A refrigerating appliance having a housing that encloses an interior space; a storage device; a gear mechanism to adjustably guide the storage device in the interior space between a high position and a low position; and a brake that is assigned to the gear mechanism to selectively dampen a movement of the storage device from the high position into the low position.
REFRIGERATING APPLIANCE WITH A HEIGHT-ADJUSTABLE STORAGE DEVICE

[0001] The present invention relates to a refrigerating appliance with a housing enclosing an interior space and a storage device which can be adjusted between a high and a low position within the interior space by a gear mechanism. Such a refrigerating appliance is known from DE 10 2006 014 370 A1.

[0002] The gear mechanism helps to ensure that the storage device retains a horizontal orientation while being adjusted between the high and the low position, so that the storage device can be adjusted without endangering the equilibrium of objects stored on it. A problem can however arise from the fact that a user, when lowering the storage device, must initially only exert a small force, but that this force—conditional on the path on which the gear mechanism guides the storage device—greatly increases during the course of the movement up to an intermediate position in which the user must balance the entire weight of the storage device and the objects located on it. If he is surprised by this or accidentally lets go of the storage device it drops back into the lower position so that there is still the danger of objects falling over.

[0003] Furthermore there is no coupling between the two parts of the gear mechanism which support the storage device on different side walls of the housing. Thus a malfunction is not excluded in which the storage device is supported by one of the drive of parts in a high position and by the other in a lower position. This means that the storage device gets into a sideways sloping position so that objects placed on it can slide towards the side or can fall over.

[0004] The object of the present invention is to develop a refrigerating appliance of the type specified above so that accidents when the storage device is being adjusted can be excluded with a greater level of certainty, without the operating comfort of the height adjustment being adversely affected.

[0005] The object is achieved by the gear mechanism being assigned a brake which selectively damps the movement of the storage device from the high position into the low position.

[0006] The braking force of this brake is expediently set so that, with normal loading, a movement of the storage device into the lower position is slowed down sufficiently to prevent it dropping abruptly into the lower position without the user having to support the storage device during its movement to achieve this. Since the brake is not effective during an upwards movement of storage device this adjustment is no more strenuous for the user than in the conventional refrigerating appliance.

[0007] Hydraulic or pneumatic dampers are especially known as selectively-acting brakes, in which a fluid is circulated by a movement driven from outside between two chambers and, when this is done, in one movement direction passes a slightly permeable non-return valve and in the opposite movement direction passes a construction. Inventively however a lower-cost solution is preferred in which the brake is embodied as a friction brake.

[0008] Preferably this friction brake comprises a first brake element and a second brake element able to be moved frictionally over the first brake element, which is adjustable by an adjusting element of the gear mechanism between two positions with different levels of friction, preferably a position in friction contact with the first braking element and a position not in friction contact with the first braking element.

[0009] Expediently the adjusting element is coupled to the storage device in a movable manner in order to establish the strong frictional contact when the storage device is moved into the lower position and to establish the weak frictional contact when the storage device is moved into the high position.

[0010] In accordance with a preferred embodiment the gear mechanism comprises an element guiding the movement of the storage device connected to the housing and the storage device, the adjusting element is movable in relation to fixed stops on the housing between a first and a second stop position, with the freedom of movement of the adjusting element between the stop positions being smaller than the freedom of movement of the element so that the adjusting element is necessarily taken along on a part of the movement of the element along with the latter and the adjustment element is able to be locked in relation to the element into a position corresponding to a weak friction contact and into a position corresponding to a strong friction contact so that, depending on the position of the adjusting element in relation to the element, a different level of friction contact is produced.

[0011] Preferably the element is able to be rotated between the upper and the lower position of the storage device.

[0012] It is further preferred for one of the braking elements to be an arc-shaped spring, so that the other braking element is able to be moved on its arc-shaped path guided by the element along a circumferential surface of the spring.

[0013] The spring is preferably provided at at least one end with a stop limiting the freedom of movement of the other braking element.

[0014] At an end of the spring, as an alternative or in addition to the stop, a latching recess can also be provided in which the other braking element is able to be latched in order to stabilize the storage device in its high or its low position.

[0015] In order to be effective as a brake for a selective direction, the spring preferably bears a projection on its circumferential surface facing away from the other brake element which is supported by the adjusting element in its second stop setting and thus presses the spring into the path of the other braking element or ensures that the spring cannot yield to the pressure of the other braking element.

[0016] The two latching positions can be realized with the aid of an arc-shaped spring of the adjusting element which runs concentrically to its axis of rotation and has two stop surfaces of which the contact with a latching projection of the element defines the two latching positions.

[0017] In order to protect the brake against damage or contamination, advantageously the element connected rotatably to the housing and the storage device can be embodied as a hollow wheel in the interior of which the braking element and the adjusting element are accommodated.

[0018] In accordance with an alternate embodiment the brake can comprise an element storing the potential energy of the storage device on transition into the low position and releasing it on transition into the high position.

[0019] To guide the movement of the storage device so that it does not tip, a number of elements connected rotatably to the housing and storage device are preferably rotationally coupled to each other.

[0020] The rotational coupling can be established via a belt between elements which engage on a same side wall of the housing.
For elements which engage on the opposite side of walls of the housing the coupling is preferably realized by a connecting rod.

The rod advantageously runs in a space-saving manner along the axis of rotation on which the two rotatable elements connected by it are articulated on the storage device.

Further features and advantages of invention are described in the subsequent description of exemplary embodiments, which refers to the enclosed figures. The figures show:

**Fig. 1** a perspective part of view of a storage device and its support in its high position;

**Fig. 2** a part view of the storage device in its low position;

**Fig. 3** a part view of one of the parts of the gear mechanisms supporting the storage device, with the wheel removed;

**Fig. 4** an internal view of the part of the gear mechanism from a direction opposite to the perspective of Fig. 3;

**Fig. 5** a part view of the part of the gear mechanism in the high position;

**Fig. 6** an intermediate stage of the part of the gear mechanism on the way to the low position;

**Fig. 7** a second intermediate stage of the part of the gear mechanism on the way to the low position;

**Fig. 8** the part of the gear mechanism in the state latched into the low position;

**Fig. 9** the part of the gear mechanism after the latch has been released;

**Fig. 10** a first intermediate stage of the part of the gear mechanism on the path into the high position;

**Fig. 11** a second intermediate stage on the path into the high position;

**Fig. 12** a part of the gear mechanism in accordance with a second embodiment of the invention which holds a storage device in the high position, and

**Fig. 13** the part of the gear mechanism of Fig. 12 with the storage device in the lower position.

**Fig. 1** shows a perspective part view of a storage device 1, here in the form of a glass plate 3 surrounded by a frame 2, which with the aid of two part of the gear mechanism 4, each supporting it at one edge, is able to be adjusted between a high position shown in Fig. 1 and a low position shown in Fig. 2. The part of the gear mechanism shown in the figure comprises a flat housing which is intended to be mounted in a recess in a side wall of refrigerating appliance housing. The opposing edge of the frame 2 not shown in the figure is supported by a part of the gear mechanism not shown in the figure, constituting a mirror image of the part of the gear mechanism 4.

**Fig. 39** Fig. 3 shows a part view of one of the parts of the gear mechanism 4, with a wheel omitted from the figure in order to guarantee a view of the inside of the housing through an opening of the housing of the part of the gear mechanism normally closed off by the wheel 5. Protruding centrally from the rear wall 8 of the gear mechanism housing visible through the opening is a central bearing bush 9, onto which normally a hollow shaft of the wheel 5 is pushed to allow rotation. The bearing bush 9 and the hollow shaft (not shown here) are surrounded by a rotatable adjustment element 10. Protruding radially from a central ring 11 of the adjusting element 10 is a stop arm 12. The stop arm 12 is shown in a stop position in which it rests against a first projection 13 of the rear wall 8.

**Fig. 40** A semicircular spring arm 14 concentric to the bearing bush is connected opposite the stop arm 12 to the ring 11.

**Fig. 41** A semicircular rib 15 protruding from the rear wall 8 is centered on the bearing bush 9. At the ends of the rib 15 are located latching recesses 16, 17 curved in a concave shape to the outside. The rib is connected in one piece to the rear wall 8 at the height of the latching recesses 16, 17. In its center section it is separated from the rear wall on both sides by a narrow gap 18 in order to enable it to yield elastically to a pressure acting in a radial direction on it. A radial projection 19 directed inwards is formed in a lower area of the rib 15 on its inner side.

**Fig. 42** A toothed belt 20 can be seen around the rib 15, which in the fully assembled state passes around both wheels of the part of the gear mechanism 4 and meshes with these wheels with teeth in order to couple their rotations to one another.

**Fig. 43** Fig. 4 shows a part view of the part of the gear mechanism 4 seen from the side of the rear wall 8 (omitted in the figure). A sprocket 21 of the wheel 5 can be seen in the figure into which the toothed belt 20 engages, and a central sleeve 22 of the wheel 5 onto which the adjustment element 10 is pushed so that it can rotate and which for its part is provided to be able to be pushed rotationally onto the bearing bush 9. A projection 23 directed radially inwards is formed on the sprocket 21. A pin 24 projects not far from the sleeve 22 into the inside of the wheel 5.

**Fig. 44** Fig. 5 shows a cross-section of the configuration of the part of the gear mechanism 4 while the storage device 1 is in the high position. The projection 23 of the sprocket 21 is engaged in the upper latching recess 16 of the rib 15. The adjusting element 10 is located in a stop position on the projection 13 of the rear wall 8.

When the wheel 5 is turned in a clockwise direction in order to bring the storage device into the lower position, the pin 24 moves into a latching position in which it strikes the inwards-curved tip of the spring arm 14. Thus the adjustment element 10 is taken along in the clockwise direction by the rotation of the wheel 5. This means that the stop arm 12 of the adjustment element 10 comes into contact with the projection 19 on the inside of the rib 15. In this position a second projection 25 of the rear wall 8 blocks the further rotation of the adjustment element 10, as shown in Fig. 6.

**Fig. 46** When the wheel, as shown in Fig. 7, is turned further in the clockwise direction, the pin 24 deflects the tip of the spring arm 14 radially outwards and enters a cutout...
between the spring arm 14 and the ring 11 of the adjusting element 10. The rib 15 comes into frictional contact with the projection 23 of the sprocket at the height of the projection 19. The rib 15 can be formed so that this frictional contact is only made when the rib is deflected outwards by the stop arm 12; it can also be formed so that the frictional contact is also made in the relaxed configuration of the rib of 15, but the rib 15 can slightly deflect the pressure of the projection 23 if the projection 19 is not supported by the stop arm 12. The friction arising between the projection 23 and the rib 15 brakes the upwards movement of the storage device 1.

[0047] When the storage device 1 has reached the lower position, the gear mechanism is in the configuration shown in FIG. 8. The adjusting element 10 continues to support the rib 15 throughout the rotation, but the projection 23 has passed the supported area of the rib 15 in the meantime and is lowered into its lower latch recess 17. Since the rib is connected rigidly at the height of the latch recess to the rear wall 8 and outer side of the cutout 17 represents a stop which the projection 23 cannot pass. The pin 24 of the wheel has reached the back of the sleeve of the spring arm 14 and pin 11 of the adjusting element and in doing so has overcome a projection 26 on the inside of the spring arm 14.

[0048] When the storage device 1 is lifted again, the wheel 5 rotates in the counterclockwise direction. As shown in FIG. 9, the projection 23 is lifted out of the lower latch recess 17 again and the pin 24 arrives at a second latch position in which it strikes the projection 26 of the spring arm 14. The pin 24 must now pass the projection 26 of the spring arm 14. Thus the configuration of FIG. 5 is eventually reached. In the simplest case the braking mechanism described above can be provided on one of the two wheels 5 of each part of the gear mechanism 4. To increase the security it can also be provided on both wheels 5.

[0052] FIG. 12 shows a section through a part of the gear mechanism set into a side wall of the refrigerating appliance in accordance with a second embodiment of the invention. The housing of the gear mechanism part is omitted in the figure for the sake of simplicity except for the bearing bush 9. The sectional plane runs through the central sleeves 22 of the two wheels 5 pushed onto the bearing bushes 9, but not around which the toothed belt 20 passes. A coil spring 28 is tensioned between the two wheels 5 and engages on their sleeves 22 via two elongated belts 30 each provided with an eye 29. Two elongated leaf springs 31 are each connected at an end facing towards the coil spring 28 rigidly to the housing, and a free end of the leaf springs 31 touches one of the sleeves 22 in each case. At a distance from the free end the leaf springs 31 each bear a projection 32 facing towards one of the belts 30.

[0053] The configuration of the part of the gear mechanism shown in FIG. 12 corresponds to the high position of the storage device 1 suspended on the wheels 5. To bring the storage device into the low position, the wheels 5 are turned by around 180° in the counterclockwise direction. In this case the belt 30 winds itself on each wheel a little way further around the sleeve 22. In this case the spring 28 is tensioned and is turned slightly, as can be seen in FIG. 13. The expansion of the spring 28 is proportional to the turning of the wheels 5, meaning that the return force of the spring 28 increases as the wheels are turned. Since shortly before reaching the lower position the drive force resulting from the weight of the storage device and its load approaches zero, the storage device is thus effectively slowed down before reaching the lower position and a sudden stop can be avoided if the storage device is not overloaded.

[0054] During the expansion and rotation of the springs 28 their belts 30 first come into contact with the projections 32 of the leaf springs 31 and deflect the latter. When the storage device reaches the lower position, the eyes 29 reach the projections 32 and the projections 32 latch into the eyes 29. This locks the storage device in the low position; it remains in the low position even when the resetting force of the spring 28 would be sufficient per se to lift the storage device up a little further. The leaf springs 31 do not yield under the pressure of the spring 28 since they are essentially stressed by in the longitudinal direction. Only when a user pulls the storage device from the lower position and thereby turns the wheels 5 in the clockwise direction do parts 33 formed on the sleeves 22 come into contact with the tips of the leaf springs 31 and drive these away from the sleeves 22. This also pulls the projections 32 out of the eyes 29. The return force of the coil spring 28 now again acts on the sleeves 22 and supports the lifting of the storage device.

1.17. (canceled)
18. A refrigerating appliance, comprising:
   a housing enclosing an interior space;
   a storage device;
   a gear mechanism to adjustably guide the storage device in the interior space between a high position and a low position;
   and
   a brake assigned to the gear mechanism, the brake to selectively dampen a movement of the storage device from the high position into the low position.

19. The refrigerating appliance of claim 18, wherein the brake is a friction brake.

20. The refrigerating appliance of claim 19, wherein the brake has a first brake element and a second brake element, the second brake element being moved with friction over the first brake element; and wherein an adjusting element of the gear mechanism adjusts the first and second brake elements between a first position with strong frictional contact between the first and second brake elements and a second position with one of weak and no frictional contact between the first and second brake elements.

21. The refrigerating appliance of claim 20, wherein the adjusting element is movable and coupled to the storage device so that, when the storage device is moved into the low position, the strong frictional contact is established and, when the storage device is moved into the high position, the one of weak and no frictional contact is established.

22. The refrigerating appliance of claim 20, wherein the gear mechanism has an element that is connected to the housing and to the storage device and that guides the movement of the storage device, wherein the adjusting element is moved in relation to fixed stops on the housing between a first stop position and a second stop position;
23. The refrigerating appliance of claim 22, wherein the element is rotated between an upper position and a lower position of the storage device.

24. The refrigerating appliance of claim 23, wherein one of the first and second braking elements is a circular arc-shaped spring and the other of the first and second braking elements is moved along a circumferential surface of the circular arc-shaped spring.

25. The refrigerating appliance of claim 24, wherein at least one end of the circular arc-shaped spring bears a stop restricting the freedom of movement of the other of the first and second braking elements.

26. The refrigerating appliance of claim 24, wherein at least one end of the circular arc-shaped spring has a latching recess into which the other of the first and second braking elements is latched.

27. The refrigerating appliance of claim 24, wherein the circular arc-shaped spring, on a circumferential surface facing away from the other of the first and second braking elements, bears a projection which is supported by the adjusting element in the second stop position of the adjusting element.

28. The refrigerating appliance of claim 27, wherein the adjusting element has an arc-shaped spring that is concentric with respect to an axis of rotation of the adjusting element, and wherein a first and second latching positions are defined by a contact between two stop surfaces of the arc-shaped spring and a latching projection of the element.

29. The refrigerating appliance of claim 23, wherein the element, which is rotatably connected to the housing and the storage device, is a hollow wheel, and wherein the first and second braking elements and the adjusting element are accommodated within the hollow wheel.

30. The refrigerating appliance of claim 18, wherein the brake has an element that stores potential energy of the storage device on transition into the low position and that releases the potential energy on transition into the high position.

31. The refrigerating appliance of claim 18, wherein a plurality of elements that are rotatably connected to the housing and the storage device are rotatably coupled to one another.

32. The refrigerating appliance of claim 31, wherein two of the plurality of elements, which engage on a same sidewall of the housing, are coupled rotationally via a belt.

33. The refrigerating appliance of claim 31, wherein two of the plurality of elements, which engage on opposite side walls of the housing, are rotationally coupled via a rod.

34. The refrigerating appliance of claim 33, wherein an axis of rotation, on which the two of the plurality of elements are articulated on the storage device, runs through the rod.

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