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DESCRIPTION

Field of the invention

[0001] The present invention is generally applicable to the technical field of the closing hinges, and particularly relates to a door closing hinge, in particular for glass doors.

Background of the invention

[0002] As known, door closers are generally used to close a door which is supported by a stationary structure, e.g. a door frame.

[0003] Door closers usually comprise a movable element fixed to the door which is pivoted on a fix element, usually fixed to the stationary structure.

[0004] Moreover, closing means acting on the movable element to automatically return the door or the like to the closed position are provided.

[0005] From the document EP0407150 a door closer is known, which includes a box-shaped body and an external arm connectable to the door for the automatic returning thereof to the closed position. Such known device has high bulking, since the box-shaped body has an extremely large size. Therefore, the installation of such a device requires expensive and difficult break-in works of the floor, which have to be made by qualified operators.

[0006] Further, due to the presence of the external arm, the aesthetic appeal of this known door closer is dramatically low.

[0007] Moreover, this known device offers an high resistance to closing if pulled. As a consequence, it can be very unsafe for a user, in particular in case of glass doors.

[0008] From DE2327389 a door closing hinge is known having all the features of the preamble of the independent claim 1.

Summary of the invention

[0009] Object of the present invention is to overcome at least partly the above drawbacks, by providing a door closing hinge having characteristics of high effectiveness, constructional simplicity and low cost.

[0010] Another object of the invention is to provide a door closing hinge of extremely moderate

bulking.

[0011] Another object of the invention is to provide a door closing hinge which is extremely easy to install.

[0012] Another object of the invention is to provide a door closing hinge which ensures the automatic closing of the door from the open position.

[0013] Another object of the invention is to provide a door closing hinge which ensures the controlled movement of the door on which it is mounted, upon the opening as well as upon closing of the door.

[0014] Another object of the invention is to provide a door closing hinge which is capable to control the movement of very heavy doors and windows, without changing its behaviour and without need of any adjustment.

[0015] Another object of the invention is to provide a door closing hinge which has a minimum number of constituent parts.

[0016] Another object of the invention is to provide a door closing hinge capable to maintain with time the exact closing position.

[0017] Another object of the invention is to provide an extremely safe door closing hinge, which does not offer any resistance to closing if pulled.

[0018] Such objects, as well as others which will appear more clearly hereinafter, are fulfilled by a system according to claim 1.

[0019] The door closing hinge of the system according to the invention includes a fix element, suitable to be anchored to a floor, and a movable element, suitable to be anchored to a door.

[0020] The movable element is rotatably coupled to the fix one to rotate about a first longitudinal axis, which may be substantially vertical, between an open door position and a closed door position.

[0021] The movable element comprises a box-shaped body, which in turn internally includes a single operating chamber. On the other hand the fix element comprises a pin which defines the above first longitudinal axis.

[0022] The door closing hinge comprises closing means acting on the movable element to automatically return the door to the closed position upon the opening thereof.

[0023] Furthermore, the door closing hinge comprises braking means acting on the closing means for counteracting the action thereof.

[0024] In this manner, it will be possible to control the rotation of the door from the open position to the closed position.

[0025] The closing means comprise a first cam element interacting with a first plunger element movable within the box-shaped body between a first compressed end position, corresponding to the open door position and a first extended end position, corresponding to the closed door position.

[0026] The first plunger element moves within the box-shaped body along a first direction, which is longitudinal and substantially perpendicular to the first longitudinal axis.

[0027] The braking means comprise a second cam element interacting with a second plunger element movable within the box-shaped body between a second compressed end position, corresponding to the closed door position and a second extended end position, corresponding to the open door position.

[0028] The second plunger element moves within the box-shaped body along the above first longitudinal direction.

[0029] The first and second cam elements are unitary with the pin.

[0030] The pin, that is the first and second cam elements, are interposed between the first and second plunger elements.

[0031] Thanks to such features, the door closing hinge is very compact and effective, and will have a strong aesthetic impact.

[0032] Moreover, thanks to such features, the door closing hinge has a minimum number of constituent parts, with great advantage of the bulkiness of the door closing hinge.

[0033] The first and second plunger elements are reciprocally opposite with respect to the pin, or equivalently with respect to the first longitudinal axis.

[0034] More precisely, the first and second plunger elements are reciprocally opposite with respect to a plane passing through the first longitudinal axis and perpendicular to the above first moving direction of the first and second plunger elements.

[0035] Both the first and second plunger elements are slidably movable along a single second longitudinal axis substantially perpendicular to the first axis and coinciding with the above first direction.

[0036] The first and second plunger elements are slidably movable in a single operating chamber which defines the second axis. In this embodiment, the first and second plunger

elements are reciprocally faced.

[0037] Due to bulkiness reasons, the working chamber defined by the box-shaped body includes both the first and second cam elements and the first and second plunger elements.

[0038] Suitably, the first plunger element may comprise at least one first pushing head interacting with at least one substantially first countershaped seat of the first cam element, whereas the second plunger element may include at least one second pushing head interacting with at least one second substantially countershaped seat of the second cam element.

[0039] Thanks to this embodiment, the door closing hinge will maintain the exact closing position with time, by being also greatly safe.

[0040] In order to minimize the vertical bulkiness, both the at least one first and second pushing heads may have a generally plate-like shape to define respective first and second planes substantially perpendicular to the first axis. Preferably, these first and second planes may be reciprocally parallel.

[0041] The said operating chamber comprises a working fluid, usually a oil.

[0042] The first plunger element comprises a substantially cylindrical first back portion and a first front portion defining the first pushing head, whereas the second plunger element comprises a substantially cylindrical second back portion and a second front portion defining the second pushing head.

[0043] The first and second back portions are designed to separate the operating chamber into a first, a second and a third adjacent variable volume compartments in reciprocal fluidic communication.

[0044] The operating chamber comprises control means for controlling the flow of the working fluid so as to allow the flow thereof from the first compartment to the third compartment through the second compartment upon the opening of the door and to allow the backflow thereof from the third compartment to the first compartment through the second compartment upon the closing of the door.

[0045] Such embodiment allows to obtain a door closing hinge which ensures the controlled movement of the door upon the opening, thus being greatly safe and practical.

[0046] Moreover, thanks to such features, the door closing hinge according to the invention allows to hydraulically control the rotation upon the closing of very heavy doors, by also minimizing the bulking.

[0047] In fact, the door closing hinge according to the invention is extremely safe, because the

reciprocal rotating movement of the fix and of the movable element is free upon closing. During the closing phase the control means adjusts the backflow of the working fluid from the third to the first variable volume compartment independently from the reciprocal rotation of the fix and of the movable element, so that an user will be free to close the door with any speed without any danger of breaking the door closing hinge and/or
the door.

[0048] Advantageous embodiments of the invention are defined according to the dependent claims.

Brief description of the drawings

[0049] Further features and advantages of the invention will appear more evident upon reading the detailed description of a few preferred, non-exclusive embodiments of a door closing hinge according to the invention, which is described as non-limiting examples with the help of the annexed drawings, in which:

FIG. 1 is an exploded view of a the door closing hinge **1;**

FiG. 2 is a schematic perspective view of the first and second cam elements **31** and **41,** unitary with the pin **20,** which are interposed between the first and second plunger elements **32, 42;**

FIG.s 3a and **3b** are respectively perspective and partly sectional views of the box-shaped body **10;**

FIG.s 4a and **4b** are respectively perspective and sectional views of the first plunger element **32;**

FIG.s 5a, 5b and **5c** are respectively perspective, sectional and front views of the second plunger element **42;**

FIG.s 6a, 6b and **6c** are respectively perspectives and side views of the first and second cam element **31, 41,** which are unitary with the pin **20;**

FIG.s 7a and **7b** are respectively sectional perspective and side views of the door closing hinge **1** in the open door position, wherein the discharging port **72** and the third passing through hole **32'''** are reciprocally uncoupled (the first and second springs **39, 47** have not been shown for sake of better intelligibility);

FIG.s 8a and **8b** are respectively sectional perspective and side views of the door closing hinge **1** in a position proximate to the closed door position, wherein the discharging port **72** and the third passing through hole **32'''** are reciprocally coupled to selectively put into fluidic communication the channel
71 with the first variable volume compartment **51,** so as to impart a latch action to the door towards the closed position (the first and second springs **39, 47** have not been shown for sake

of better intelligibility);

FIG.s 9a and **9b** are respectively sectional perspective and side views of the door closing hinge **1** in the closed door position (the first and second springs **39, 47** have not been shown for sake of better intelligibility).

Detailed description of a preferred embodiment

[0050] Referring to the above mentioned figures, the door closing hinge **1** is advantageously applicable to doors, in particular glass doors, which may be supported by a floor.

[0051] In the figures both the door and the stationary support structure, which are not part of the present invention, have not shown because they are known *per se.*

[0052] As particularly shown in FIG. 1, the system according to the invention includes a plate **2,** which may be anchored to the floor by suitable fasteners **3.**

[0053] In this manner, it is possible to install the door closing hinge **1** easily and smoothly, avoiding for instance the expensive and difficult break-in works which are necessary with the known solutions.

[0054] The door closing hinge **1** may be used individually, with a simple hinge on the other end of the door, or in a combination of two or more of door closing hinges **1.**

[0055] In particular, the door closing hinge **1** comprises a box-shaped body **10** rotatably coupled to a pin **20,** in such a manner to rotate about a first longitudinal axis **X,** which may be substantially vertical.

[0056] In the embodiment shown in the appended figures, the box-shaped body **10** is anchored to the door to define the movable element of the door closing hinge **1,** whereas the pin **20** is anchored to the floor **S** through the plate **2** to define the fix element thereof.

[0057] The pin **20,** which may have elongated shape to define the axis **X,** may include a first anchoring portion **21** suitable to the anchoring of the pin **20** to the plate **2** and a second working portion **22,** the function of which will be better explainer hereinafter. The first and the second portion may be monolithic, as they are both part of the same pin **20.**

[0058] In this manner a user, upon the opening of the door, will cause the reciprocal rotation of the box-shaped body **10** and of the pin **20** around the axis **X.**

[0059] In order to ensure the automatic closing of the door once opened, closing means are

provided, generally indicated with **30,** acting on the movable element of the door closing hinge **1** to automatically return the door to the closed position.

[0060] Braking means generally indicated with **40** acting on the closing means **30** to counteract the action thereof are further provided.

[0061] As particularly shown in FIG. 2, the closing means **30** comprises a first cam element **31** interacting with a first plunger element **32,** whereas the braking means **40** includes a second cam element **41** interacting with a second plunger element **42.**

[0062] As used herein, the term "cam" means a mechanical part, having any configuration, suitable to change a circular motion into a rectilinear motion.

[0063] Both the first and second cam elements **31, 41** are unitary with the pin **20.** In particular, the first and second cam elements **31, 41** may define the working portion **22** of the pin **20.**

[0064] On the other hand, the first and second plunger elements **32, 42** are movable within the box-shaped body **10.**

[0065] Both the plunger elements **32, 42** are slidably movable in a single operating chamber **50,** which defines a second longitudinal axis **Y** substantially perpendicular to the first axis **X.**

[0066] The operating chamber **50** houses also the first and second cam elements **31, 41.** Appropriately, the operating chamber **50** may be cylindrical.

[0067] In particular, the first plunger element **32** slidably moves along the second axis **Y** between a first compressed end position, corresponding to the open door position, and a first extended end position, corresponding to the closed door position.

[0068] On the other hand, the second plunger element **42** slidably moves along the second axis **Y** between a second compressed end position, corresponding to the closed door position, and a second extended end position, corresponding to the open door position.

[0069] The pin **20,** or equivalently the longitudinal axis **X,** or equivalently the first and second cam elements **31, 41,** is interposed between the first and second plunger elements **32, 42.**

[0070] The first and second plunger elements **32, 42** are reciprocally opposite with respect to a plane **π** passing through the first longitudinal axis **X** and perpendicular to the second longitudinal axis **Y.**

[0071] The first and second plunger elements **32, 42** are reciprocally faced in the operating chamber **50.**

[0072] The box-shaped body **10** has an elongated shape along the axis **Y.** In other words, the

box-shaped body **10** develops mainly in length along the axis **Y,** with the length dimension higher than the other two dimensions.

[0073] In a preferred but non-exclusive embodiment of the invention, the first plunger element **32** may comprise a couple of first pushing heads **33, 33'** interacting with a corresponding couple of substantially first countershaped seats **34, 34'** of the first cam element **31,** whereas the second plunger element **42** may include a second pushing head **43** interacting with a second substantially countershaped seat **44** of the second cam element **41.**

[0074] Advantageously, both the first pushing heads **33, 33'** and the second one **43** may have a generally plate-like shape to define respective first planes **π', π"** and a second plane **π'".**

[0075] Thanks to the above features, the bulk of the body, in particular the vertical one, will be extremely minimized, and the aesthetic appeal greatly increased.

[0076] Suitably, the second plane **π'"** defined by the second pushing head **43** may lay between the first planes **π', π"** defined by the first pushing heads **33, 33'.**

[0077] As particularly shown in FIG. 3, the pushing heads **33, 33'** and **43** may include respective couples of substantially flat upper and lower walls, respectively indicated with **35** and **35'; 36** and **36', 45** and **45'.**

[0078] On the other hand, the countershaped seats **34, 34'** and **44** may comprise respective couples of substantially flat upper and lower walls, respectively indicated with **37** and **37'; 38** and **38', 46** and **46'.**

[0079] The upper and lower walls **35** and **35'; 36** and **36'** of the pushing heads **33, 33'** may respectively face the corresponding upper and lower walls **37** and **37'; 38** and **38'** of the countershaped seats **34, 34',** whereas the upper and lower walls **45** and **45'** of the pushing head **43** may face the corresponding upper and lower walls **46** and **46'** of the countershaped seat **44.**

[0080] In a preferred but-non exclusive embodiment of the invention, all the planes **π', π"** and **π'"** may be substantially perpendicular to the first axis **X** and preferably reciprocally parallel.

[0081] Suitably, the upper and lower walls **35** and **35'; 36** and **36', 45** and **45', 37** and **37'; 38** and **38', 46** and **46'** may be all substantially parallel to the second axis **Y.**

[0082] It is however understood that the pushing heads **33, 33'** and **43** may have any shape, as long as substantially plate-like, without departing from the scope of protection of the invention defined by the appended claims. For instance, the pushing heads **33, 33'** and **43** may be substantially wedge-shaped, with converging upper and lower walls.

[0083] Appropriately, the first pushing heads **33, 33'** may comprise respective first flat front

faces **35"** and **36",** whereas the second pushing head **43** may comprise a second flat front face **45".**

[0084] The front faces **35", 36"** and **45"** may be all substantially parallel each other and to the first longitudinal axis **X.**

[0085] The first countershaped seats **34, 34'** may include respective first substantially flat contact surfaces **37", 38",** whereas the second countershaped seat **44** may include a second substantially flat contact surface **46".**

[0086] The first contact surfaces **37", 38"** may be reciprocally parallel each other, and in particular they may be co-planar, i.e. they may lay on the same plane. On the other hand, the first contact surfaces **37", 38"** may be perpendicular to the second countershaped seat **44.**

[0087] The front faces **35", 36"** and **45"** may respectively be in contact engage with the contact surfaces **37", 38"** and **46".**

[0088] As already pointed out above, the cam elements **31, 41** are unitary with the pin **20.**

[0089] The first front faces **35", 36"** and the first contact surfaces **37", 38"** will be substantially parallel to each other in the closed door position and substantially perpendicular to each other in the open door position, whereas the second front face **45"** and the second contact surface **46"** will be substantially perpendicular to each other in the closed door position and substantially parallel to each other in the open door position.

[0090] To promote the pushing of the heads **33, 33'** of the first plunger element **32** against the countershaped seats **34, 34'** of the first cam element **31,** that is to promote the interaction between the first front faces **35", 36"** and the first contact surfaces **37", 38",** first counteracting elastic means may be provided, which may comprise, respectively consist of, a first spring **39,** acting on the first plunger element **32.**

[0091] On the other hand, to promote the pushing of the head **43** of the second plunger element **42** against the countershaped seat **44** of the second cam element **41,** that is to promote the interaction between the second front face **45"** and the second contact surfaces **46",** second counteracting elastic means may be provided, which may comprise, respectively consist of, a second spring **47,** acting on the first second element **42.**

[0092] Advantageously, the first contact surfaces **37", 38"** of the first cam element **31** may be designed according to the teachings of the International Patent Application n° WO2007125524, in the name of the same Applicant.

[0093] In particular, the first contact surfaces **37", 38"** of the first cam element **31** may be offset with respect to the axis **X** of a predetermined distance, such as the first front faces **35", 36"** of the first plunger element **32** in its extended end position is positioned beyond said axis

X.

[0094] Suitably, the surfaces **37", 38"** may have a distance from the axis **X** which may be comprised between 1 mm and 6 mm, preferably comprised between 1 and 3 mm and even more preferably close to 2 mm.

[0095] Thanks to such feature, the closing movement of the door closing hinge will be completely automatic. In other words, the plunger element **32** will start to work after few rotation degrees, starting from the open position.

[0096] The operating chamber **50** is filled with a predetermined quantity of a working fluid, usually oil.

[0097] The first plunger element **32** comprises a substantially cylindrical first back portion **32'** and a first front portion **32"** which include the first pushing heads **33, 33',** whereas the second plunger element **42** comprises a substantially cylindrical second back portion **42'** and a second front portion **42"** including the second pushing head **43.**

[0098] The first and second back portions **32', 42'** are designed to separate the operating chamber **50** into a first, a second and a third adjacent variable volume compartments in reciprocal fluidic communication, respectively indicated **51, 52** and **53.**

[0099] The three compartments **51, 52** and **53** may be designed in such a manner that the second compartment **52** is interposed between the first and third compartments **51, 53.** In this manner, the fluidic communication between the first and third compartments **51, 53** will necessarily involves the passage of the working fluid trough the second compartment **52.**

[0100] Appropriately, the first variable volume compartment **51** houses the first counteracting elastic means **39,** the third variable volume compartment **53** houses the second counteracting elastic means **47** and the second variable volume compartment **52** houses both the first and second cam elements **31, 41.**

[0101] Suitably, the first and third compartments **51, 53** may be designed to have in correspondence of the closed door position respectively the maximum and minimum volume, whereas in correspondence of the open door position respectively the minimum and maximum volume.

[0102] The operating chamber **50** comprises control means, generally indicated with **60,** to control the flow of the working fluid, in such a manner to allow the flow thereof from the first compartment **51** to the third compartment **53** through the second compartment **52** upon the opening of the door and to allow the backflow thereof from the third compartment **53** to the first compartment **51** through the second compartment **52** upon the closing of the door **D.**

[0103] Advantageously, the control means **60** may comprise a first hole **61** passing through the first plunger element **32,** preferably in correspondence of the first front portion **32"** thereof, so as to put into fluidic communication the first compartment **51** and the second compartment **52,** and a second hole **62** passing through the second plunger element **42,** preferably in correspondence of the first front portion **42"** thereof, so as to put into fluidic communication the third compartment **53** and the second compartment **52.**

[0104] Furthermore, the control means **60** may comprise a first check valve **63** interacting with the first passing through hole **61** and a second check valve **64** interacting with the second passing through hole **62.**

[0105] The first and second check valves **63, 64** reciprocally cooperates so as to allow the flow of the working fluid from the first compartment **51** to the second compartment **52** through the first passing through hole **61** and from the second compartment **52** to the third compartment **53** through the second passing through hole **62** upon the opening of the door **D,** and to prevent the backflow thereof upon the closing of the same door **D.**

[0106] With this purpose the check valves **63, 64** interacting with the passing through holes **61, 62** may be of the butterfly type, with the butterflies **65, 65'** housed in the compartments **66, 66'** in correspondence with the inlet of the passing through holes **61, 62.**

[0107] This way, when the door is opened, that is when it passes from the closed door position to the open one, the decreasing of volume of the first compartment **51,** i.e. the pressure of the working fluid in the compartment, will causes the butterfly element **65** axially slide in the compartment **66,** in such a manner that the working fluid is free to flow through the hole **61** towards the second compartment **52.**

[0108] At the same time the pressure of the working fluid in the second compartment **52** will causes the butterfly element **65'** axially slide in the compartment **66',** in such a manner that the working fluid is free to flow through the hole **62** towards the third compartment **53.**

[0109] Vice versa, when the door is closed, that is when it passes from the open position to the closed one, the butterfly elements **65, 65'** will axially slide in the direction opposite to the opening one and will close, thus preventing the backflow of the working fluid through the holes **61, 62.**

[0110] In order to allow the controlled backflow of the working fluid, the control means **60** may further comprise an hydraulic circuit, generally indicated with **70,** internal to the box-shaped body **10.**

[0111] Advantageously, the hydraulic circuit **70** may comprise a channel **71** in fluidic communication with the operating chamber **50** to allow the controlled backflow of the working fluid from the third compartment **53** to the first compartment **51** through said second compartment **52** upon the closing of the door **D.**

[0112] Suitably, the channel **71** may comprise an inlet port **72,** particularly shown in FIG. 3b, and at least one first outlet port **73.** Preferably, the channel **71** may comprise a second outlet port **74,** the function of which is better explained below.

[0113] The inlet port **72** may put into fluidic communication the second compartment **52** and the channel **71,** while the first outlet port **73** may put into fluidic communication the channel **71** and the first compartment **51.**

[0114] Appropriately, the second plunger element **42** may be inserted into the operating chamber **50** with a predetermined clearance, in such a manner that the cylindrical outer surface of the back portion **42'** thereof will define a interspace **75,** preferably substantially tubular, with the side wall of the operating chamber **50.** The interspace **75** may be suitable to put into a mutual fluidic communication the third and second variable volume compartments **53, 52.**

[0115] In this manner, when the door is closed, that is when it passes from the open door position to the closed one, the decreasing of volume of the third compartment **53,** i.e. the pressure of the working fluid in the compartment, will causes the flowing of the working fluid through the interspace **75,** in such a manner to flow towards the second compartment **52.**

[0116] At the same time the pressure of the working fluid in the second compartment **52** will causes the flowing of the working fluid through the inlet port **72,** the channel **71** and the first outlet port **73,** until the first compartment **51.**

[0117] Thanks to the above features, it will be possible to control the rotation of the door from the open to the closed position and vice versa. More generally, the door closing hinge according to the invention ensures a controlled movement of the door upon the opening as well as upon the closing thereof.

[0118] In fact, upon the opening, the controlled movement will prevent the door from suddenly opening, so as to protect both the door itself and a possible user who is in the corresponding action area. Further, upon the closing, the controlled movement will allow to prevent the said doorfrom strongly impact with the frame.

[0119] Thanks to such features, the door closing hinge according to the invention will be extremely safe and practical for a user.

[0120] The door closing hinge according to the invention will be greatly safe also because the reciprocal rotating movement of the fix and of the movable element is free upon its closing. In fact, upon the closing phase, the oil will flow from the third compartment **53** to the second one **52** and then to the first one **51** independently from the reciprocal rotation speed of the fix and movable elements.

[0121] In this manner, a user will be free to close the door with any speed without any danger to break the door closing hinge or the door.

[0122] In order to adjust the rotation speed of the door from the open to the closed position, the channel **71** may include first suitable adjusting means.

[0123] Advantageously, the first adjusting means may comprise a first screw **81** passing through the box-shaped body **10** and interacting with the first outlet port channel **73** to obstruct the passing section of the working fluid therein.

[0124] In this manner, it is possible to adjust the passing section of the first outlet port **73,** i.e. adjusting the volume of working fluid which passes through it, thus adjusting the closing speed of the door.

[0125] Suitably, the first back portion **32"** of the first plunger element **32** may comprise a third passing through hole **32"',** slidable unitary therewith along the second longitudinal axis **Y.**

[0126] Advantageously, the second outlet port **74** of the channel **71** and the third passing through hole **32"'** are susceptible to be reciprocally uncoupled when the first plunger element **32,** during its sliding along the axis **Y,** is in proximity of the compressed end position and reciprocally coupled when the same first plunger element **32** is in proximity of the extended end position.

[0127] In the last position, the coupling between the second outlet port **74** and the third passing through hole **32"'** will selectively put into fluidic communication the channel **71** and the first variable volume compartment **51,** so as to impart a latch action to the door towards the closed position.

[0128] Appropriately, in order to adjust the above latch action, i.e. the force by which the door accelerates towards the closed position, the channel **71** may include second suitable adjusting means.

[0129] Advantageously, the second adjusting means may comprise a second screw **82** passing through the box-shaped body **10** and interacting with the second outlet port **74** to obstruct the passing section of the working fluid therein.

[0130] In this manner, it is possible to adjust the passing section of the second outlet port **74,** i.e. adjusting the volume of working fluid which passes through it, thus adjusting the latch action of the door towards the closed position.

[0131] Suitably, the first outlet port **73** may be located downstream of the second outlet port **74** along the channel **71.**

[0132] Advantageously, the first outlet port **73** may be located sufficiently far from the second

outlet port **74,** in such a manner that the back portion **32'** of the first plunger element **32** will not obstruct the passage of the working fluid through it during its sliding along the axis **Y.**

[0133] From the above description, it is evident that the door closing hinge according to the invention fulfils the intended objects.

[0134] The door closing hinge according to the invention is susceptible to many changes and variants, all falling within the inventive concept expressed in the annexed claims. All particulars may be replaced by other technically equivalent elements, and the materials may be different according to the needs, without departing from the scope of of the invention as defined in the appended claims.

[0135] Although the door closing hinge has been particularly described referring to the annexed figures, the reference numbers used in the description and claims are used to improve the intelligence of the invention and do not constitute any limit to the claimed scope.

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP0407150A **[0005]**
- DE2327389 **[0008]**
- WO2007125524A **[0092]**

PATENTKRAV

1. System til lukning af en glasdør, som er understøttet af et gulv, hvilken dør er bevægelig imellem en åben position og en lukket position, hvilket system omfatter:

- et dørlukkehængsel (1);
- en montageplade (2) til at blive forankret på gulvet ved hjælp af passende fastgørelseselementer (3);

hvor dørlukkehængslet omfatter:

- et fast element (20), som kan forankres til gulvet via montagepladen (2);
- et bevægeligt element (10), som kan forankres til døren, hvilket bevægeligt element (10) er drejeligt forbundet med det faste element (20) til at dreje omkring en første langsgående akse (X) imellem den åbne dørposition og den lukkede dørposition;
- det bevægelige element (10) omfatter et kasseformet legeme (10), det faste element (20) omfatter en aksel (20) som definerer den første langsgående akse (X);
- lukkeorganer (30) til den automatiske returnering af døren fra den åbne til den lukkede position, hvilke lukkeorganer (30) omfatter et første kamelement (31), som samvirker med et første stempelelement (32), som er bevægeligt i det kasseformede legeme (10) imellem en første sammentrykt endeposition svarende til den åbne dørposition og en første udstrakt endeposition svarende til den lukkede dørposition;
- bremseorganer (40), som påvirker lukkeorganerne (30) for at modvirke virkningen deraf, hvilke bremseorganer (40) omfatter et andet kamelement (41), som samvirker med et andet stempelelement (42), som er bevægeligt i det kasseformede legeme (10) imellem en anden sammentrykt endeposition, svarende til den lukkede dørposition og en anden ustrakt endeposition svarende til den åbne dørposition;

hvor

- både det første og andet kamelement (31, 41) er udformede i ét stykke med akslen (20);
- akslen (20) er anbragt imellem det første og andet stempelelement (32, 42), idet sidstnævnte (32, 42) er indbyrdes modstående i forhold til akslen (20);

- det første og andet stempelelement (32, 42) er begge forskydeligt bevægeligt langs en anden akse (Y), som er i det væsentlige vinkelret på den første akse (X), idet det kasseformede legeme (10) har en aflang form langs den anden akse (Y);

hvor det første stempelelement (32) omfatter en i det væsentlige cylindrisk første bageste del (32') og en første forreste del (32"), som omfatter i det mindste ét første skubbehoved (33, 33'), det andet stempelelement (42) omfatter en i det væsentlige cylindrisk anden bageste del (42') og en anden forreste del (42"), som omfatter i det mindste ét andet skubbehoved (43),

kendetegnet ved, at det første og andet stempelelement (32, 42) er forskydeligt bevægelige i et enkelt funktionskammer (50), som definerer den anden akse (Y), igennem hvilket det første og andet stempelelement (32, 42) er koaksialt indsatte, at funktionskammeret (50) omfatter et arbejdsfluid, idet den første og anden bageste del (32', 42') er udformede til at opdele funktionskammeret (50) i et første, et andet og et tredie tilstødende variabel volumenkamre (51, 52, 53) i indbyrdes fluid forbindelse, og yderligere

kendetegnet ved, at funktionskammeret (50) omfatter styreorganer (60) til at styre strømningen af arbejdsfluidet, som er udformet til at tillade strømningen deraf fra det første kammer (51) til det tredie kammer (53) via det andet kammer (52) ved åbningen af døren, og at tillade tilbagestrømningen deraf fra det tredie kammer (53) til det første kammer (51) via det andet kammer (52) ved lukningen af døren.

2. System ifølge krav 1, hvor det første stempelelement (32) omfatter i det mindste ét første skubbehoved (33, 33'), som samvirker med i det mindste ét første, i det væsentlige modsvarende udformet sæde (34, 34') i det første kamelement (31), det andet stempelelement (42) omfatter i det mindste ét andet skubbehoved (43), som samvirker med i det mindste ét andet, i det væsentlige modsvarende udformet sæde (44) i det andet kamelement (41).

3. System ifølge det foregående krav, hvor både det i det mindste ene første og andet skubbehoved (33, 33', 43) har en generelt pladelignende form til at definere henholdsvis i det mindste ét første og andet plan (π', π", π"') som er i det væsentlige vinkelrette på den første akse (X), idet det i det mindste ene første og andet plan (π', π", π"') fortrinsvis er indbyrdes parallelle.

4. System ifølge krav 2 eller 3, hvor det i det mindste ene første og andet skubbehoved (33, 33', 43) omfatter henholdsvis i det mindste én første og anden plan frontflade (35", 36", 45"), som er i det væsentlige parallelle med hinanden og med den første langsgående akse (X), idet de i det mindste ene første og anden modsvarende udformede sæder (34, 34', 44) omfatter henholdsvis i det mindste en første og anden i det væsentlige plan kontaktflade (37", 38", 46"), som er vinkelret på hinanden og parallelle med den første langsgående akse (X), idet den i det mindste ene første og anden frontflade (35", 36", 45") er i kontaktindgreb med den i det mindste ene første og anden kontaktflade (37", 38", 46").

5. System ifølge det foregående krav, hvor den i det mindste ene første frontflade (35", 36") og i den mindste ene første kontaktflade (37", 38") er i det væsentlige parallelle med hinanden i den lukkede dørposition, og i det væsentlige vinkelrette på hinanden i den åbne dørposition, idet den i det mindste ene anden frontflade (45") og i det mindste ene anden kontaktflade (46") er i det væsentlige vinkelrette på hinanden i den lukkede dørposition og i det væsentlige parallelle med hinanden i den åbne dørposition.

6. System ifølge ethvert af kravene 2 til 5, hvor lukkeorganerne (30) omfatter første modvirkende elastiske organer (39), som påvirker det første stempelelement (32) for at fremme den gensidige vekselvirkning mellem det i det mindste ene første skubbehoved (33, 33') og det i det mindste ene første modsvarende udformede sæde (34, 34'), bremseorganerne (40) omfatter andet modvirkende elastisk organ (47), som påvirker det andet stempelelement (41) til at fremme den gensidige vekselvirkning mellem det i det mindste ene andet skubbehoved (43) og det i det mindste ene andet modsvarende udformede sæde (44).

7. System ifølge ethvert af de foregående krav, hvor det første og tredie variable volumenkammer (51, 53) er udformede til at have, i overensstemmelse med den lukkede dørposition, henholdsvis det maksimale og minimale volumen, og i overensstemmelse med den åbne dørposition henholdsvis det minimale og maksimale volumen, idet det første modvirkende elastiske organ (39) er placeret i det første kammer (51), det andet modvirkende elastiske organ (47) er placeret i det tredie kammer (53) og såvel det første som det andet kamelement (31, 41) er placerede i det andet kammer (52).

8. System ifølge ethvert af de foregående krav, hvor styreorganerne (60) omfatter et første hul (61), som forløber igennem det første stempelelement (32) for at bringe det

første kammer (51) og det andet kammeer (52) i fluid forbindelse, og et andet hul (62), som forløber igennem det andet stempel (42), for at bringe det tredie kammer (53) og det andet kammer (52) i fluid forbindelse, hvilke styreorganer (60) yderligere omfatter en første kontraventil (63), som vekselvirker med den første passage igennem hullet (61) og en anden kontraventil (64), som vekselvirker med den anden passage igennem hullet (62), idet den første og anden kontraventil (63, 64) samvirker indbyrdes for selektivt at åbne ved åbningen af døren, hvorved de tillader strømningen af arbejdsfluidet fra det første kammer (51) til det andet kammer (52) via den første passage gennem hullet (61) og fra det andet kammer (52) til det tredie kammer (53) via den anden passage igennem hullet (62), og til selektivt at lukke ved lukningen af døren, hvorved de forhindrer tilbagestrømningen af arbejdsfluidet der igennem.

9. System ifølge krav 8, hvor styreorganerne (60) yderligere omfatter et hydraulisk kredsløb (70) indvendigt i det kasseformede legeme (10) til at bringe det tredie kammer (53) og det første kammer (51) i fluid forbindelse via det andet kammer (52) ved lukning af den første og anden kontraventil (63, 64), hvorved der tillades tilbagestrømning af arbejdsfluidet ved lukningen af døren.

10. System ifølge krav 9, hvor hydraulikkredsløbet (70) omfatter et mellemrum (75) imellem det andet stempelelement (42) og funktionskammeret (50) til at bringe det tredie variable volumenkammer (53) og det andet variable volumenkammer (52) i fluid forbindelse, idet hydraulikkredsløbet (70) yderligere omfatter en kanal (71), som forløber igennem det kasseformede legeme (10), som har i det mindste én indløbsåbning (72) i fluid forbindelse med det andet variable volumenkammer (52) og i det mindste én udløbsåbning (73) i fluid forbindelse med det første variable volumenkammer (51).

11. System ifølge krav 10, hvor kanalen (71) omfatter en anden udløbsåbning (74), idet den første bagsidedel (32") på det første stempelelement (32) omfatter et tredie gennemgående hul (32"'), som er forskydeligt i ét stykke dermed langs den anden langsgående akse (Y), idet den anden udløbsåbning (74) og det tredie gennemgående hul (32"') er i stand til indbyrdes at blive frakoblede, når det første stempelelement (32) er i nærheden af den sammentrykte endeposition og indbyrdes at blive sammenkoblede, når det første stempelelement (32) er i nærheden af den udstrakte endeposition, for selektivt at bringe kanalen (71) i fluid forbindelse med det første variable volumenkammer (51) for derved at tilvejebringe en låsningsvirkning på døren imod den lukkede position.

DRAWINGS

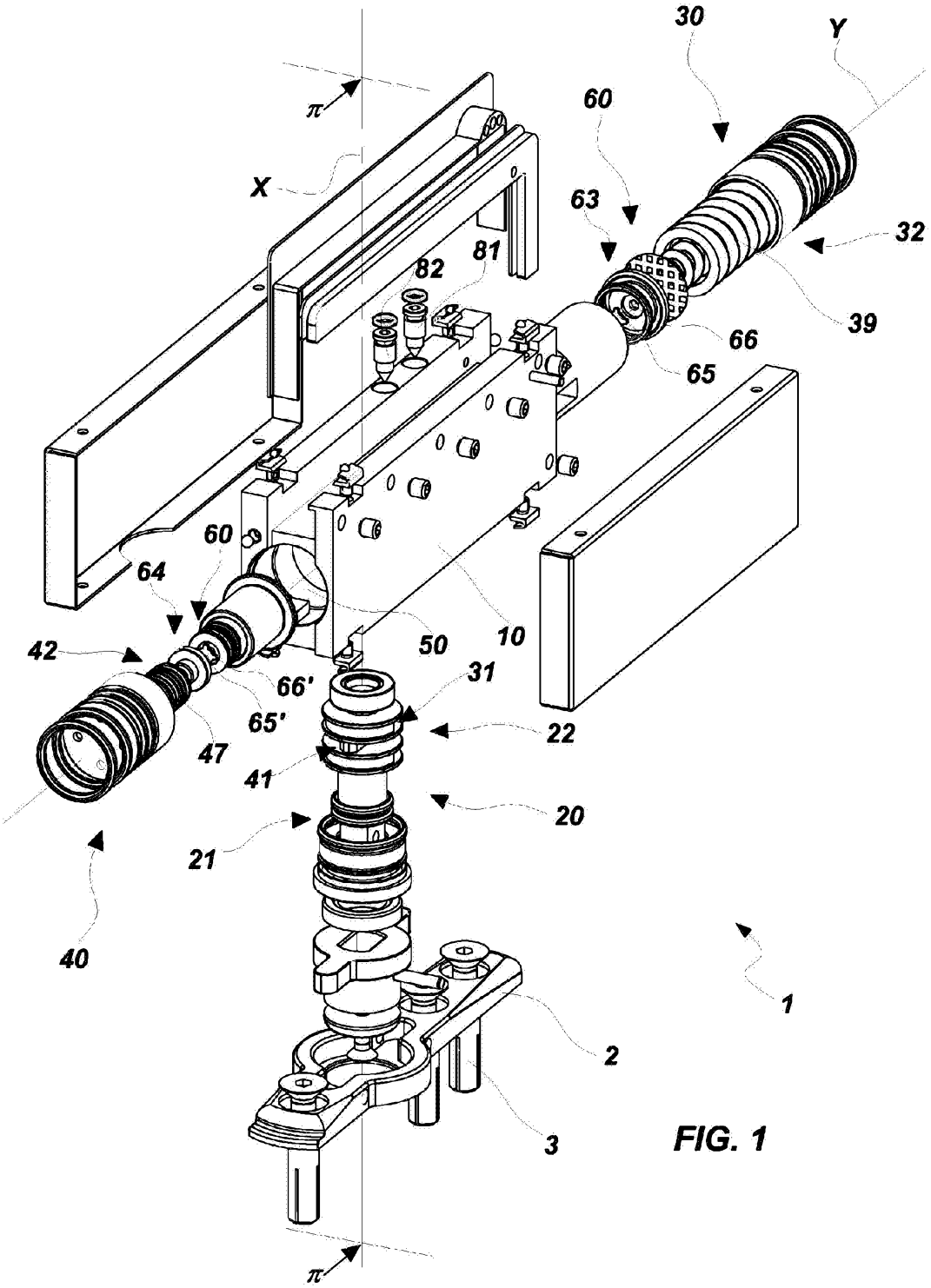


FIG. 1

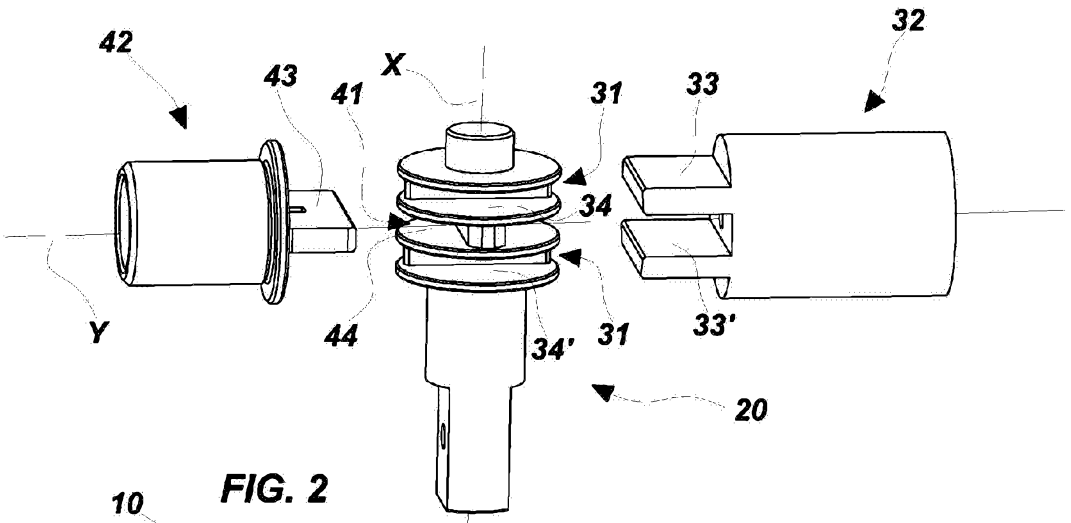


FIG. 2

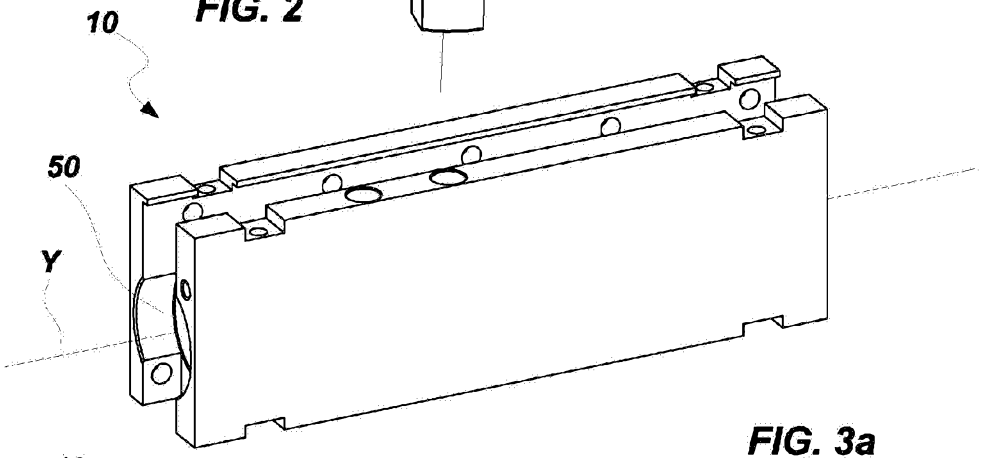


FIG. 3a

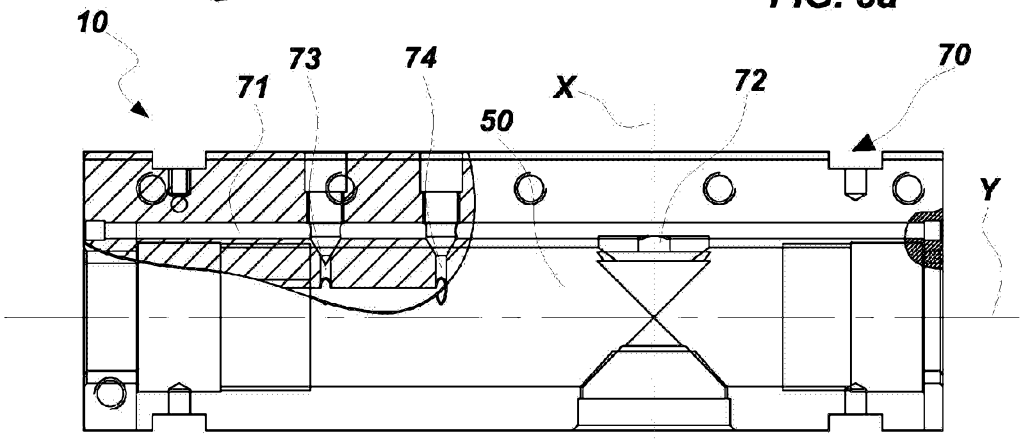


FIG. 3b

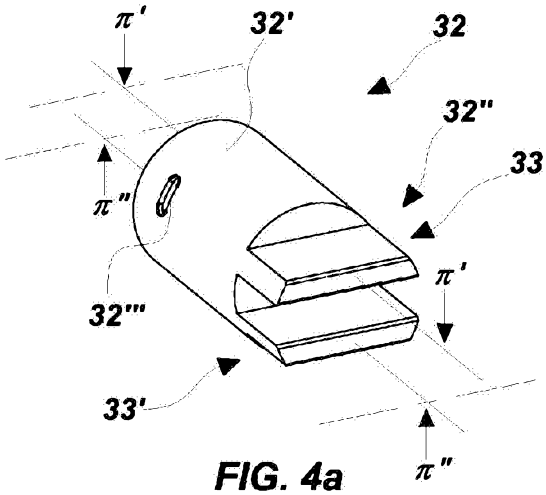


FIG. 4a

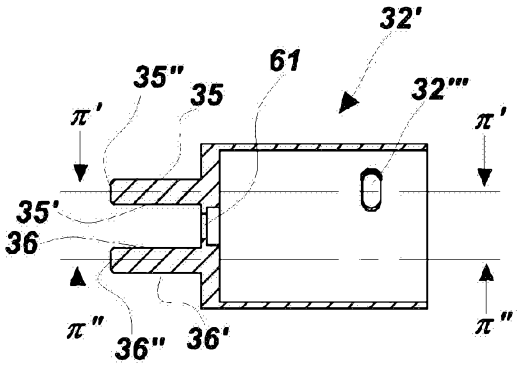


FIG. 4b

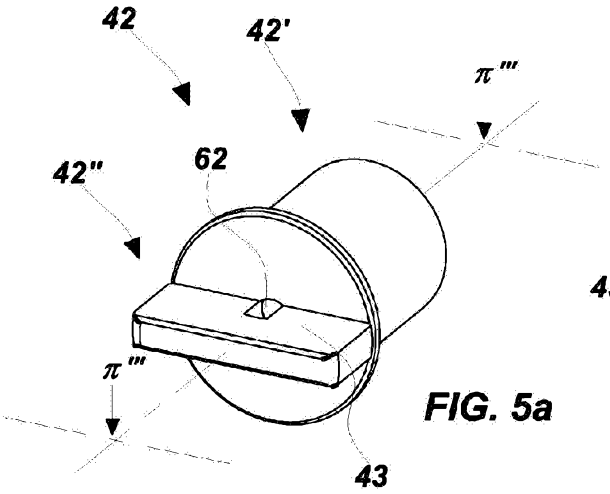


FIG. 5a

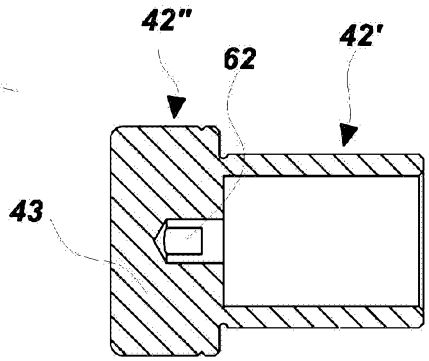


FIG. 5b

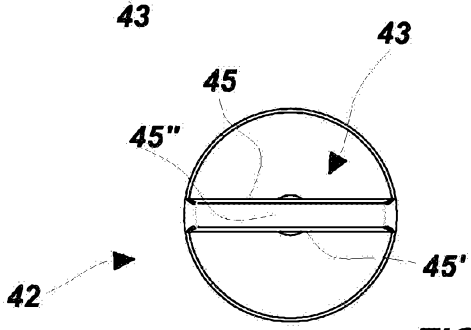


FIG. 5c

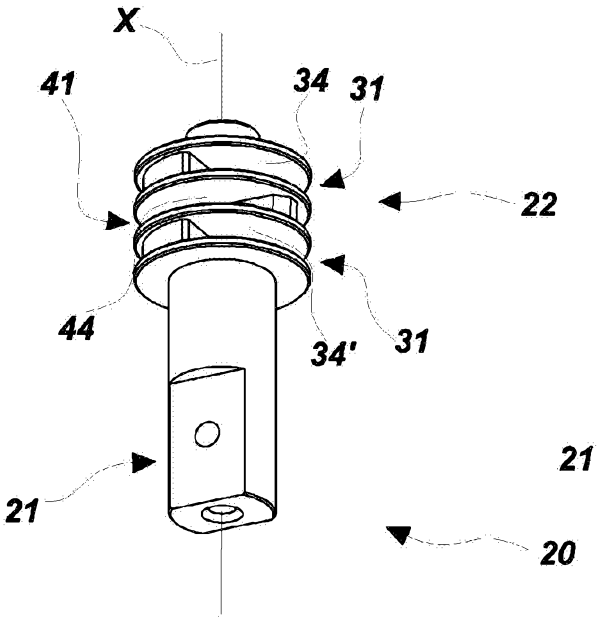


FIG. 6a

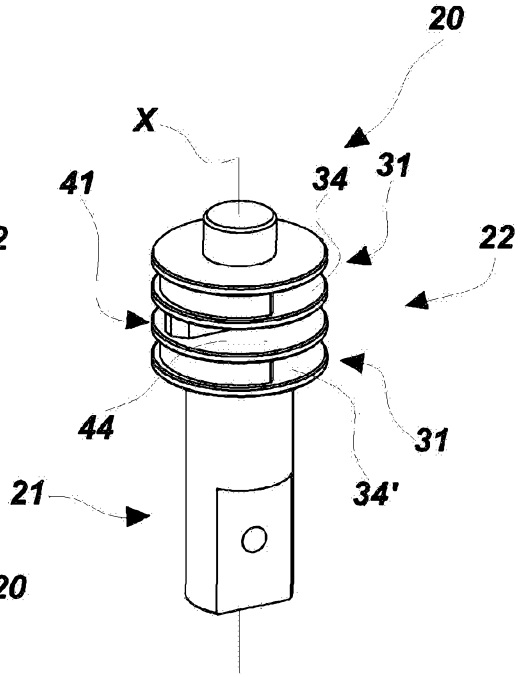


FIG. 6b

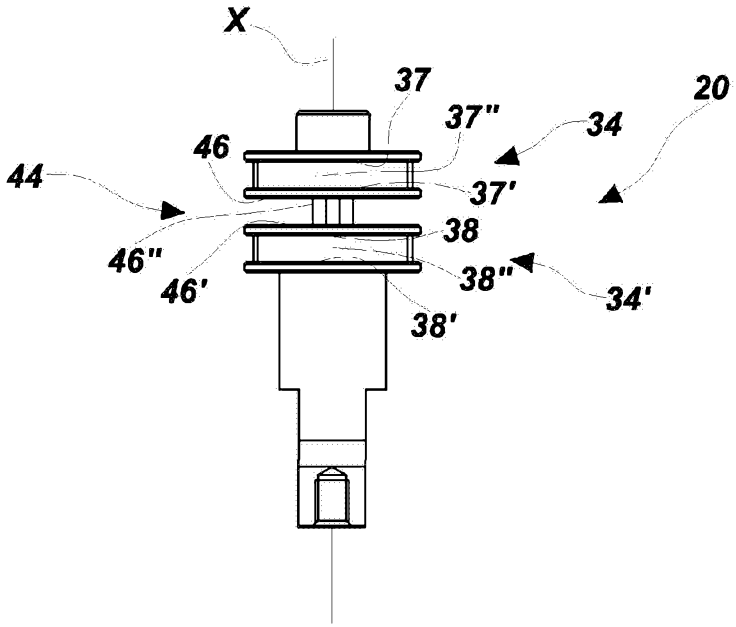
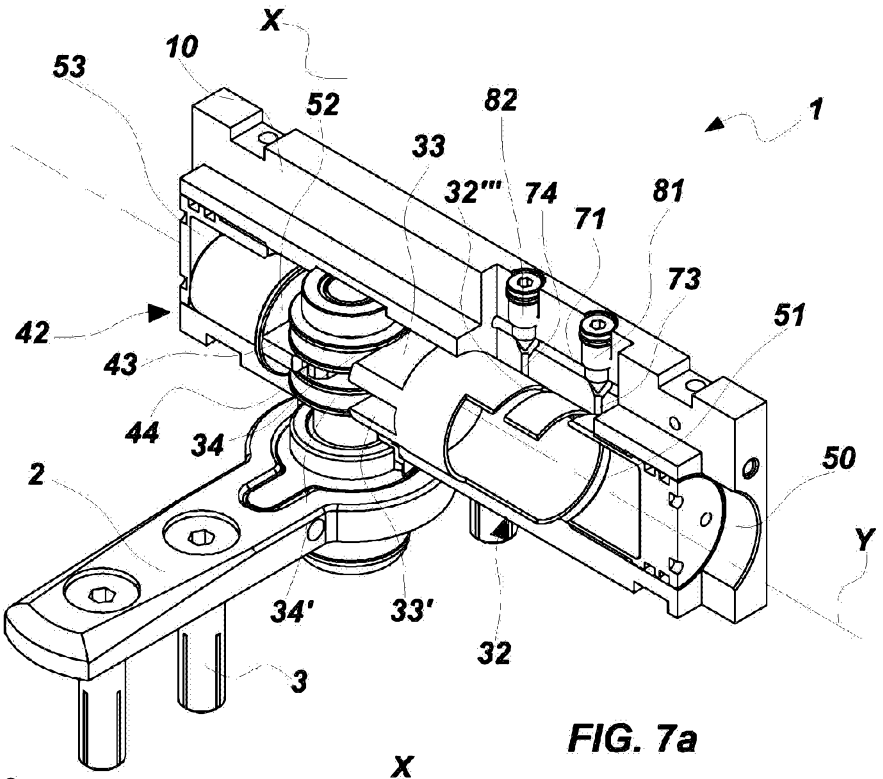


FIG. 6c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73
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43
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FIG. 7a

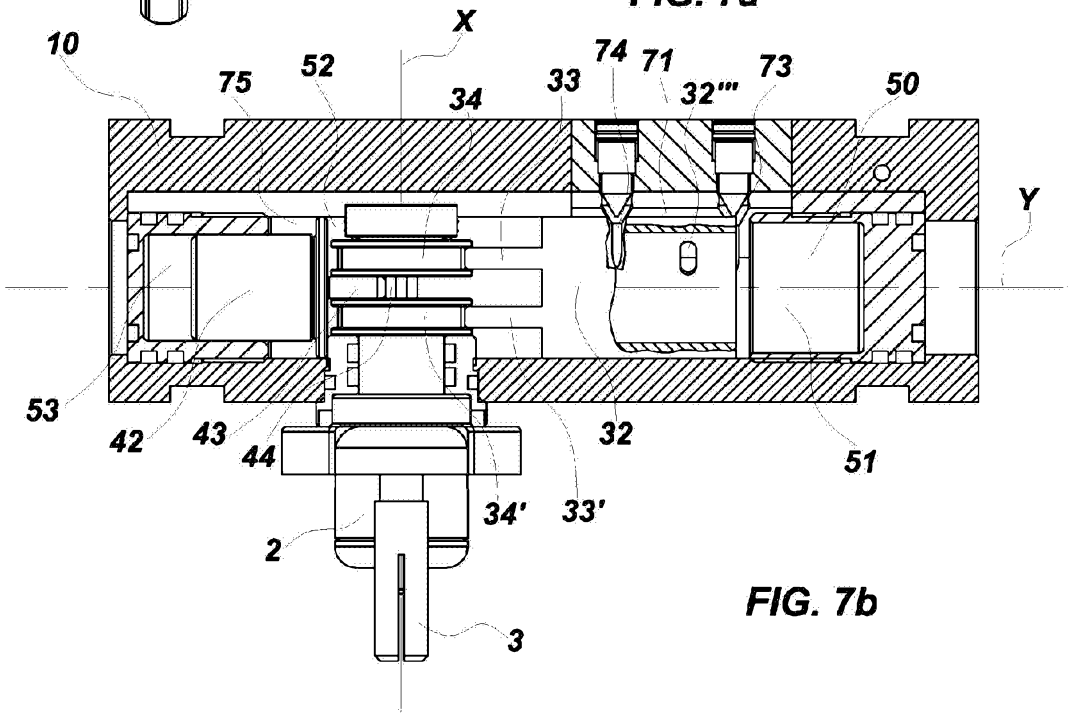
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FIG. 7b

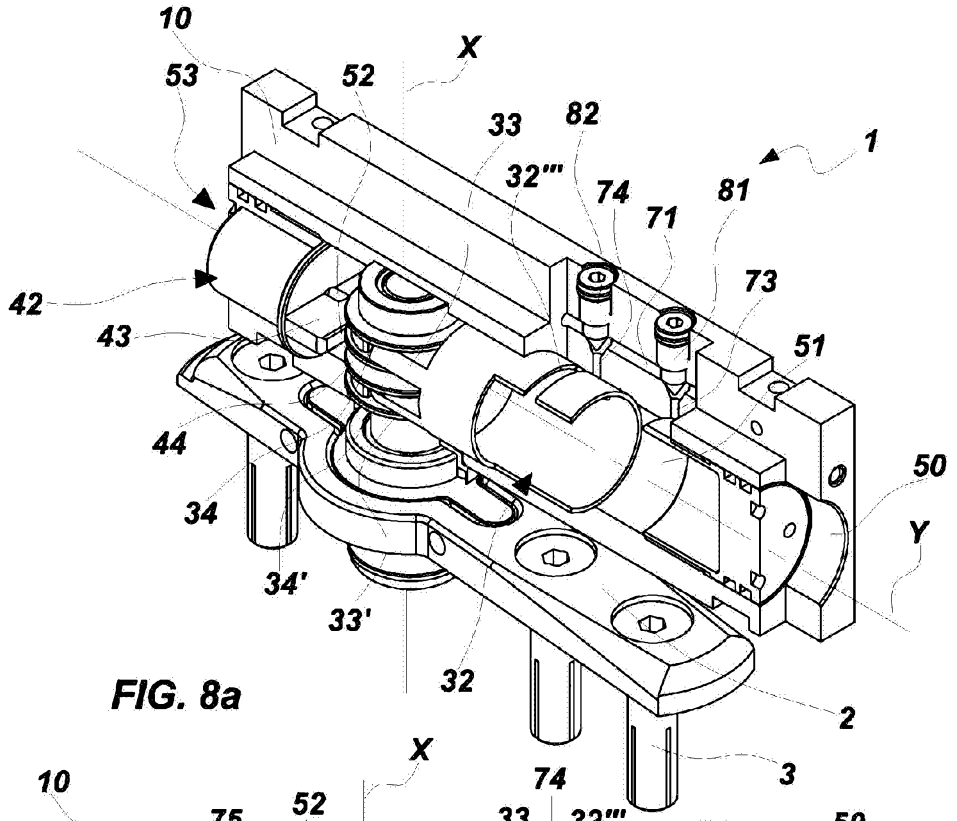
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FIG. 8a

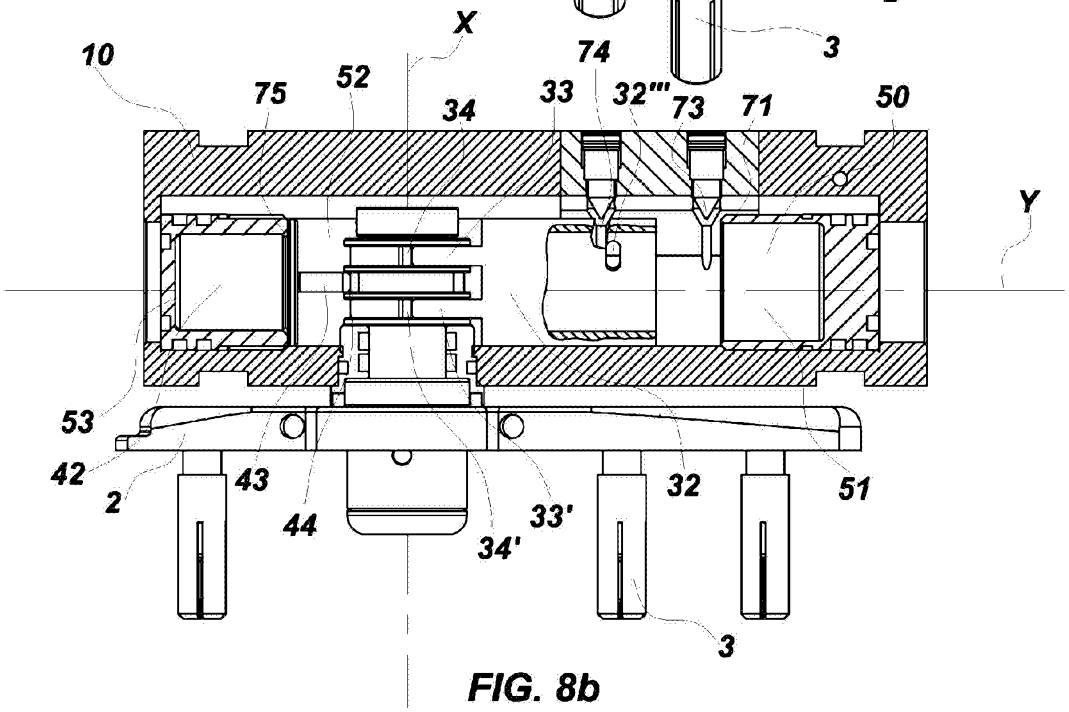
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FIG. 8b

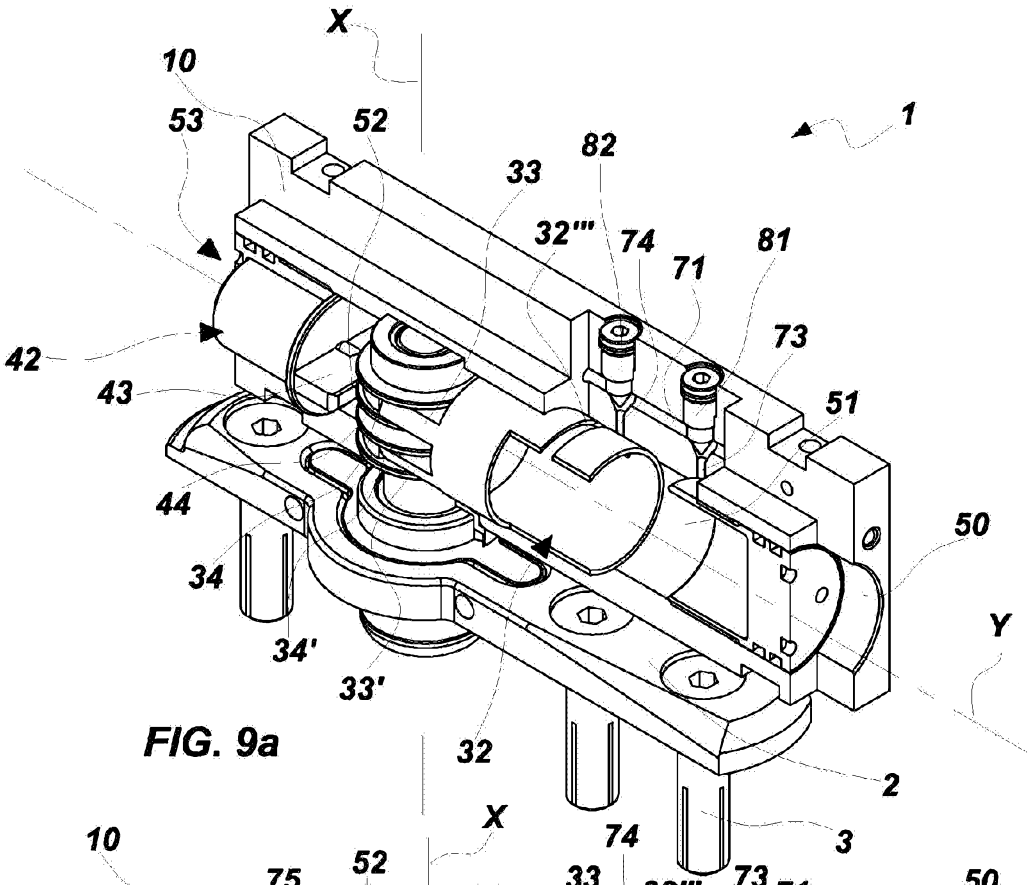
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FIG. 9a

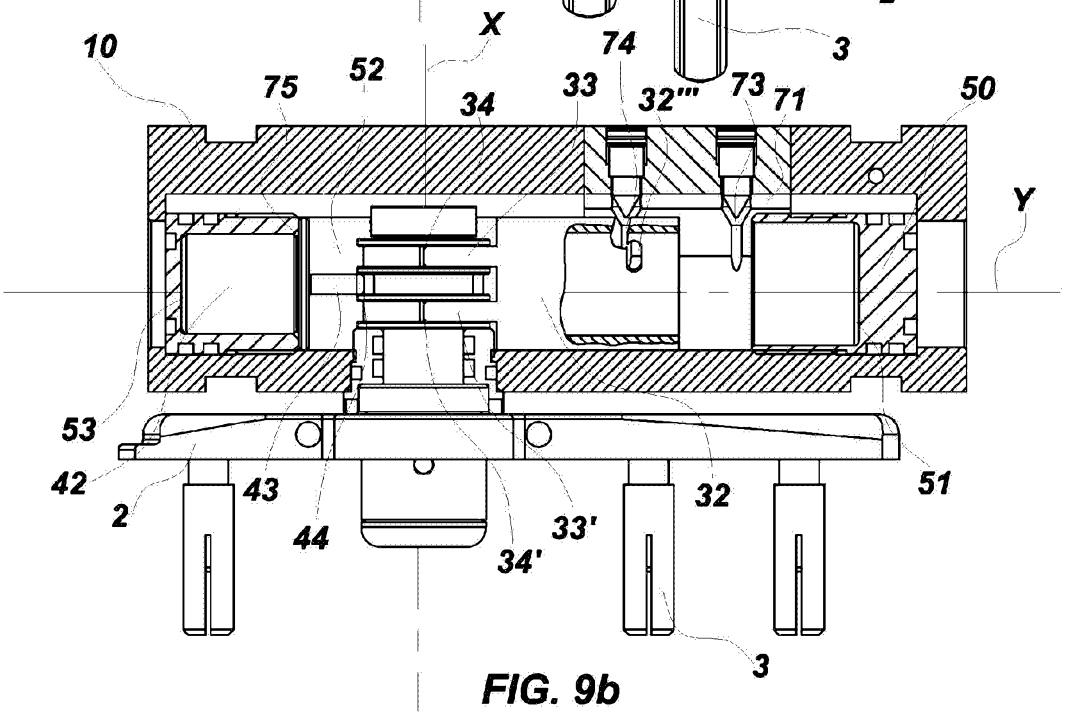
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FIG. 9b