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DOOR HOLDING AND CLOSING MECHANISM

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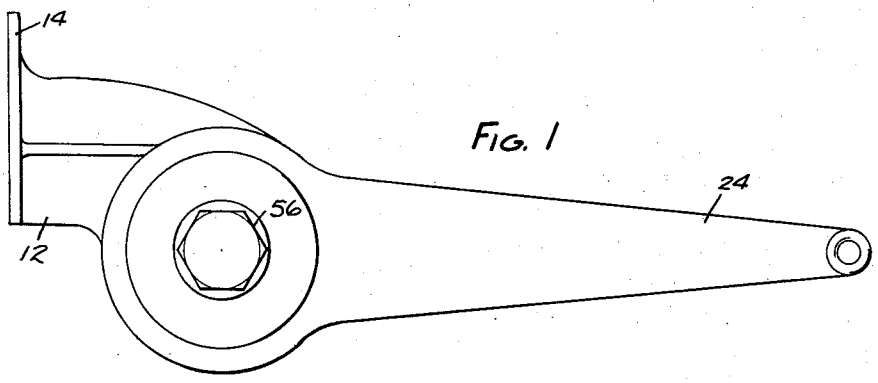


FIG. 1

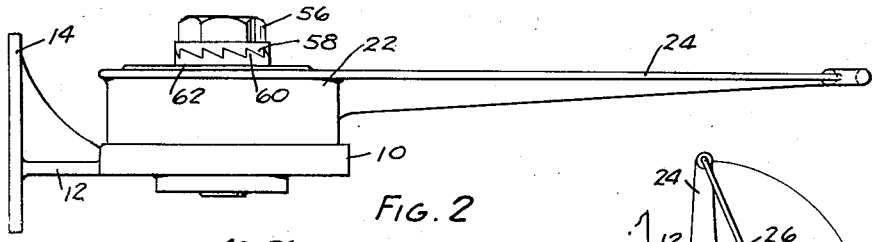


FIG. 2

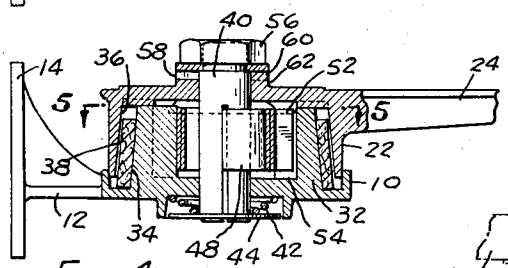


FIG. 4

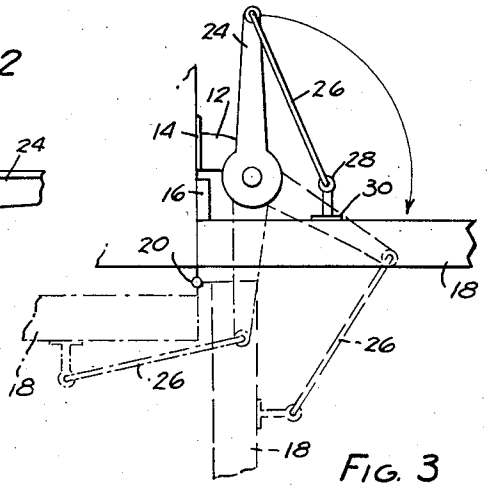


FIG. 3

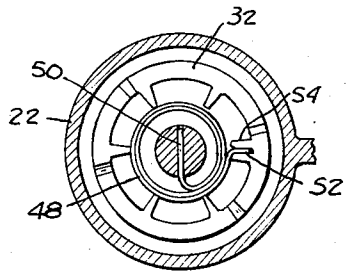


FIG. 5

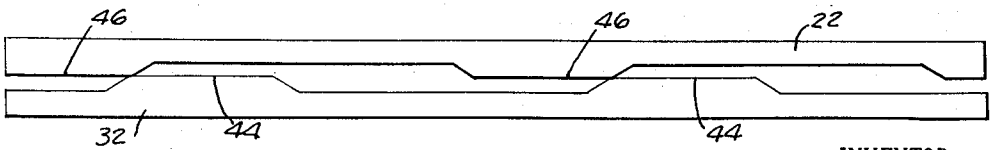


FIG 6

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DOOR HOLDING AND CLOSING MECHANISM

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This invention relates to door actuating mechanisms, and more particularly to a device for holding a door in an open position and moving it to the closed position when the door is moved beyond a predetermined position in the closing direction. My door actuating mechanism is intended primarily for use with doors of closets or other confined enclosures where no vent is provided.

Difficulties have been encountered in providing a mechanism for closing the doors of closets and other confined areas. When the edge of the door moves into the door jamb and therefore traps air, a rapid build-up in the force required to move the door to the fully closed position is encountered. As a result where door closing mechanisms are employed, closet doors frequently do not move to the fully closed position but stand slightly open.

An object of my invention is to provide a simplified door holding and closing mechanism adapted particularly for use with the doors of closets or other confined areas.

A further object of my invention is to provide a closing mechanism for closet doors wherein a brake is employed to hold the door in any open position to which it is moved, and a spring is employed to urge the door to the fully closed position when the door is moved beyond a predetermined position in the closing direction.

Another object of my invention resides in the provision of a cone type brake to hold a door in an open position, and cooperating brake releasing cam members to release the brake when the door is moved to a predetermined position in the door closing direction to permit a spring to move the door to the fully closed position.

Yet another object of the invention is to provide a simple door closure which may readily be attached to a door regardless of the side on which the door is hinged, it only being necessary to turn the device upside down to adapt it for use on doors hinged on the opposite side.

Still a further object of my invention resides in the provision of a manually adjustable member whereby the force exerted to move the door to the closed position may be varied through wide limits to insure the exertion of sufficient force to fully close the door.

Other objects and advantages of this invention will be apparent from the following detailed description considered in connection with the accompanying drawing submitted for purposes of illustration only and not intended to define the scope of the invention, reference being had for that purpose to the subjoined claims.

In the drawing wherein similar reference characters refer to similar parts throughout the several views:

Fig. 1 is a plan view of my improved door actuating mechanism.

Fig. 2 is a side elevational view thereof.

Fig. 3 is a small scale schematic line drawing illustrating the relative position of the device when the door is fully open, fully closed and in an intermediate position.

Fig. 4 is a fragmentary enlarged sectional elevational view of the device.

Fig. 5 is a sectional view taken substantially on the line 5—5 of Fig. 4, looking in the direction of the arrows.

Fig. 6 is a flat projection view illustrating the relation of the cooperating cam surfaces which are employed to disengage the brake.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawing, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring now more praticularly to Figs. 1 to 3 it will be observed that my improved door holding and closing mechanism comprises a member in the form of a cylindrical base **10** having an arm **12** terminating in an abutment **14** adapted to be secured as by wood screws adjacent a door stop **16** against which a door **18** hinged at **20** aligns.

A member in the form of a housing **22** is mounted for rotation and axial telescoping movement on the member or base **10**, and is provided with an arm **24**, which as illustrated in Fig. 3, is pivotally connected to one end of a link **26**, the other end of the link being pivotally connected to a door bracket **28** having a base **30** secured to the door in any desired manner as by wood screws. In Fig. 3 the linkage is illustrated by means of full lines in the position when the door **18** is fully closed. The linkage is illustrated in broken lines when the door **18** is opened to a 90° position, and the linkage is illustrated in dot-dash lines when the door **18** is in the fully open position, or opened 180° with reference to the door closed position illustrated in full lines.

Referring now more particularly to Figs. 4 to 6 it will be observed that the cylindrical base **10** is provided with an upstanding cylindrical web **32** having a conical braking surface **34**. The housing **22** has an internal conical braking surface **36** disposed at the same conical angle as the braking surface **34** carried by the base **10**. The conical braking surface **36** of the housing **22** is preferably larger, of a greater diameter than the conical braking surface **34** carried by the base **10** so that a conical insert **38** which is preferably formed of high friction material such as molded rubber having a high coefficient of static friction may be positioned therebetween to increase the braking or holding effect of the brake.

The central portion of the housing **22** is apertured to receive a stud **40** projecting through an aperture in the central portion of the base **10**. A spring **42** interposed between a washer **44** secured to the stud **40** and the housing **10** is employed to yieldingly urge the base **10** and housing **22** toward each other to actuate the brake formed by the conical surfaces **34** and **36**.

Cam means are employed to release the brake **34, 36, 38**. The outer edge of the web **32** is contoured as illustrated diagrammatically in Fig. 6 to provide spaced cam surfaces **44** adapted to cooperate with reversely disposed cam surfaces **46** formed in the housing **22** to shift the housing **22** axially relative to the base **10** in opposition to the spring **42** thereby separating the conical braking surfaces **34** and **36** and disengaging the brake.

When the housing **22** is displaced angularly relative to the web **32** of the base **10** so that the cam surfaces **44** and **46** are in engagement the housing **22** is shifted axially relative to the web **32** of the base **10** and the conical braking surfaces are held apart. When the housing **22** is positioned so that the cam surfaces **44** and **46** are out of

engagement with each other, the spring 42 urges the conical brake surfaces into contact to hold the door 18 in any open position to which it is moved between the 90° door open position illustrated by broken lines in Fig. 3 and the 180° door fully opened position illustrated therein by the dot-dash lines. When the door is moved from the 90° open position illustrated by broken lines in Fig. 3 toward the closed position illustrated by full lines in Fig. 3, the cam surfaces 44 and 46 engage to release the conical brake 34—36—38 whereupon the door is free to move to the fully closed position without the restraining force exerted by the brake.

Spring means are employed to move the door to the fully closed position illustrated in full lines in Fig. 3 when the door has been moved in the closing direction from the approximate 90° open position illustrated in dotted lines in Fig. 3.

A flat or clock-type spring 48 having one of its ends 50 secured to the stud 40 and having its other end 52 secured in a slot in a boss 54 integral with the cylindrical web 32 carried by the cylindrical base 10 exerts a torsional force on the arm 24 to urge the door to the closed position.

The spring 48 may be wound up or tensioned to increase the torsional force urging the door toward the closed position. A member 56 having wrench engaging configurations is fixed to the end of the stud 40 as illustrated. The member 56 has ratchet teeth 58 to engage oppositely disposed ratchet teeth 60 formed on a boss 62 at the central portion of the housing 22.

The spring 48 should preferably have a low rate, and must operate efficiently through the entire 180° of movement of the door from the fully closed to the fully open position.

To increase the force exerted to close the door the member 56 is tightened with a wrench to wind up the spring 48 thereby increasing the door closing force exerted by the device. The device should be adjusted after installation on a door to insure that sufficient door closing force is exerted to move the door to the fully closed position after the edge of the door moves into the door jamb and traps air.

The spring 42 which exerts axial force to engage the brake 34—36—38 must exert sufficient axial energy to enable the brake to hold the maximum torsional force which can be exerted by the clock-type spring 48 to close the door 18.

My door holding and closing device is universal in application because it can readily be applied to doors hinged on opposite sides. All that is necessary to install it on a door having the hinges positioned at the opposite side is to turn it upside down.

Any type of linkage may be employed to connect the arm 24 to the door 18, and suitable rubber grommets or other dampening or resilient means may be employed to insure quiet actuation.

In the operation of my improved door holding and closing device the brake is either all on or all off. For example: to yieldably hold the door in any open position between approximately 90° open and the full 180° open position it is all on. When the door is manually urged toward the fully closed position the brake is totally released at a point slightly beyond the 90° open position. It will be apparent that if desired the cam surfaces 44 and 46 can be varied as to circumferential length to release the brake and move the door to the fully closed position from angular open positions less than or more than the approximate 90° open position as discussed herein.

It will be apparent that various changes may be made in the construction and operation of the device without departing from the spirit of my invention as defined by the following claims.

I claim:

1. A door holding and closing mechanism comprising a pair of telescoping relatively rotatable members, means to connect one of said members to a fixed support adjacent a door stop and to operatively connect the other of said members to a door, conical braking surfaces provided on and located between said telescoping members, yielding means urging one of said members toward said other member to apply the brake, cam means operable by predetermined rotational movement of the member connected to the door to shift said members relatively in opposition to said yielding means to disengage the brake between a door closed position and a predetermined open position of the door, and additional yielding means to urge the door toward the closed position when the brake is disengaged.

2. The invention defined in claim 1 wherein a conical insert of high friction material is interposed between said conical braking surfaces.

3. The invention defined in claim 2 wherein the conical insert has a high coefficient of static friction to increase the braking effect of the brake.

4. The invention defined in claim 1 wherein the additional yielding means is a clock-type spring, and manually operable means to vary the door closing force exerted by said additional yielding means.

5. A door holding and closing device comprising relatively rotatable cone brake members, yielding means urging one of said cone brake members toward the other to engage the brake, cam means to separate said members to disengage the brake, connecting means to secure one of said brake members to a support adjacent a door, means including an arm and a linkage to connect the other of said brake members to a door, and spring means urging the brake member connected to the door to rotate in a door closing direction, the arm and cam means being related in such a manner that the brake is disengaged between a door closed position and a right angular or approximately 90° open position and the brake is engaged between said approximate 90° open position and a fully open position when the door is displaced approximately 180° with respect to the door closed position.

6. The invention defined in claim 5 wherein a conical insert of high friction material is interposed between the cone brake members.

7. The invention defined in claim 5 wherein manually operable means are employed to vary the force exerted by said spring means.

8. A door holding and closing device comprising relatively rotatable and axially movable members, means to attach one of said members to a support adjacent a door hinge, linkage means to operably connect the other of said members to a door, one of said members comprising a base having a conical braking surface, the other of said members comprising a housing having a conical braking surface cooperating with the braking surface of the first mentioned member, a stud projecting through said members, ratchet means to adjustably connect the stud and the other of said members, yielding means engaging said stud to urge one of said members toward said other member to engage the brake, cooperating cam means between said members to shift one of said members axially to disengage the brake, a spring interposed between and operably connected to said stud and the first named member, the cam and linkage means being proportioned so that when the door is open between approximately 90° and the fully open or 180° position the brake is engaged to hold the door in any angularly adjusted position to which it is moved and when the door is moved in the closing direction from the approximately 90° open position the cam means disengages the brake and the spring moves the door to the fully closed position.

9. The invention defined in claim 8 wherein a conical insert of high friction material is interposed between the conical braking surfaces.

10. The invention defined in claim 8 wherein manually operable means are employed to vary the force exerted by the spring means.

11. A door holding and closing mechanism comprising a stationary member and a rotatable member defining a pair of relatively rotatable members, means to connect the stationary member to a fixed support adjacent a door stop, means to operatively connect the rotatable member to a door, conical braking surfaces provided on and located between said relatively rotatable members, yielding means urging one of said members in the brake applying direction, cam means between said members operable by predetermined rotational movement of said rotatable member to engage and disengage the brake between a door closed position and a predetermined open position of the door, and means to urge the door toward the closed position when the brake is disengaged.

12. The invention defined in claim 11 wherein a conical insert of high friction material is interposed between said conical braking surfaces.

13. The invention defined in claim 11 wherein the means to urge the door toward the closed position comprises a clock-type spring.

14. The invention defined in claim 13 wherein manually operable means are employed to vary the door closing force exerted by the spring.

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