

[54] HINGE

[76] Inventor: **Wilhelm Gronbach, Dr. Fritz**  
Huber-Strasse No. 73, 8090  
Wasserburg, Germany

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[58] Field of Search..... 16/190, 145, 180

[56] **References Cited**

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*Primary Examiner—Paul R. Gilliam*  
*Assistant Examiner—Doris L. Troutman*  
*Attorney, Agent, or Firm—Fleit & Jacobson*

[57] **ABSTRACT**

The hinge comprises a compression spring for balancing the weight of leaves which are hinged on a horizontal axis, such as covers, flaps or the like, particularly in refrigerating chests. One end of the compression spring bears under initial stress on the stationary hinge member. The other end of the spring bears by means of the end of a spring-guiding rod, which supports the spring, on the second hinge member, which is secured to the leaf. The lower end of the spring-guiding rod bears by means of a rocker on a knife edge bearing provided on the stationary hinge member. The guiding rod is provided with coarse pitch screw threads at its end opposite to the slider. The rocker carries a nut which has coarse pitch screw threads and is in threaded engagement with the lower end of the guiding rod.

**8 Claims, 4 Drawing Figures**

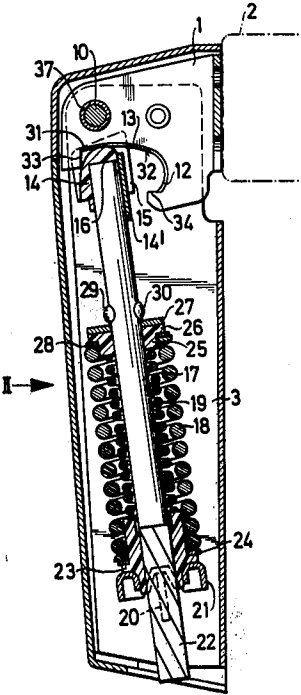


Fig. 1

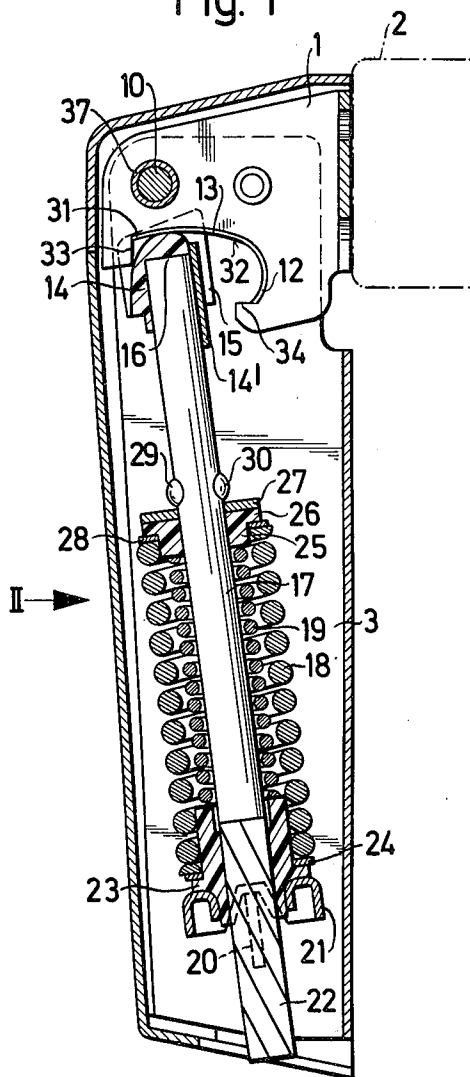
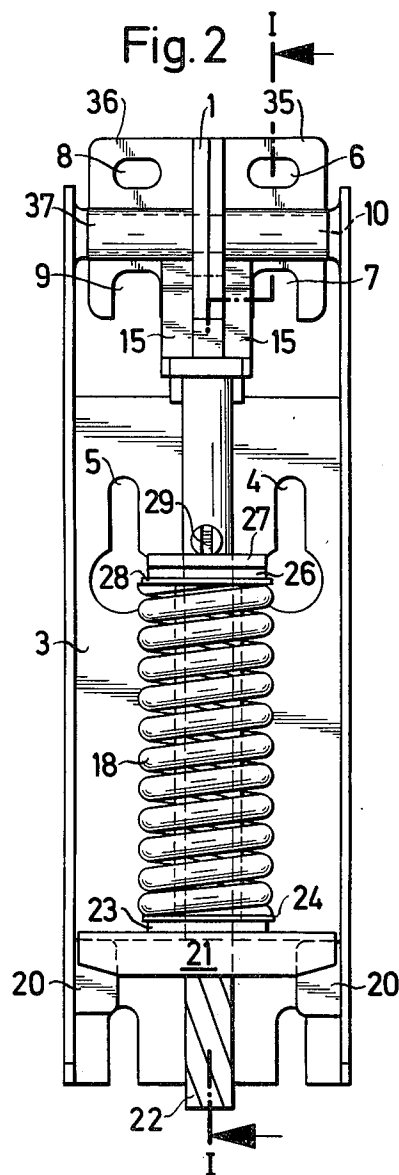


Fig. 2





## HINGE

This invention relates to a hinge which comprises a compression spring for balancing the weight of leaves which are hinged on a horizontal axis, such as covers, flaps or the like, particularly in refrigerating chests, in which hinge one end of the compression spring bears under initial stress on the stationary hinge member, the other end of the spring bears by means of the end of a spring-guiding rod, which supports the spring, on the second hinge member, which is secured to the leaf, and the lower end of the spring-guiding rod bears by means of a rocker on a knife edge bearing provided on the stationary hinge member.

A hinge of this kind has been disclosed in the German Patent Specification No. 1,708,350. In that known hinge, the spring-guiding rod carries at its upper end a slider, which consists of polyacetal resin or a material having similar properties and is guided by a cam face, which comprises a control cam face portion and a stressing cam face portion. Such hinge is designed to compensate the cosine-shaped turning moment of the cover throughout its opening movement. For this compensation, the spring force and spring characteristic must match the turning moment of the cover within fairly close limits. For this reason, different springs are required, which correspond to cover turning moments differing by increments of 1 kilogram-meter.

It is an object of the invention to enable a control of the cover turning moments to be expected by springs in a number which is reduced preferably to one-third.

In a hinge of the kind described first hereinbefore, this object is accomplished according to the invention in that the guiding rod is provided with coarse pitch screw threads at its lower end and that the rocker carries a nut which has coarse pitch screw threads and is in threaded engagement with the lower end of the guiding rod. In the absence of the cam face comprising a control cam face portion and a stressing cam face portion in accordance with the German Patent Specification No. 1,708,350 a balancing of weights can be ensured only in a single position. Owing to the design of the lower end of the guiding rod, the hinge in accordance with the invention enables a balancing of weight in a larger range, which depends in each case on the thickness of the spring or springs and the weight of the leaf. The hinge according to the invention has the further advantage that the number of springs to be kept on stock by the buyer are reduced. Besides, the need of adjusting the known hinge to the actual cover turning moment is entirely eliminated.

When it is essential that the function of the hinge should reach the cosine-shaped turning moment of the cover as soon as possible and compensates the same throughout the opening movement, it is contemplated according to the invention to provide the spring-guiding rod at its upper end with a slider, which consists of polyacetal resin or a material having similar properties and is guided by a cam face which comprises a control cam face portion and a stressing cam face portion and which is directly provided in the hinge member that is secured to the leaf.

According to another feature of the invention, the coarse pitch screw threads are multiple threads. These have the advantage of providing for a contact on a large surface so that the desired function is maintained indefinitely in spite of the pressure contact between the

faces of the threads during a displacement of the spring-guiding rod in its longitudinal direction.

According to a further feature of the invention, the coarse pitch nut is made of plastics material, preferably of polyacetal resin. Such coarse pitch nut does not take up moisture and for this reason is dimensionally stable. Besides, the nut resists oil and acid and in spite of its good clamping action is highly slidable.

In a particularly preferred embodiment of the invention the coarse pitch nut is held against rotation in the rocker and a washer is provided between the nut and the lower end of the spring. With this design, the washer acts as a brake during a longitudinal movement of the guiding rod because the washer is carried along by the spring and the latter is rotated by the guiding rod owing to the frictional engagement.

The hinge according to the invention may be provided with a double brake if this is required. For this purpose it is a feature of the invention that the guiding rod is provided adjacent to the upper end of the spring with a bushing that consists of plastics material, preferably of polyacetal resin, and has an upper annular flange, which is embedded between two washers, the upper one of which bears on retaining cams on the guiding rod whereas the lower washer bears on the upper end of the spring.

In a particularly desirable embodiment of the invention the slider provided at the upper end of the spring-guiding rod and consisting of polyacetal resin or a material having similar properties has a curved recessed bearing surface, which engages a pin mounted in the second, movable hinge member. Because the upper end of the spring-guiding rod does not bear directly on a pivot pin mounted in the second hinge member but a sliding surface bearing having a recessed curved bearing surface is interposed, a canting at the bearing is avoided whereas such canting is otherwise inevitable owing to manufacturing tolerances. Besides, there can be no frictional resistance due to such canting at the bearing.

In a development of the invention opposite ends of the pivot pin are received by respective recesses in mutually opposite surfaces of the stationary hinge member and these mutually opposite surfaces are shaped so as to define the two end positions of the hinge. This has the advantage that the hinge can be covered on the outside by caps of plastics material whereby the appearance of the hinge is improved. The zero position of the hinge is selected so that in said position the turning moment of the cover is not opposed at all.

Two embodiments of the invention will be described hereinafter with reference to the drawing, in which

FIG. 1 is a sectional view showing the hinge according to a first embodiment of the invention,

FIG. 2 is an elevation showing the hinge according to this embodiment of the invention as viewed from the open side of the hinge housing,

FIG. 3 is a sectional view showing a hinge according to another embodiment of the invention, and

FIG. 4 is an elevation showing the hinge according to this embodiment of the invention as viewed from the open side of the hinge housing.

The hinge comprises a hinge member 1, which is secured to a leaf 2, and a stationary hinge member 3, which is secured to a base, e.g., of a refrigerating chest. The hinge member 3 consists of a U-shaped housing, which is open on the side facing away from the refriger-

ating chest, and is secured to the refrigerating chest with the aid of openings 4, 5. The movable hinge member 1 is secured to the leaf 2 by means of bores 6 to 9. It is readily apparent from FIG. 2 that the bores required for the fixation are exposed even when the hinge has been assembled so that it can be secured quickly and in a simple manner to the base and cover of the refrigerating chest.

The two hinge members are hingedly interconnected by a hinge pin 10. A cam face 12 is provided directly in the hinge member 1 which is secured to the leaf 2. In the embodiment shown by way of example the cam face 12 consists of a snapped-in stamping 13 of spring steel strip.

This cam face 12 serves to guide a slider 14, which consists of polyacetal resin and is provided with lateral guide flanges 15. The slider 14 of polyacetal resin is mounted on the shank end 16 of a spring-guiding rod 17, which is rotatable about its axis in the slider 14. 14 is a slider fitting, which consists of sheet metal and is inserted into the mold used to make the slider. This fitting is visible in the drawing only because the slider has a groove there.

The spring-guiding rod 17 is mounted in the stationary hinge member 3 at a point which is spaced by a distance depending on the initial stress of the spring 18 or the springs 18, 19 from the point where the other end of the rod is pivoted. The embodiment shown by way of example comprises a knife-edge bearing 20, which supports a rocker 21. As described thus far, the hinge according to the invention is designed like that of German Patent Specification No. 1,708,350.

According to the invention the guiding rod 17 is provided with coarse pitch screw threads 22 at the end which is remote from the slider 14. A nut 23 having coarse pitch screw threads is mounted on the rocker 21. The lower end of the spring-guiding rod 17 is threaded in the coarse pitch nut 23. In the embodiment shown by way of example the coarse pitch screw threads are multiple screw threads having a helix angle of about 20°. The specific helix angle will depend on the number of parallel threads, the area of the thread faces and on the height of the nut, i.e., on the clamping surface area. In the embodiment shown by way of example the coarse pitch nut 23 consists of polyacetal resin. The nut is held against rotation in the rocker 21. A washer 24 is provided between the nut 23 and the lower end of the spring 18 or of the springs 18, 19.

In the embodiment shown by way of example the hinge is provided with a dual brake. For this purpose the spring-guiding rod 17 is provided adjacent to the upper end of spring 18 or springs 18, 19 with a bushing 25 of plastics material, specifically polyacetal resin. The bushing 25 has an upper annular flange 26, which is embedded between two washers 27, 28. The upper washer bears on retaining cams 29, 30 provided on the spring-guiding rod 17. The lower washer bears on the upper end of the spring 18 or springs 18, 19.

The mode of operation of the hinge according to the invention is readily apparent from the above description of its elements or construction. FIG. 1 shows the hinge in closed condition. The stressed spring 18 or springs 18, 19 force the slider 14 against the stressing cam face portion 31, which by means of the hinge pin 10 exerts an additional closing pressure on the leaf 2 of the refrigerating chest. When the leaf 2 is now turned open, the relaxing spring 18 or springs 18, 19 cause the

slider 14 to move along the cam face 12 so as to ensure a balancing of masses.

Stops 33 and 34 are provided at respective ends of the cam face 12 and cooperate with the slider 14 and with the back of the spring-guiding rod 17 to define the fully open position of the leaf 2. The hinge 34 is formed by bending in the hinge member 1 itself. The fixing lugs 35, 36 formed with the bores 6 to 9 are bent at right angles from the legs of the hinge member 1.

The hinge pin 10 is mounted in a bearing sleeve 37 between the bores 6, 8 and 7, 9 of the fixing lugs 35, 36.

The coarse pitch screw threads 22 in conjunction with the coarse pitch nut 23 enable the control of the turning moments to be expected by springs in a number which is reduced to one-third. As has been mentioned hereinbefore, there is nevertheless no need for an adjustment in adaptation to the actual turning moment.

In the embodiment shown in FIGS. 3 and 4, the hinge comprises a hinge member 101, which is secured to a leaf 102, and a stationary hinge member 103, which is secured to a base, e.g., of a refrigerating chest. The hinge member 103 consists of a U-shaped housing, which is open on the side facing away from the refrigerating chest, and is secured to the refrigerating chest with the aid of openings 104, 105. The movable hinge member 101 is secured to the leaf 102 by means of bores 106 to 109. It is readily apparent from FIG. 4 that the bores required for the fixation are exposed even when the hinge has been assembled so that it can be secured quickly and in a simple manner to the base and cover of the refrigerating chest.

The two hinge members are hingedly interconnected by a hinge pin 110.

The spring-guiding rod 111 is mounted in the stationary hinge member 103 at a point which is spaced by a distance depending on the initial stress of the spring 112 or the springs 112, 113 from the point where the other end of the rod is pivoted. The embodiment shown by way of example comprises a knife-edge bearing 114, which supports a rocker 115.

The guiding rod 111 is provided with coarse pitch screw threads 116 at the end which is remote from the hinge pin 110. A nut 117 having coarse pitch screw threads is mounted on the rocker 115. The lower end of the spring-guiding rod 111 is threaded in the coarse pitch nut 117. In the embodiment shown by way of example the coarse pitch screw threads are multiple screw threads having a helix angle of about 20°. The specific helix angle will depend on the number of parallel threads, the area of the thread faces and on the height of the nut, i.e., on the clamping surface area. In the embodiment shown by way of example the coarse pitch nut 114 consists of polyacetal resin. The nut is held against rotation in the rocker 115. A washer 118 is provided between the nut 117 and the lower end of the spring 112 or of the springs 112, 113.

In the embodiment shown by way of example the hinge is provided with a dual brake. For this purpose the spring-guiding rod 111 is provided adjacent to the upper end of spring 112 or springs 112, 113 with a bushing 119 of plastics material, specifically polyacetal resin. The bushing 119 has an upper annular flange 120, which is embedded between two washers 121, 122. The upper washer bears on retaining cams 123, 124 provided on the spring-guiding rod 111. The lower washer bears on the upper end of the spring 112 or springs 112, 113.

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At its end opposite to the rocker 115, the spring-guiding rod 111 carries a sliding-surface bearing 125, which has a recessed curved bearing surface bearing on a pin 126, which is mounted in the second hinge member 101. Opposite ends of the pivot pin 126 are received by respective recesses 127 in mutually opposite surfaces of the U-shaped housing of the stationary hinge member 103. These recesses are shaped to define the two end positions of the hinge.

The hinge pin 110 is mounted in a bearing sleeve 129 between the bores 106, 108 and 107, 109 of the fixing lug 128.

The coarse pitch screw threads 116 in conjunction with the coarse pitch nut 117 enable the control of the turning moments to be expected by springs in a number which is reduced to one-third. As has been mentioned hereinbefore, there is nevertheless no need for an adjustment in adaptation to the actual turning moment.

What is claimed is:

1. A hinge adapted to balance covers or flaps or refrigerating chests, comprising:
  - a stationary leaf hinge member;
  - a movable leaf hinge member pivotally mounted on said stationary leaf hinge member;
  - a bearing surface on one of said hinge members displaced from the pivotal axis of said leaf hinge members;
  - a bearing element mounted on the other of said hinge members and riding on said bearing surface;
  - a guiding-rod having an abutment stop means thereon;
- first means pivotally mounting one end of said guiding-rod on the stationary leaf hinge member and including nut means fixed to said stationary leaf hinge member with said one end of the rod being rotatably engaged with said nut means;
- second means connecting the other end of said guiding-rod to said bearing element so that, upon opening or closing said hinge, said bearing element, in following said bearing surface, causes said guiding-rod to move axially through said nut means while pivoting about said one end of said guiding-rod;
- a pre-stressed compression spring mounted on said guiding-rod and bearing on one end against said abutment stop means and on the other end against

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said nut means imposing an axial force on said guiding-rod;

said guiding-rod and said nut means defining mutually coacting means for braking movement of said guiding-rod during opening and closing of said hinge comprising a first set of coarse pitch screw threads defined on the outer periphery of the one end of said guiding-rod, and a second set of coarse pitch screw threads defined on the internal surface of said nut means, said sets being complementary and of the type having a helix angle in the order of 20° and being threadedly engaged forcing said guiding-rod to undergo a rotational braking movement when moving through said nut means.

2. A hinge according to claim 1, characterized in that the spring-guiding rod is provided at its abutting end with a slider, which comprises polyacetal resin said bearing surface further includes a cam face which comprises a control cam face portion and a stressing cam face portion and which is secured in the hinge member that is secured to the cover.

3. A hinge according to claim 1, characterized in that the coarse screw threads are multiple threads, preferably six-start threads.

4. A hinge according to claim 1, characterized in that the nut is made of plastics material.

5. A hinge according to claim 1 including means for holding said nut against rotation in the guiding rod pivotal means and further including a washer disposed between the nut and the lower end of the spring.

6. A hinge according to claim 1, including retaining cams on said guiding rod and a bushing on the upper end of said guiding rod that comprises a plastics material, and has an upper annular flange and further including two washers, an upper washer which bears on said guiding rod retaining cams and a lower washer which bears on the upper end of the spring.

7. A hinge according to claim 2, characterized in that the slider has a curved recessed bearing surface and including a pin mounted in the second movable hinge member.

8. A hinge according to claim 7, characterized in that opposite ends of the pin are received by respective recesses in mutually opposite surfaces of the bearing surface and these mutually opposite surfaces are shaped to define two end positions of the hinge.

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