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(54) **HINGE FOR CONTROLLING INCLINED DOORS OR DOOR-LEAVES**

(57) A control hydraulic hinge for cold stores comprising a stationary support structure (**S**) and at least one inclined door-leaf (**A**) moveable between a door-leaf open and door-leaf closed position. The hinge comprises a hinge body (**10**); a pin (**20**) mutually coupled with the hinge body (**10**) to rotate around a first axis (**X**); a cam element (**21**) integrally joined to the pin (**20**); a slider (**31**) slidable along a second axis (**Y**) comprising a cam follower element (**32**) interacting with the cam element (**21**); recovery elastic means (**40**) acting on the slider (**31**) to recover the initial position. The cam follower element (**32**) has a suitable shape, so that the door-leaf (**A**) has a substantially constant opening and/or closing speed.

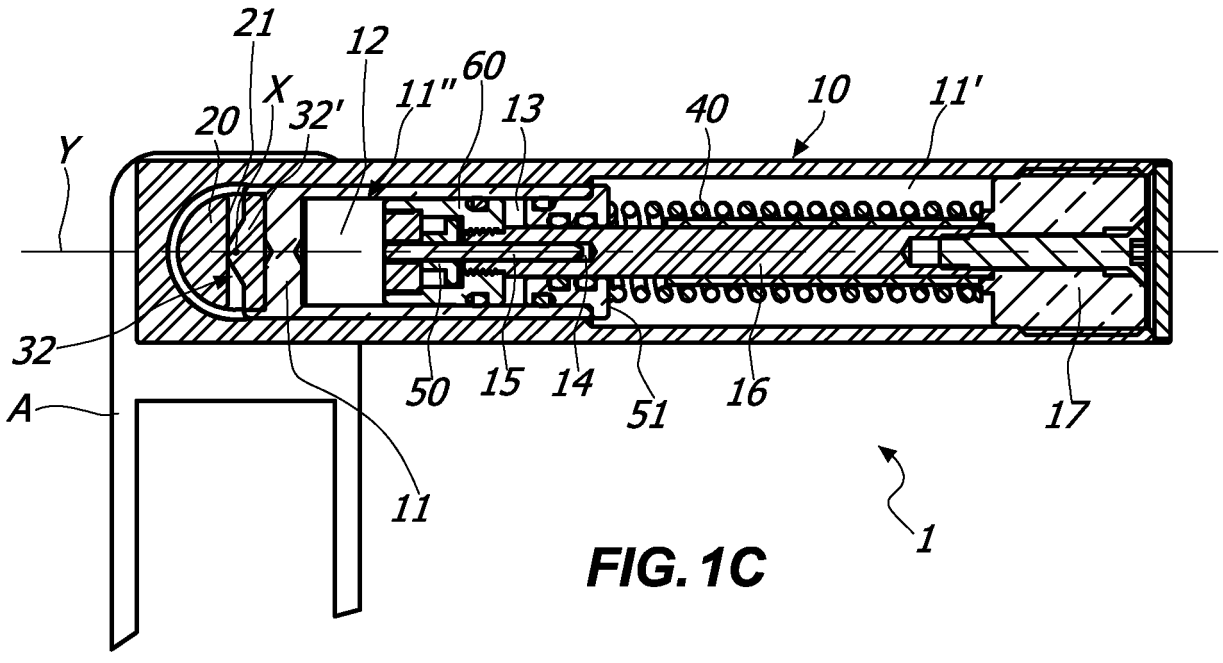

FIG. 1C

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Description

Field of the invention

[0001] The present invention generally regards the technical field of hinges, and it particularly regards a control hinge, in particular for doors, door-leaves and the like of the inclined type.

State of the Art

[0002] As known, the glass door-leaves of refrigerators for the large-scale distribution, such as supermarkets or hypermarkets are relatively heavy, about 20 - 25 kg.

[0003] As of today, such door-leaves are simply hinged to the frame by means of hinges or similar mechanisms. In case of door-leaves mounted on an inclined frame, the components of the force acting on the hinges of the door-leaf change depending on the position of the door-leaf.

[0004] It is clear that unless it is controlled manually, the door ends up banging against the gaskets of the refrigerator when closing, with potential risk of damaging or breaking the same.

[0005] On the other hand, due to the reasons outlined above, the door-leaf is particularly heavy to open.

Summary of the invention

[0006] An object of the present invention is to overcome the aforementioned drawbacks, by providing a control hinge in particular for inclined doors that is highly efficient and relatively economic.

[0007] Another object of the invention is to provide a hinge that allows to control the inclined door-leaf for the entire angular rotation from the opening position to the closing position.

[0008] Another object of the invention is to provide a hinge that allows to have a substantially constant closing speed of the inclined door-leaf for the entire angular rotation from the opening position to the closing position.

[0009] Another object of the invention is to provide a hinge that allows an easy opening of the inclined door-leaf.

[0010] These and other objects that will be more apparent hereinafter, are attained by a hinge according to what is described, illustrated and/or claimed herein.

[0011] The dependent claims describe advantageous embodiments of the invention.

Brief description of the drawings

[0012] Further characteristics and advantages of the invention will be more apparent in light of the detailed description of a preferred but non-exclusive embodiment of a hinge 1, illustrated by way of non-limiting example with reference to the attached drawings, wherein:

FIGS. 1A, 1B and **1C** are respectively a schematic view of an inclined frame **S** mounted on which is a glass door-leaf **A**, a lateral and a cross-sectional view along a line plane *I C - I C* of a first preferred but non-exclusive embodiment of the hinge **1**, wherein the cam element **21** is in the initial position;

FIGS. 2A, 2B and **2C** are respectively a schematic view of an inclined frame **S** mounted on which is a glass door-leaf **A**, a lateral and cross-sectional view along a line plane *II C - II C* of the embodiment of the hinge **1** of FIG. 1, wherein the cam element **21** is in the first intermediate working position;

FIGS. 3A, 3B and **3C** are respectively a schematic view of an inclined frame **S** mounted on which is a glass door-leaf **A**, a lateral and cross-sectional view along a line plane *III C - III C* of the embodiment of the hinge **1** of FIG. 1, wherein the cam element **21** is in the second intermediate working position;

FIGS. 4A, 4B and **4C** are respectively a schematic view of an inclined frame **S** mounted on which is a glass door-leaf **A**, a lateral and cross-sectional view along a line plane *IV C - IV C* of the embodiment of the hinge **1** of FIG. 1, wherein the cam element **21** is in the final position;

FIG. 5 is an enlarged cross-sectional view of the pin **20** and of the slider **31**;

FIG. 6 is an enlarged cross-sectional view of a further embodiment of the pin **20** and of the slider **31**;

FIG. 7 is an enlarged cross-sectional view of a further embodiment of the pin **20** and of the slider **31**;

FIGS. 8A and **8B** are cross-sectional views of a further preferred but non-exclusive embodiment of the hinge **1**, respectively in door-open and door-closed position.

Detailed description of a preferred embodiment

[0013] With reference to the aforementioned figures, the hinge according to the invention, indicated in their entirety with number **1**, can advantageously be used with closing elements **A** mounted inclined on a support structure **S**.

[0014] For example, as illustrated in FIGS. 1A, 2A, 3A and 4A, the hinge **1** may be applied to cold stores with inclined doors, or it can be integrated in the tubular frame thereof.

[0015] In a further example, the hinge **1** may be applied to glass door-leaves, such as those of a display window or display case.

[0016] Generally, the hinge **1** is suitable for rotatably coupling a stationary support structure, for example a tubular frame **S**, and a closing element, for example a door-leaf **A**, rotatably movable between an opening position, illustrated for example in FIG. 1A, and a closing position, illustrated for example in FIG. 4A, around a rotation axis **X**.

[0017] It should be observed that even though hereinafter reference shall be made to the frame **S** and the door-leaf **D**, the hinge **1** is applicable to any stationary

support structure and any closing element, even though not necessarily inclined, without departing from the scope of protection of the attached claims.

[0018] Suitably, the hinge **1** may be a control or hydraulic brake hinge for hydraulically damping the opening or closing displacement of the door-leaf **A**. However, the hinge **1** may hydraulically brake the closing displacement of the door-leaf **A**.

[0019] It is clear that even though reference hereinafter will be made to the hinge **1** as acting as a closing control or hydraulic brake hinge, it may also act as an opening control or hydraulic brake hinge without departing from the scope of protection of the attached claims.

[0020] The hinge **1** may include a hinge body **10**, may be substantially sheet-like defining a plane, and a pin **20** defining the rotation axis **X**.

[0021] It is clear that the closing element **A** and the stationary support structure **S** may also rotate around an axis parallel to the axis **X** without departing from the scope of protection of the attached claims.

[0022] In a preferred but non-exclusive embodiment, the hinge body **10** may be anchored to the frame **S** and the pin **20** to the door-leaf **A**. In such case, the pin **20** may be movable, while the hinge body **10** may be fixed.

[0023] On the other hand, the pin **20** may be fixed and the hinge body **10** may be movable without departing from the scope of protection of the attached claims.

[0024] Advantageously, the hinge body **10** and the pin **20** may be mutually coupled to rotate around the axis **X** between the door-leaf open **A**, illustrated for example in FIG. 1A, and the door-leaf closed position **A**, illustrated for example in FIG. 4A.

[0025] In the preferred but non-exclusive embodiment illustrated in the attached figures, the hinge **1** may open in both directions of rotation of the pin **20**. However, it is clear that the hinge may also open in a single direction of rotation without departing from the scope of protection of the attached claims.

[0026] Suitably, the pin **20** may include a cam element **21** integrally joined thereto interacting with a slider **11** slidable along an axis **Y** defined by the working chamber **11**' inside the hinge body **10**.

[0027] Such axis **Y** may be substantially perpendicular to the axis **X**. It is clear that the axes **X** and **Y** may also be parallel without departing from the scope of protection of the attached claims.

[0028] In any case, the slider **11** may slide in the hinge body **10** between a retracted end-stop position proximal to the bottom cap **17**, illustrated for example in FIG. 1C, and an extended end-stop position distal therefrom, illustrated for example in FIG. 4C.

[0029] Such retracted and extended end-stop positions may suitably vary, and not necessarily corresponding to the maximum distal and/or proximal position that can be taken by the slider **11**.

[0030] In the preferred but non-exclusive embodiment illustrated in FIGS. 1A to 4C, a hydraulic chamber **11"** filed with oil or other hydraulic damping fluid may be provided for inside the slider **11**.

[0031] The hydraulic chamber **11"** may be configured according to the disclosures of the international patent application number PCT/IB2015/050603, on behalf of the Applicant. Furthermore, such application illustrates the operation of the hydraulic chamber **11"** and the relative components.

[0032] In particular, according to such disclosures the hydraulic chamber **11"** may include a cylinder **60**, which may be fixed to the hinge body **10** by means of the rod **16**.

[0033] It is clear that even though described in the present application is a hinge **1** in which the hydraulic chamber **11"** is slidable and the cylinder **60** is stationary, the opposite may also apply, i.e. the cylinder may slide with respect to the working chamber, without departing from the scope of protection of the attached claims.

[0034] According to the disclosures of the international patent application number PCT/IB2015/050603, the cylinder **60** may divide the hydraulic chamber **11"** into a first and a second variable volume compartment **12**, **13**, placed in fluid communication with each other and preferably adjacent. The working fluid may circulate in a hydraulic circuit inside the hydraulic chamber **11"**, and more in particular it may flow from one to the other of the compartments **12**, **13** through a calibrated passage obtained by interference between the hole **14** and valve pin **15**. Valve means **50** for controlling the through-flow of the working fluid between the two compartments **12**, **13** may be present.

[0035] The hydraulic chamber **11**' and the relative components therein may define hydraulic damping means, as better outlined hereinafter.

[0036] In a preferred but non-exclusive embodiment of the invention, elastic means **40**, mutually interacting with the slider **11** may be provided for inside the hinge body **10**.

[0037] Advantageously, the elastic counteracting means may include, respectively may consist of, a spiral spring **40** with predetermined diameter.

[0038] Even though hereinafter reference will be made to a spiral spring **40** only, it is clear that any elastic means may be used, just like one or more elastic elements may be used, without departing from the scope of protection of the attached claims.

[0039] Suitably, the elastic means **40** may be recovery means, i.e. having a force such to return the slider **11** from the proximal position to the distal position but not closing or opening the door-leaf **A**.

[0040] However, the recovery elastic means **40** may advantageously be configured and/or dimensioned so as to push the door-leaf **A** towards the open or closed position, so as to facilitate the user opening or closing the door-leaf **A** manually.

[0041] In a preferred but non-exclusive embodiment, the spiral spring **40** may be fitted onto the rod **16**, which may possibly serve as a guide for the same.

[0042] Once the spiral spring **40** has been fitted onto the rod **16**, the spring **40** will remain interposed between the bottom cap **17** of the hinge body **10** and the rear face

51 of the slider **31**, which will act as an abutment face for the spring **40**.

[0043] On the other hand, the slider **11** may include a cam follower element **32**' with an operative face **32** and thus interacting with the cam element **21** so that the rotation of the latter around the axis **X** promotes the sliding of the slider along the axis **Y**.

[0044] Advantageously, the cam element **21** may be substantially flat. More in particular, in the initial position for example illustrated in FIG. 1C the substantially flat cam element **21** may be substantially perpendicular to the axis **Y**, while in the final position illustrated for example in FIG. 4C it may be substantially parallel to the axis **Y**.

[0045] The operative face **32** may have a suitable shape, which will allow to control the closing of the door-leaf **A** from the full opening position illustrated for example in FIG. 1A to the closing position illustrated for example in FIG. 4A.

[0046] In particular, thanks to the particular shape of the operative face **32**, the door-leaf **A** may close at a substantially constant speed, thus that is without banging against the frame **S**.

[0047] The presence of the spring **40** dimensioned as mentioned above will facilitate the opening of the door-leaf **A** by the user. As a matter of fact **40**, thanks to the spring the apparent weight of the opening door-leaf **A** will be lesser than the actual weight, i.e. the weight that the user would be required to overcome without the spring.

[0048] Suitably dimensioning the spring **40** will allow to reduce the actual weight of the opening door-leaf **A** up to by 50% of the weight thereof.

[0049] Generally, the operative face **32** may have an operative portion **33** with at least one first section **35**' and **35"**.

[0050] The latter may be equal to each other. In particular, the configuration of the operative face **32** may be symmetrical with respect to the axis **Y**, so that the hinge **1** behaves in the same way in both directions of rotation of the pin **20**.

[0051] However, it is clear that the sections **35**', **35"** of the operative face **32** may be configured differently with respect to each other without departing from the scope of protection of the attached claims.

[0052] Likewise, it is clear that in case of a hinge opening in only one direction of rotation of the pin **20** the operative face **32** may include a single section **35**' or **35"** without departing from the scope of protection of the attached claims.

[0053] The sections **35**', **35"** may be substantially flat and preferably inclined with respect to the axis **Y**. More in particular, the inclination may be divergent with respect to the axis **Y** in the direction of the bottom cap **17**.

[0054] It is clear that, depending on the needs, such sections may for example be slightly curved, without departing from the scope of protection of the attached claims.

[0055] Advantageously, the operative portion **33** may include a second section **36** interposed between the first sections **35**', **35"**.

[0056] Suitably, the section **36** may be substantially flat. Thus, it may cooperate with the substantially flat cam element **21** in the initial position so as to keep the hinge in the closed position, for example as illustrated in FIG. 1A.

[0057] It is clear that in case of a hinge opening in a single direction of rotation of the pin **20**, the portion **33**, which will not necessarily be in a central position with respect to the cam follower element but for example in a peripheral position, may include only one inclined section and a top section.

[0058] Furthermore, depending on the needs, the first sections and the second section may not be necessarily flat, but slightly curved for example.

[0059] The flat or curved top section could also be absent, and it could reduce at a point.

[0060] As particularly illustrated in FIGS. 1A to 4C, during the closing rotation of the door-leaf **A** the cam element **21** and the cam follower element **32**' interact mutually.

[0061] More in particular, as particularly illustrated in FIGS. 1A to 2C, starting from the fully opened position of the door-leaf **A** illustrated in FIG. 1A, the cam element **21** will rotate around the axis **X** for a first angular section to pass from the initial position (FIG. 1C) to an intermediate working position (FIG. 2C) in which the central portion **22** thereof tilts in the central portion **33** of the operative face **32**.

[0062] Such rotary movement brings the end portion **23"** of the cam element **21** to contact with the end **37"** of the lateral portion **34"** of the cam element **32**'. The distance **d1** taken along the axis **Y** between the central portion **36** and the end **37"** will define the aforementioned first angular rotation section, which - in the preferred but non-exclusive embodiment illustrated in the attached figures - may be of about 20°.

[0063] During such rotation the slider **11** will remain stationary with respect to the hinge body **10**, so that the corresponding rotation of the door-leaf **A** is substantially free, i.e. non-braked.

[0064] Subsequently, the cam element **21** will continue to rotate around the axis **X** for a further second angular section, which may for example be of about 40°. Such movement will bring the cam element **21**, along with the door-leaf **A**, from the first intermediate working position (FIG. 2C) to a second intermediate working position (FIG. 3C).

[0065] During such second rotation step, the end portion **23"** of the cam element **21** may exclusively rest against the lateral portion **34"** of the cam element **32**', up to impacting against the central portion **33**.

[0066] Thus, the second rotation step of the cam element **21** will displace the slider **11** along the axis **Y**, promoting the through-flow of the working fluid from compartment **12** to compartment **13** through the calibrated passage defined between the hole **14** and the valve pin **15**. Thus, the movement of the door-leaf **A** around the

axis **X** will be hydraulically damped with a first predetermined resistance strength.

[0067] The length of the lateral portion **34"** of the cam element **32**' against which the end portion **23"** of the cam element **21** rests, i.e. substantially the distance **d2** between the ends **37**' and **37"**, may define the second angular section of the rotation of the door-leaf **A**.

[0068] Subsequently, the cam element **21** will continue to rotate around the axis **X** for a further third angular section, which may for example be of about 30°. Such movement will bring the cam element **21**, along with the door-leaf **A**, from the second intermediate working position (FIG. 3C) to the final position (FIG. 4C).

[0069] During the third rotation step, the end portion **23"** of the cam element **21** may exclusively rest against the central portion **33** of the cam follower element **32**', and more in particular against the section **35"** thereof.

[0070] The length of the latter, i.e. substantially the distance **d3** between the ends **37**' and **37"'**, may define the third angular section of the rotation of the door-leaf **A**.

[0071] Given the particular conformation of the central portion **33**, such rotary movement will considerably increase the pressure of the working fluid inside the hydraulic chamber **11"** with respect to the pressure that develops during the second rotation step. Thus, the movement of the door-leaf **A** around the axis **X** will be hydraulically damped with a second resistance strength greater than the first resistance strength which develops during the second rotation step.

[0072] Thanks to the mutual configuration of the cam elements **21** and cam follower elements **32** mentioned above, the closing rotation of the door-leaf **A** may occur at a substantially constant speed.

[0073] In a preferred but non-exclusive embodiment, the cam element **21** may have a predetermined distance **d5** from the axis **X**.

[0074] In this manner, the central portion **33** in the final portion (FIG. 4C) will act against the cam element **21** to force the closing door-leaf **A** against the frame **S**. Such configuration may be particularly useful to promote the mutual interaction between the cam element **21** and the cam follower element **32'** substantially for the entire opening and/or closing rotation of the door-leaf **A**.

[0075] In the embodiment described above, the damping means that supply the resistance strength to the weight force **A** during the rotation are of the hydraulic type.

[0076] In an alternative embodiment, for example illustrated in FIGS. 8A and 8B, the damping means that supply the resistance strength to the weight force of the door-leaf **A** during the rotation may be of the mechanical type.

[0077] More in particular, such mechanical damping means may include or consist of a compression spring **40**'.

[0078] Such spring may have characteristics such to supply the aforementioned resistance strength. More in particular, the compression spring **40**' may have a high rigidity, for example of at least 10 Kgf / mm.

[0079] In the present document, the expression rigidity of a compression spring is used to indicate the force required to compress the length unit, for example expressed in kilogram-force per compression millimetre of the spring.

[0080] The slider **11** may be defined by a solid cylinder which includes the cam follower element **32**'.

[0081] The spring **40**' may be interposed between the slider **11** and the hinge body **10**. More in particular, the spring **40**' may be interposed between the slider **11** and the bottom cap **17** of the latter. The working chamber **11**' may be without the rod **16**.

[0082] All the other characteristics of the embodiment of the hinge **1** of FIGS. 8A and 8B may be identical to those of the embodiment of the hinge **1** of FIGS. 1A to 4C. In particular, the configuration of the cam element **21** and that of the cam follower element **32**' may be identical.

[0083] The operation may also be substantially be the same one described above, except for the fact that the resistance strength is given by the progressive compression of the spring **40**'.

[0084] In light of the above, it is clear that the hinge according to the invention attains the pre-set objectives.

[0085] The hinge according to the invention is susceptible to numerous modifications and variants all falling within the inventive concept outlined in the attached claims. All details can be replaced by other technically equivalent elements, and the materials can be different depending on the technical needs, without departing from the scope of protection of the invention.

[0086] Even though the hinge has been described with reference to the attached figures, the reference numbers utilised in the description and in the claims are meant for improving the intelligibility of the invention and thus do not limit the claimed scope of protection in any manner whatsoever.

Claims

1. A hinge for the opening and/or closing control of a closing element (**A**) anchored to a stationary support structure (**S**), such as a wall, a frame or a floor, in particular for inclined doors or door-leaves (**A**), the hinge comprising:

- a hinge body (**10**) anchorable to one of the closing element (**A**) and the stationary support structure (**S**) said hinge body (**10**) internally comprising at least one working chamber (**11**') defining a first longitudinal axis (**Y**);
- a pin (**20**) defining a second longitudinal axis (**X**) anchorable to the other of the closing element (**A**) and the stationary support structure (**S**), said pin (**20**) and said hinge body (**10**) being mutually coupled to each other to rotate relatively with respect to each other around said second

axis (**X**) or around an axis parallel thereto;
- at least one slider element (**11**) inserted in said at least one working chamber (**11**');

wherein said pin (**20**) includes a cam element (**21**) integrally rotatable therewith, said slider element (**11**) comprising a cam follower element (**32**') interacting with said cam element (**21**) so that during said opening and/or closing mutual rotation between said pin (**20**) and said hinge body (**10**) around said second axis (**X**) corresponds to the sliding of said slider element (**11**) along said first axis (**Y**), damping means being provided for mutually interacting with said slider element (**11**) during the displacement thereof;
wherein said cam follower element (**32**') has at least one first operative portion (**33**) with a first end area (**37**') proximal to said second axis (**X**) and a second opposite end area (**37"**) distal therefrom, said cam element (**21**) having at least one second operative portion (**22**) and at least one third operative portion (**23"**) mutually configured so that during said mutual opening and/or closing rotation between said pin (**20**) and said hinge body (**10**) around said second axis (**X**):

- for a first angular section, said at least one second operative portion (**22**) rotates on said first end area (**37**') from an initial working position to a first intermediate working position wherein said at least one third operative portion (**23"**) comes into contact with said second end area (**37"**), so that said slider element (**11**) remains substantially stationary and so that the rotation of the closing element (**A**) is substantially non-braked;
- for a second angular section, said cam element (**21**) rotates around said second axis (**X**) exclusively with said at least one third operative portion (**23"**) in contact with said at least one first operative portion (**33**) to pass from said first intermediate working position to a final working position wherein said at least one third operative portion (**23"**) is in proximity or in contact with said first end area (**37**'), so as to promote the sliding of said slider element (**11**) along said first axis (**Y**) and the consequent damping of the rotation of the closing element (**A**) with a predetermined resistance strength.

2. Hinge according to claim 1, wherein said first and second end areas (**37**', **37"**) have a first mutual distance (**d1**) along said first axis (**Y**) defining said first angular section.

3. Hinge according to claim 1 or 2, wherein said first and second end areas (**37**', **37"**) have a second distance (**d2**) defining said second angular section of the rotation of said cam element (**21**).

4. Hinge according to claim 1, 2 or 3, wherein said at least one first operative portion (**33**) has at least one first section (**35**', **35"**) substantially inclined with respect to said first axis (**Y**), said at least one first section (**35**', **35"**) being interposed between said first and second end areas (**37**', **37"**), said at least one first section (**35**', **35"**) being preferably flat or slightly curved.

5. Hinge according to any one of the preceding claims, wherein said cam element (**21**) is substantially flat or slightly curved, said flat or slightly curved cam element (**21**) in said initial position being preferably substantially perpendicular to said first axis (**Y**) and in said final position it is substantially parallel to said first axis (**Y**).

6. Hinge according to claim 5, wherein said at least one first operative portion (**33**) has at least one second section (**36**) adjacent to said at least one first section (**35**', **35"**) which includes or which defines said first end area (**37**'), said second section (**36**) being substantially counter-shaped with respect to said cam element (**21**) so as to cooperate therewith to keep the hinge in the closed and/or open position in said initial position.

7. Hinge according to any one of the preceding claims, wherein said at least one first operative portion (**33**) has at least one third section (**34**', **34"**) adjacent to said at least one first section (**35**', **35"**) which includes or which defines said second end area (**37"**), said at least one third operative portion (**23"**) during said second angular section coming in contact first with said third section (**34**', **34"**) and then with said first section (**35**', **35"**) of said cam follower element (**32**'), said at least one third section (**34**', **34"**) preferably being substantially inclined with respect to said at least one first section (**35**', **35"**) so that the first resistance strength due to the interaction between said at least one third operative portion (**23"**) and said third section (**34**', **34"**) is different with respect to the second resistance strength due to the interaction between the at least one third operative portion (**23"**) and said first section (**35**', **35"**), said second resistance strength preferably being greater than said first resistance strength.

8. Hinge according to the preceding claim, wherein said at least one third section (**34**', **34"**) of said cam follower element (**32**') is substantially flat, said at least one third section (**34**', **34"**) being preferably substantially perpendicular to said first axis (**Y**).

9. Hinge according to claim 7 or 8, wherein said at least one first operative portion (**33**) has a third end area (**37"**) interposed between said at least one third section (**34**', **34"**) and at least one first section (**35**', **35"**),

said second and third end areas (**37"**, **37"'**) having a third distance (**d3**) defining the portion of said second angular section wherein the rotation of the closing element (**A**) is hydraulically damped with said first resistance strength, said first and third end areas (**37**', **37"'**) having a fourth distance (**d4**) defining the portion of said second angular section wherein the rotation of the closing element (**A**) is damped with said second resistance strength.

10. Hinge according to one or more of the preceding claims, wherein said cam element (**21**) and said cam follower element (**32**) are mutually configured so that during said mutual opening and/or closing rotation the speed of said closing element (**A**) is substantially constant.

11. Hinge according to any one of the preceding claims, wherein said cam element (**21**) has a fifth predetermined distance (**d5**) from said second axis (X), so as to interact with said cam follower element (**32**') substantially for the entire opening and/or closing rotation of said closing element (**A**).

12. Hinge according to any one of the preceding claims, further comprising recovery elastic means (**40**) acting on said slider element (**11**) to return it to its initial position subsequently to said mutual opening and/or closing rotation.

13. Hinge according to any one of the preceding claims, wherein said damping means are of mechanical type and include at least one compression spring (40'), the latter preferably having a rigidity of at least 10 Kgf / mm.

14. Hinge according to any one of claims 1 to 12, wherein said damping means are of the hydraulic type and include:

- a hydraulic damping fluid, preferably oil;
- a hydraulic circuit (**12**, **13**, **14**) in which said hydraulic damping fluid circulates;
- control means (**50**) inserted in said hydraulic circuit (**12**, **13**, **14**) to control the circulation of said hydraulic damping fluid during the displacement of said slider element (**11**);

so as to hydraulically damp the mutual opening and/or closing rotation of said pin (**20**) and of said hinge body (**10**).

15. A system comprising:

- a stationary support structure (**S**), such as for example a wall, a frame or a floor;
- at least one closing element (**A**) rotatably mounted on said stationary support structure (**S**) to rotate around a rotation axis (**X**), said stationary support structure (**S**) being configured so that said rotation axis (**X**) is inclined with respect to a vertical axis;
- at least one hinge (**1**) interposed between said stationary support structure (**S**) and said at least one closing element (**A**), said at least one hinge (**1**) being the control hinge according to one or more of the preceding claims.

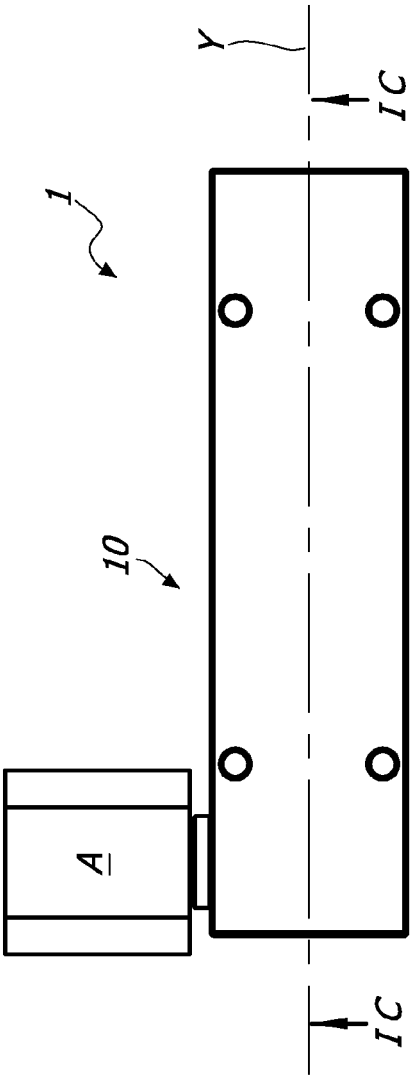


FIG. 1B

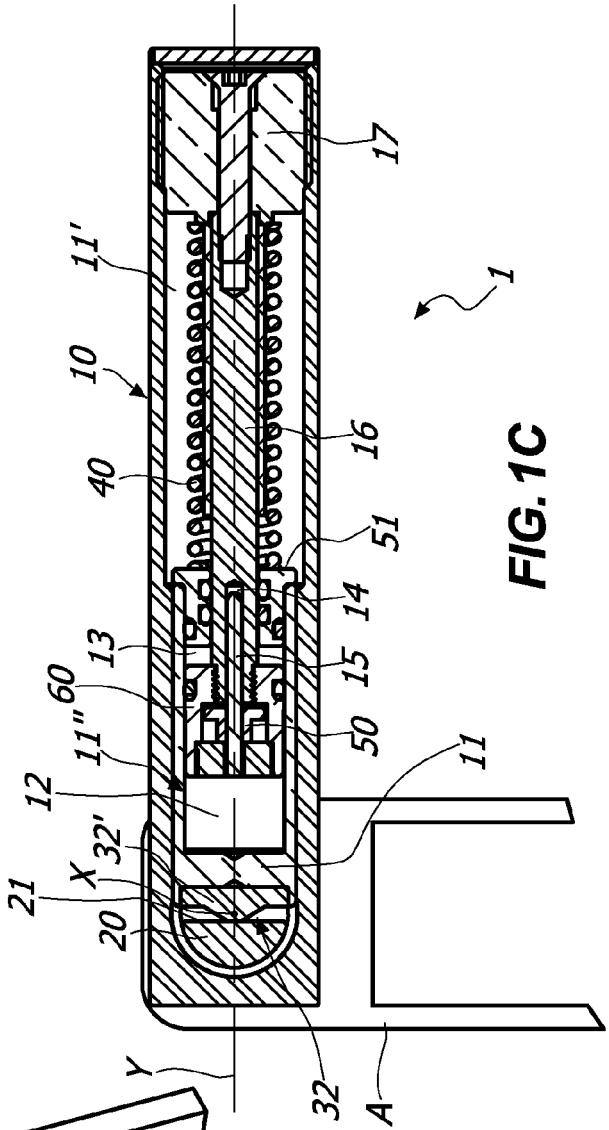


FIG. 1C

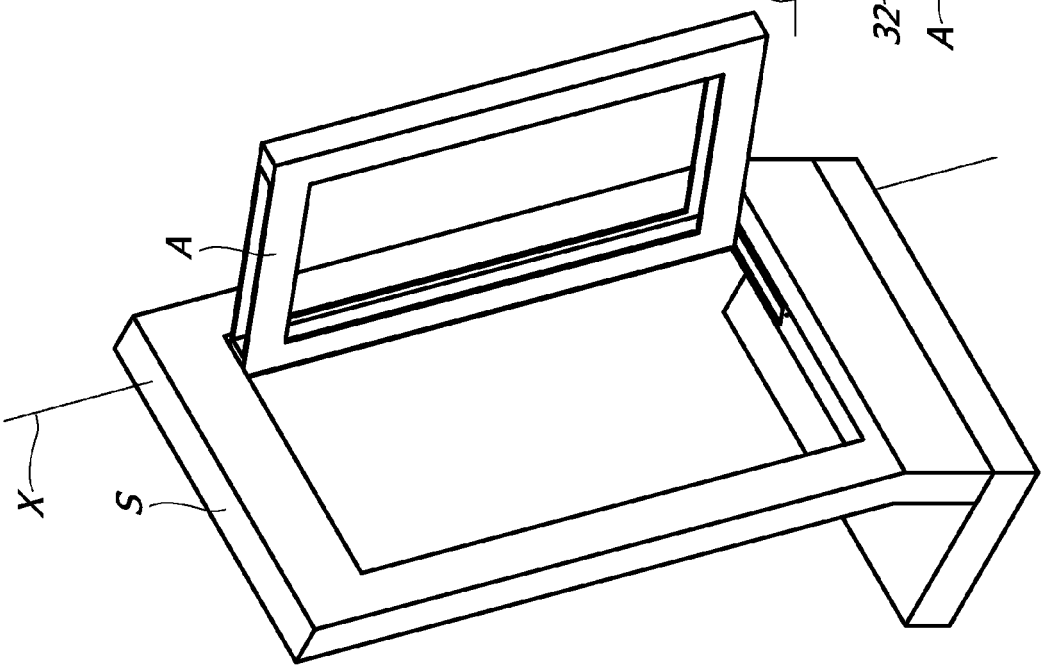
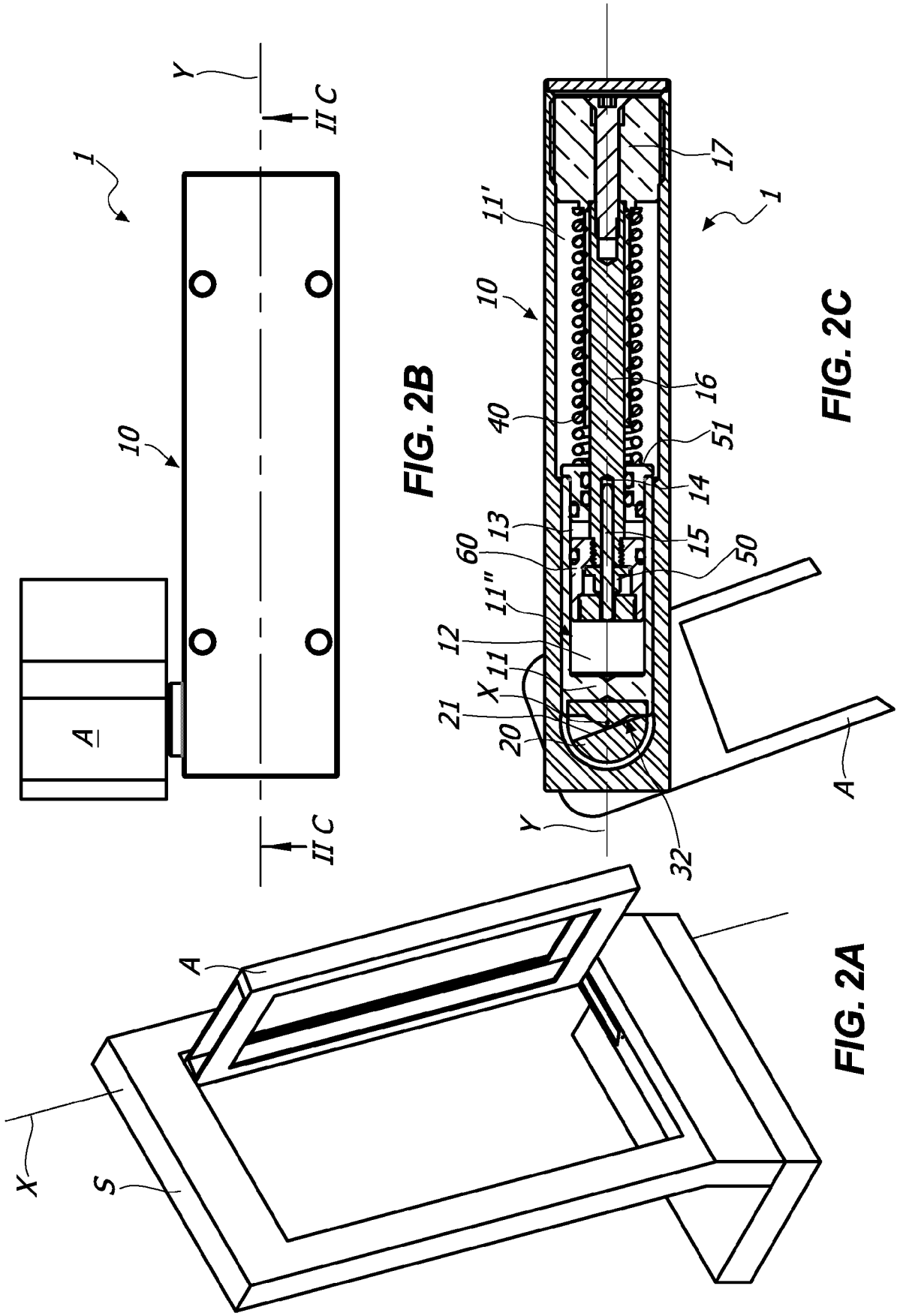


FIG. 1A


1
10
A
II C
Y
X
S
A
FIG. 2A
FIG. 2B
FIG. 2C
11'
17
16
51
40
14
15
13
60
11"
12
11
21
20
50
32

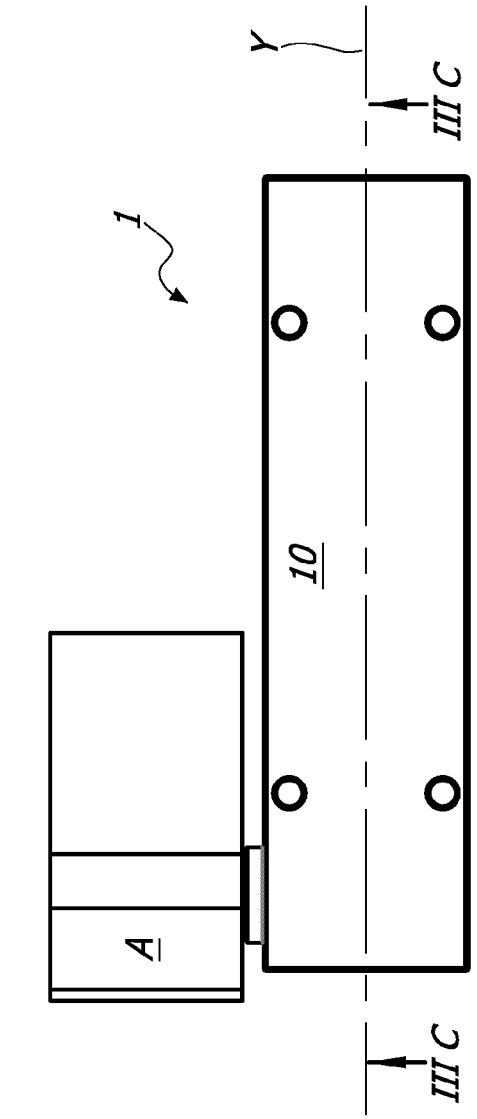


FIG. 3B

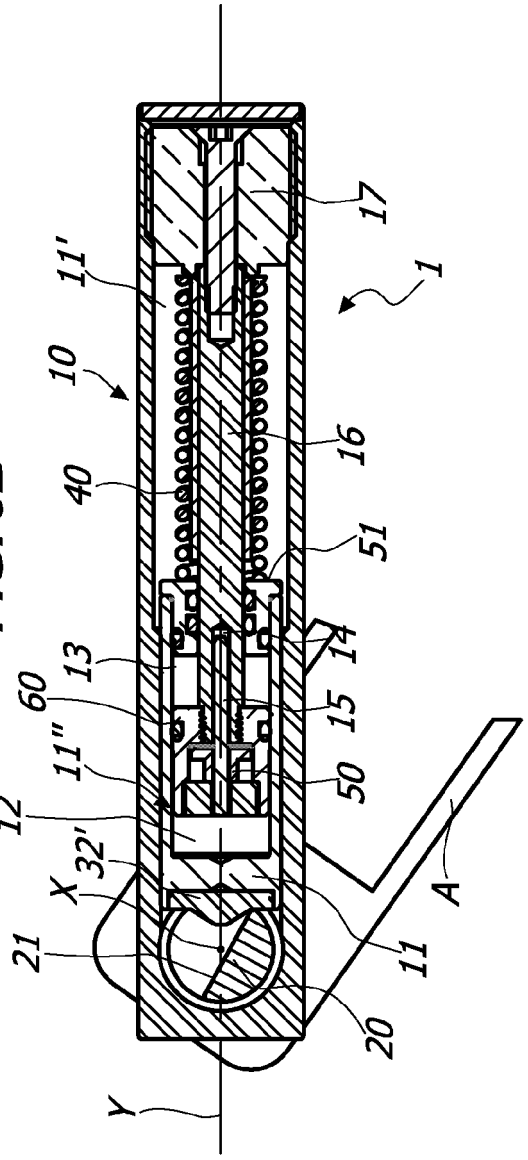


FIG. 3C

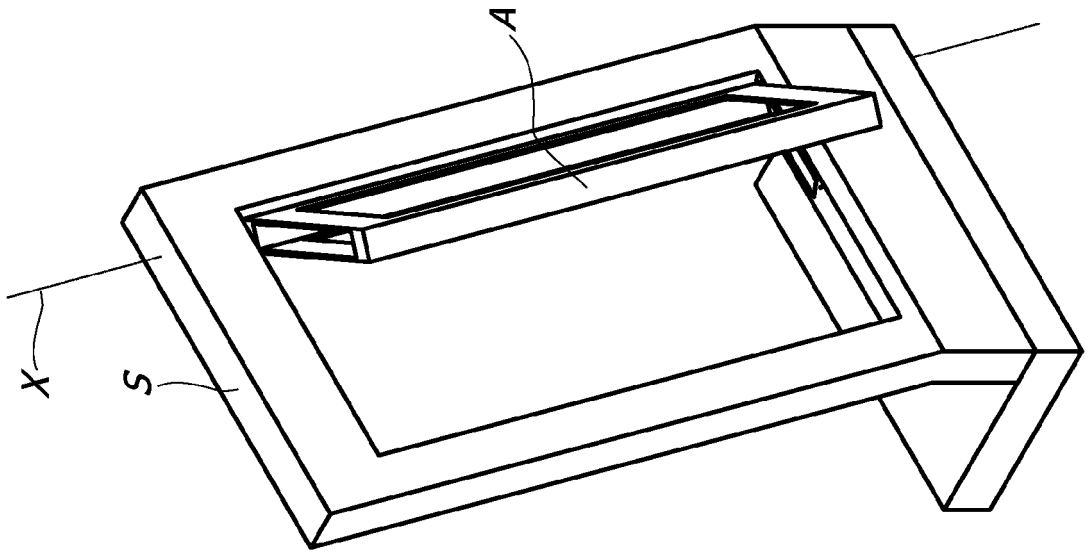


FIG. 3A

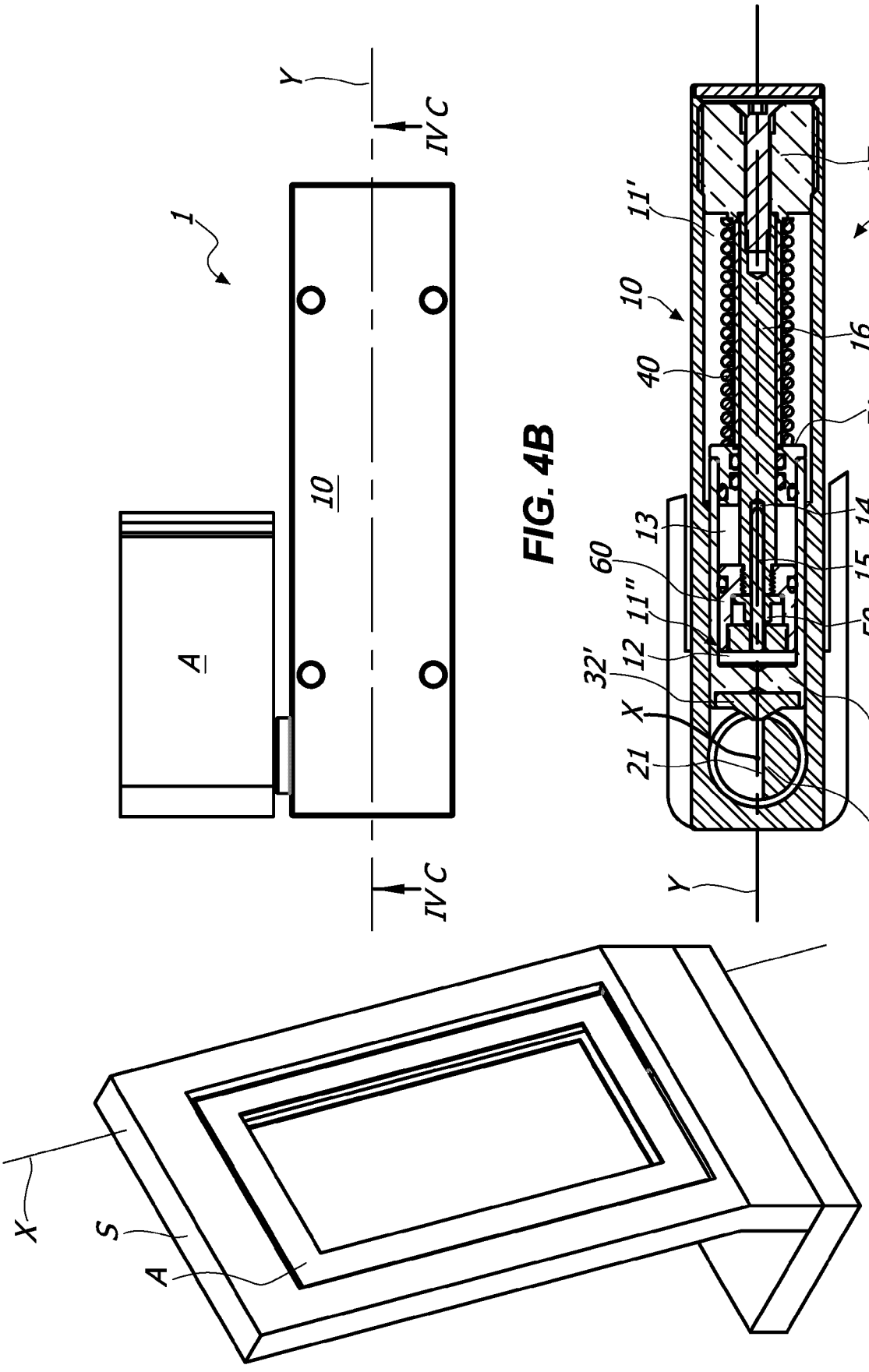
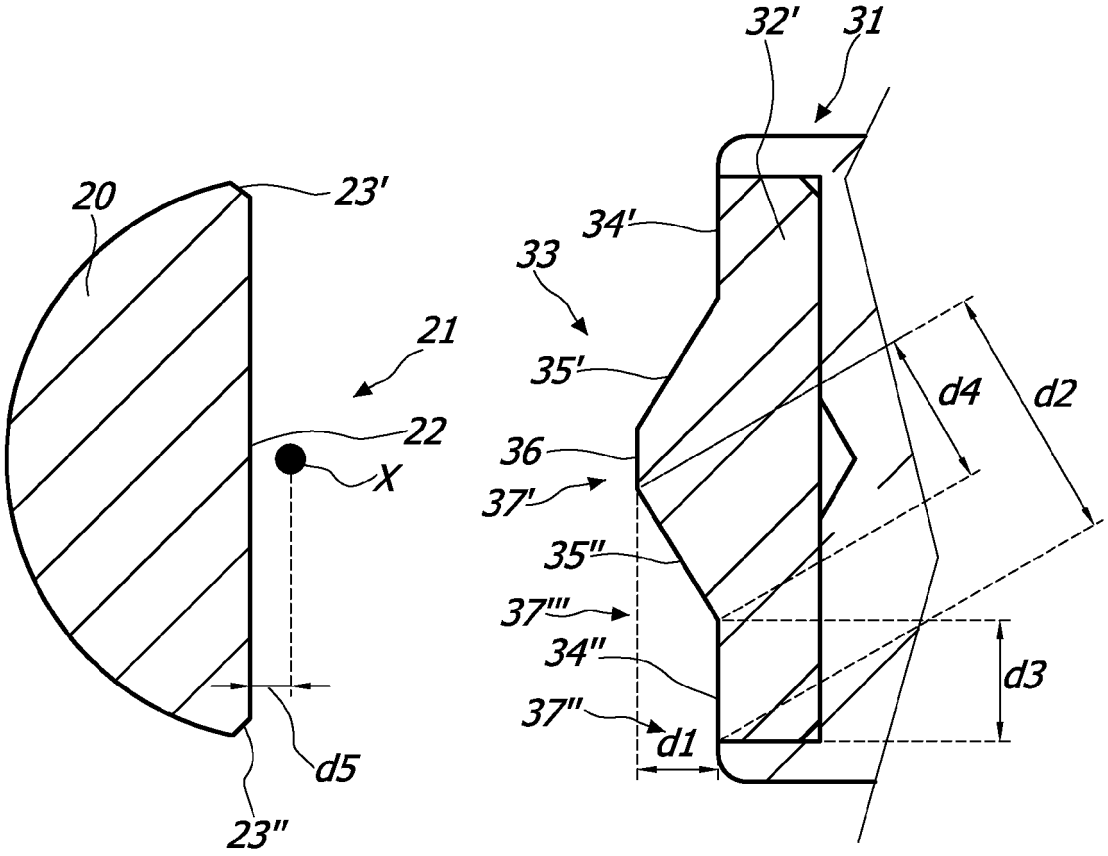


FIG. 4A

FIG. 4B

FIG. 4C


32'
31
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23'
34'
33
21
35'
d4
d2
22
X
36
37'
35''
37'''
34''
d3
37''
d1
d5
23''

FIG. 5

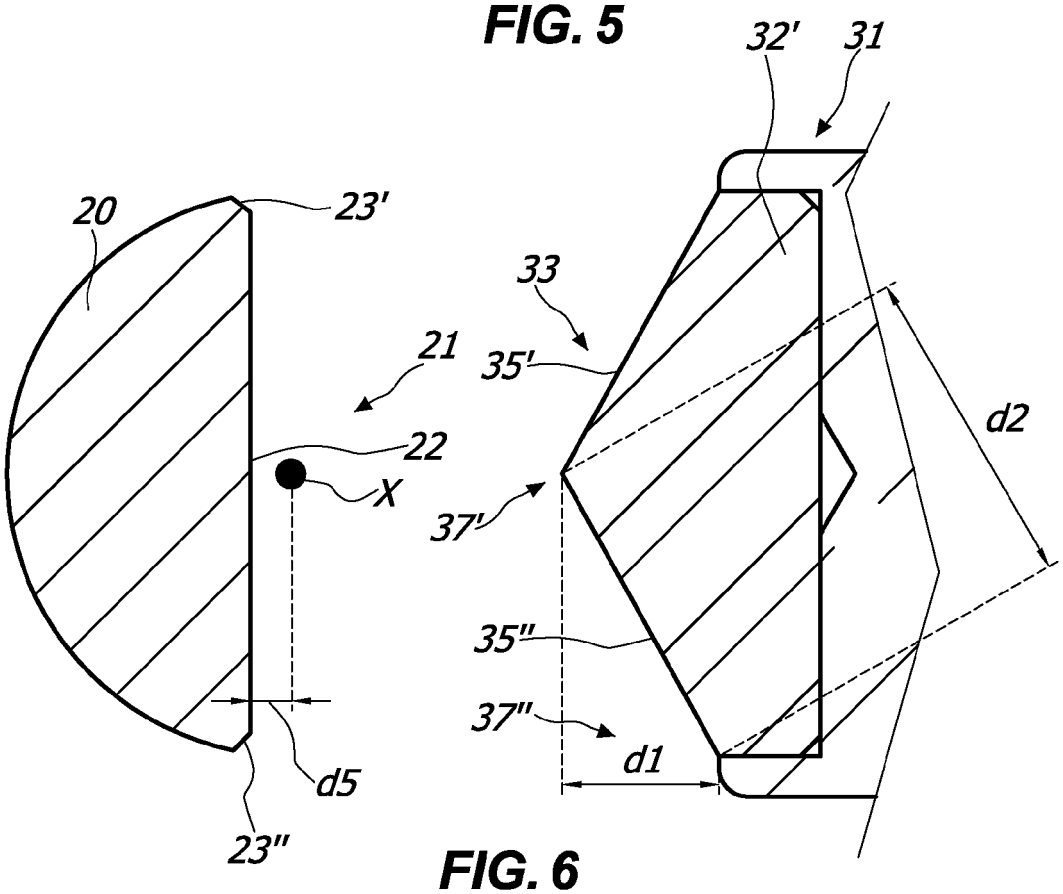
32'
31
20
23'
33
21
35'
d2
22
X
37'
35''
37''
d1
d5
23''

FIG. 6

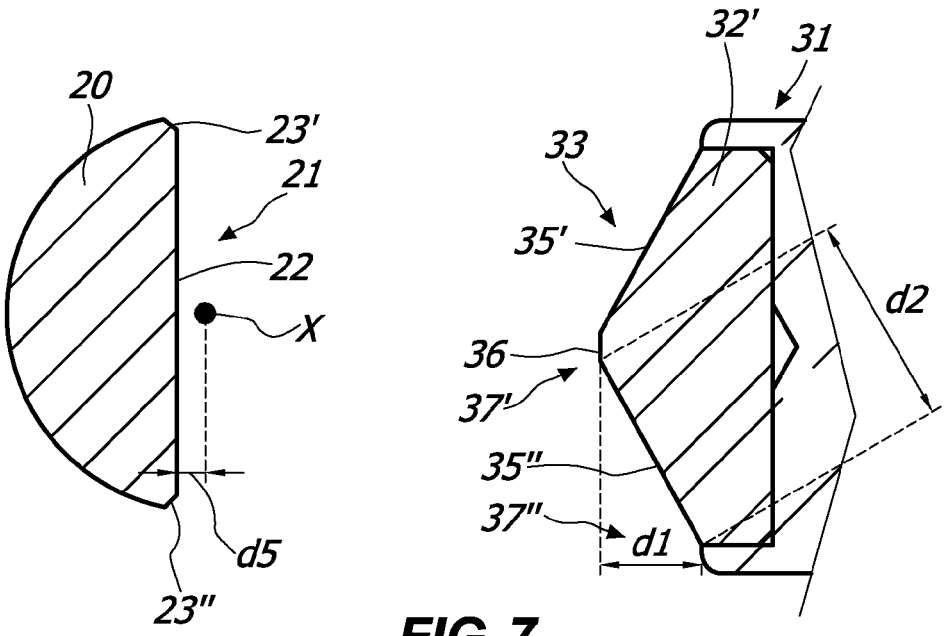

FIG. 7

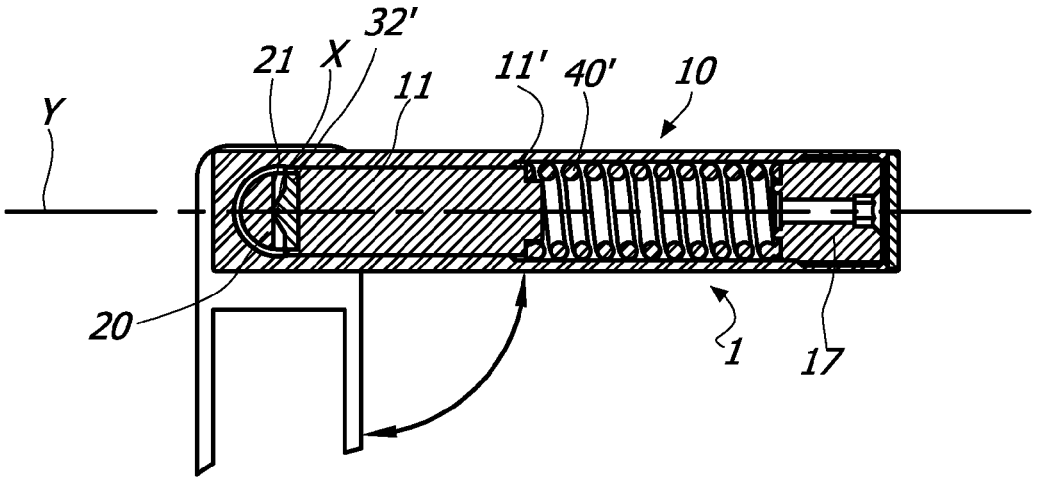

FIG. 8A

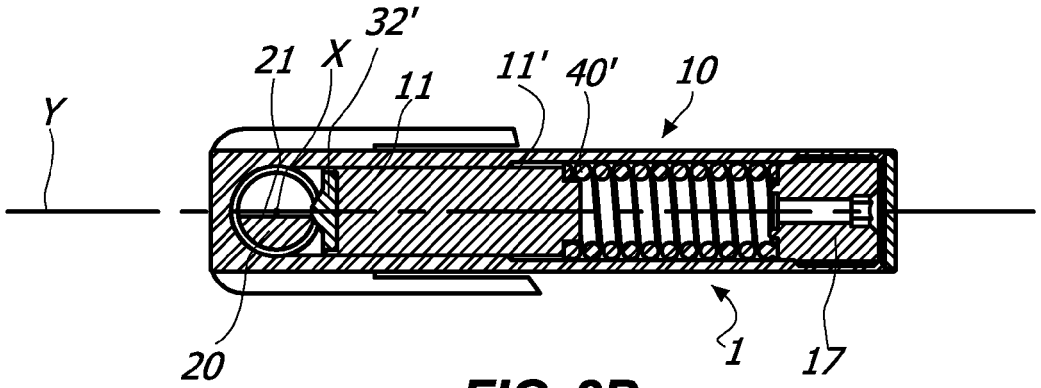

FIG. 8B

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EUROPEAN SEARCH REPORT

Application Number
EP 19 16 9402

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	WO 2012/049518 A1 (CHOW CHUNG [CN]) 19 April 2012 (2012-04-19) * page 1, line 17 - page 4, line 7 * * page 6, lines 22-25 * * page 13, lines 12-14 * * page 15, line 15 - page 17, line 28 * * page 24, line 23 - page 26, line 6 * * figures 1-5, 18, 19, 24-29 *	1-14 15	INV. E05F1/06 E05F1/12 E05F3/20
X A	GB 2 525 444 A (BESTKO PREC LTD [CN]) 28 October 2015 (2015-10-28) * figures 1, 2, 7-9 * * page 3, lines 27-35 * * page 4, lines 9-34 * * page 8, lines 8-28 * * page 9, lines 8-36 * * page 11, lines 25-36 *	1-14 15	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	10 September 2019	Mund, André

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