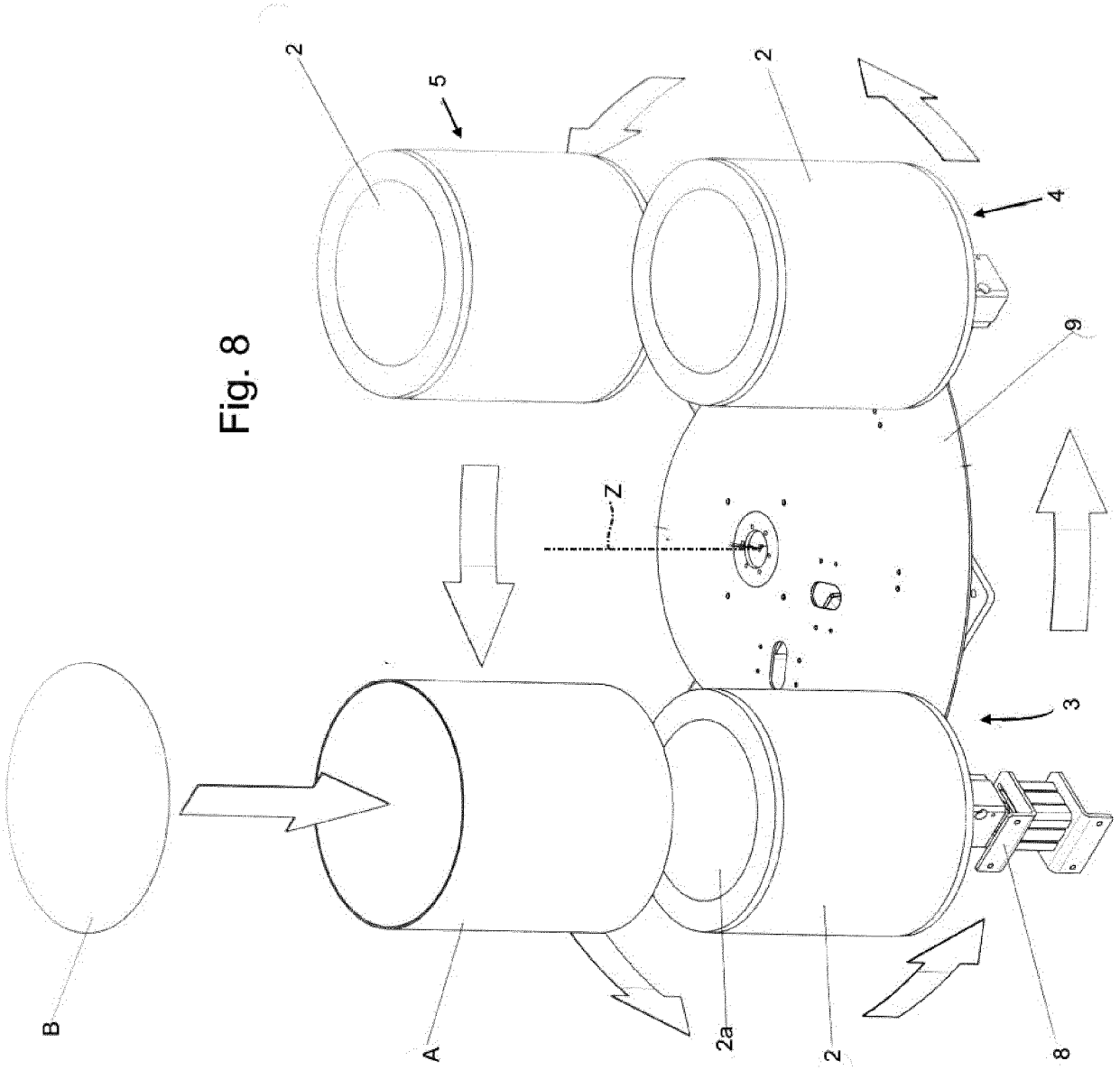

Fig. 8

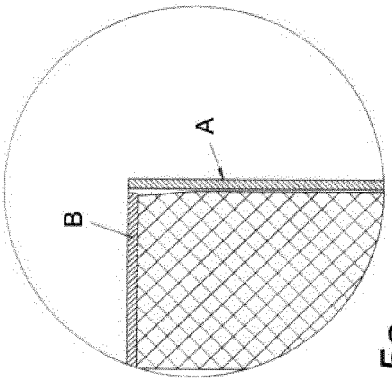

Fig. 5a

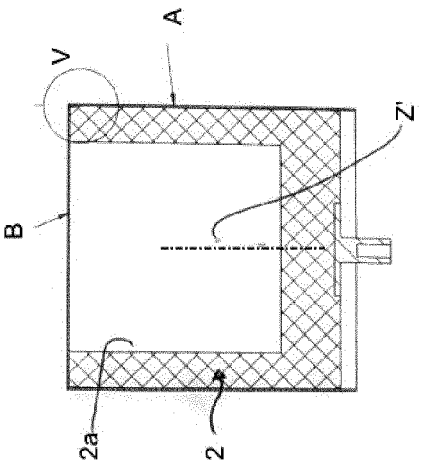

Fig. 5

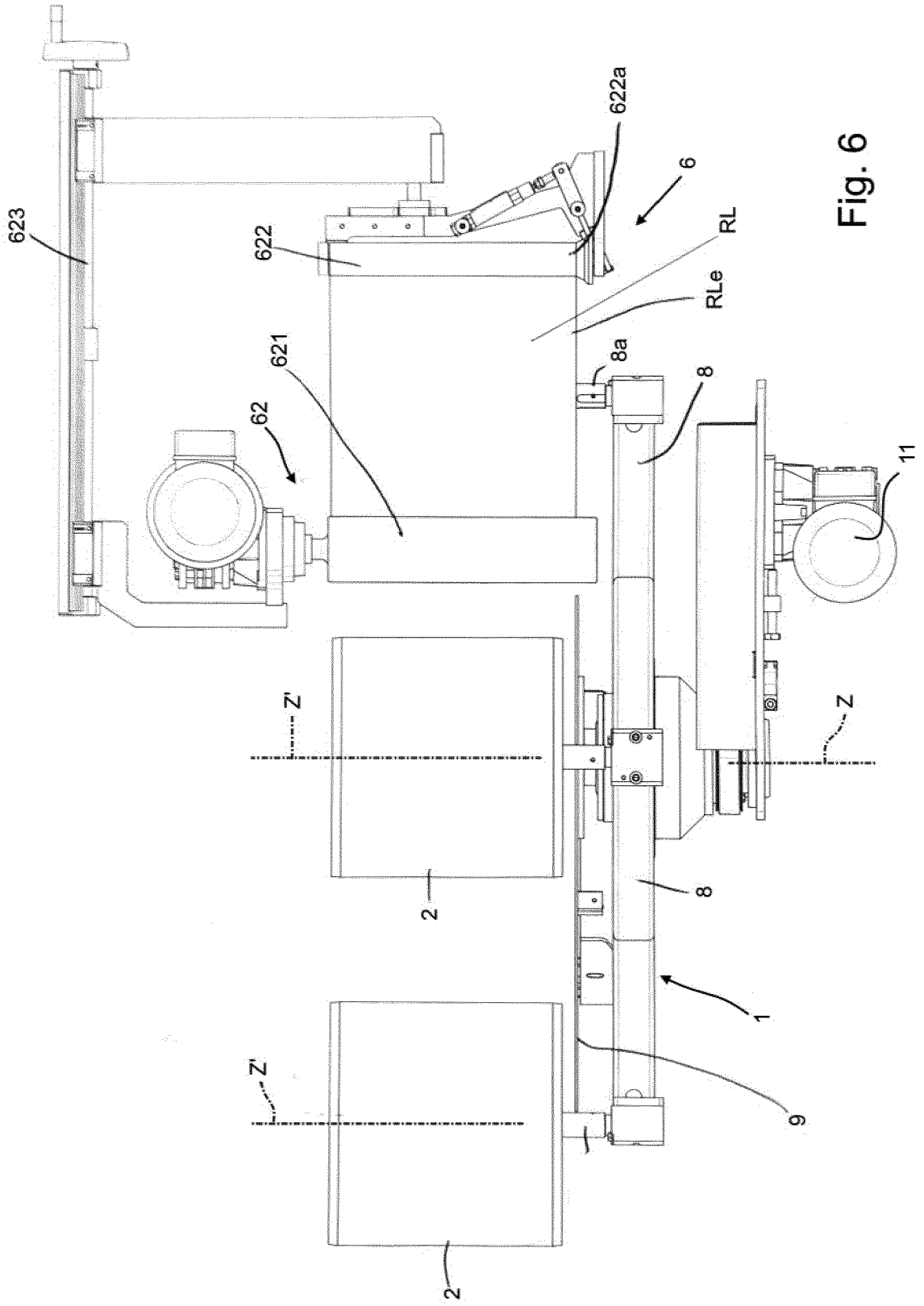

Fig. 6

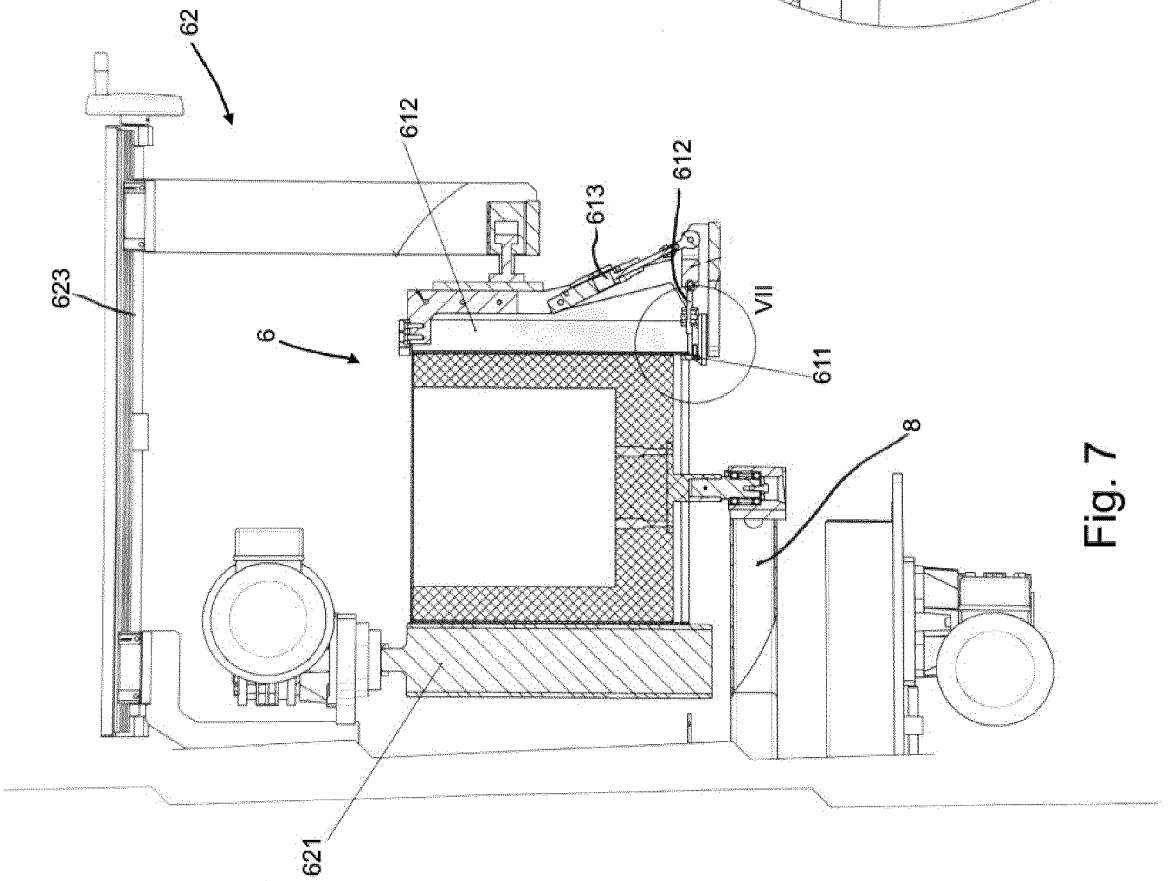

Fig. 7

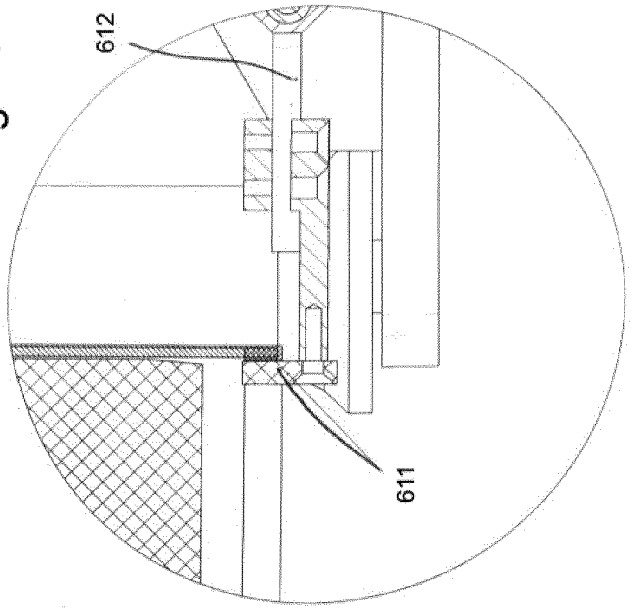

Fig. 7a

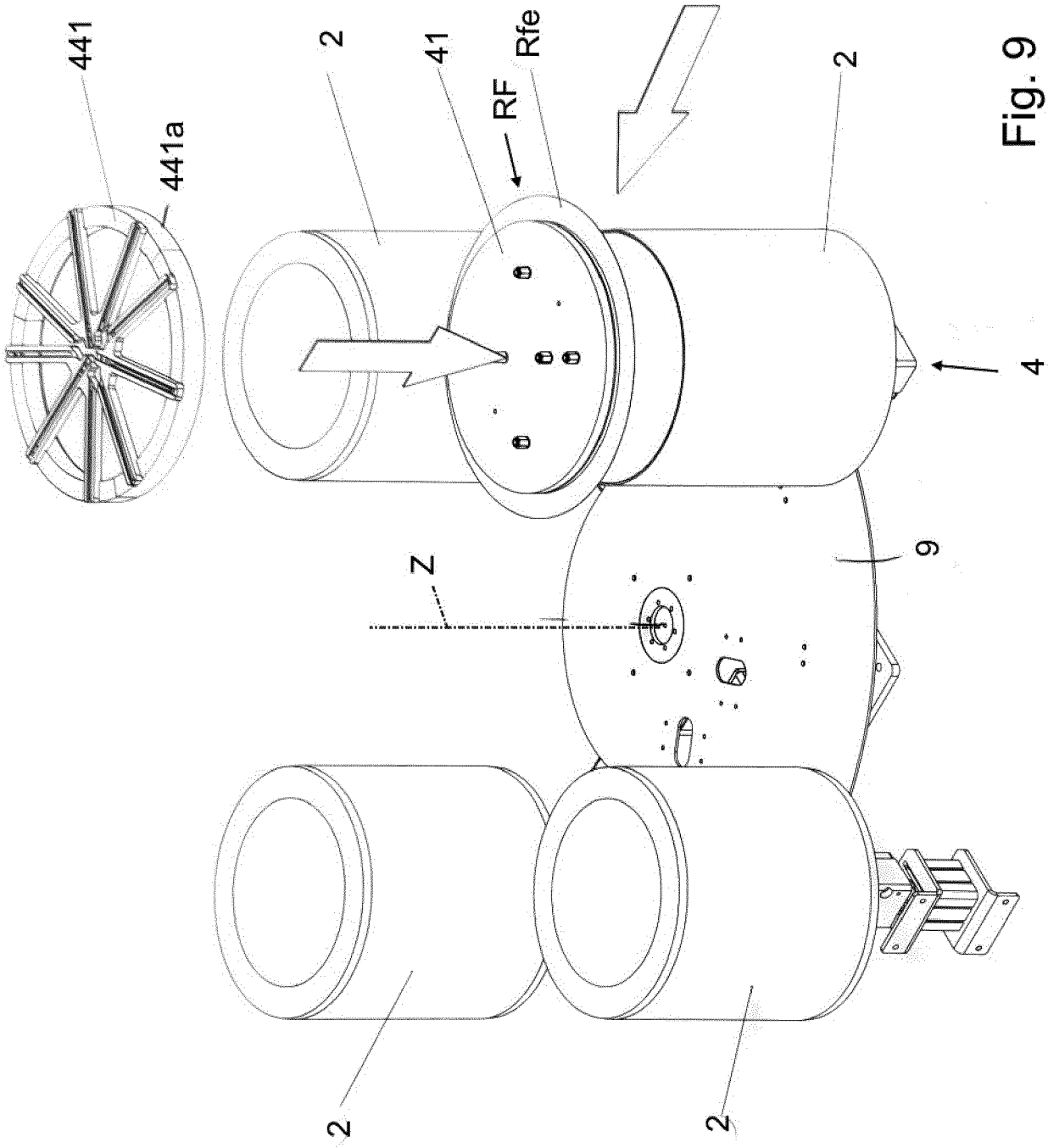

Fig. 9

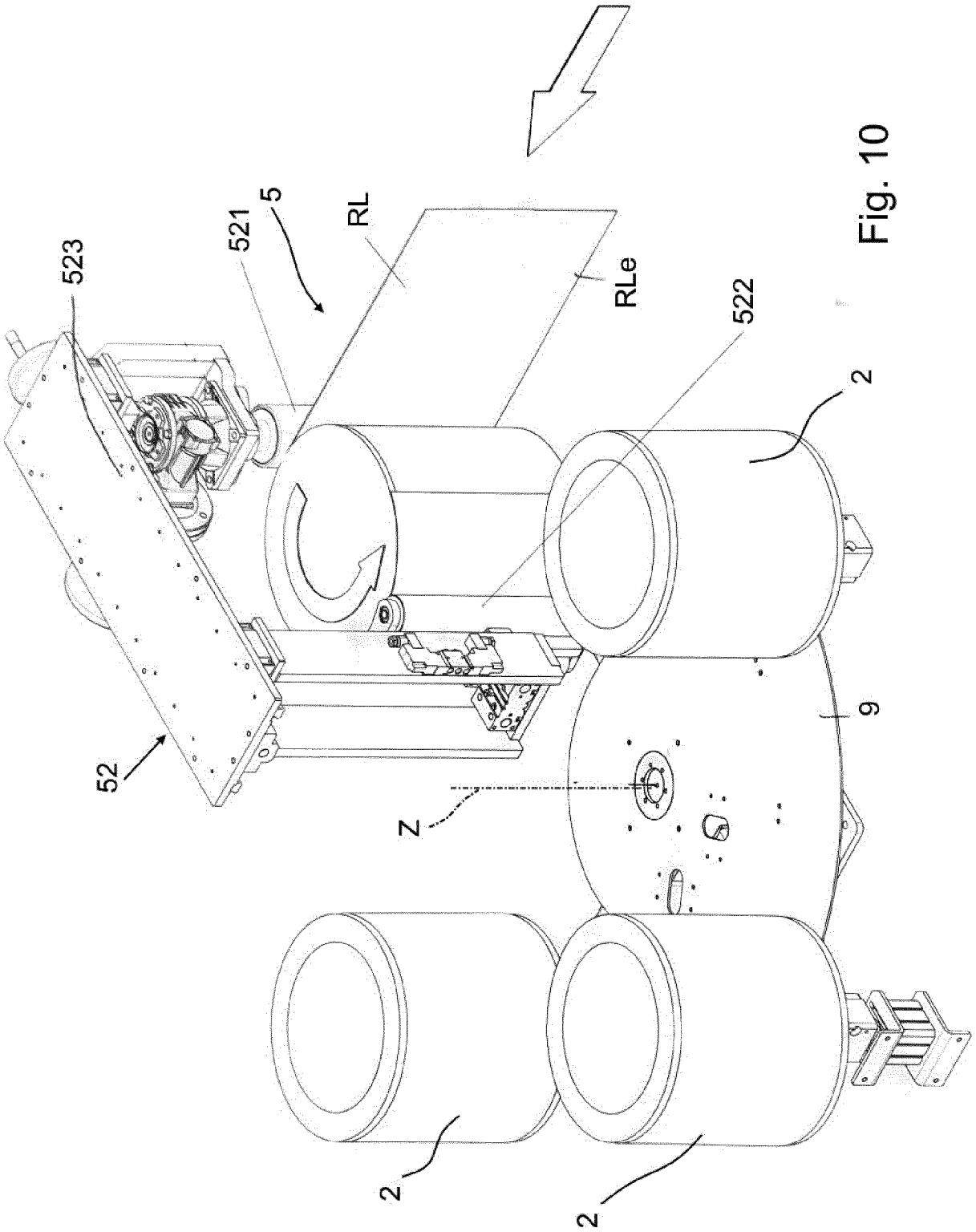

Fig. 10

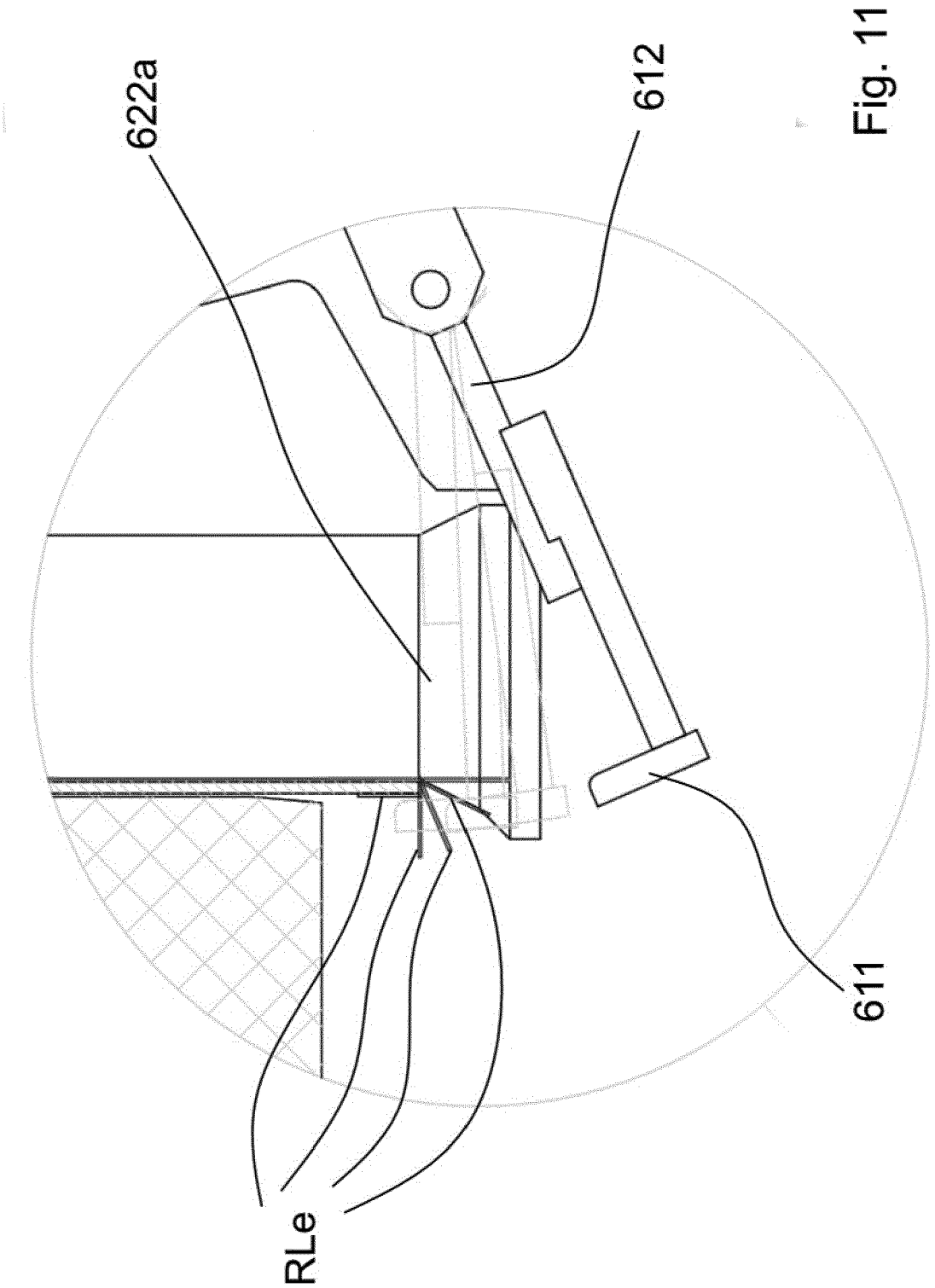

Fig. 11

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EUROPEAN SEARCH REPORT

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The present search report has been drawn up for all claims

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Munich	19 August 2021	Cardoso, Victor

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