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DOOR HINGE

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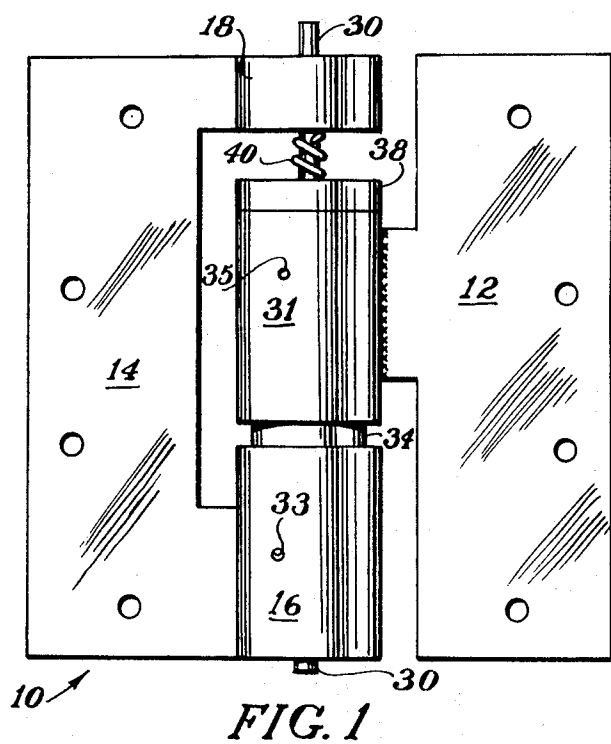


FIG. 1

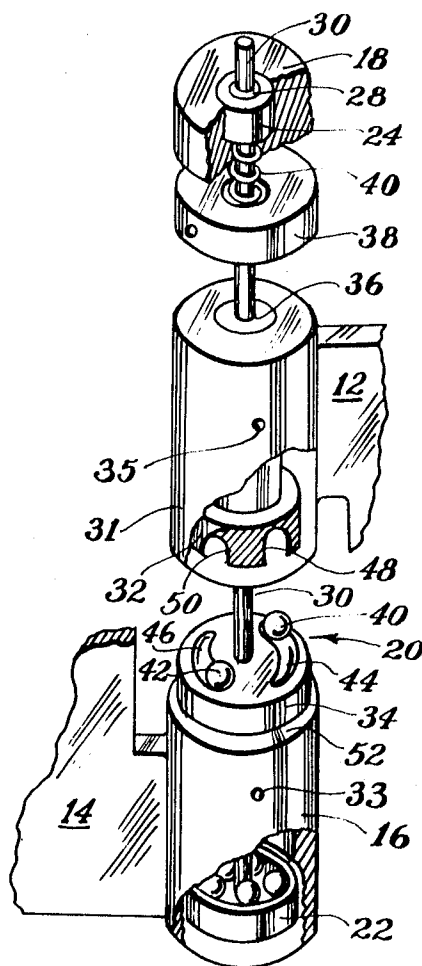


FIG. 2

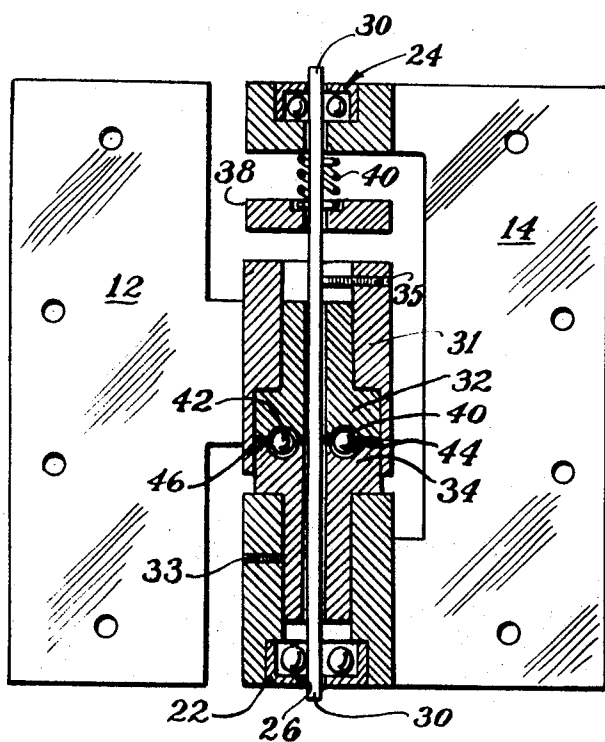


FIG. 3

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1

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DOOR HINGE

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5 Claims

ABSTRACT OF THE DISCLOSURE

An automatic self-closing door hinge which is actuated by the weight of the door it is mounted on. The hinge utilizes an inclined plane riding on rotatable members.

The aforementioned abstract is neither intended to define the invention of the application which, of course, is measured by the claims, nor is it intended to be limiting as to the scope of the invention in any way.

This invention relates to door hinges and more specifically to an automatic self-closing door hinge.

BACKGROUND OF THE INVENTION

Automatic door closing devices are usually hydraulic cylinder types. Such devices are generally expensive, require periodic maintenance and are often objectionably large. Prior attempts to overcome these defects with the use of an inclined plane device were unsuccessful since misalignment or cocking of the inclined planes would render the device inoperative.

The present invention provides a self-closing hinge which overcomes these deficiencies with a minimum of components. The hinge is constructed in a simple manner utilizing the inclined plane principle. A smooth ball will roll down a smooth inclined plane by its own weight once the static friction has been overcome. The rolling friction losses are much lower than the static friction losses, so that the ball will actually gain momentum as it continues to roll unless it is obliged to stop at a recess or detent point. An additional feature has been incorporated in the invention by the addition of a mating inclined plane resting on the ball. The mating plane surface is essentially parallel with the first or lower plane.

These inclined planes are cut in a cylinder with side retaining walls to form a race in which the ball is permitted to roll freely. The inclined race is cut in an arc on a concentric circle. The upper cylinder is made similar in construction to the lower one, and cooperating with the ball and lower cylinder will be caused to have circular motion. The number of rotational degrees traversed or the amount of angular rotation will be twice the number of degrees that each race arc transcends less the number of the degrees of the arc occupied by the ball. In addition arc alignment means is provided to insure proper alignment of the inclined planes at all times. In the present embodiment a rod is utilized to accomplish the proper alignment.

The present invention is ideally suited for use in applications such as refrigerators and freezers which must have their doors kept closed to operate efficiently, as well as closet doors, storm and screen doors, and auto doors where the closing of the door is a matter of convenience or safety.

Accordingly, it is a primary object of this invention to provide an automatic self-closing door hinge.

Another object of this invention is to provide a simple inexpensive door hinge that can be used on heavy doors and provide an automatic self-closing feature.

A further object is to provide a door hinge which requires a minimum of energy to open the appended door and is automatically self-closing.

2

These and other objects, features and advantages of the invention will, in part, be pointed out with particularity and will, in part, become obvious from the following more detailed description of the invention taken in conjunction with the accompanying drawing which forms an integral part thereof.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side view of the present invention.

FIG. 2 is a prospective exploded view of the invention showing the method of assembly; and

FIG. 3 is a cross sectional view of the present embodiment of the invention.

Referring to FIGS. 1, 2, and 3 the automatic self-closing hinge is generally referred to by reference numeral 10 and is comprised of a male flange assembly 12 and a female flange assembly 14. The female flange assembly 14 has a lower section 16 and an upper section 18. The lower section has the cylindrical lower half 34 of the main ball bearing assembly 20 mounted therein and an auxiliary bearing 22. The present embodiment utilizes a ball bearing type of bearing but a self-lubricating bearing such as Oilite or Teflon would do equally as well. The upper section 18 of the female flange assembly 14 has an auxiliary bearing 24 incorporated therein. Here again a self-lubricating type of bearing would be adequate. The tight clearance holes 26 and 28 are incorporated in the lower 22 and upper 24 auxiliary bearings serve as locating holes for rod 30 which will be explained later keep the hinge in alignment. Retaining means such as obtained by force fitting or a set screw 33 may be provided to captivate the lower half 34 of the main bearing assembly 20 within the lower portion 16 of the female flange assembly 14.

The male flange assembly contains a hollow cylindrical shaped extension 31 within which is inserted the mating cylinder or upper 32 half of the ball bearing assembly 20. Retaining means such as a set screw 35 is incorporated in the male flange assembly 12 for the purpose of captivating the alignment shaft 30. The upper half 32 of the ball bearing assembly 20 is mounted by a press or force fit, or other suitable retaining means within the male flange assembly 12. A close tolerance hole 36 is provided in the upper half 32 of the ball bearing assembly 20 for the purpose of maintaining alignment. A dust cover 38 and retaining spring 40 covers the opening in the male flange assembly 12 to prevent dust or dirt particles from entering the main ball bearing assembly 20.

In a typical application of the present invention a pair door hinges 10 would be mounted on a door and frame. The male flange assembly 12 is normally appended to the door and the female flange 14 is appended to the frame. The two flange portions 12 and 14 of the hinge would be in juxtaposition when the door was closed. The races 44 and 46 are cut in a concentric circle and will therefore provide angular rotation as balls 40 and 42 roll down the inclined plane. The lower half 34 is aligned to its proper position when inserted in the lower part 16 of the female flange assembly 14. The upper portion 32 of the bearing assembly 20 is aligned in juxtaposition with the lower part 16 when it is affixed within the hollow cylindrical extension 31 of the male flange assembly 12 and operates in cooperation with it. Opening the closed door by an external force causes the balls to be moved to the highest portion of their respective races. This is accomplished since the weight of the door acting by friction thru the upper races 48 and 50 would move the balls in the lower races 42 and 44. Releasing the door once opened would cause the balls to run down the inclined plane, accelerated by the weight of the door resting on the balls. The movement of the balls 40 and

3

42 within the angular races 42, 44, 48 and 50 causes the door to close. The weight of the door on the balls would normally tilt the male flange extension 31 to one side causing friction losses at surfaces 50 and 52. Alignment rod 30 inserted thru the clearance holes 26 and 28 prevents the tilting from occurring. Set screw 35 retains the alignment rod 30 in position in the present embodiment but this may be accomplished by any number of retaining means.

Although only two balls are depicted in the present embodiment any number of balls may be utilized to accomplish the same results. The balls utilized in the present embodiment are of steel material, however, they may be manufactured of other materials such as glass, Teflon, nylon, brass and the like. In the present embodiment the hinges 10 are constructed completely of aluminum except for the balls used in the bearings or their housings which are made of steel. The auxiliary bearings 22 and 24 in the present embodiment incorporated the above mentioned ball bearings.

What I claim as new and desire to secure by Letters Patent is:

1. An automatic, self-closing door hinge comprising:

- (a) a male flange having a tubular housing integral therewith;
- (b) a female flange having axially spaced tubular housings integral therewith, said tubular housings on said female flange being coaxial with each other and, in the assembled condition, being positioned adjacent opposite ends of said tubular housing on said male flange and coaxial therewith;
- (c) a first tubular bearing retainer rigidly mounted within said tubular housing of said male flange;
- (d) a second tubular bearing retainer partially mounted within said tubular housing of said male flange and partially mounted within said tubular housing of said female flange in coaxially confronting opposition to said first bearing retainer;
- (e) arcuate bearing races formed in the confronting end surfaces of said first and second bearing retainers, said races being of increasing depth along the length thereof;

4

(f) a plurality of balls positioned within said races;
(g) an alignment rod extending through said housings that are integral with said male and female flanges and through said first and second bearing retainers;

(h) bearing means for journaling the opposite ends of said rod in said housing that are integral with said female flange;

(i) means for rigidly securing said rod to said housing integral with said male flange; and

(j) means for rigidly securing said second bearing retainer to one of said housings integral with said female flange.

2. The hinge in accordance with claim 1 wherein said races are comprised of discontinuous helical segments.

3. The hinge in accordance with claim 1 wherein there is further included a dust cover intermediate said housing on said male flange and the upper one of said housings on said female flange.

4. The hinge in accordance with claim 3 wherein said dust cover is tubular and is mounted on said alignment rod.

5. The hinge in accordance with claim 4 wherein there is further included biasing means mounted on said rod intermediate said dust cover and the upper one of said housings on said female flange.

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