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(54) **Hinge for movable parts of motor vehicle bodyworks, such as doors, boots, bonnets and/or hatchback doors**

(57) A hinge for doors, bonnets, boots or hatchback doors of motor vehicles comprises a first and a second hooking portion connectable to a fixed part and to a movable part of a chassis/bodywork respectively, as well as a kinematic articulation mechanism interposed between the first and the second hooking portions; the hinge further comprises a servo control unit simultaneously associated with the first and the second hooking portions.

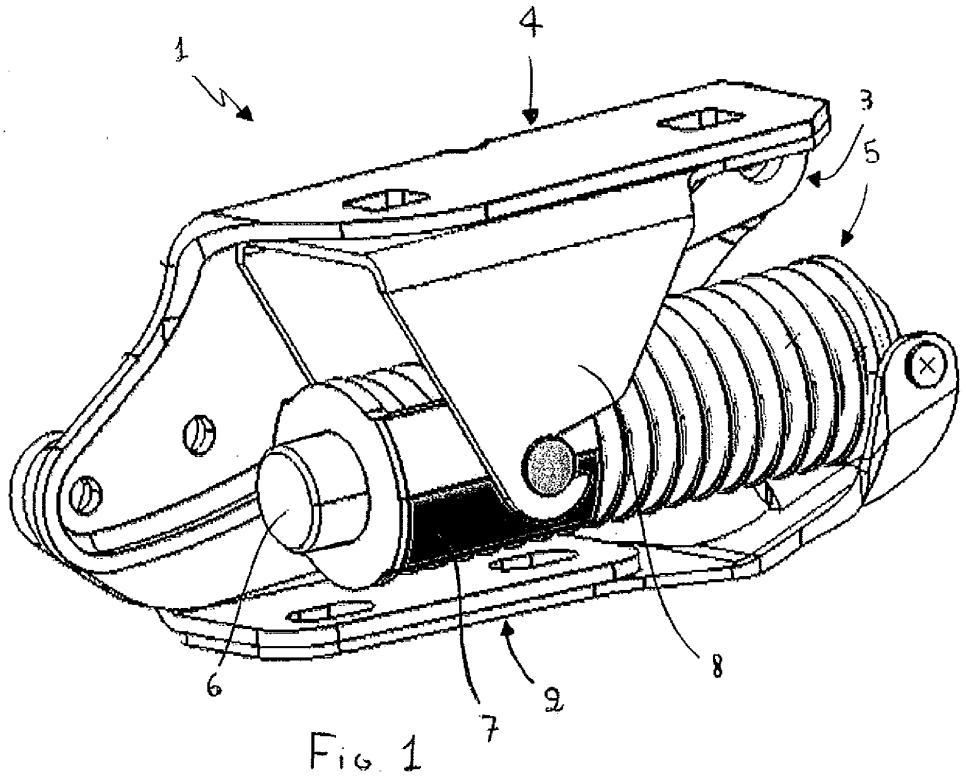

Fig. 1

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Description

[0001] The object of the present invention is a hinge apt for moving and supporting movable parts of motor vehicles, such as doors, boots, bonnets, hatchback doors and the like.

[0002] As is known, motor vehicles can be equipped with servomechanisms that aid in the closing or opening of movable parts of the bodywork thereof. Solutions of this type can be found for example on "high-end" vehicles for civilian use and on commercial/industrial vehicles provided with doors/hatchback doors that are particularly heavy or unwieldy.

[0003] Servo control devices of a known type are usually realised with hydraulic or pneumatic actuators, which are apt for exerting a "supplementary force" with respect to that of the operator (or even, in some cases, for exerting all the force needed without intervention on the part of the operator, who only needs to use an opening or closing command) in order to conveniently move the door or bonnet or whatever else needs to be opened or closed. Generally, these above-mentioned devices are mounted separately with respect to the kinematic articulation mechanisms of a variety of doors and hatchback doors.

[0004] Though widely employed, the prior art described hereinabove has some drawbacks that limit its overall utility; specifically, the overall dimensions of the servo actuating mechanisms of a known type are quite sizeable, especially considering that they must be interposed in operating volumes comprised between the "fixed" parts and the "movable" parts of the bodywork (which under closed conditions, prove to be fitted very snugly to each other).

[0005] Moreover, another disadvantage of the servo actuators of a known type lies in their cost and their intrinsic complexity. In fact, hydraulic or pneumatic elements must ensure marked levels of reliability and hermetic sealing for the working fluid/gas, and this inevitably requires a structure and equipment (including seals, sliding elements and materials) that markedly affect costs.

[0006] The fact that servo control mechanisms of a known type and that work with fluids/gases are particularly sensitive to variations in environmental temperature should be kept in mind. In fact, variations of this sort directly affect viscosity and thus the so-called "equivalent modulus of elasticity" of the working fluid, sometimes making the action of the entire mechanism too strong or too weak.

[0007] The present invention is thus aimed at devising a hinge for movable parts of motor vehicle bodyworks (for example doors, bonnets, boots and/or hatchback doors) that is capable of overcoming the limitations cited hereinabove.

[0008] The present invention is principally aimed at devising a hinge that can be put to use functionally integrating greater and more practical utility in terms of offering aid in opening and closing the above-mentioned "movable parts of bodywork", while offering at the same time considerable overall compactness and production costs that are as low as possible.

[0009] Furthermore, the present invention is aimed at devising a hinge that can also replace previously installed elements, for example by means of *aftermarket* upgrades or during maintenance procedures or repair work

[0010] The defined technical task and the specified aims are substantially achieved by a hinge for movable parts of motor vehicle bodyworks, having the characteristics recited in one or more of the appended claims.

[0011] The description of a preferred but not exclusive embodiment of a hinge according to the invention is now provided by way of approximate and non-limiting example, and illustrated in the accompanying drawings, in which:

- Figure 1 is a schematic view of the hinge according to the invention in a first operative configuration (corresponding to a "closed" situation of a movable bodywork part); and
- Figure 2 is a schematic view of the hinge according to the invention in a second operative configuration (corresponding to an "opened" situation of a movable bodywork part).

[0012] With reference to the accompanying drawings, the hinge according to the present invention is indicated in its entirety by the reference number 1 and it substantially comprises a first hooking portion 2 (connectable to a fixed part of a chassis and/or a bodywork), a kinematic articulation mechanism 3 connected to the first hooking portion 2, and a second hooking portion 4 connected to the kinematic articulation mechanism 3 (and also connectable to a movable part of a chassis and/or a bodywork).

[0013] Advantageously, the present hinge further comprises a servo control unit 5 simultaneously associated with the first and the second hooking portions 2, 4.

[0014] At this point the difference between the present invention and the state of the art presented hereinabove should be pointed out. In fact, owing to the structural and functional incorporation of the servo control unit and owing to the fact that this unit is made up of an active element that is extremely compact and that operates without the intervention of fluids or gases, high performance levels are achieved in terms of the generation of the active force, and at the same time, a marked reduction in the overall dimensions is also achieved.

[0015] In further detail, it can be observed that the kinematic articulation mechanism 3 can conveniently define an articulated quadrilateral and thus comprises:

- a first connecting lever 3a, which, in turn, has a first pin 3b (connected to the first hooking portion 2) and a second pin 3c (which is instead connected to the second hooking portion 4; and
- a second connecting lever 3d, which has a third pin 3e (connected to the first hooking portion 2) and a

fourth pin 3f (which is instead connected to the second hooking portion 4).

[0016] For its part, the servo control unit 5 comprises at least one actuator 5a, which is apt for exerting a so-called "active force" at least on the second hooking portion 4 (which is connected to the door/hatchback door and that is thus capable of transmitting servo control action).

[0017] According to the needs at hand, the servo control unit 5 may also be connected to components of the kinematic articulation mechanism, or more generally, it can be mounted on/dismounted from a hinge previously installed /in use on the vehicle. With this aim, the servo control unit can utilise "extra travel" of the movable part thereof, without the use of tools and without manoeuvring and/or using external components.

[0018] In an illustrative embodiment of the present invention, the actuator 5a comprises at least one pre-loaded axial spring. This spring is interconnected through a fifth pin 5b and a sixth pin 5c with the first and the second hooking portions 2 e 4, respectively, so as to be able to exert the above-mentioned "active force" in a linear proportion to the elongation thereof extending between the fifth pin 5b and the sixth pin 5c.

[0019] With reference to the accompanying drawings, it is possible to observe the presence of a spring-guiding element 6, which is axially fitted in the pre-loaded spring, as well as the presence of an end housing 7, which is coaxial with the spring-guiding element 6 and placed in correspondence with the fifth pin 5b or the sixth pin 5c.

[0020] Should one wish to make the invention more flexible in terms of different installations (or, in other words, if one wishes to produces only one object that can be adapted for use in servo controlling doors and/or hatchback doors varying in surfaces and weights), the presence of a pre-load adjusting unit for the actuator 5a can conveniently be provided. This adjusting unit can be realised in any manner whatsoever, even according to prior art technologies.

[0021] As concerns the positioning of the pre-load adjusting unit, it can be integrated into (and even more preferably, it can coincide with) the spring-guiding element 6 or the end housing 7.

[0022] Moreover, the pre-load adjusting unit for the servo control unit can also perform the function of an "opening limit stop" for the movable part of a door/hatchback door during normal procedures, and even an extra supplementary range of travel of the movable part of the door/hatchback door can be made available without having to manoeuvre any components.

[0023] Again, in order to make it possible to adapt the present invention to different situations of operation or use in a variety of settings, the presence of at least one geometric-adjustment element 8 is a possibility. This geometric-adjustment element is connectable to the first and/or the second hooking portion in order to vary a relative position of the fifth and/or sixth pin 5b and/or 5c, thus varying the "lever arms" and therefore the servo control actuating modes as well.

[0024] Should one wish to increase the functions of the present invention further, a damping element is conveniently installable in the hinge 1, the damping element being apt for generating a damping force.

[0025] This damping force is exerted coordinately with the active force generated by the servo control unit 5, and according to prior art technology this damping element is preferably apt for generating a viscous force (or in any case a force proportional to a displacement and/or a relative speed between two components of the same hinge).

[0026] An object of the present invention is also a motor vehicle comprising bodywork and a predetermined number of movable parts of this bodywork (e.g.: doors, bonnets, boots and/or hatchback doors movably articulated relative to the bodywork). Advantageously, this motor vehicle comprises at least one hinge as described hereinabove and as claimed below (conveniently, this hinge is interposed between the bodywork and at least one of the "movable parts" listed above).

[0027] The invention achieves numerous advantages.

[0028] In fact, owing to the particular structural design of the present hinge, the device can be mounted in spaces that are quite limited, and the servo control function can be integrated with the kinematic articulation function. Furthermore, the complete absence of working fluids or gases makes this device virtually free from functional variations due to environmental factors such as temperature.

[0029] Moreover, the present invention is capable of markedly facilitating the opening of a door/hatchback door or a similar movable object, and capable of keeping it stably in an open position without the aid of additional mechanical stops.

[0030] A further advantage achieved by the present hinge is offered by the fact it is possible to safeguard any "fragile" or "delicate" parts of the vehicle that may be mounted in the vicinity of the door/bonnet/hatchback door, during the closing step. In fact, the servo control means as described hereinabove and claimed below, also functions as a "brake" during closure, thereby preventing violent closure and thus the transmission of abrupt stresses.

[0031] Lastly, it can be observed that the reduced total number of parts and the absence of working fluids or gases make the present invention extremely reliable, easy to maintain and above all economical.

Claims

1. A hinge for movable parts of motor vehicle bodyworks, said movable parts preferably being doors, bonnets, boots, and/or hatchback doors, said hinge comprising:

- a first hooking portion (2) connectable to a fixed part of a chassis and/or a bodywork;
- a kinematic articulation mechanism (3) connected to said first hooking portion (2); and
- a second hooking portion (4) connected to said kinematic articulation mechanism (3) and connectable to a movable part of a chassis and/or a bodywork, **characterised in that** it further comprises a servo control unit (5) simultaneously associated with the first and the second hooking portions (2, 4).

2. The hinge as claimed in claim 1, wherein said kinematic articulation mechanism comprises:

- a first connecting lever (3a) having a first pin (3b) connected to the first hooking portion (2) and a second pin (3c) connected to the second hooking portion (4); and
- a second connecting lever (3d) having a third pin (3e) connected to the first hooking portion (2) and a fourth pin (3f) connected to the second hooking portion (4).

3. The hinge as claimed in claim 1 or 2, wherein said servo control unit (5) comprises at least one actuator (5a) adapted to exert an active force at least on said second hooking portion (4).

4. The hinge as claimed in claim 3, wherein said at least one actuator (5a) comprises at least one pre-loaded axial spring interconnected through a fifth pin (5b) and a sixth pin (5c) with the first and the second hooking portions (2 and 4) respectively, said pre-loaded axial spring preferably adapted to exert said active force in a linear proportion to the elongation thereof extending between said fifth pin (5b) and said sixth pin (5c).

5. The hinge as claimed in any one of the preceding claims, wherein said servo control means (5) further comprises:

- a spring-guiding element (6) axially fitted in the pre-loaded spring; and
- an end housing (7) coaxial with said spring-guiding element (6) and placed in correspondence with the fifth pin (5b) or the sixth pin (5c).

6. The hinge as claimed in any one of the preceding claims, wherein a pre-load adjusting unit for said at least one actuator (5a) is also present.

7. The hinge as claimed in claim 6, wherein said adjusting unit is preferably integrated into, and more preferably coincident with, the spring-guiding element (6) or the end housing (7).

8. The hinge as claimed in any one of the preceding claims, wherein at least one geometric-adjustment element (8) is present and connectable to the first and/or second hooking portion (2 and/or 4) in order to vary a relative position of the fifth and/or sixth pin (5b and/or 5c).

9. The hinge as claimed in any one of the preceding claims, wherein there is also present a damping element adapted to generate a damping force that is exerted coordinately with said active force generated by the servo control unit (5), said damping element preferably being adapted to generate a viscous force or a force proportional to a displacement and/or a relative speed between two components of the hinge (1).

10. A motor vehicle comprising a bodywork and a predetermined number of movable parts of said bodywork, said movable parts preferably being doors and/or bonnets, and/or boots, and/or hatchback doors movably articulated relative to said bodywork, **characterised in that** it comprises at least one hinge as claimed in any one of the preceding claims, which is interposed between the bodywork and at least one of said movable parts.

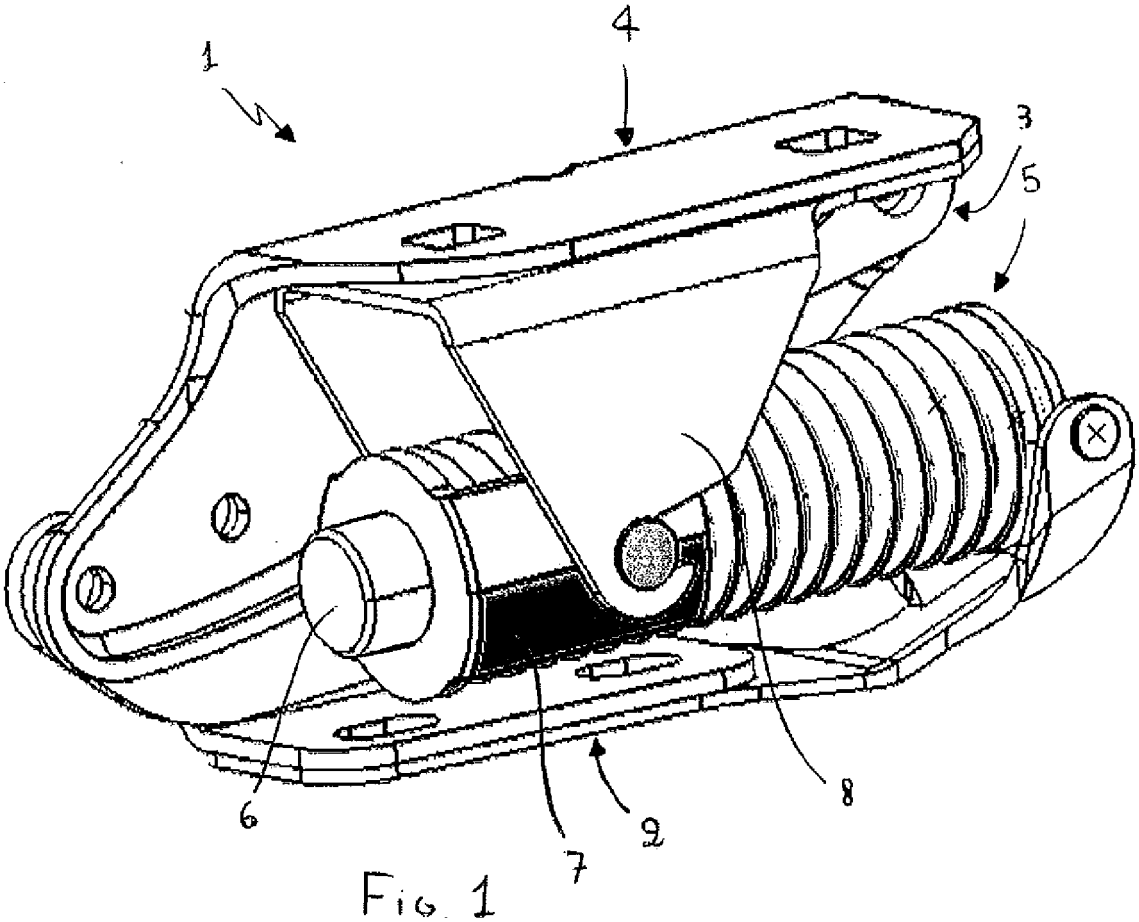

Fig. 1

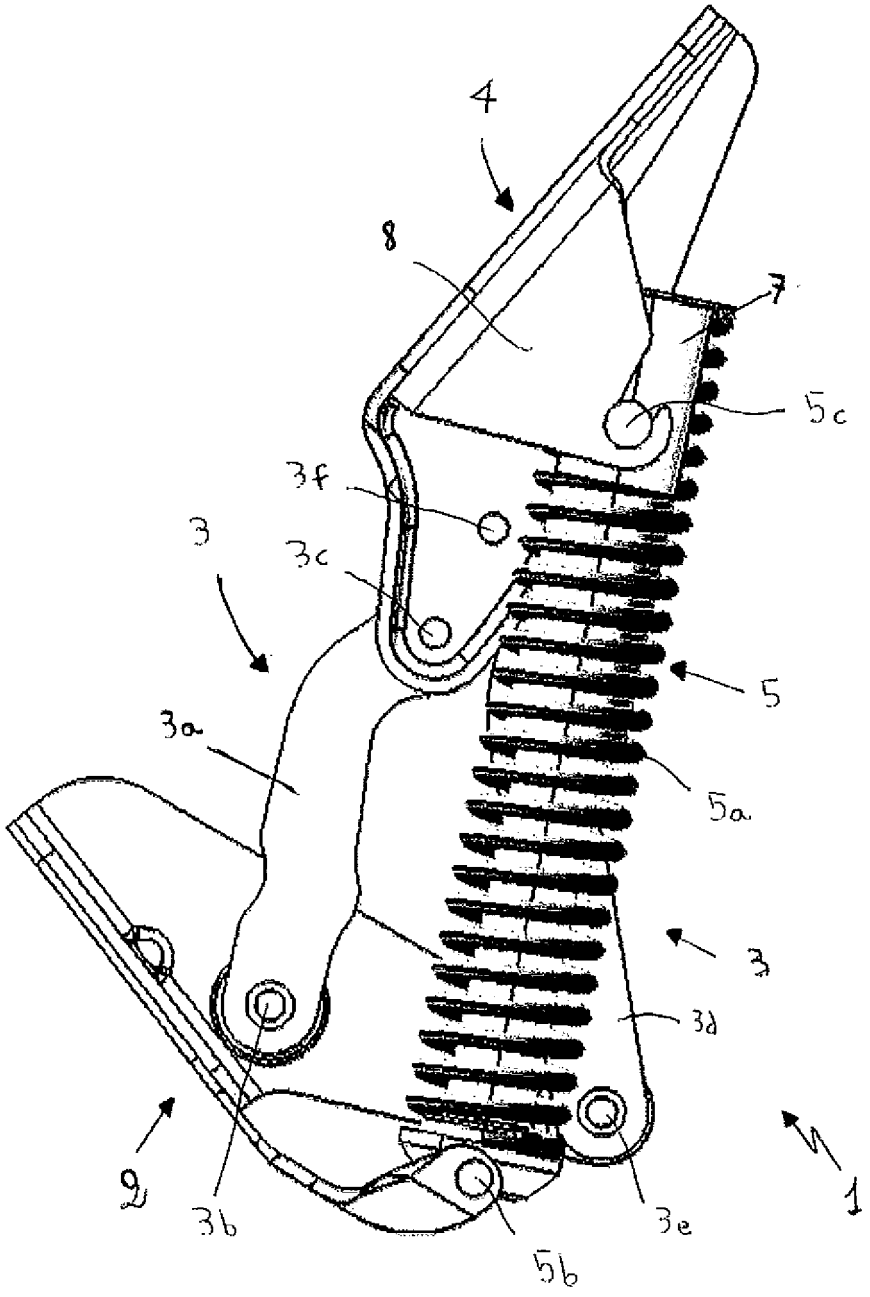

Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 14 17 7798

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	US 2003/217436 A1 (HASHIM WAQAR [US] ET AL) 27 November 2003 (2003-11-27) * paragraphs [0001], [0017], [0019], [0021], [0022], [0024] * * figures 2,3 *	1-5,10 6,7,9	INV. E05D3/14 E05F1/12 E05D5/06
X Y	US 2005/264029 A1 (BODNER MICHAEL E [US]) 1 December 2005 (2005-12-01) * paragraphs [0008], [0020], [0021], [0022], [0023], [0024] * * figure 2 *	1-4,8,10 6,7,9	
X	US 2005/172453 A1 (DUFFY MICHAEL J [CA]) 11 August 2005 (2005-08-11) * paragraphs [0026] - [0028] * * figures 6,7 *	1,3,10	
Y A	US 2013/087956 A1 (KRAJENKE GARY W [US] ET AL) 11 April 2013 (2013-04-11) * paragraphs [0001], [0011], [0018] * * figure 1 *	6,7 8	
			TECHNICAL FIELDS SEARCHED (IPC)
Y A	DE 101 59 591 C1 (INNOTEC FORSCHUNGS & ENTW GMBH [DE]) 25 September 2003 (2003-09-25) * paragraphs [0001], [0016] * * page 2; figure 2 *	9 1	E05D E05F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	2 December 2014	Wagner, Andrea

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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02-12-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2003217436 A1	27-11-2003	NONE	
US 2005264029 A1	01-12-2005	NONE	
US 2005172453 A1	11-08-2005	BR PI0506634 A	08-05-2007
		EP 1716304 A2	02-11-2006
		JP 4842149 B2	21-12-2011
		JP 2007524048 A	23-08-2007
		KR 20060129369 A	15-12-2006
		US 2005172453 A1	11-08-2005
		US 2006225247 A1	12-10-2006
		WO 2005076859 A2	25-08-2005
US 2013087956 A1	11-04-2013	BR 102012020767 A2	12-11-2013
		CN 103032500 A	10-04-2013
		DE 102012218037 A1	11-04-2013
		US 2013087956 A1	11-04-2013
DE 10159591 C1	25-09-2003	NONE	

EPO FORM P0459

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