(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 832 942 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
29.08.2018 Bulletin 2018/35

(51) Int Cl.:
E05D 3/14 *(2006.01)* ***E05F 1/12*** *(2006.01)*
E05D 5/06 *(2006.01)*

(21) Application number: **14177798.7**

(22) Date of filing: **21.07.2014**

(54) **HINGE FOR MOVABLE PARTS OF MOTOR VEHICLE BODYWORKS, SUCH AS DOORS, BOOTS, BONNETS AND/OR HATCHBACK DOORS**

SCHARNIER FÜR BEWEGLICHE TEILE EINER KRAFTFAHRZEUGKAROSSERIE WIE ZUM BEISPIEL TÜREN, KOFFERRAUMKLAPPEN, MOTORHAUBEN UND/ODER HECKKLAPPEN

CHARNIÈRE POUR LES PARTIES MOBILES DE CARROSSERIES DE VÉHICULE AUTOMOBILE, COMME PORTES, COUVERCLES DE COFFRE, CAPOTS ET/OU HAYONS

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **30.07.2013 IT MI20131277**

(43) Date of publication of application:
04.02.2015 Bulletin 2015/06

(73) Proprietor: **De Molli Giancarlo Industrie S.p.A.**
21040 Castronno (VA) (IT)

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

(74) Representative: **Tarabbia, Luigi**
Bugnion S.p.A.
Viale Lancetti, 17
20158 Milano (IT)

(56) References cited:
DE-C1- 10 159 591
US-A- 2 641 795
US-A1- 2003 217 436
US-A1- 2005 172 453
US-A1- 2005 264 029
US-A1- 2013 087 956

EP 2 832 942 B1

Printed by Jouve, 75001 PARIS (FR)

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). An example of such solution is shown in document US 2003/217436 A1 and in document US 2 641 795 A. 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. An example of such solution is shown in document US 2005/264029 A1. 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. 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. 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.

[0005] 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. 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.

[0006] 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).

[0007] 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). The present hinge further comprises a servo control unit 5 simultaneously associated with the first and the second hooking portions 2, 4.

[0008] 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.

[0009] 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 sec-

ond hooking portion 4).

[0010] 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).

[0011] According to the needs at hand but not covered by the claims, 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.

[0012] In 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.

[0013] 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.

[0014] 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 is provided. This adjusting unit can be realised in any manner whatsoever, even according to prior art technologies.

[0015] As concerns the positioning of the pre-load adjusting unit, it coincides with the spring-guiding element 6 or the end housing 7.

[0016] 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.

[0017] Again, in order to make it possible to adapt the present invention to different situations of operation or use in a variety of settings, at least one geometric-adjustment element 8 is present. 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.

[0018] 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.

[0019] 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) .

[0020] 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). 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).

[0021] The invention achieves numerous advantages.

[0022] 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.

[0023] 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.

[0024] 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.

[0025] 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,

it further comprises a servo control unit (5) simultaneously associated with the first and the second hooking portions (2, 4)
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), 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, **characterised in that** 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);
a pre-load adjusting unit for said at least one actuator (5a) is also present, said adjusting unit is coincident with the spring-guiding element (6) or the end housing (7),
- and 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).

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, wherein said pre-loaded axial spring is 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) .

4. 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).

5. 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.

Patentansprüche

1. Scharnier für bewegliche Teile einer Kraftfahrzeugkarosserie, wobei die beweglichen Teile vorzugsweise Türen, Motorhauben, Kofferraumklappen, und/oder Heckklappen sind, wobei das Scharnier umfasst:

- einen ersten Hakenabschnitt (2), der mit einem festen Teil eines Chassis und/oder einer Karosserie verbindbar ist;
- einen kinematischen Gelenkmechanismus (3), der mit dem ersten Hakenabschnitt (2) verbunden ist; und
- einen zweiten Hakenabschnitt (4), der mit dem kinematischen Gelenkmechanismus (3) verbunden und mit einem beweglichen Teil eines Chassis und/oder einer Karosserie verbindbar ist,

es umfasst ferner eine Servosteuereinheit (5), die gleichzeitig mit dem ersten und dem zweiten Hakenabschnitt (2, 4) verbunden ist, wobei die Servosteuereinheit (5) mindestens einen Aktuator (5a) umfasst, der angepasst ist, eine aktive Kraft mindestens auf den zweiten Hakenabschnitt (4) auszuüben, wobei der mindestens eine Aktuator (5a) mindestens eine vorgespannte axiale Feder umfasst, die durch einen fünften Stift (5b) und einen sechsten Stift (5c) mit jeweils dem ersten und dem zweiten Hakenabschnitt (2 bzw. 4) miteinander verbunden ist, **dadurch gekennzeichnet, dass** die Servosteuermittel (5) ferner umfassen:

- ein Federführungselement (6), das axial in die vorgespannte Feder eingepasst ist; und
- ein Endgehäuse (7), das koaxial zu dem Federführungselement (6) ist und an dem fünften Stift (5b) oder dem sechsten Stift (5c) platziert ist;

eine Vorspannungseinstellungseinheit für den mindestens einen Aktuator (5a) vorhanden ist, wobei die Einstellungseinheit mit dem Federführungselement (6) oder dem Endgehäuse (7) zusammenfällt und mindestens ein geometrisches Einstellungselement (8) vorhanden und mit dem ersten und/oder zweiten Hakenabschnitt (2 und/oder 4) verbindbar ist, um eine relative Position des fünften und/oder sechsten Stiftes (5b und/oder 5c) zu verändern.

2. Scharnier nach Anspruch 1, wobei der kinematische Gelenkmechanismus umfasst:

- einen ersten Verbindungshebel (3a) mit einem ersten Stift (3b), der mit dem ersten Hakenabschnitt (2) verbunden ist, und einem zweiten Stift (3c), der mit dem zweiten Hakenabschnitt (4) verbunden ist;
und
- einen zweiten Verbindungshebel (3d) mit einem dritten Stift (3e), der mit dem ersten Hakenabschnitt (2) verbunden ist, und einem vierten Stift (3f), der mit dem zweiten Hakenabschnitt (4) verbunden ist.

3. Scharnier nach Anspruch 1, wobei die vorgespannte Axialfeder so angepasst ist, dass sie die aktive Kraft in einem linearen Verhältnis zu ihrer Dehnung zwischen dem fünften Stift (5b) und dem sechsten Stift (5c) ausübt.

4. Scharnier, nach einem der vorhergehenden Ansprüche, wobei auch ein Dämpfungselement vorhanden ist, das angepasst ist, eine Dämpfungskraft zu erzeugen, die koordiniert mit der von der Servosteuereinheit (5) erzeugten aktiven Kraft ausgeübt wird, wobei das Dämpfungselement vorzugsweise angepasst ist, um eine viskose Kraft oder eine Kraft proportional zu einer Verschiebung und/oder einer relativen Geschwindigkeit zwischen zwei Komponenten des Scharniers (1) zu erzeugen.

5. Kraftfahrzeug umfassend eine Karosserie und eine vorbestimmte Anzahl von beweglichen Teilen der Karosserie, wobei die beweglichen Teile vorzugsweise Türen und/oder Motorhauben und/oder Kofferraumklappen und/oder Heckklappen sind, die relativ zu der Karosserie beweglich angelenkt sind, **dadurch gekennzeichnet, dass** es mindestens ein Scharnier nach einem der vorhergehenden Ansprüche umfasst, das sich zwischen der Karosserie und mindestens einem der beweglichen Teile befindet.

Revendications

1. Charnière pour les parties mobiles de carrosseries de véhicule automobile, lesdites parties mobiles étant de préférence des portes, des capots, des couvercles de coffre et/ou des hayons, ladite charnière comprenant :

- une première partie d'accrochage (2) pouvant être reliée à une partie fixe d'un châssis et/ou d'une carrosserie ;
- un mécanisme d'articulation cinématique (3) relié à ladite première partie d'accrochage (2) ; et
- une seconde partie d'accrochage (4) reliée au dit mécanisme d'articulation cinématique (3) et pouvant être reliée à une partie mobile d'un châssis et/ou d'une carrosserie,

celle-ci comprend de plus une unité asservie (5) associée simultanément à la première et à la seconde parties d'accrochage (2, 4), ladite unité asservie (5) comprend au moins un actionneur (5a) adapté pour exercer une force active au moins sur ladite seconde partie d'accrochage (4), dans laquelle ledit au moins un actionneur (5a) comprend au moins un ressort axial préchargé relié à travers un cinquième axe (5b) et un sixième axe (5c), respectivement, aux première et seconde parties d'accrochage (2 et 4), **caractérisée en ce que** ledit moyen asservi (5) comprend de plus :

- un élément de guidage à ressort (6) axialement monté dans le ressort préchargé ; et
- un logement terminal (7) coaxial au dit élément de guidage à ressort (6) et placé en correspondance du cinquième axe (5b) ou du sixième axe (5c) ;

une unité de réglage de précharge pour ledit au moins un actionneur (5a) est aussi présent, ladite unité de réglage coïncidant avec l'élément de guidage à ressort (6) ou le logement terminal (7), et au moins un élément de réglage géométrique (8) est présent et pouvant être relié à la première et/ou à la seconde partie d'accrochage (2 et/ou 4) afin de varier une position relative du cinquième axe et/ou du sixième axe (5b et/ou 5c).

2. Charnière selon la revendication 1, dans laquelle ledit mécanisme d'articulation cinématique comprend :

- un premier levier de raccordement (3a) comportant un premier axe (3b) relié à la première partie d'accrochage (2) et un second axe (3c) relié à la seconde partie d'accrochage (4) ;
et
- un second levier de raccordement (3d) comportant un troisième axe (3e) relié à la première partie d'accrochage (2) et un quatrième axe (3f) relié à la seconde partie d'accrochage (4).

3. Charnière selon la revendication 1, dans laquelle ledit ressort axial préchargé est adapté pour exercer ladite force active dans une proportion linéaire par rapport à son allongement se prolongeant entre ledit cinquième axe (5b) et ledit sixième axe (5c).

4. Charnière selon l'une quelconque des revendications précédentes, dans laquelle il se trouve aussi un élément d'amortissement adapté pour générer une force d'amortissement étant exercée de façon coordonnée avec ladite force active générée par l'unité asservie (5), ledit élément d'amortissement étant, de préférence, adapté pour générer une force de viscosité ou une force proportionnelle à un déplacement et/ou une vitesse relative entre deux composants de la charnière (1).

5. Véhicule automobile comprenant une carrosserie et un nombre prédéterminé de parties mobiles de ladite carrosserie, lesdites parties mobiles étant de préférence des portes et/ou des capots et/ou des couvercles de coffre et/ou des hayons montés articulés de façon mobile par rapport à ladite carrosserie, **caractérisé en ce qu'**il comprend au moins une charnière, selon l'une quelconque des revendications précédentes, étant interposée entre la carrosserie et au moins une desdites parties mobiles.

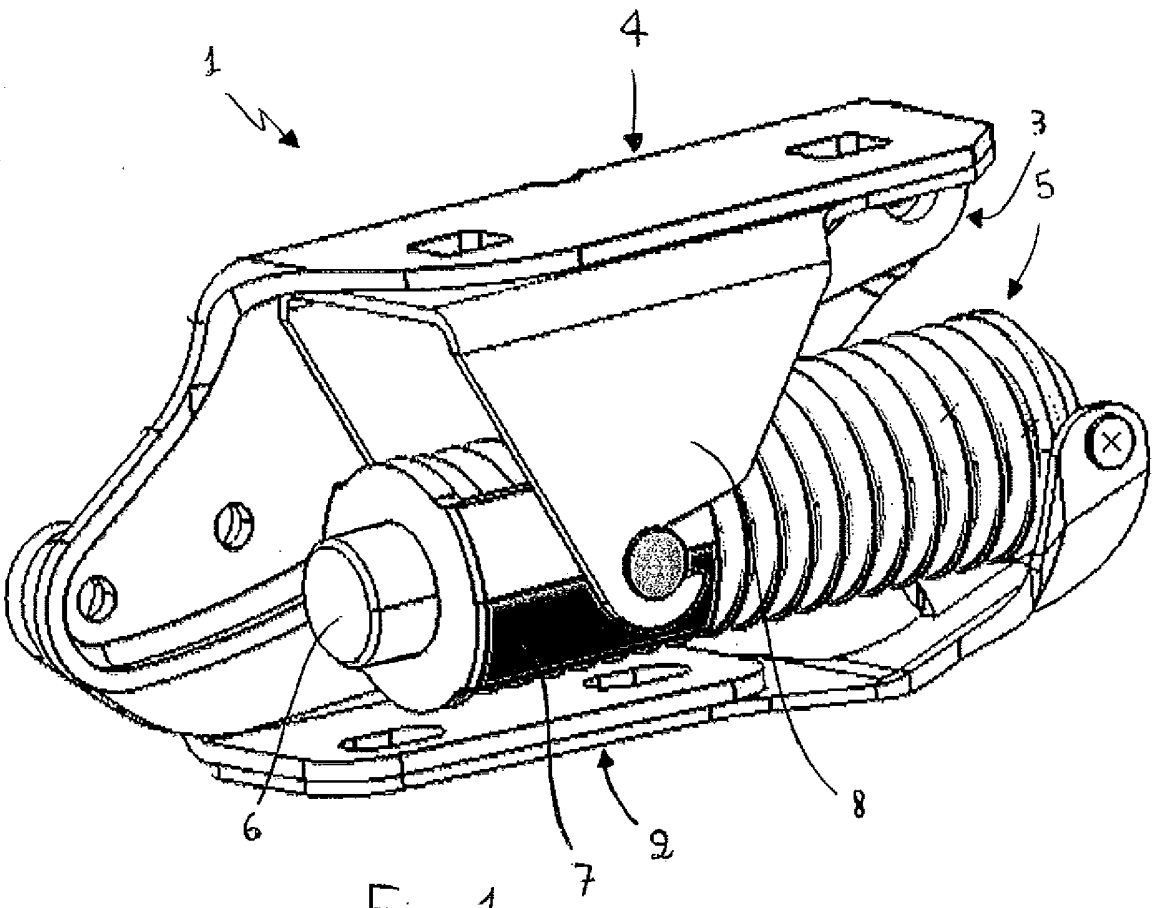

Fig. 1

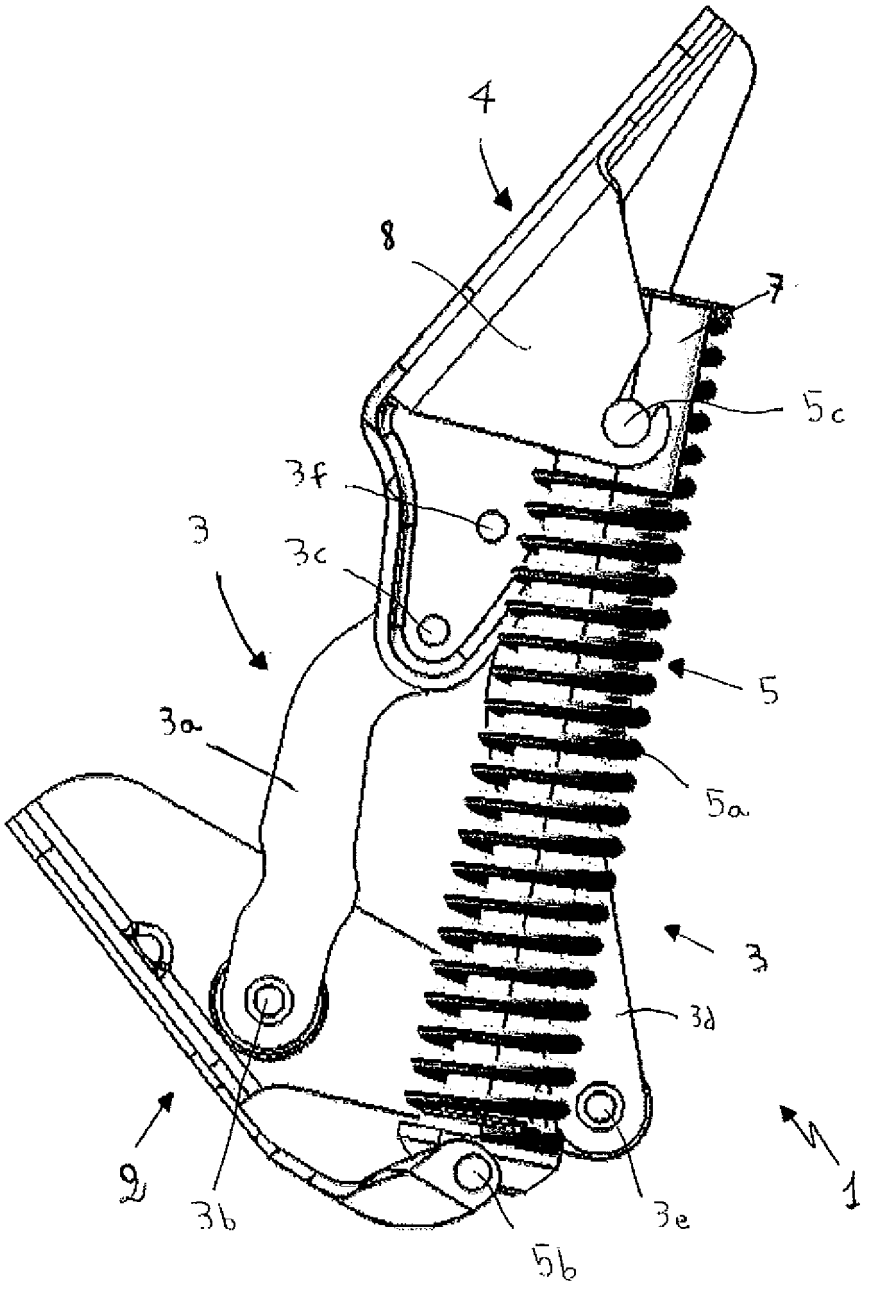

Fig. 2

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

- US 2003217436 A1 **[0004]**
- US 2641795 A **[0004]**
- US 2005264029 A1 **[0004]**