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(54) **Hinge device for a household appliance**

Scharniervorrichtung für Haushaltsgeräte

Charnière pour appareil ménager

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## Description

**[0001]** The present invention relates to the field of household appliances, in particular dishwashers. More particularly, the present invention concerns an improved hinge device for operatively connecting the door and the main body of the appliance.

**[0002]** Household appliances such as dishwashers are quite popular nowadays.

**[0003]** It is known how the market very often requires that these appliances are arranged as an integral part of the home furnishings.

**[0004]** This choice, in fact, offers considerable advantages from the ergonomics and aesthetics of the home environment.

**[0005]** Unfortunately, since the appliance has to be inserted in an environmental context that is different from time to time, its structure needs often to be arranged in order to properly match with the surrounding furniture. To this aim, for example, adjustable plinth elements or removable spacers are commonly used.

**[0006]** In addition, aesthetic door panels are often used to provide the exterior of the appliance with a design that aesthetically matches with the design lines of neighbouring pieces of furniture.

**[0007]** These aesthetic panels are often cumbersome and remarkably extend beyond the hinge line of the door to cover the plinth region of the appliance.

**[0008]** Even if they considerably improve the external aesthetic appearance of the appliance, these aesthetic panels have a considerable impact from the functional point of view. In fact, their remarkable length may be of prejudice for a correct rotation of the door, in particular during its opening movement.

**[0009]** In order to solve this problem, the height of the appliance structure or body may be varied but this choice introduces severe constraints for a correct matching of the appliance with the surrounding furniture, particularly when a common working plane is to be arranged.

**[0010]** Thus, some known appliances have been provided with relatively complex gear mechanisms to operatively connect the door and the main body of the appliance. Thanks to these hinge mechanisms, the door can move according to a rotational and translational trajectory with respect to main body of the appliance.

**[0011]** Unfortunately, these gear mechanisms have proven to be relatively expensive for a production at industrial level. Further, they are relatively complex to install on the appliance with a remarkable waste of time and labour.

**[0012]** Swiss patent application nr. CH683886A5 discloses a hinge mechanism comprising a support plate, which is fixed to the main body of the appliance, and a hinge plate, which is fixed to the appliance door. The support plate is provided with a rotation pin that is accommodated on an elongated and curved slot of the hinge plate. The rotation of the door determines the rotation of the hinge plate. This causes the relative sliding

movement of the rotation pin along the slot. In this manner a rotational and translational movement of the door is ensured.

**[0013]** This kind of hinge device has the drawback that both the hinge plate and the rotation pin are subject to severe friction phenomena, since the whole weight of the door is loaded on the rotation pin. This fact may imply the need of frequent maintenance or adjustment interventions to ensure a reliable and precise movement of the door.

**[0014]** The main aim of the present invention is to provide a hinge device for a household appliance, in particular a dishwasher, which allows the overcoming of the above mentioned drawbacks.

**[0015]** Within this aim, it is an object of the present invention to provide a hinge device, which allows the door of the household appliance to move according to a rotational and translational trajectory.

**[0016]** It is an object of the present invention to provide a hinge device, which has a robust structure that allows the reduction of friction phenomena during the movement of the door.

**[0017]** It is an object of the present invention to provide a hinge device, which has a simple structure and which is easy to install on a household appliance.

**[0018]** It is also an object of the present invention to provide a hinge device, which is easy to manufacture at industrial level, at competitive costs.

**[0019]** Thus, the present invention provides a hinge device for a household appliance, according to the claim 1 that is proposed in the following.

**[0020]** The hinge device, according to the invention, comprises a support plate, which is solidly connected to the main body of the appliance and a hinge plate, which is operatively connected to said support plate.

**[0021]** The hinge devices comprises lever means, which are rotationally connected to said support plate and are slidingly connected to the appliance door.

**[0022]** Said lever means are arranged to force the door to move according to a rotational and translational trajectory with respect to the main body of the appliance.

**[0023]** It is therefore possible to install longer décor panels on the door and reduce the height of the plinth.

**[0024]** The appliance structure can thus be arranged with less severe constraints, thereby obtaining an improved and easier integration with the surrounding furniture, with considerable advantages from the ergonomic and aesthetic point of view.

**[0025]** The hinge device, according to the invention, has a simple and robust structure and it is quite easy to manufacture and install at industrial level.

**[0026]** Further features and advantages of the hinge device, according to the present invention, will become apparent from the following description of preferred embodiments, taken in conjunction with the drawings, in which:

- figure 1 represents a schematic section diagram of

- a household appliance comprising the hinge device, according to the present invention; and
- figure 2 represents a schematic view of a part of the hinge device, according to the present invention; and
- figure 3 represents schematic views of some parts of the hinge device, according to the present invention;
- figure 4 is a schematic representation of an opening manoeuvre in appliance of figure 1.

**[0027]** Referring now to the cited figures, the present invention relates to a hinge device 100 for operatively connecting the main body 10 and the door 11 of a household appliance 1.

**[0028]** The household appliance 1 is preferably a dishwasher. Of course, it is intended that the hinge device 100 might be used in other kinds of appliances, such as dryers, washing machines, ovens, and the like.

**[0029]** The main body 10 of the appliance 100 preferably comprises a plinth 12 and an upper portion 13, which define an internal volume 130 that can be accessed by the user through the door 11.

**[0030]** The door 11 preferably comprises an inner portion 110 and one or more external aesthetic panels 111. The panels 111 advantageously extend towards the ground, well beyond the position of hinge device 100, so as to cover at least a portion of the plinth 12.

**[0031]** The hinge device 100 comprises at least a support plate 101, which is solidly connected to the main body 10. The permanent connection of the plate 101 to the body 10 is ensured by properly arranged first connecting means 14, e.g. by a plurality of rivets.

**[0032]** The hinge device 100 comprises also a hinge plate 103, which is operatively connected to the support plate 101. The hinge plate 103 is rotationally connected to the support plate 101 and slidingly connected to the door 11.

**[0033]** In particular, the hinge plate 103 has a first portion 1031, which is rotationally connected with a first pin member 1011A of the support plate 102, at a first rotation point 101A. At the lower edge of the first portion 1031, a half-circular open slot 1031A is advantageously present for accommodating at least partially the first pin member 1011 A.

**[0034]** **The first portion** 1031 comprises also a curved open slot 1031B, which is substantially vertically oriented and extends from the lower edge towards the centre of the portion 1031.

**[0035]** The slot 1031B is aimed at accommodating a second pin member 1011B of the support plate, during the rotation of the hinge plate 103 around the first pin member 1011A.

**[0036]** The second pin member 1011 B can slide within the slot 1031B, thereby avoiding a translational movement of the hinge plate 103 with respect to the support plate 101.

**[0037]** In this manner, the stable positioning of the first pin member 1011 A within the half-circular slot 1031 A

is ensured.

**[0038]** The hinge plate 103 is also provided with a second portion 1032, which is solid with the first portion 1031 and which is slidingly connected with the door 11, in particular with its inner portion 110.

**[0039]** **The second portion** 1032 comprises an elongated slot 1032A, which extends in a direction substantially parallel to the door 11 and accommodates a connecting member 104. Said connecting member is solidly fixed to the inner portion 110 of the door 11 and cooperates with said elongated slot to provide the sliding connection of said second portion 1032 to the door 11.

**[0040]** In particular, since the hinge plate is operatively connected to the support plate 101, said connecting member cooperates with the contour 1032B of said elongated slot to slidingly bear the door weight.

**[0041]** The connecting member 104 may be in principle a single rivet or other equivalent second connecting means.

**[0042]** **The connecting member** 104 is provided with an elongated body, which is solidly connected to the door 11 by means of rivets 1041A and 1042B, respectively at the connecting points 1041 and 1042. This allows the achievement of a better distribution of the effort needed to bear the door weight.

**[0043]** Advantageously, the hinge plate 103 comprises also a third portion 1033, which connects the first portion 1031 and the second portion 1032. The third portion 1033 is properly shaped, so as to conform to the shaped of the inner door 110, thereby making easier the sliding of the hinge plate 103 with respect to the door 11.

**[0044]** The hinge plate 103 preferably comprises also a fourth portion 1034, which comprises hook means 1034A for the connection of the hinge plate 103 with a spring, or other known equivalent elastic means (not shown) that are connected to the main body 10. In this way, during the door opening it is offered a certain resistance to the force that is exerted by the user. At the same time, the return of the door towards the closing position is favoured.

**[0045]** The hinge device 100 comprises also lever means 102, which are rotationally connected to the support plate 101 and which are solidly connected to the door 11, optionally through connecting member 104.

**[0046]** The lever means 102 may comprise a properly arranged kinematic chain, which is aimed at enabling the transmission of forces between the support plate 101 (and therefore the main body 10) and the door 11.

**[0047]** **The lever means** 102 comprise a lever arm, which is properly shaped to determine a translational movement of the door 11 during its rotation.

**[0048]** The lever arm 102 has a first end 1021 that is rotationally connected to the support plate 101.

**[0049]** **The first end 1021 is connected to the second pin member 1011B, at a second rotating point 101B.**

**[0050]** This solution offers the advantage of ensuring an easy installation and positioning of the hinge plate

103. To this aim, it is in fact sufficient to accommodate the pin members 1011A and 1011B, respectively within the open slots 1031A and 1031B, and the connecting member 104 within the elongated slot 1032A.

[0051] In addition, thanks to a proper positioning of the second rotation point 101B at a longer distance from the main body 10 (see figure 4), it is possible to obtain a more remarkable translational movement of the door 11, with a shorter lever arm 102.

[0052] The lever arm 102 is solidly connected to the door 11, particularly to its inner portion 110, at a second end 1022.

[0053] **The second end 1022 is connected by means of the connecting member 104 which are fixed to the door 11, so as to ensure an efficient transmission of forces between the main body 10 and the door 11, during its opening.**

[0054] In particular, the second end 1022 is advantageously connected at one of its connecting points 1041 or 1042 by means of a screw 1041A or 1042B. Rivets can also be used instead of screws.

[0055] The opening operation of the door 11 of the appliance 1, is now described in more detail.

[0056] When the user opens the door 11, he exerts a force F1, which has a component that is directed substantially perpendicularly to the door surface, towards the ground. The hinge plate 103 rotates around the first pin member 1011A, with a rotational movement. The force F1, exerted by the user, forces the lever arm 102 to rotate around the second pin member 1011B with its first end 1021.

[0057] At the same time, the second end 1022 of the lever arm 102 exerts on the door 11 a force F2, which tends to move the door 11 with a translational movement, away from the main body 10. As mentioned before, the actual entity of said translational movement is determined by the shape of the arm 102 and the positioning of the second rotating point 101B.

[0058] The force F2 is basically due to the constraining reaction arising at the second pin member 1011B when the force F1 is applied.

[0059] The translational movement of the door 11 is made possible by the relative sliding connection between the hinge plate 102, which remains anchored to the support plate 102, and the door 11. During the movement of the door 11, the connecting member 104 moves relatively with respect to the hinge plates 103 along the elongated slot 1032A, with a linear movement.

[0060] The combined action of the forces F1 and F2 forces the door 11 to perform a rotational and translational movement with respect to the first point of rotation represented by the first pin member 1011A. Thus, the bottom portion 111A of the aesthetic panel 111 can move along a trajectory 50 that is a portion of an arc, which preferably elliptic. In this way, the volume occupied by the bottom portion 111A is quite lowered.

[0061] During the closing manoeuvre, the door 11 performs a substantially opposite rotational and translational

movement. Also, the various parts of the hinge device 100 moves substantially in an opposite way with respect to the opening movement of the door 11.

[0062] The hinge device 100, according to the present invention, has proven to fulfil the intended aims and objects.

[0063] The rotational and translational movement of the door 11, with a trajectory 50 that is not circular but, preferably, elliptic, allows to reduce the volume occupied by the door 11, particularly by the lower portion 111A of the aesthetic panels.

[0064] This fact allows the achievement of remarkable advantages in terms of versatility of the appliance installation and the possibility of enhancing the volume capacity of the appliance, while keeping constant his height.

[0065] The appliance 1 may thus be provided with a larger internal volume 103, longer aesthetic panels 111 and a deeper line for the plinth 12.

[0066] The hinge device 100 has a simple and robust structure, which is easy to install on the appliance. For example, the hinge plate 103 may be easily positioned between the pins 1011A-1011B and the connecting member 104.

[0067] The hinge device 100 allows to remarkably reduce the arising of friction phenomena during the movement of the door, thanks to an improved distribution of the effort needed for bearing the door weight.

[0068] As it is apparent from the above description, the structure of hinge device is outstanding simple and has proven to be easy to manufacture at industrial level, at competitive costs.

## Claims

1. A hinge device (100) for operatively connecting a door (11) and a main body (10) of a household appliance (1), said hinge device comprising at least a support plate (101), which is solidly connected to said main body, and a hinge plate (103), which is rotationally connected to said support plate on a first pin member (1011A) of the hinge plate (103) at a first rotation point (101A), **characterized in that** the hinge plate (103) comprises a curved slot (1031B) in which a second pin member (1011B) of the hinge plate (103) is accommodated during the movement of said hinge plate, and **in that** it comprises lever means (102) which are rotationally connected at one end to said second pin member (1011B) at a second rotation point (101B) and at another end to an elongated body forming a connecting member (104) connected to said door and sliding in an elongated slot (1032A) of the hinge plate (103).
2. A hinge device according to claim 1, **characterized in that** the hinge plate (103) presents at its lower edge a half-circular slot (1031A) configured to cooperate with said first pin member (1011A).

3. A hinge device according to claim 1 or 2, **characterized in that** said hinge plate (103) is slidingly connected to said door.
4. A hinge device, according one or more of the previous claims, **characterized in that** said connecting member (104) is configured to force the door to slide relatively to the said connection member along a linear direction.
5. A hinge device, according to claim 4, **characterized in that** said elongated body of the connecting member (104) is solidly connected to said door at a plurality of connecting points (1041, 1042).
6. A dishwasher **characterized in that** it comprises a hinge device (1), according to one or more of the previous claims.

#### Patentansprüche

1. Eine Scharniervorrichtung (100) zum betriebsmäßigen Verbinden einer Tür (11) und eines Hauptkörpers (10) von einem Haushaltsgerät (1), die besagte Scharniervorrichtung weist zumindest eine Stützplatte (101), die fest mit dem besagten Hauptkörper verbunden ist, und eine Scharnierplatte (103), die drehbar mit der besagten Stützplatte über ein erstes Bolzenteil (1011 A) von der Scharnierplatte (103) an einem ersten Drehpunkt (101A) verbunden ist, auf, **dadurch gekennzeichnet, dass** die Scharnierplatte (103) einen gekrümmtem Schlitz (1031 B) aufweist, in welchen ein zweites Bolzenteil (1011 B) von der Scharnierplatte (103) während der Bewegung von der besagten Scharnierplatte aufgenommen ist, und dadurch dass sie Hebelmittel (102) aufweist, welche drehbar an einem Ende mit dem besagten zweiten Bolzenteil (1011 B) an einem zweiten Rotationspunkt (101 B) und an einem anderen Ende mit einem länglichen Körper, der ein Verbindungsteil (104) bildet, das mit der besagten Tür verbunden ist und sich in einem länglichen Schlitz (1032A) von der Scharnierplatte (103) verschiebt, verbunden sind.
2. Eine Scharniervorrichtung gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Scharnierplatte (103) an ihrer unteren Kante einen halbkreisförmigen Schlitz (1031 A) aufweist, der konfiguriert ist, um mit dem besagten ersten Bolzenteil (1011 A) zusammenzuwirken.
3. Eine Scharniervorrichtung gemäß Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die besagte Scharnierplatte (103) verschiebbar mit der besagten Tür verbunden ist.
4. Eine Scharniervorrichtung gemäß einem oder meh-

renen der vorangegangenen Ansprüche, **dadurch gekennzeichnet, dass** das besagte Verbindungsteil (104) konfiguriert ist, um zu erzwingen, dass die Tür sich relativ zu dem besagten Verbindungsteil entlang einer linearen Richtung verschiebt.

5. Eine Scharniervorrichtung gemäß Anspruch 4, **dadurch gekennzeichnet, dass** der besagte längliche Körper von dem Verbindungsteil (104) mit der besagten Tür an einer Vielzahl von Verbindungspunkten (1041, 1042) fest verbunden ist.
6. Eine Geschirrspülmaschine **dadurch gekennzeichnet, dass** sie eine Scharniervorrichtung (1) gemäß einem oder mehreren der vorangegangenen Ansprüche aufweist.

#### Revendications

1. Dispositif à charnière (100) pour raccorder en service une porte (11) et un corps principal (10) d'un appareil ménager (1), ledit dispositif à charnière comprenant au moins une plaque de support (101), qui est solidement raccordée audit corps principal, et une plaque charnière (103) qui est raccordée à rotation à ladite plaque de support sur une première broche (1011A) de la plaque charnière (103) en un premier point de rotation (101A), **caractérisé en ce que** la plaque charnière (103) comprend une fente incurvée (1031D), dans laquelle une seconde broche (1011B) de la plaque charnière (103) est reçue au cours du déplacement de ladite plaque charnière, et **en ce qu'**il comprend des moyens à levier (102) qui sont raccordés à rotation, à une extrémité, à ladite seconde broche (1011B) en un second point de rotation (101B) et, à une autre extrémité, à un corps allongé formant un élément de raccordement (104) raccordé à ladite porte et coulissant dans une fente allongée (1032A) de la plaque charnière (103).
2. Dispositif à charnière selon la revendication 1, **caractérisé en ce que** la plaque charnière (103) présente, sur son bord inférieur, une fente semi-circulaire (1031A) configurée pour coopérer avec ladite première broche (1011A).
3. Dispositif à charnière selon la revendication 1 ou la revendication 2, **caractérisé en ce que** ladite plaque charnière (103) est raccordée à coulissement à ladite porte.
4. Dispositif à charnière selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** ledit élément de raccordement (104) est configuré pour forcer la porte à coulisser par rapport audit élément de raccordement dans une direction linéaire.

5. Dispositif à charnière selon la revendication 4, **caractérisé en ce que** ledit corps allongé de l'élément de raccordement (104) est raccordé solidement à ladite porte en une pluralité de points de raccordement (1041, 1042). 5
6. Machine à laver la vaisselle, **caractérisée en ce qu'elle** comprend un dispositif à charnière (1) selon une ou plusieurs des revendications précédentes. 10

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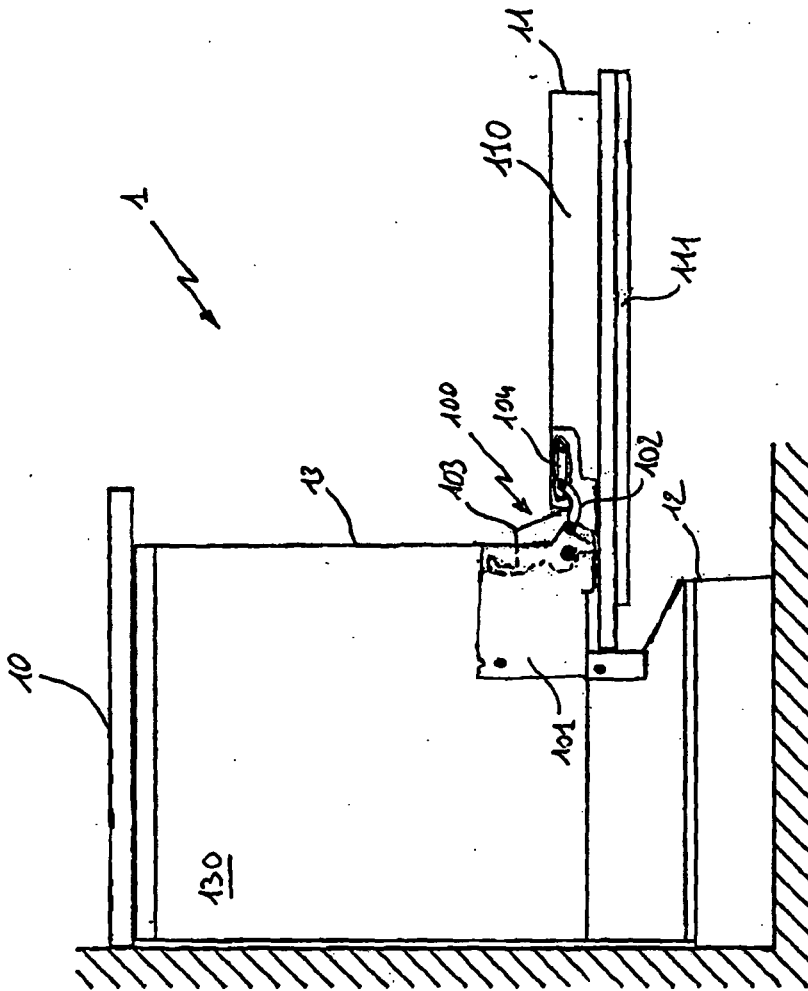


Figure 1

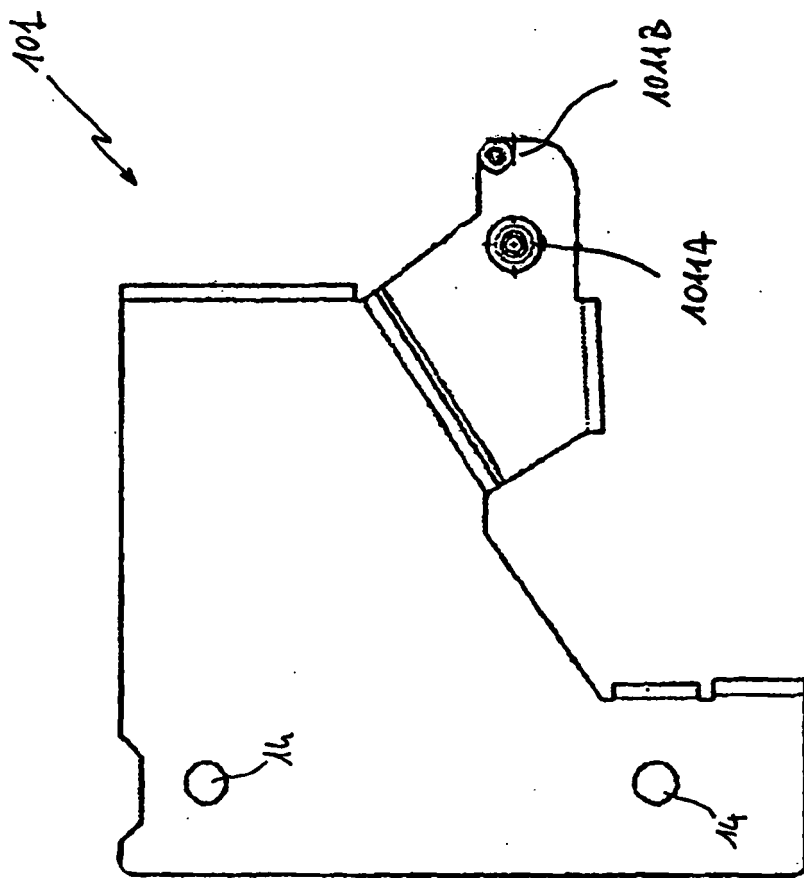


Figure 2

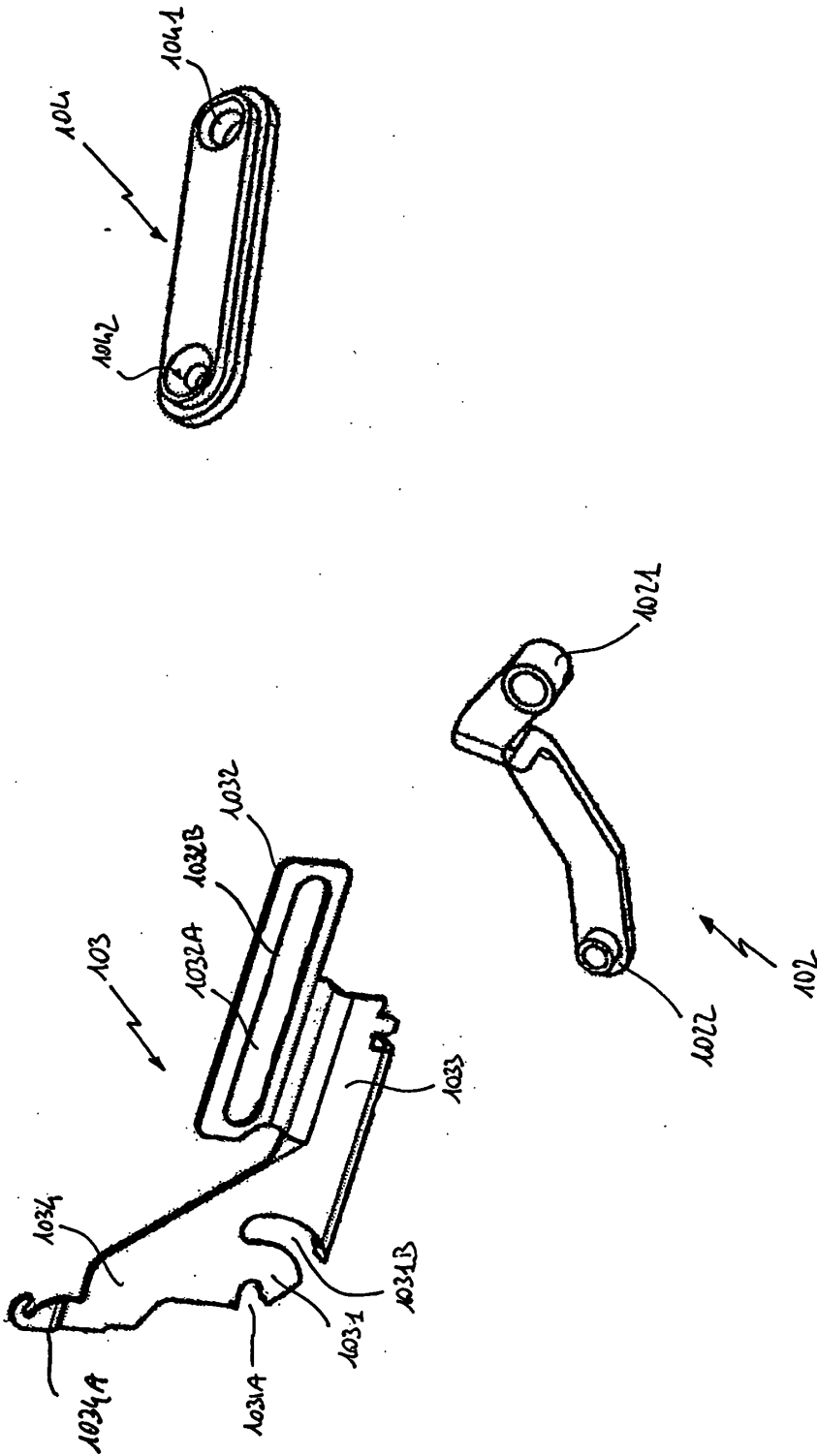


Figure 3

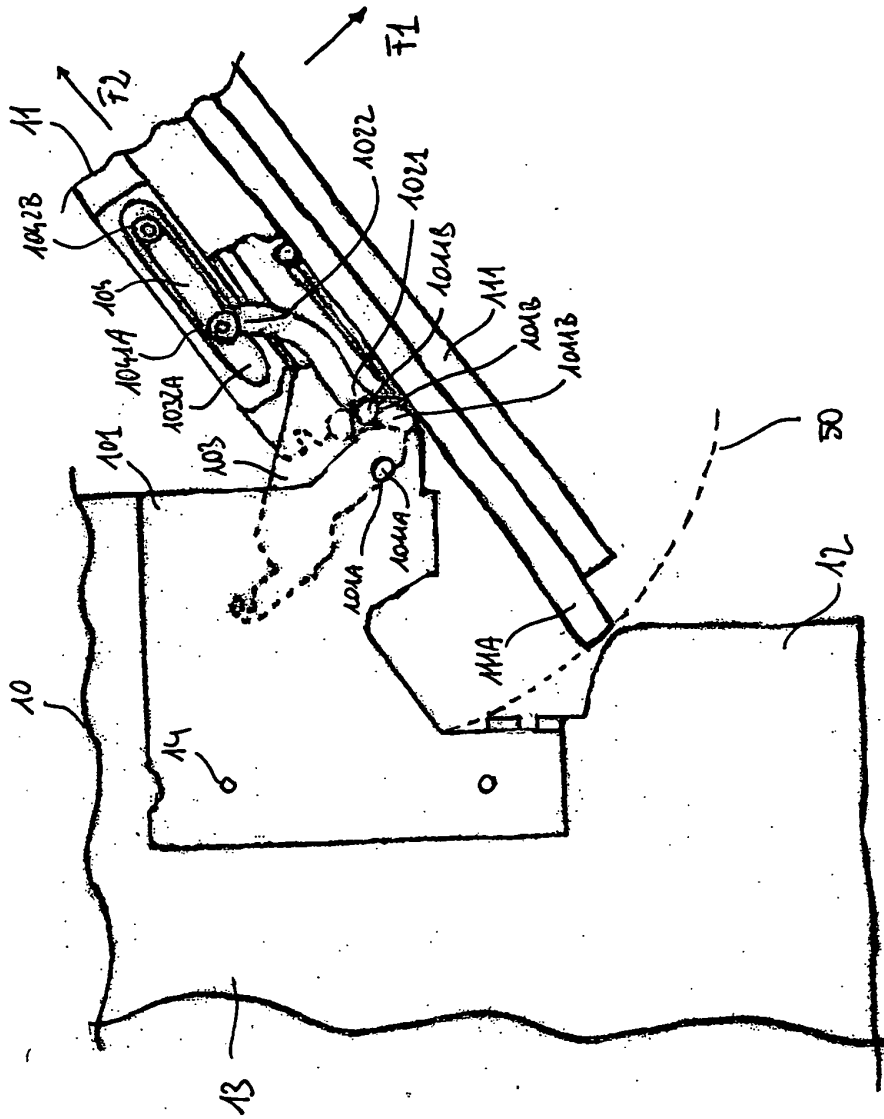


Figure 4

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- CH 683886 A5 [0012]