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(54) Glue applicator for bookbinding machines

(57) This is a new glue applicator for bookbinding machines comprising one or more tank(s) of glue with a base for connecting it to the bookbinding machine, one or more delivery cylinder(s) with on/off mechanisms for controlling the flow of glue, one or more pair(s) of guides for the volume being bound, installed on the delivery cylinders, and two or more components for applying the glue. There is a glue flow on/off mechanism on or in each of said delivery cylinders. The components for applying the glue preferably consist of a slot in the top of a delivery cylinder and holes or openings (nozzles) in the vertical side of each guide facing the opposite guide.

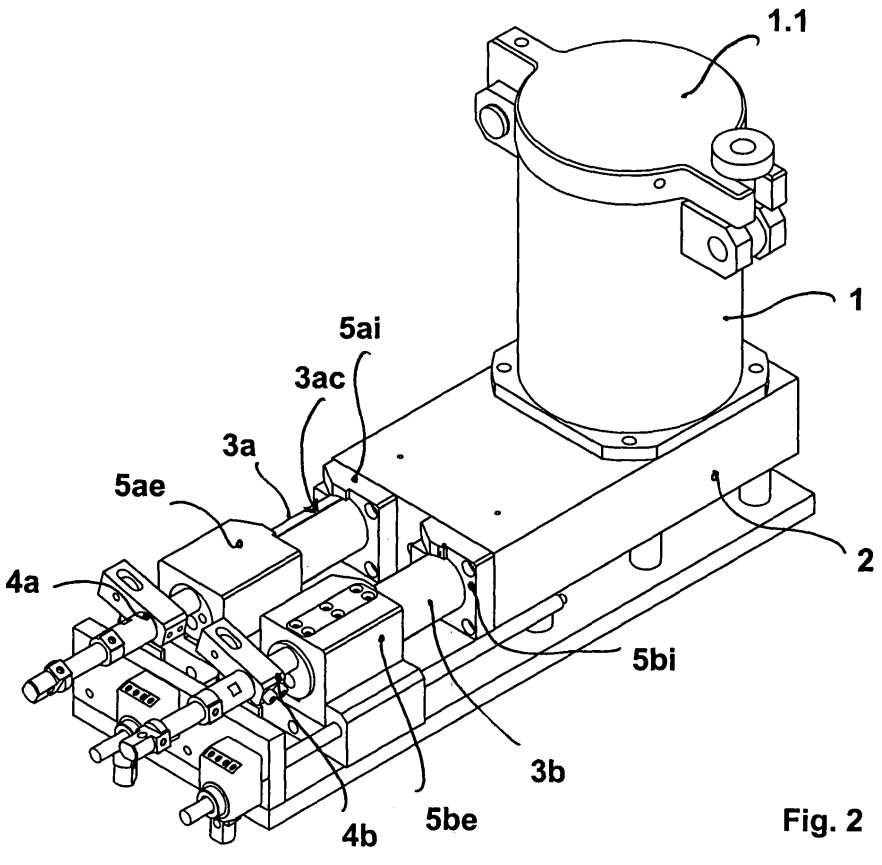


Fig. 2

EP 1 876 031 A1

Description

[0001] The present patent concerns bookbinding, book and brochure leaf collators, and bookbinding machines in particular.

[0002] To be more specific, this patent refers to the devices and mechanisms for spreading glue on the spine of the sheaf of leaves to bind, or on any other material.

[0003] There are known automatic machines for binding volumes that comprise one or more clamp(s), a vibrating table, one or more cutter(s), rollers and spatulas for applying hot-melt glue, a cover feeder and a press.

[0004] Each sheaf of leaves forming a book or brochure to bind is manually or mechanically positioned between the clamps, which carry said sheaf throughout the bookbinding process.

[0005] The sheaf carried by the clamps is carried to the vibrating table, which brings the leaves into line.

[0006] Then the sheaf of leaves is forwarded to the cutter, which removes any excess material to flatten the spine of the book.

[0007] Rollers and blades then spread hot-melt glue on the spine of the book and possibly also on the edge of the first and last leaves on the side of the spine.

[0008] The cover feeder places each unfolded or ready-folded cover in the cover press, which attaches the covers to the sheaf of leaves.

[0009] The rollers and blades for spreading the hot-melt glue are partially immersed in one or more heated tank(s) containing said glue.

[0010] Paperback books are bound with a heated glue (called hot-melt in bookbinding jargon), i.e. a known type of glue that is solid at room temperature but liquefies when heated to a variable temperature, depending on the different types of glue, making it fluid enough for it to be applied with the rollers and blades.

[0011] This hot-melt glue poses considerable problems and drawbacks, as well as having numerous limits.

[0012] The glue has to be heated up to high temperatures in order for it to be used. All parts in contact with the glue melting tanks, or in the vicinity of any objects coming into contact with the glue, are consequently likely to reach high temperatures, meaning that the operator risks being burned.

[0013] The hot-melt glue may drip or splash outside the tanks or off the rollers or blades for various reasons. These splashes of glue soil the various parts of the bookbinding machine and can spoil the sheaf of leaves being bound, as well as posing a hazard for the operator.

[0014] Although the heated hot-melt glue becomes fluid, it retains a degree of viscosity that prevents any increase in the speed of the various parts involved in carrying and applying the glue beyond certain limits. As a consequence, the entire bookbinding chain also has to adapt to the speed limit imposed by the type of hot-melt glue used in the gluing stage, thus limiting the speed and productivity of the whole system.

[0015] New types of paper, of increasingly sophisticated consistency (due to the use of protective plastic surface coatings) and new types of ink used in the printing process, interfere with the results in terms of the adhesion of the hot-melt glue because the support to which it is applied is no longer a cellulose paste, but may be plastic, PVC or other material.

[0016] The glue is used up during the binding of the books, so the level in the tanks from where it is collected by the rollers and blades progressively drops, making it necessary for a feeder device or an operator to top up the tanks with more liquid or solid glue to keep the level of glue in the tanks at an optimal, or at least minimum, level for collection.

[0017] The amount of glue deposited on the spine of the book also depends on how much glue is collected by the rollers and blades from the corresponding tanks. As a consequence, when the tanks contain plenty of glue, a greater quantity of glue is deposited on the spine of the book; conversely, if the level of the glue in the tanks is low, a smaller amount of glue is collected by the rollers and blades and not enough glue is deposited on the spine of the book.

[0018] Such variations pose problems for the operators, who have to overcome the problem by frequently stopping the machine to top up the tanks of glue.

[0019] In the bookbinding machines used at present, the glue tanks, rollers and blades are mounted on a trolley and integral with it, or attached directly to the body of the bookbinding machine. This poses a considerable problem when it comes to servicing, given the overall dimensions and considerable weight to shift if the assembly needs to be opened or moved.

[0020] When heated, the hot-melt glue produces fumes and vapors that can have an irritating effect.

[0021] To overcome all the above-mentioned drawbacks, a new glue applicator has been designed and realized for use with bookbinding machines.

[0022] One object of the new glue applicator for bookbinding machines is to use a lower working temperature for the various parts involved in distributing the glue and for the hot-melt glue.

[0023] Another object of the new glue applicator for bookbinding machines is to be able to use other glues, as well as the normal hot-melt glue, such as polyurethane based glues in the bookbinding process.

[0024] Another object of the new glue applicator for bookbinding machines is to require fewer maintenance or servicing operations by the operators.

[0025] Another object of the new glue applicator for bookbinding machine is to enable the application of an even, constant quantity of glue for all the paperback volumes being bound.

[0026] Another object of the new glue applicator for bookbinding machines is to enable the use and application of different types of glue during the course of the same bookbinding process.

[0027] These and other direct and complementary objects are achieved by the new glue applicator for book-

binding machines comprising one or more tank(s) of glue with a base or body for connecting it to the bookbinding machine, one or more delivery cylinder(s) with glue delivery on/off mechanisms, one or more pair(s) of guides for the volumes to bind, and two or more components for applying the glue.

[0028] The tank consists of a cylindrical or otherwise shaped heated container (also called a melter), complete with a sealed cover and a device for increasing the pressure therein.

[0029] The base for the tank serves the purpose of supporting the tank and connecting it the bookbinding machine, and also of conveying the glue from the tank to the delivery cylinders.

[0030] The delivery cylinders consist of substantially parallel cylinders, lying substantially horizontally and substantially at right angles to the direction in which the volumes to bind are fed forward.

[0031] On or in each of said delivery cylinders there is an on/off mechanism or valve for controlling the flow of glue from the tank and through the base to the glue applicator members.

[0032] Each pair of guides is installed on each of said delivery cylinders so that the two guides are parallel and the sheaf of leaves to glue passes between said two guides. One of said guides is substantially fixed to the delivery cylinder, while the other can be displaced in a direction perpendicular to the movement of the volumes so as to adjust the distance between the two guides to suit the thickness of the volumes. Precision displacement means are used to control the displacement of the mobile guide.

[0033] The components for applying the glue consist of accessories, devices, nozzles and other such elements suitable for enabling an established quantity of glue to be delivered from the delivery cylinders and spread over the spine of the volumes and along the sides in the vicinity of the spine.

[0034] Said components for applying the glue are installed inside the delivery cylinders and the volume guides.

[0035] To be more precise, a first type of glue applicator component consists of a slot in the top of the delivery cylinders, aligned with the axis of said delivery cylinders.

[0036] A second type of glue applicator component consists of a series of holes (nozzles) on the vertical side of each guide facing towards the opposite guide on the same delivery cylinder. Holes and/or channels inside the guides and in communication with the inside of the delivery cylinders enable the passage of the glue from inside said delivery cylinders through said holes in the guides.

[0037] The on/off mechanism or valve for controlling the flow of glue to the delivery cylinders can consist of a revolving tube, hereinafter called a shutter, housed inside the delivery cylinder and complete with slots or holes in its perimeter. The turning of said shutters brings the holes or slots into or out of alignment with the holes or slot in the delivery cylinders, thereby enabling or preventing the passage of the glue under pressure in the delivery cylinders through said holes or slots.

[0038] Said inside shutters can be turned by electromechanical or pneumatic actuators suitably controlled so as to allow the delivery of glue through the slots in the delivery cylinders, or through the slots in the guides, only when it is required, i.e. during the passage of a volume.

[0039] A mechanism induces a partial backflow of the glue through the delivery channels and holes when the shutter is closed to prevent any glue from leaking or overflowing through the applicator slots and holes when there is no volume on which to apply the glue.

[0040] The characteristics of the new glue applicator for bookbinding machines, for use with polyurethane glues in particular, will be better clarified by the following description with reference to the drawings, which are attached as a non-restrictive example.

[0041] Figures 1 and 2 respectively illustrate a top view and an axonometric view of an embodiment of the new glue applicator for bookbinding machines.

[0042] In this example, the new applicator comprises a tank (1) with a base or body for its connection to the bookbinding machine (2), two delivery cylinders (3a, 3b) with corresponding glue delivery on/off mechanisms (4a, 4b), and two pairs of volume guides (5a, 5b).

[0043] The tank (1) consists of a cylinder with a sealed top cover (1.1).

[0044] Said tank (1) can be heated to enable the use of glues whose fluidity is improved by an increase in temperature.

[0045] A device or mechanism (not shown) increases the pressure inside the tank, e.g. by delivering compressed air.

[0046] The base (2) for the tank (1) serves both as support for the underside of the tank (1) and as a means for connecting the assembly to the bookbinding machine and for conveying the glue contained inside the tank (1) towards the delivery cylinders (3a, 3b).

[0047] Said delivery cylinders (3a, 3b) consist of cylinders lying substantially parallel to one another, substantially horizontal and substantially at right angles to the direction in which the volumes to bind are fed forward.

[0048] In this example, the delivery cylinder (3a) that the volume encounters first has a slot (3ac) to the top, lying parallel to the length of the delivery cylinder (3a). The glue applied to the spine of the volume is delivered through said slot (3ac).

[0049] The delivery cylinder (3b) that the volume encounters afterwards has two holes or openings (3bc) in its upper part, coinciding with the two guides (5be, 5bi), for delivering the glue that is applied to the edge of the first and last sheet in the vicinity of the spine of the volume.

[0050] On or in each of said delivery cylinders (3a, 3b) there is an on/off mechanism or valve (or shutter) (4a, 4b) for enabling/preventing the flow of glue coming from the tank (1) through the base (2).

[0051] Figure 3 schematically illustrates one said de-

livery cylinders (3a, 3b), showing a preferred embodiment of said on/off valves (4a, 4b).

[0052] The delivery cylinder (3a, 3b) contains a further inside cylindrical tube, hereinafter called a shutter (4a, 4b), coming up against the inside of the slots or holes (3ac, 3bc) in the delivery cylinder (3a, 3b). The wall of said internal shutter (4a, 4b) has holes or slots (4ac, 4bc) of similar size, shape and arrangement as the holes or slots (3ac, 3bc) in the delivery cylinders (3a, 3b).

[0053] Each internal shutter (4a, 4b) extends from the corresponding delivery cylinder (3a, 3b) on the side opposite the tank (1) and base (2), and said extremity is closed mechanically. Lever mechanisms and/or electromechanical or pneumatic mechanisms are attached to the extremity of the shutter (4a, 4b) extending from inside the cylinder to enable a partial rotation of said internal shutter (4a, 4b) around its central axis. By means of said rotation, the holes or slots (4ac, 4bc) in the internal shutter (4a, 4b) are brought into or out of alignment with the holes or slots in the delivery cylinder (3a, 3b).

[0054] Depending on the angular position of the internal shutters (4a, 4b) in relation to the delivery cylinders (3a, 3b), the glue under pressure in the tank (1) and flowing in the delivery cylinders (3a, 3b) may or may not pass through the holes or slots (3ac, 3bc, 4ac, 4bc) in the internal shutters (4a, 4b) and delivery cylinders (3a, 3b).

[0055] On each delivery cylinder (3a, 3b) there is a pair of guides (5ai, 5ae, 5bi, 5be).

[0056] Each pair of guides (5ai, 5ae; 5bi, 5be) comprises one guide (5ai, 5bi) in the vicinity of the tank (1) and base (2) and one guide (5ae, 5be) in a position opposite the tank (1) and base (2).

[0057] The guides (5ai, 5bi) in the vicinity of the tank (1) and base (2) are fixed to the delivery cylinders (3a, 3b).

[0058] The guides (5ae, 5be) opposite the tank (1) and base (2) are capable of movement parallel to the delivery cylinders (3a, 3b).

[0059] To be more precise, the second guides (5bi, 5be) on the delivery cylinder (3b) encountered by the volume have holes or openings on their surface in contact with said delivery cylinder (3b), communicating with holes or openings (5bc) on their surface facing the opposite guides (5be, 5bi).

[0060] The glue emerging through the holes (3bc) in the second delivery cylinder (3b) is thus applied to the edge near the spine of the first and last sheets of the volume in transit between said guides (5bi, 5be).

[0061] For this purpose, the movable guide (5be) opposite the tank (1) and base (2) has a hole facing towards the delivery cylinder (3b), that may be of elongated shape or otherwise suitable for receiving the glue through the hole (3bc) in the delivery cylinder (3b) whatever the position of said guide (5be) on the path along which it slides on the delivery cylinder (3b) .

[0062] The guides (5ae, 5be) opposite the tank (1) and base (2) are moved by precision mechanisms, lever mechanisms or actuators - in this example, these are grip controls and reduction gears with a numerical indicator (6a, 6b).

[0063] Other embodiments of the invention are feasible, such as the one illustrated in Figure 4, wherein there are three tanks (1) on a base (2), each serving a single delivery cylinder (3a, 3b, 3c) complete with corresponding guides (5a, 5b, 5c).

[0064] There is a mechanism for the partial suction of the glue contained in the delivery cylinders (3a, 3b) and shutters (4a, 4b) to prevent any leakage and/or overflowing of the glue through the applicator slots or holes (3ac, 5bc).

[0065] Each tank can be filled with the same type of glue or different types of glue so as to enable two or more applications of glue on the same part of the volume, or of different glues on different parts of the volume.

[0066] The glue contained in the tank (1) is conveyed under pressure to the delivery cylinders (2) from where, when the corresponding shutters (4a, 4b) are arranged in the open position, it passes through the holes or slots (3ac) in the delivery cylinders (3a) or the holes or slots (5bc) in the guides (5b).

[0067] The glue is not delivered continuously, but only when the shutters (4a, 4b) in the delivery cylinders (3a, 3b) are opened and rotated.

[0068] Said shutters (4a, 4b) are only opened and rotated during the passage of the volume so as to enable the delivery of the glue only when it is needed.

[0069] The new glue applicator for bookbinding machines offers considerable advantages.

[0070] The new glue applicator enables the use of glues that do not require excessive heating.

[0071] The new glue applicator enables the glue to be applied only where it is needed on each volume.

[0072] The glue passes from the tank (1) to the point of application through closed cylinders, so there is no risk of dripping or splashing.

[0073] The glue is delivered only during the passage of a volume, so no glue is wasted.

[0074] The tanks and the path of the glue are closed, so any emission of fumes into the atmosphere is reduced to a minimum.

[0075] The new glue applicator allows for the use of both rapid-drying and slow-drying glues.

[0076] The new glue applicator allows for the use of different types of glue for different parts of the volume (spine, edges).

Claims

1. Extrusion-type glue applicator for bookbinding machines **characterized in that** it comprises:

   • one or more tank(s) (1) for containing the glue and suitable for being placed under pressure;
   • one or more glue delivery cylinder(s) (3a, 3b) connected to said tank (1) and complete with on/off valves or mechanisms (4a, 4b) for ena-

bling/preventing the flow of glue, arranged horizontally and at right angles to the direction in which the volumes to bind are fed;
• one or more pair(s) of volume guides (5ai, 5ae, 5bi, 5be) on each delivery cylinder (3a, 3b);
• one or more glue applicator component(s) suitable for applying the glue to the spine of the volume in transit, connected to one of said delivery cylinders (3a) and situated between the guides (5ai, 5ae) on said delivery cylinder (3a);
• one or more pair(s) of lateral components suitable for applying the glue to the edge of the first and last leaf in the vicinity of the spine of the volume in transit, wherein said lateral components for applying the glue are connected to a delivery cylinder (3b) and situated between the guides (5bi, 5be), beyond the guides (5bi, 5be) or on top of the guides (5bi, 5be) on said delivery cylinder (3b).

2. Extrusion-type glue applicator for bookbinding machines according to claim 1, **characterized in that** said component for applying glue to the spine of the volume consists of a slot or opening (3ac) situated on the top of the delivery cylinder (3a).

3. Extrusion-type glue applicator for bookbinding machines according to claim 1, **characterized in that** each of said components for applying glue to the edge of the first and last leaf in the vicinity of the spine volume consists of a series of holes or openings (5bc) on the side of each guide (5bi, 5be) facing the opposite guide (5be, 5bi) and in communication with the inside of said delivery cylinder (3b).

4. Extrusion-type glue applicator for bookbinding machines according to claim 1, **characterized in that** at least one of each pair of said guides (5ai, 5bi; 5ae, 5be) is fixed.

5. Extrusion-type glue applicator for bookbinding machines according to claim 1, **characterized in that** at least one of each pair of said guides (5ae, 5be; 5ai, 5bi) is movable.

6. Extrusion-type glue applicator for bookbinding machines according to claims 4, 5, **characterized in that** the guides (5ai, 5bi) nearer the tank (1) and base (2) are fixed, while the guides (5ae, 5be) further away from the tank (1) and base (2) are movable.

7. Extrusion-type glue applicator for bookbinding machines according to previous claims, **characterized in that** said delivery cylinders (3a, 3b) have a hole or opening in their wall in line with the fixed guides (5ai, 5bi), and wherein said fixed guides (5ai, 5bi) have a hole or opening aligned or communicating with said hole in said cylinders (3a, 3b) connected to the holes or slots (5ac, 5bc) delivering the glue.

8. Extrusion-type glue applicator for bookbinding machines according to previous claims, **characterized in that** said delivery cylinders (3a, 3b) have a hole or opening in their wall coinciding with the movable guides (5ae, 5be), and wherein said guides (5ae, 5be) have an opening or hole in the wall on which they slide with respect to the delivery cylinder (3a, 3b) such that, whatever the displaced position of said movable guides (5ae, 5be), said holes in the delivery cylinders (3a, 3b) are always in communication with the openings or slots in said movable guides (5ae, 5be), and wherein said openings or slots in said movable guides (5ae, 5be) are connected with the holes or slots (5ac, 5bc) delivering the glue.

9. Extrusion-type glue applicator for bookbinding machines according to previous claims, **characterized in that** said movable guides (5ae, 5be) are moved by micrometrically precise manual or servocontrolled mechanized means.

10. Extrusion-type glue applicator for bookbinding machines according to previous claims, **characterized in that** each on/off valve or mechanism (4a, 4b) governing the flow of glue in each delivery cylinder (3a, 3b) comprises a further internal cylindrical tube (4a, 4b), or shutter, revolvingly housed inside said delivery cylinder (3a, 3b) and adhering to the inside of the slot or holes (3ac, 3bc) in the delivery cylinder (3a, 3b), wherein said shutter (4a, 4b) has holes or slots (4ac, 4bc) in its wall of much the same shape, size and arrangement as the holes or slots (3ac, 3bc) in the corresponding delivery cylinder (3a, 3b), and wherein the rotation of said shutter (4a, 4b) brings the holes or slots (4ac, 4bc) in the shutter (4a, 4b) into or out of alignment with the holes or slots in the delivery cylinder (3a, 3b), thereby enabling or preventing the passage of the glue through the holes or slots in the delivery cylinder (3a, 3b).

11. Extrusion-type glue applicator for bookbinding machines according to the previous claim, **characterized in that** each shutter (4a, 4b) extends from the end of the corresponding delivery cylinder (3a, 3b) lying opposite the tank (1) and base (2), with an extremity that is blind or closed mechanically, and wherein lever mechanisms, electromechanical or pneumatic mechanisms attached to said projecting extremity of the shutter (4a, 4b) are suitable for partially rotating said shutter (4a, 4b) around its central axis.

12. Extrusion-type glue applicator for bookbinding machines according to claims 11, 12, **characterized in that** the rotation of said internal shutters (4a, 4b) is governed by mechanical, electromechanical or

pneumatic servocontrolled mechanisms as a volume passes.

13. Extrusion-type glue applicator for bookbinding machines according to previous claims, **characterized in that** it has a mechanism for the partial suction of the glue contained in the delivery cylinder (3a, 3b) and shutters (4a, 4b), so that the flow of glue has a very precise start and a distinct interruption in the extrusion of the glue in the area where the glue is applied.

14. Extrusion-type glue applicator for bookbinding machines as in previous claims, **characterized in that** each delivery cylinder (3a, 3b), each shutter (4a, 4b) and the partial glue suction mechanism are concentric so as to create a single cylindrical channel for the passage of the glue, and wherein the partial glue suction mechanism consists of a piston or stem contained inside and concentric to the shutter (4a, 4b) so that it can be partially withdrawn from said shutter (4a, 4b) and thereby exert a partial suction action, or negative pressure, on the glue contained inside the shutter (4a, 4b) and inside said delivery cylinder (3a, 3b) specifically at the time of said shutter being closed (4a, 4b).

15. Extrusion-type glue applicator for bookbinding machines as in previous claims, **characterized in that** it has more than one tank (1) of glue, suitable for containing glues that differ in terms of their quality, working temperature or drying time, and wherein each tank (1) is complete with at least one delivery cylinder (3) and corresponding guides (5), shutter (4) and partial glue suction mechanism for applying each glue contained in said tank to a specific part of the volume being bound.

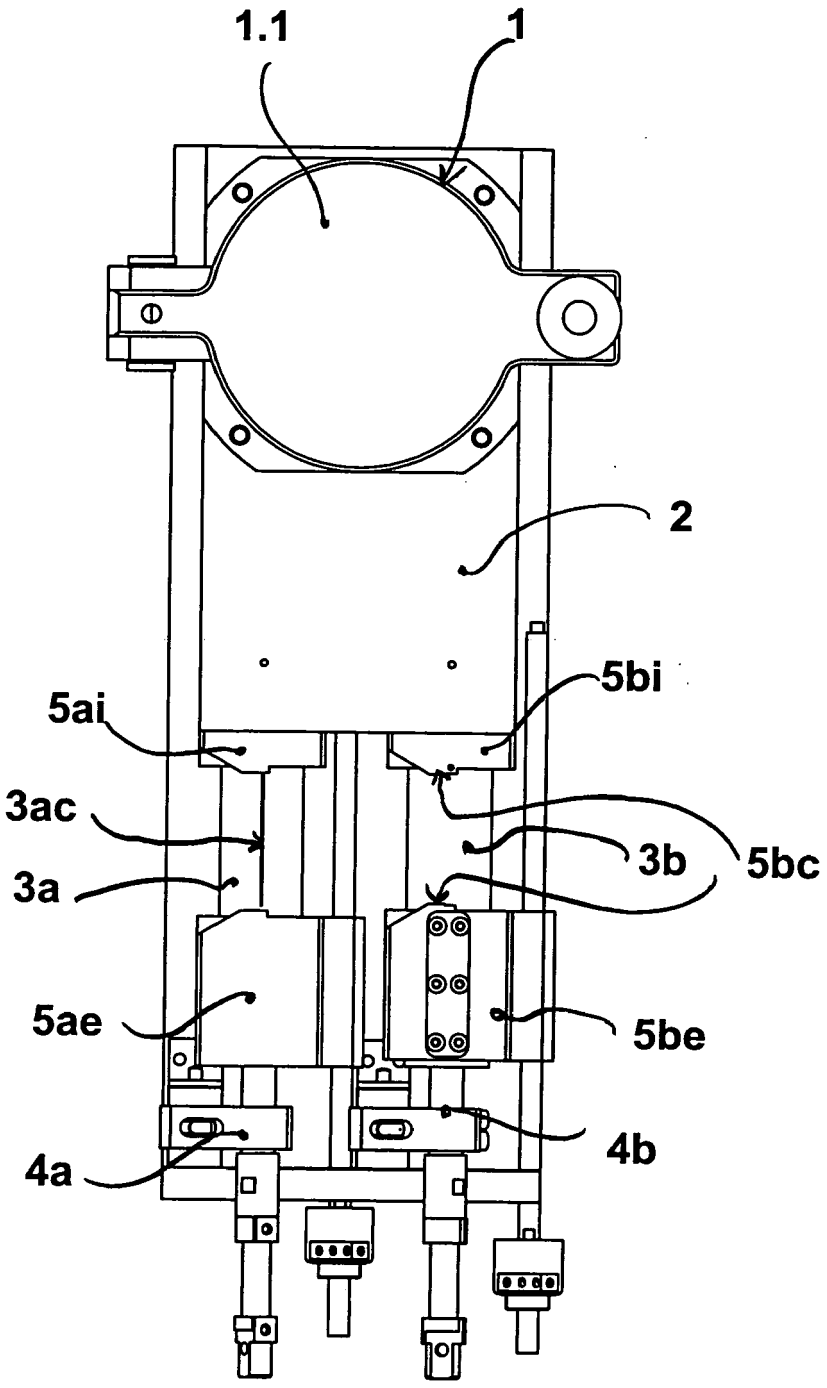


Fig. 1

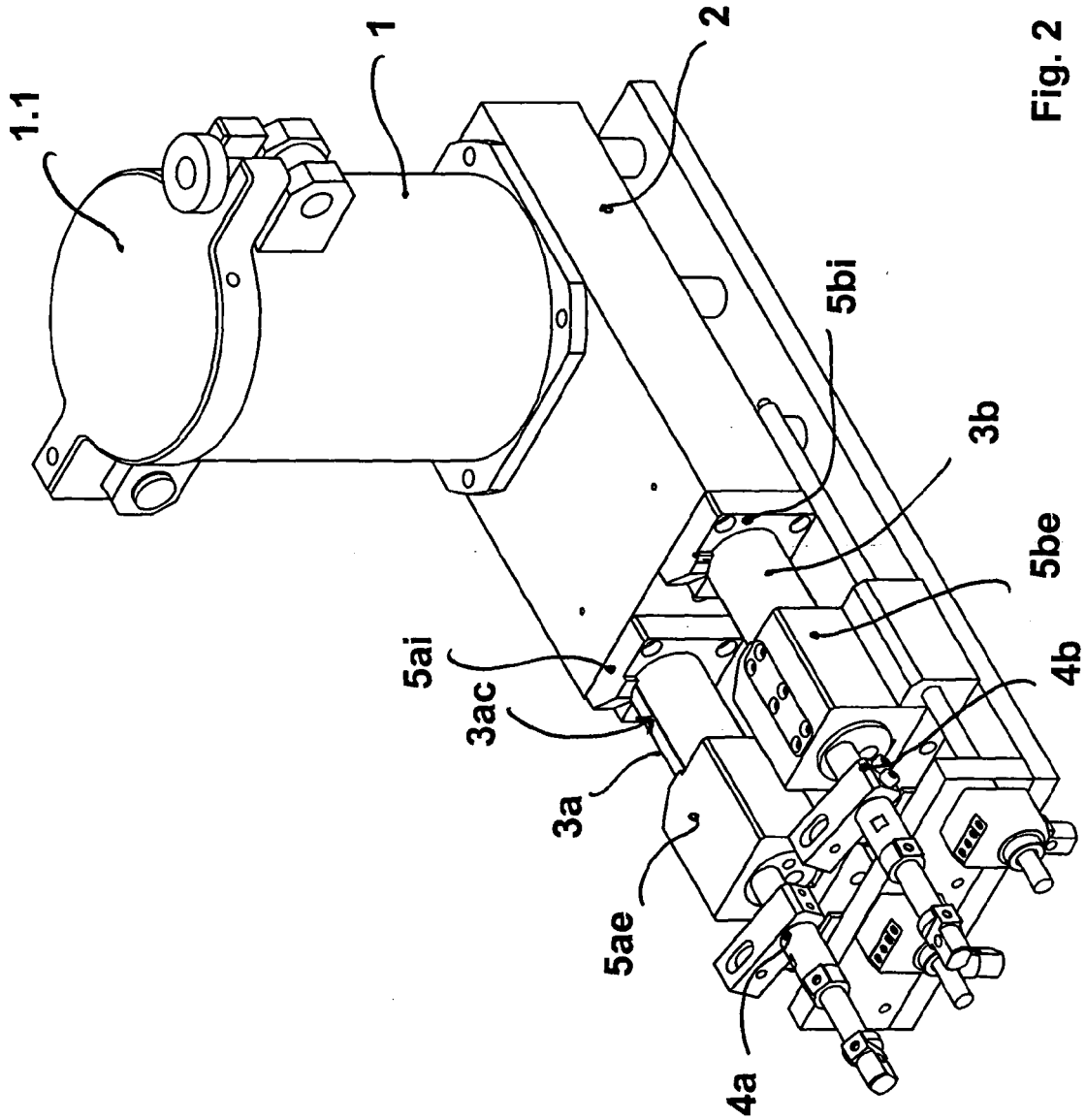


Fig. 2

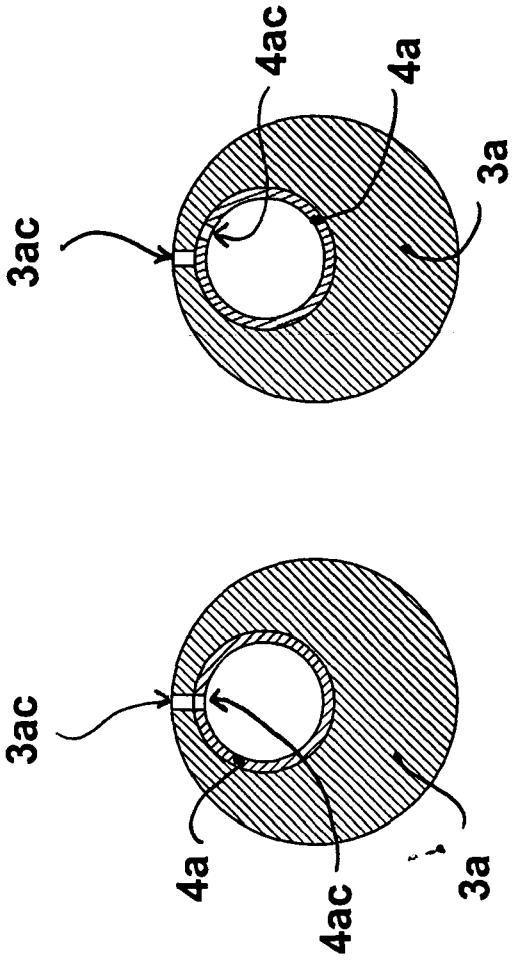


Fig. 3

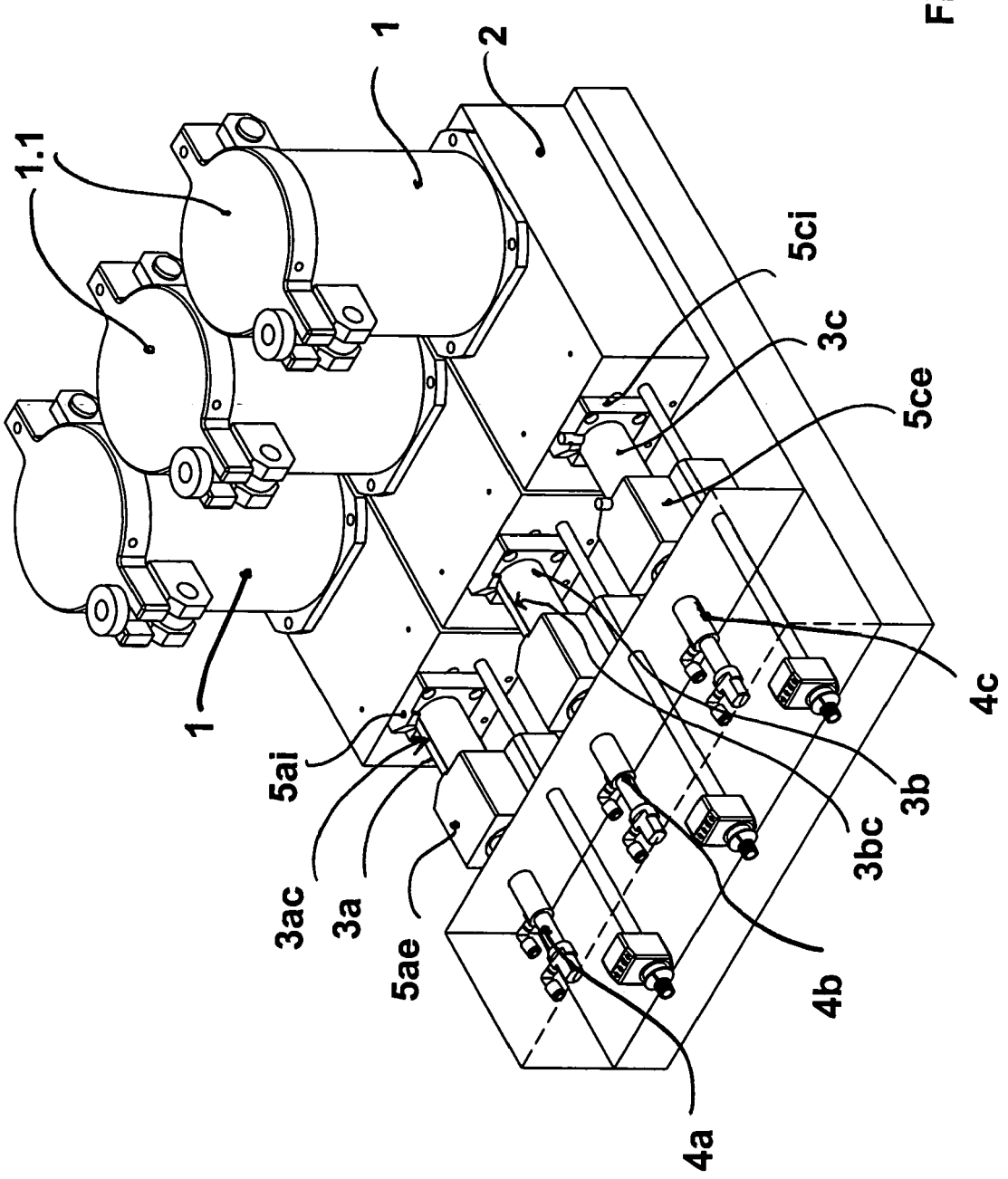


Fig. 4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 42 5464

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	GB 447 219 A (ALFRED JAMES KITCAT) 14 May 1936 (1936-05-14) * page 3, line 26 - line 87; figure 1 *	1-15	INV. B42C9/00
A	US 2003/215309 A1 (ENGERT HOLGER [DE] ET AL) 20 November 2003 (2003-11-20) * paragraph [0022] *	1-15	
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			TECHNICAL FIELDS SEARCHED (IPC)
			B42C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	31 October 2006	Acton, Paola

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 06 42 5464

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82