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

(11) EP 1 523 929 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
20.04.2005 Bulletin 2005/16

(51) Int Cl.[7]: **A47L 15/42**, E05F 1/12

(21) Application number: **04024203.4**

(22) Date of filing: **11.10.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL HR LT LV MK

(30) Priority: **13.10.2003 IT BO20030592**

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(54) Balancing device for a door of an household appliance

(57) A balancing device for a door of an household appliance, provided with chassis to which is hinged the door, includes at least an articulated means (1) provided with a balance means (2) equipped with swiveling connection means at least first (3), second (4) and third (5) respectively for the appliance chassis, for an elastic mean (6), for an end of a tension rod mean (7) whose remaining end has a coupler (8) for the door of the appliance.

The first swiveling connection means (3) is meddle and misaligned to the remaining two. The elastic mean (6) transmits to the balance means (2) a force opposing the door weight and transmitted to the balance means (2) by the tension rod mean (7).

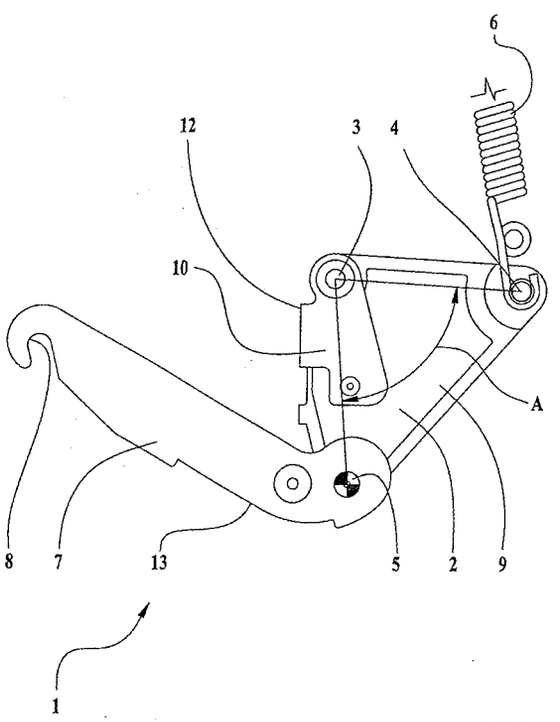

FIG.1

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Description

[0001] The present invention concerns the technical field of the hinges, and refers to a balancing device for a door of an household appliance particularly for stopping, in intermediate positions, a door, a shutter or a porthole in general, of an electrical appliance device, such an oven, a dishwasher and similar, having rotation hinges with horizontal axis and below the same door.

[0002] There are known ovens, dishwasher and similar provided with horizontal axis hinges for the rotation of a door from a closed condition, in which such door is vertical, to an open condition in which the door is lowered to an almost horizontal position.

[0003] Such appliances sometimes have known balancing devices, connected to their body and to the door to avoid that this last, during descent opening, can reach, due to the falling, an excessive speed and to allow the door stop in at least some intermediate positions between opening and closing.

[0004] A drawback of such known balancing devices consists in the fact that they include complex and numerous elements, generally at least three main stiff elements with at least two special cam profiles having high surface finishing for regularity and fluidity of the mutual matching, being therefore expensive, complex and critical production.

[0005] Other drawback consists in that mutual matching portions, of such known devices, are wearing provoking irregularity and defects of operations or breakups.

[0006] A object of the present invention is to propose a simple balancing device and including a reduced number of parts, balancing, at least partially, the door in intermediate opening conditions.

[0007] Other object is to propose a device of smaller dimension, reliable and few wearing.

The above-mentioned objects are achieved according to the content of the claims.

[0008] The characteristics of the invention are underlined in the following, with particular reference to the attached drawings, in which:

- figures 1 and 2 show side views of articulated means respectively right and left of the balancing device for a door of an household appliance object of the present invention;
- figures 3 and 4 illustrate views, not in scale, respectively from the top and from left of a balance means of figure 1;
- figure 5 illustrates a side view, not in scale, of a tension rod mean of figure 1;
- figure 6 illustrates a side view of a variant of the device of figure 1;
- figures 7 and 8 illustrate section and plant views respectively of a slide mean of figure 6.

[0009] With reference to the figures 1 - 5, numeral 1 indicates, right or left articulated means of the balancing device for a vertical door of an appliance provided with a chassis to which is hinged the door at bottom.

[0010] The articulated means 1, right or left, are connected to respective side portions of door and of chassis close to the hinges having fixed horizontal rotation axis or translating axis for lifting the lower edge of the door in the opening conditions.

[0011] Each articulated means 1 is provided with a balance means 2 having swiveling connection means at least first 3, second 4 and third 5 respectively for the appliance chassis, for an elastic mean 6 and for an end of a tension rod mean 7, made of cut plate, whose remaining end has a coupler 8 for the appliance door.

[0012] The first swiveling connection means 3 is intermediate and misaligned to the remaining two.

[0013] The elastic mean 6, for instance a helical spring, transmits to the balance means 2, triangular plain shaped, a force opposing the door weight and transmitted to the balance means 2 by the tension rod mean 7.

[0014] The rotation axis of the swiveling connection means 3, 4, 5 are nearly perpendicular to the plan defined by the balance means 2 and the elastic mean 6 and the tension rod mean 7 lie approximately on a same plan nearly parallel to said plain defined by the balance means 2.

[0015] The linking line of the first connection means 3 to the second 4 forms, with the linking line of the first connection means 3 to the third 5, an angle A ranging from 90° to 70°, preferably of around 80°.

[0016] The distance between the connection means first 3 and second 4 is less than the distance between the connection means first 3 and third 5 and this last distance is less of the distance between the connection means second 4 and third 5.

[0017] In such way the connection means are located in the vertex of an irregular almost right triangle.

[0018] The distance between the connection means first 3 and second 4 is bigger than half distance between the third mean of connection 5 and the coupler 8 of the tension rod mean 7 for the door.

[0019] The couplers to the chassis for the free ends of the tension rod mean and of the elastic mean and for the first connection mean 3 are positioned in way that this last first connection mean 3 is interposed between the elastic means 6 and the tension rod mean 7.

[0020] The balance means 2 is made of a shaped plate having, close to vertexes, the connection means 3, 4, 5.

[0021] The plate of the balance means 2 has a linear linear folding 12 linking a first flat wall 9, having all of the connection means 3, 4, 5, with a second flat wall 10 placed at least close to the first connection means 3.

[0022] Walls 9, 10 have respective projections 11 fit for maintaining the mutual parallelism in cooperation with the folding 12.

[0023] The first connection mean 3 consists in a pass-

ing hole carried out in the walls first 9 and second 10.

[0024] The folding 12 constitutes a stop fit for matching an arrest of the appliance chassis in a extreme door opening condition.

[0025] The connection means second 4 and third 5 include respective hardened steel pivots fixed by orbital forming of a fixing end.

[0026] The pivot of the third connection means 5 is double diameter type and has a stop shoulder for the tension rod mean 7.

[0027] The coupler 8 of the tension rod mean 7 consists in an open buttonhole for a pivot of the door.

[0028] The tension rod mean 7 has a respective projection fit to reduce the transversal clearance slidingly matching a flat element of the chassis.

[0029] The edge opposite to the balance means 2 of the tension rod mean 7 has a housing 13 carried out by a simultaneous cutting.

[0030] In the variant of the device illustrated in the figures 6 - 8, the housing 13 is engaged by a slide mean 14 designed, for instance, to the driving of door hinge means for the translation of the rotation axis.

[0031] The slide mean 14 is made of material having a low friction coefficient, for instance nylon or teflon, and is approximately ice skate shaped, in other words having a rectilinear portion joined to a curved portion.

[0032] The slide mean 14 has fixing holes 15 for a fixing pivot to the tension rod mean 7 and it has a groove 16 for the housing 13.

[0033] The operation of the device provides that the spring of the elastic means 6 transmits to the balance means an antagonist torque of the door weight torque.

[0034] The above described conformation and geometry of the articulated means, causes an increase of the antagonist torque the door is opening allowing the balancing of the later also in intermediate opening conditions.

[0035] An advantage of the present invention is to provide a simple balancing device for balancing the door in intermediate opening conditions.

[0036] Further advantage is to provide a smaller, reliable and few wearing device, and having a fluid and silent operation.

[0037] The aforesaid invention is described, with reference to the attached drawings, by way of example not limiting, and therefore it is evident that all its possible modifications of variants suggested by the practice or by the operation and use, are in any case included in the ambit defined by the following claims.

Claims

1. Balancing device for a door of an household appliance provided with a chassis to which is hinged the door; the device is **characterized in that** it includes at least an articulated means (1) provided with a balance means (2) equipped with swiveling connection means at least first (3), second (4) and third (5) respectively for the appliance chassis, for an elastic mean (6), for an end of a tension rod mean (7) whose remaining end has a coupler (8) for the appliance door; the first swiveling connection means (3) being intermediary and misaligned to the remaining two and the elastic mean (6) transmitting to the balance means (2) a force opposing the door weight and transmitted to the balance means (2) by the tension rod mean (7).

2. Device according to claim 1 **characterized in that** it includes two articulated means (1) each associated to a respective side of the door.

3. Device according to the claim 1 **characterized in that** the rotation axis of the swiveling connection means (3, 4, 5) are nearly perpendicular to the plan defined by the balance means (2).

4. Device according to the claim 1 **characterized in that** the elastic means (6) and connecting rod mean (7) lie approximately on a same plain.

5. Device according to the claim 4 **characterized in that** the lying plan of elastic means (6) and of connecting rod mean (7) is parallel to the plan defined by the balance means (2).

6. Device according to the claim 1 **characterized in that** the linking line of the connection means first (3) and second (4) forms, with the linking line of the connection means first (3) and third (5), an angle (A) ranging from 90° to 70°, preferably of about 80°.

7. Device according to claim 1 or to claim 6 **characterized in that** the distance between the connection means first (3) and second (4) is less than the distance between the connection means first (3) and third (5) and this latter is less then the distance between the connection means second (4) and third (5).

8. Device according to claim 1 or claim 7 **characterized in that** the distance between the connection means first (3) and second (4) is bigger than half of the distance between the third connection mean (5) and the coupler (8) of the tension rod mean (7) for the door.

9. Device according to claim 1 or claim 8 **characterized in that** the first connection means (3) is interposed between the elastic mean (6) and the tension rod mean (7).

10. Device according to claim 1 **characterized in that** the balance means (2) is approximately triangular shaped with the vertexes having the connection

means (3, 4, 5) and it is made of a shaped plate.

11. Device according to claim 10 **characterized in that** the plate of the balance means (2) has a folding (12) for linking a first wall (9), having the connection means (3, 4, 5), with a second wall (10) placed at least close to the first connection means (3).

12. Device according to claim 10 **characterized in that** the walls (9, 10) have respective projections (11) fit to maintain the parallelism between the themselves walls, in cooperation with the folding (12).

13. Device according to claim 12 **characterized in that** the first connection mean (3) consists in a passing hole carried out in the walls first (9) and second (10).

14. Device according to claim 11 **characterized in that** the folding (12) forms a stop destined to match an arrest of the appliance chassis in a door extreme opening condition.

15. Device according to claim 1 **characterized in that** the connection means second (4) and third (5) comprise respective pivots.

16. Device according to claim 1 **characterized in that** the coupler (8) of the tension rod mean (7) consists in an open buttonhole for a pivot of the door.

17. Device according to claim 1 **characterized in that** the tension rod mean (7) includes a respective projection destined to the sliding matching of a plain element of the chassis.

18. Device according to claim 1 **characterized in that** the edge opposed to the balance means (2) of the tension rod mean (7) has a housing (13) for a slide mean (14) for driving the hinge means of the door.

19. Device according to claim 18, **characterized in that** the slide mean (14) provides fixing holes (15) for a block pivot to the tension rod mean (7) and provides a groove (16) for the housing (13).

20. Device according to any one of the preceding claims **characterized in that** the slide mean (14) is approximately ice skate shaped.

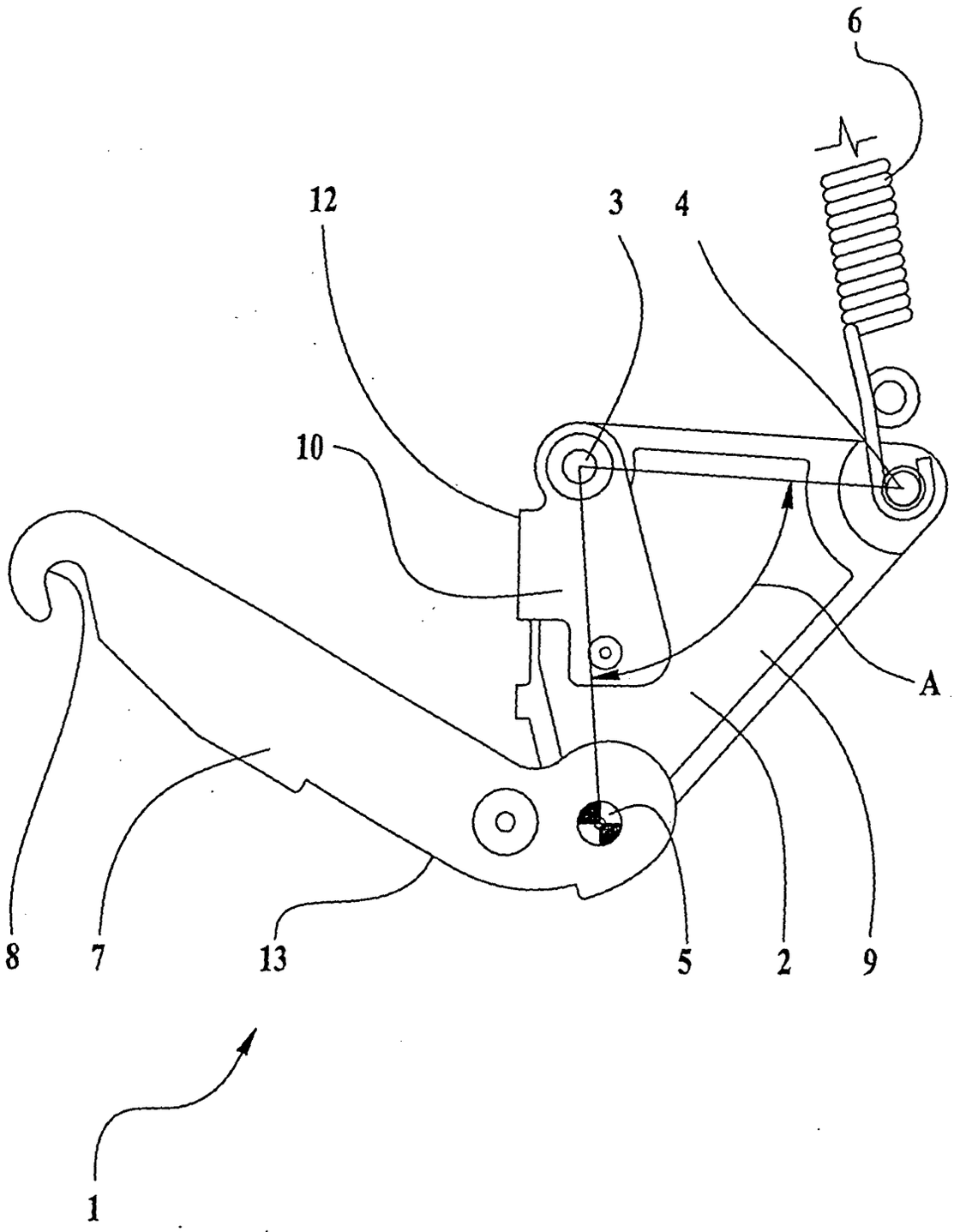


FIG.1

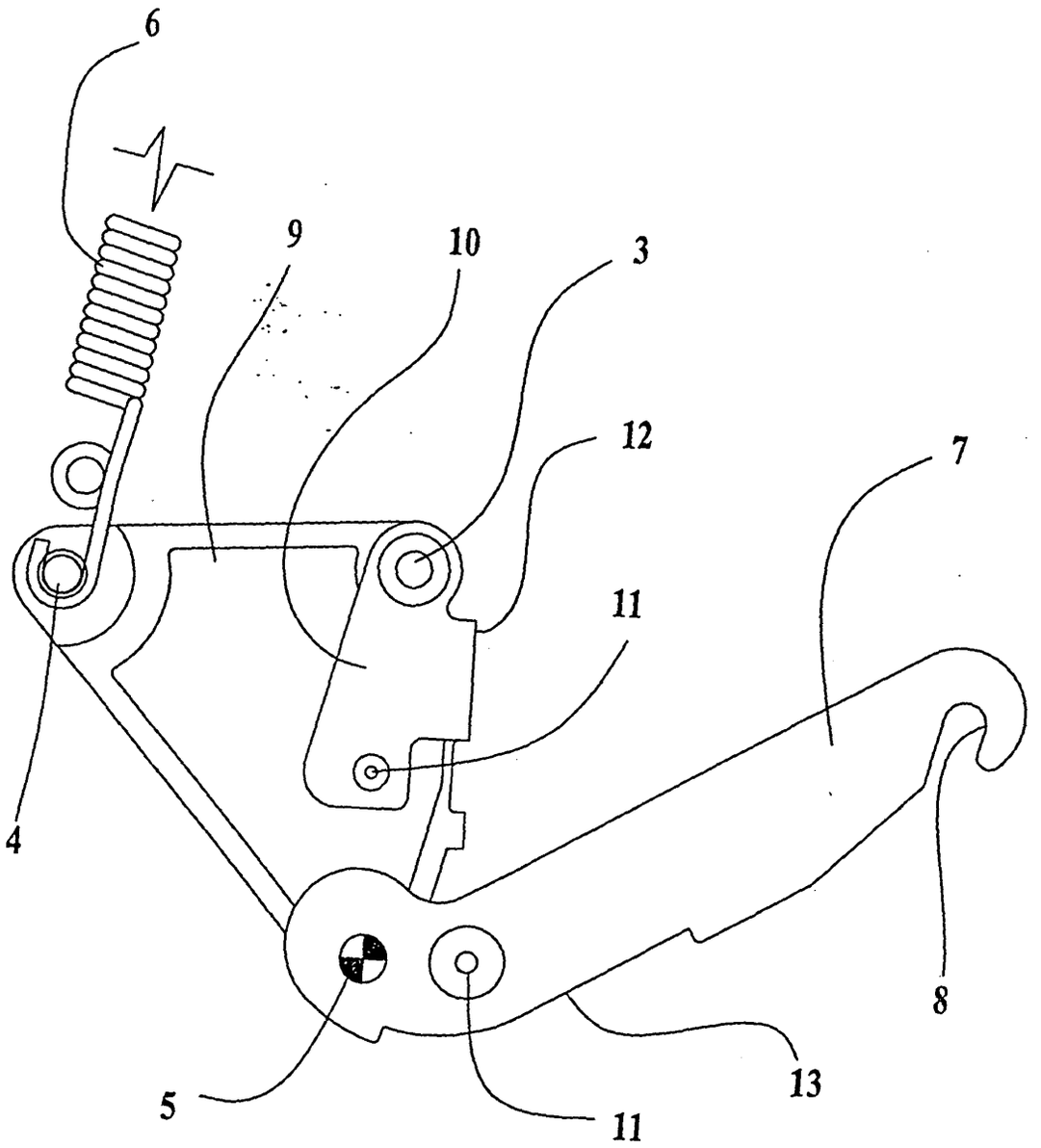


FIG.2

FIG.7

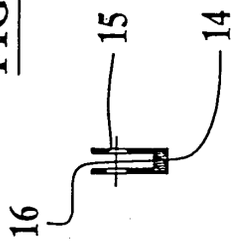


FIG.8

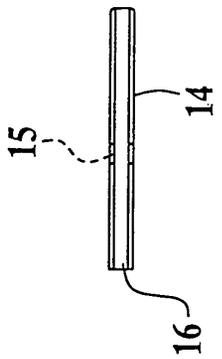


FIG.5

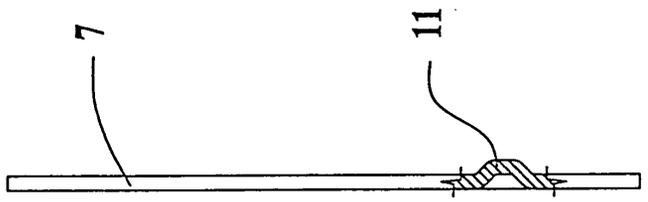


FIG.3

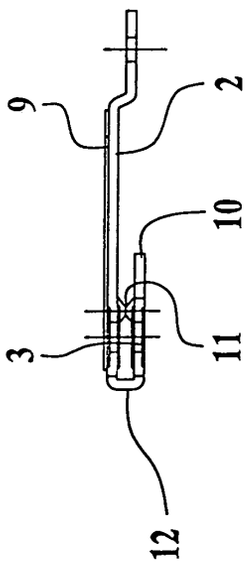
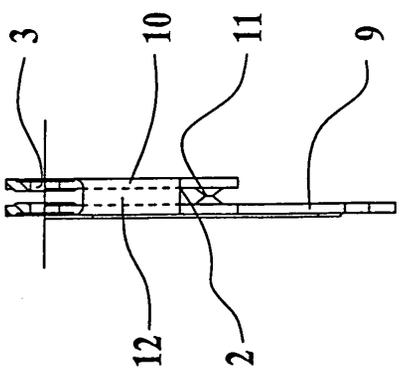


FIG.4



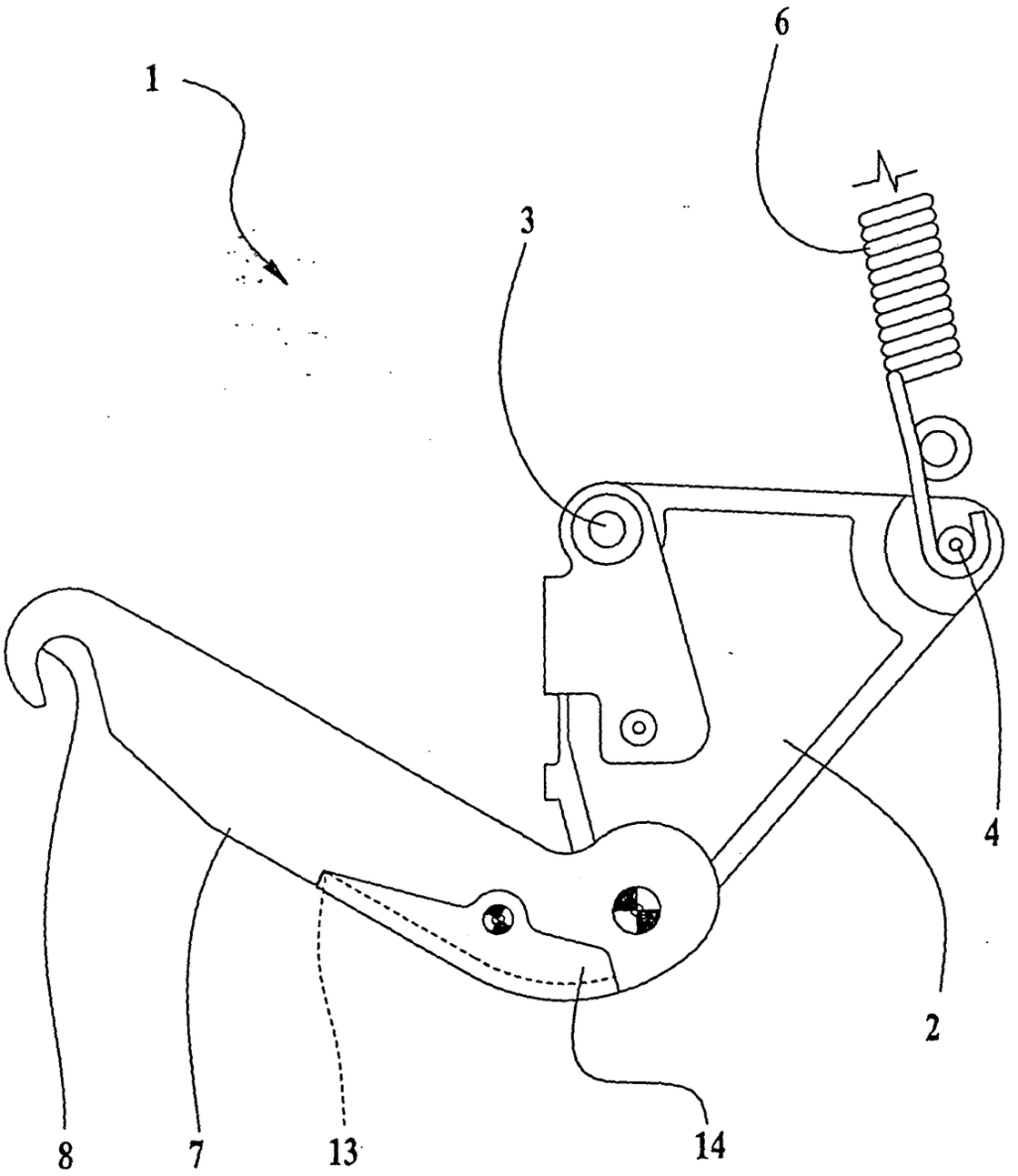


FIG.6