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(71) Applicants:
- **Whirlpool Europe s.r.l.**
  21025 Comerio (IT)
- **De Molli Giancarlo Industrie S.p.A.**
  21040 Castronno (VA) (IT)

(72) Inventor: **De Molli, Romeo**
21040, Castronno (IT)

(74) Representative: **Guerci, Alessandro**
Whirlpool Europe S.r.l.
Patent Department
Viale G. Borghi 27
21025 Comerio (VA) (IT)

(54) Movable-axis hinge for furniture doors and the like

(57) A movable-axis hinge comprises a first coupling unit connectable to a fixed part of a piece of furniture or the like, a second coupling unit connectable to a moving part of a piece of furniture or the like, a kinematic movement mechanism interposed and hinged between the first coupling unit and the second coupling unit and capable of reversibly configuring the moving part between a closed state and an open state and finally an assistance device that acts, operationally, on the kinematic movement mechanism; the assistance device is reversibly configurable between an assisted closing state, in which it exerts an action of drawing back the moving part towards the fixed part, and a stable state in which it exerts at least an action of holding the moving part in position at at least a given angle of opening with respect to the fixed part.

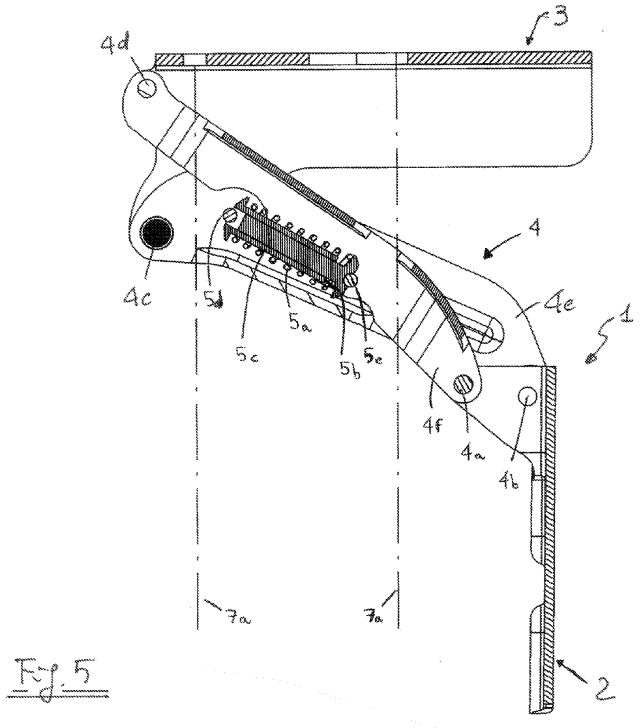

Fig. 5

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Description

[0001] The present invention has as its subject-matter a hinge for pieces of furniture, which can be used for example in doors or shutters of furniture or electrical appliances such as refrigerators, freezers and so on.

[0002] As is known, for the purpose of satisfying requirements of movement and juxtaposition between the various panel-shaped units that constitute a piece of furniture or an electrical appliance equipped with one or more doors/shutters, use is very frequently made of what are known as "movable-axis hinges", which generally connect a "fixed part" to a "moving part" and allow the latter to be moved in space using a rotary-translational movement action in which the axis of rotation itself does not have a fixed position but moves in its turn.

[0003] Structurally, movable-axis hinges therefore have two coupling units for the fixed parts and the moving parts, and within these two coupling units there is an appropriate kinematic mechanism that defines the action of moving the moving part and, consequently, the (ideal) axis of rotation around which the moving part (or "door") moves when opening and/or closing.

[0004] There are, moreover, known movable-axis hinges in which an assistance device is mounted, which assistance device assists the closing movement of the door: such a device is generally based on an elastic component installed appropriately in the kinematic mechanism of the hinge, which is activated beyond a certain "threshold angle" that corresponds to a given angle of rotation of the door with respect to the fixed part.

[0005] The prior art described in summary does however have some limitations.

[0006] Indeed, it is observed that movable-axis hinges of the known type are generally somewhat complex in the structure of the kinematic mechanism, which in turn is based on a large number of parts hinged together: for example, it is not infrequent to find movable-axis hinges provided with seven pivots, which therefore suffer from great structural complexity and high cost.

[0007] Moreover, as regards the assistance device, it is known that those of the known type operate only during the closing movement of the door, and below the threshold angle at which they are activated they remain unused: this limits the functionality of the hinge and does not allow optimal exploitation of its component parts.

[0008] The main aim proposed by the present invention is, therefore, to devise a movable-axis hinge for furniture doors and the like capable of overcoming the above-mentioned disadvantages.

[0009] In particular, the aim of the present invention is to devise a movable-axis hinge that allows the structure to be definitely simplified, while ensuring said functionality with respect to the more complex hinges of the known type (either in terms of maximum angle of opening, or in terms of identifying the trajectory of the ideal axis of rotation of the door, or indeed in terms of adaptability to various types of doors for furniture or refrigerators or similar objects).

[0010] The present invention also has the aim of producing a movable-axis hinge that allows greater efficiency of the actual assistance device and, in particular, makes it possible to achieve improvements in either the closing movement or the opening movement.

[0011] A further aim of the present invention is to provide a hinge that is economical and reliable to manufacture, and is also very easy to assemble (also taking account of the need for an assistance device to be installed inside) and to be implemented inside a piece of furniture or an electrical appliance such as a refrigerator or the like.

[0012] Further characteristics and advantages will become more apparent from the description of an embodiment given as a non-restrictive example of a movable-axis hinge illustrated in the attached figures, in which:

- Fig. 1 shows a diagrammatic plan view of a hinge in accordance with the present invention;
- Fig. 2 and 3 show two enlarged views of Figure 1, which in turn show two different embodiments of one part of the hinge according to the invention;
- Fig. 4 shows a diagrammatic front view of the hinge in Figure 1;
- Fig. 5 shows a view in partial cross-section of the hinge in Figure 4 along the line V-V in an open configuration;
- Figure 6 is a partial cross-section similar to figure 5 showing the hinge in a closed configuration;
- Figure 7 shows a perspective view of the hinge in Figure 1; and
- Figures 8 and 9 show two views in partial cross-section of two embodiments relating to a structural detail of the hinge according to the present invention.

[0013] The protection device according to the present invention is designated as a whole by the number 1 in the attached figures, and it mainly comprises a first coupling unit 2 (connectable to a fixed part of a piece of furniture or the like) and a second coupling unit 3 (connectable instead to a moving part of a piece of furniture or the like); a kinematic movement mechanism 4 is also present, interposed and hinged between the first coupling unit 2 and the second coupling unit 3 and is capable of reversibly configuring what is known as the "moving part" (in other words, the "door") between a closed state and an open state.

[0014] Advantageously, there is an assistance device 5 that acts, operationally, on the kinematic movement mechanism 4, which is reversibly configurable between an assisted closing state shown in figure 6 (in which it exerts an action of drawing back the moving part towards

the fixed part) and a stable state shown in figure 5 (in which instead it exerts at least an action of holding the moving part in position at at least a given angle of opening with respect to the fixed part).

[0015] At this point the difference from the known art will be observed, since the latter generally comprises hinges in which the "assistance devices" exert a single function (that of assisting closure) at less than a certain angle, while above this said angle they are not capable of exerting any action to control, to maintain a position or to exert a thrust on said door: in contrast, the present invention incorporates two functions that are complementary with one another, and this functional integration is implemented in a single device mounted inside said hinge.

[0016] Still from the functional point of view it will be noted that the assistance device 5 is reversibly configurable between the above-mentioned "assisted closing" and "stable" states corresponding to at least one predetermined critical angle of partial opening of the moving part with respect to the fixed part: in particular, the assisted closing state occurs (and remains "active") between a minimum angle of closing of the moving part with respect to the fixed part (or in other words, starting from a minimum or zero angle of opening) and within the above-mentioned critical angle of partial opening, while the stable state occurs (and remains "active") between the critical angle of partial opening and a maximum angle of full opening of the moving part with respect to the fixed part.

[0017] Since it is also desirable to increase the functional capacity of the present invention, the assistance device 5 can be reversibly configurable (also) in a state of assisted opening corresponding to what is known as a "complementary threshold angle".

[0018] Conveniently, this further function of the present invention can be implemented in correspondence to a complementary threshold angle that coincides with the critical angle of partial opening: in this way, while the simple "holding" function provides for the moving part (or "door") to be held in a stable position of partial opening, the (additional and optional) assisted opening function facilitates movement of said door, which can then be opened with less effort.

[0019] From the structural point of view, it will be noted that any critical angle of partial opening (and/or, if necessary, any complementary threshold angle) can be chosen: for example, the critical angle of partial opening can correspond substantially to half the value of the maximum angle of full opening.

[0020] Going into the details of the invention and with reference to the attached figures, it will be noted that the kinematic movement mechanism 4 comprises (and preferably includes, for the purposes of introducing the maximum structural simplicity), a first pivot 4a and a second pivot 4b, which are connected to the first coupling unit 2; a first arm 4e is then present (mounted rotatably on the second pivot 4b and having a third pivot 4c at one of its ends opposite said second pivot 4b) and a second arm 4f is also present (which in turn is rotatably mounted on the first pivot 4a and has a fourth pivot 4d at one of its ends opposite said first pivot 4a).

[0021] Conveniently, for the purposes of producing a kinematic mechanism of the "hinged quadrilateral" type, the second coupling unit 3 is connected to the third pivot 4c and the fourth pivot 4d (and consequently is connected to the first and second arms described above).

[0022] For its part, the assistance device 5 comprises an elastic reaction unit 5a, preferably pre-loaded and even more preferably constituted by an axial spring (or also by a pressurised fluid): such an elastic reaction unit 5a is interposed operationally between the first arm 4e and the second arm 4f, and its dynamic/kinematic action varies, as already stated, when the angular position of said two arms varies with respect to the coupling units 2 and 3.

[0023] The elastic reaction unit 5a is capable of generating an elastic reaction force aligned along an operating direction, and the course of application of such an elastic reaction force can conveniently be inverted (or even cancelled out, if need be) in correspondence to the critical angle of partial opening and/or in correspondence to the complementary threshold angle.

[0024] For the purpose of qualitatively improving the kinematics of the moving part (or "door"), the assistance device 5 can also comprise motion-damping means, preferably of the viscous type, which can be activated operationally between the first coupling unit 2 and the second coupling unit 3 and preferably between the first arm 4e and the second arm 4f: these damping means can in turn comprise a fluid-type damper or can be based on surfaces in mutual friction.

[0025] In the embodiment illustrated, the motion-damping means comprise a damper mounted coaxially with the elastic reaction unit 5a and composed of a sleeve and a stem, as will be explained in detail below: in effect, the assistance device 5 comprises the following list of parts:

- an elastic reaction unit 5a developing axially;
- a support sleeve 5b and a support stem 5c (which form the body of the damper) partially penetrating into each other and capable of supporting the elastic reaction unit 5a at opposite ends;
- a first coupling foot 5d emerging from one end of said support sleeve 5b and capable of engaging (for example via a socket) with the first arm 4e (or alternatively the second arm 4f); and
- a second coupling foot 5e emerging from one end of said support stem 5c and capable of engaging (for example via a socket) with the second arm 4f (or the first arm 4e in the event that the first coupling foot is engaged with the second arm 4f).

[0026] For the purposes of allowing rapid and efficient assembly of the hinge 1, it is possible for the assistance

device 5 also to comprise assembly means 8 that can be activated operationally between the support sleeve 5b and the support stem 5c and are capable of supporting and pre-loading the elastic reaction unit 5a.

[0027] In the embodiment illustrated, such assembly means 8 (figures 8 and 9) comprise a predetermined number of reciprocally countershaped engagement units, and the engagement units in turn can comprise undercuts and/or expansions and/or threads and/or counter-threads that are mutually complementary.

[0028] Conveniently, the above-mentioned engagement units are made in the support sleeve 5b and the support stem 5c respectively, so that partial assembly of said sleeve and said stem allows the coupling and preloading of the elastic reaction unit 5a to be produced simultaneously.

[0029] According to a further characteristic (optional and in any case not restrictive) of the present invention, pretensioning means can also be present, capable of minimising and/or cancelling out any persistent play between the pivots 4a, 4b, 4c, 4d, the arms 4e and/or 4f and the coupling units 2 and/or 3 in operating states.

[0030] Advantageously, the above-mentioned pretensioning means can coincide with the assistance device 5).

[0031] In case of special functional requirements, such as the possibility/necessity of limiting the maximum travel of the moving part with respect to the fixed part, the present invention can comprise travel-limitation means 6 for the opening and/or closing of the moving part with respect to the fixed part: structurally, these travel-limitation means 6 can comprise at least one matching body mounted on the first arm 4e (or, according to the demands of the moment, on the second arm 4f) and capable of interfering with the assistance device 5 corresponding to a limiting angle of opening of the moving part with respect to the fixed part.

[0032] In order to permit faster and easier implementation, the present invention can finally provide the presence of appropriate assembly means 7, which are capable of allowing said hinge 1 to engage with a fixed part and/or a moving part.

[0033] Going into the details, these assembly means 7 are capable of permitting the engagement of the hinge 1 in one of its partial or full closing configurations (as distinct from the known type of hinges, which can be mounted only if they are in the fully open or fully closed configuration) and preferably comprise through-holes and/or cavities made in the coupling units 2, 3 and/or in the arms 4e, 4f , suitably aligned.

[0034] In other words, the aforementioned cavities are capable of defining an access and operation axis 7a for a tool (a powered screwdriver or the like) corresponding to a partially or fully closed configuration of the hinge 1, so that an operator/assembler can handle the hinge 1 with the greatest freedom and can operate efficiently and conveniently through this access and operation axis 7a in order to insert first screws or nails and, later on, the tool itself.

[0035] During the opening movement, the movable-axis hinge passes from the closed configuration of figure 6 (in which the assistance device 5 is not shown for sake of clarity) to the open configuration of figure 5. During such movement the elastic reaction unit or spring 5a is progressively compressed up to a predetermined degree of rotation corresponding roughly to the configuration in which both pivots 4a and 4b are substantially aligned with the fourth pivot 4d. After such critical angle of partial opening, by continuing the opening movement the force of the spring 5a contributes towards such opening (i.e. the spring 5a expands) up to the full opening configuration of figure 5 in which the spring 5a keeps the hinge in an open configuration. Such "inversion" of the action of the spring is due to the geometry and shape of the arms 4e and 4f and the position of the pivots. Particularly, during the opening movement of the hinge 1 the first pivot 4a and the second pivot 4b of the first coupling unit 2 reach a position (not shown) in which they are substantially aligned with the fourth pivot 4d of the second coupling unit 3. In this aligned configuration the distance between the feet 5d and 5e of the assistance device 5 is the lowest (i.e. maximum force action of the spring 5a). After such position, the first pivot 4a moves towards a position which is further with respect to a line joining the second pivot 4b and the fourth pivot 4d, on the side far from the second coupling unit 3 (configuration shown in figure 5).

[0036] The invention achieves advantages that are of interest.

[0037] In the first place, it will be noted that the particular structural and functional combination of the units of the present device allow full functionality of said hinge, and in particular they allow a complete definition of the trajectory of the ideal axis of rotation of the door, a wide choice of partial or full opening angles and a remarkable simplification of structure compared with hinges that offer the same kinematic abilities using a larger number of pins.

[0038] It will also be noted that the present invention has a further, remarkable advantage in that the assistance device can be utilised in either the opening movement or the closing movement of the door, considerably increasing operational flexibility and, consequently, the freedom of action of the end user of the piece of furniture (or refrigerator) when he acts on the door.

[0039] Moreover, it will be observed that the present invention permits rapid and efficient assembly of the hinge, and at the same time permits equally easy assembly thereof on the fixed and/or moving parts.

[0040] Finally, it should be noted that the present invention makes it possible to achieve great reliability, considerable structural simplification and minimisation of production and maintenance costs.

Claims

1. Movable-axis hinge for furniture doors and the like, comprising:

   - a first coupling unit (2) connectable to a fixed part of a piece of furniture or the like;
   - a second coupling unit (3) connectable to a moving part of a piece of furniture or the like;
   - a kinematic movement mechanism (4) interposed and hinged between said first coupling unit (2) and said second coupling unit (3) and capable of reversibly configuring said moving part between a closed state and an open state; and
   - an assistance device (5) that acts, operationally, on said kinematic movement mechanism (4),

   characterised by the fact that said assistance device (5) is reversibly configurable between an assisted closing state, in which it exerts an action of drawing back the moving part towards the fixed part, and a stable state in which it exerts at least an action of holding the moving part in position at at least a given angle of opening with respect to the fixed part.

2. Hinge according to claim 1, in which the assistance device (5) is reversibly configurable between said assisted closing state and said stable state corresponding to at least one predetermined critical angle of partial opening of the moving part with respect to the fixed part, the assisted closing state occurring preferably between a minimum angle of closing of the moving part with respect to the fixed part and said critical angle of partial opening, and the stable state occurring preferably between the critical angle of partial opening and a maximum angle of full opening of the moving part with respect to the fixed part.

3. Hinge according to claims 1 or 2, in which the assistance device (5) is also reversibly configurable in a state of assisted opening corresponding to a complementary threshold angle, said complementary threshold angle preferably coinciding with the critical angle of partial opening.

4. Hinge according to any one of the preceding claims, in which the critical angle of partial opening corresponds substantially to half the value of said maximum angle of full opening.

5. Hinge according to any one of the preceding claims, in which said kinematic movement mechanism (4) comprises, and preferably includes:

   - a first pivot (4a) and a second pivot (4b) connected to the first coupling unit (2);
   - a first arm (4e) mounted rotatably on said first pivot (4a) and having a third pivot (4c) at one of its ends opposite said first pivot (4a); and
   - a second arm (4f) rotatably mounted on said second pivot (4b) and having a fourth pivot (4d) at one of its ends opposite said second pivot (4b),

   the second coupling unit (3) being rotatably connected to said third pivot (4c) and said fourth pivot (4d).

6. Hinge according to claim 5, in which the assistance device (5) comprises an elastic reaction unit (5a), preferably pre-loaded and even more preferably constituted by an axial spring, interposed operationally between said first arm (4e) and said second arm (4f).

7. Hinge according to claim 5, in which said elastic reaction unit (5a) is capable of generating an elastic reaction force aligned along an operating direction, a course of application of said elastic reaction force being inverted and/or cancelled out corresponding to the critical angle of partial opening and/or corresponding to said complementary threshold angle.

8. Hinge according to any one of the preceding claims, in which the assistance device (5) also comprises motion-damping means, preferably of the viscous type, which can be activated operationally between the first coupling unit (2) and the second coupling unit (3) and preferably between the first arm (4e) and the second arm (4f).

9. Hinge according to claim 8, in which said motion-damping means comprise a damper (5b) mounted coaxially with the elastic reaction unit (5a).

10. Hinge according to any one of the preceding claims, in which the assistance device (5) comprises:

    - an elastic reaction unit (5a) developing axially;
    - a support sleeve (5b) and a support stem (5c) partially penetrating into each other and capable of supporting the elastic reaction unit (5a) at opposite ends;
    - a first coupling foot (5d) emerging from one end of said support sleeve (5b) and capable of engaging, preferably via a socket, with the first arm (4e) or the second arm (4f); and
    - a second coupling foot (5e) emerging from one end of said support stem (5c) and capable of engaging, preferably via a socket, with the second arm (4f) or the first arm (4e).

11. Hinge according to claim 10, in which the assistance device (5) also comprises assembly means (8) that can be activated operationally between the support

sleeve (5b) and the support stem (5c) and are capable of supporting and pre-loading the elastic reaction unit (5a).

12. Hinge according to claim 11, in which said assembly means (8) comprise a predetermined number of reciprocally countershaped engagement units, said engagement units preferably comprising undercuts and/or expansions and/or threads and/or counterthreads that are mutually complementary, and made in the support sleeve (5b) and in the support stem (5c) respectively.

13. Hinge according to any one of the preceding claims, in which pretensioning means are also present, capable of minimising and/or cancelling out any persistent play between the pivots (4a, 4b, 4c, 4d), the arms (4e, 4f) and the coupling units (2, 3) in operating states, said pretensioning means preferably coinciding with the assistance device (5).

14. Hinge according to any one of the preceding claims, in which travel-limitation means (6) are also present, for the opening and/or closing of the moving part with respect to the fixed part, said travel-limitation means (6) preferably comprising at least one matching body mounted on the first arm (4e) or on the second arm (4f) and capable of interfering with the assistance device (5) corresponding to a limiting angle of opening of the moving part with respect to the fixed part.

15. Hinge according to any one of the preceding claims, in which assembly means (7) are also present, capable of allowing said hinge (1) to engage with a fixed part and/or a moving part, said assembly means (7) being capable of permitting the engagement of the hinge (1) in one of its partial or full closing configurations and preferably comprising through-holes and/or cavities made in the coupling units (2, 3) and/or in the arms (4e, 4f) and capable of defining an access and operation axis (7a) for a tool corresponding to a partially or fully closed configuration of the hinge (1).

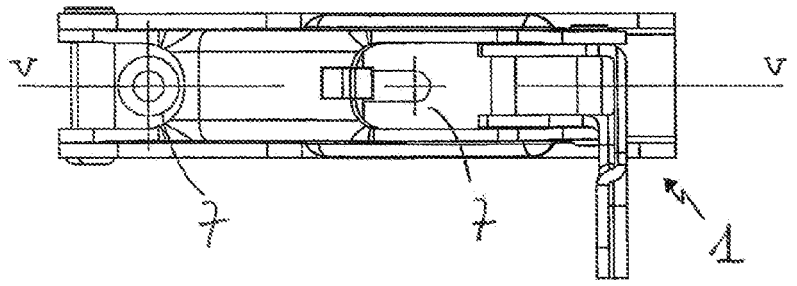

Fig. 4

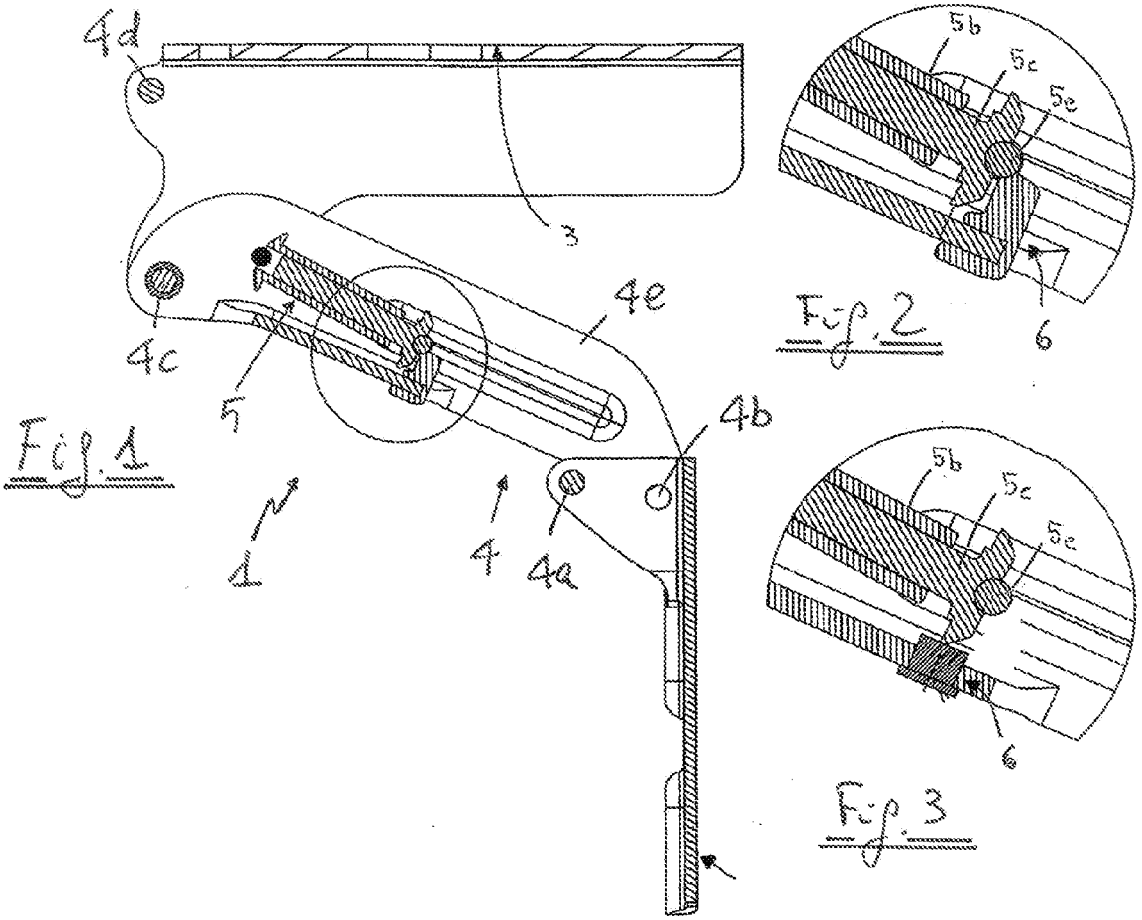

Fig. 1

Fig. 2

Fig. 3

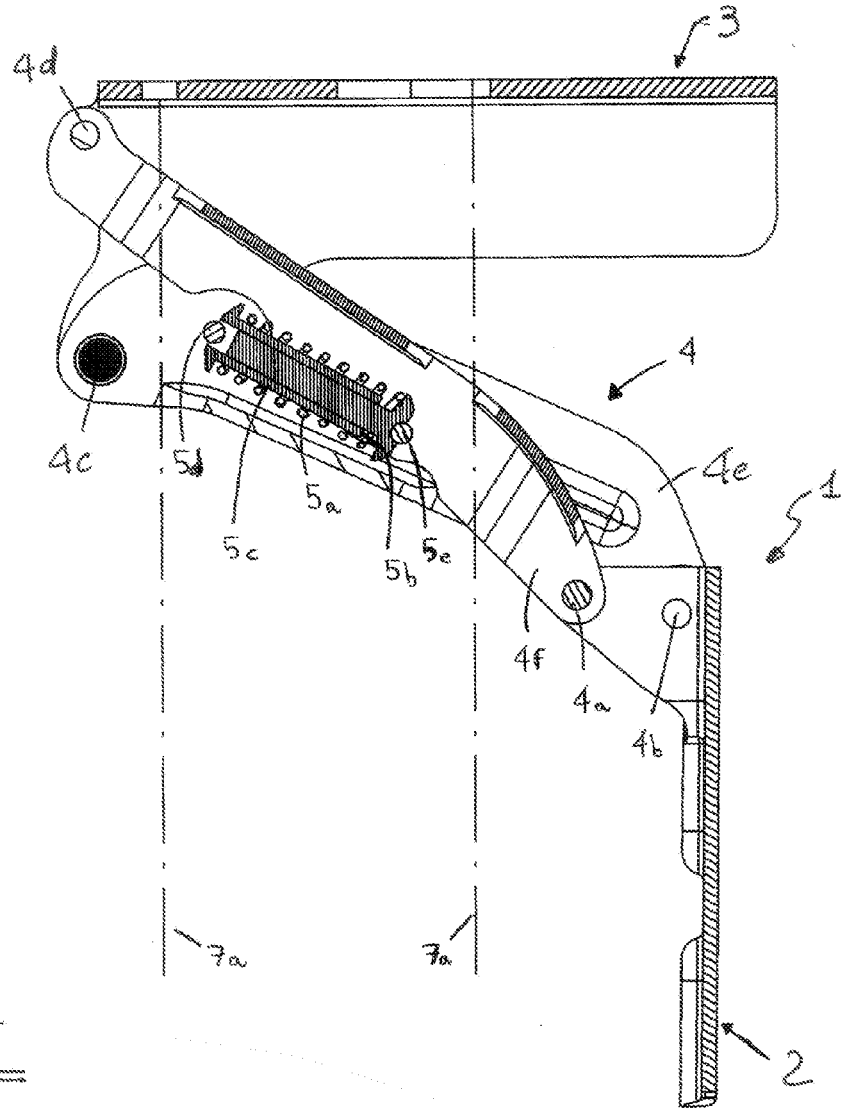

Fig. 5

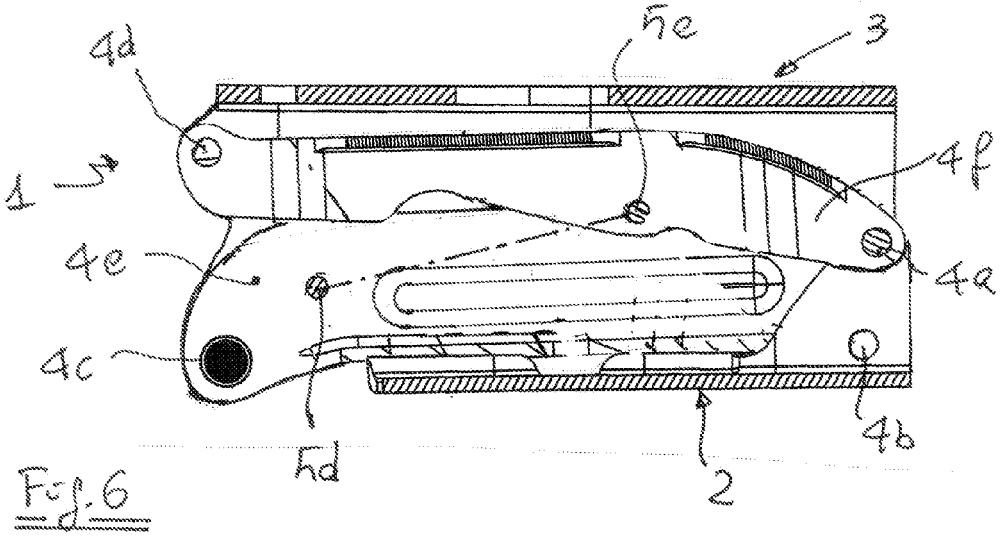

Fig. 6

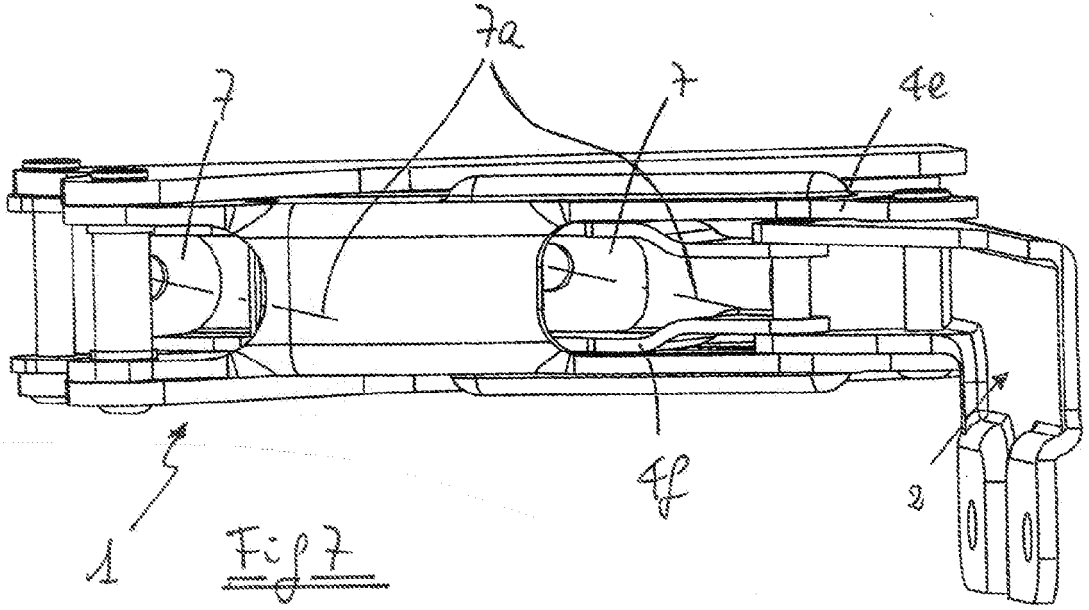

Fig 7

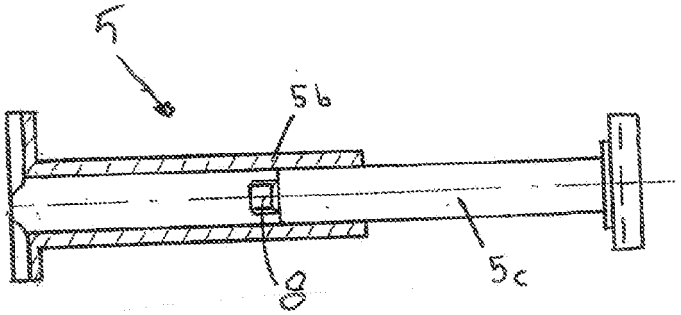

Fig. 8

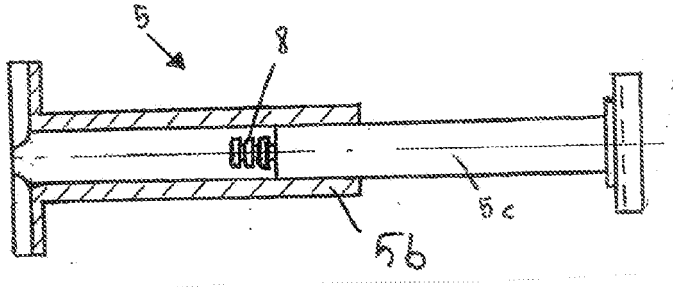

Fig. 9

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EUROPEAN SEARCH REPORT

Application Number
EP 10 19 3720

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A	* page 9, paragraphs 2,4 * * page 10, paragraphs 1,2 * * figures 1,2 *	6,7,10	

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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	4 January 2011	Wagner, Andrea

CATEGORY OF CITED DOCUMENTS

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