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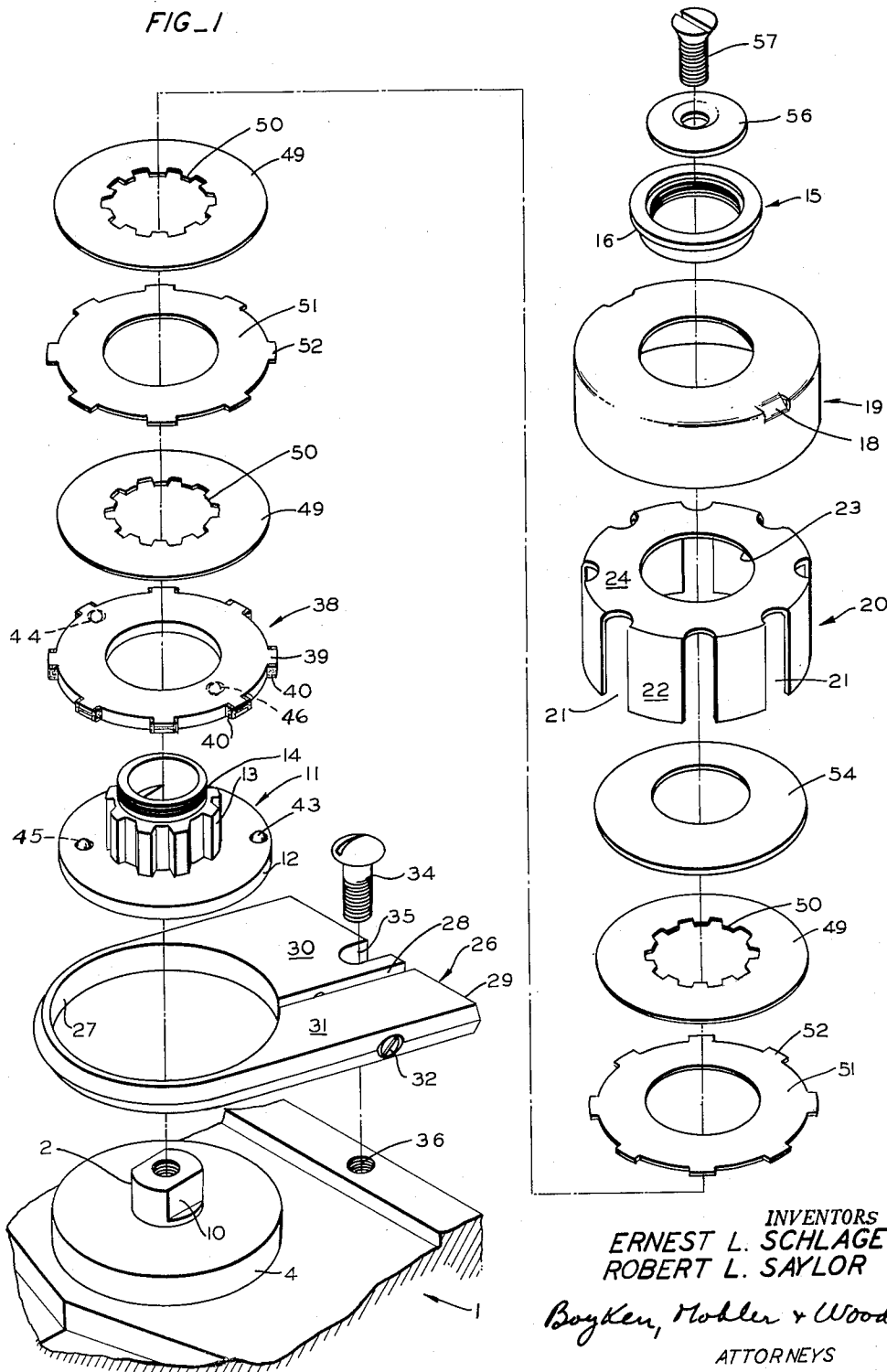
3,028,619

HOLD OPEN DEVICE FOR DOOR CLOSER

Filed Sept. 22, 1958

2 Sheets-Sheet 1

FIG. 1



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FIG. 2

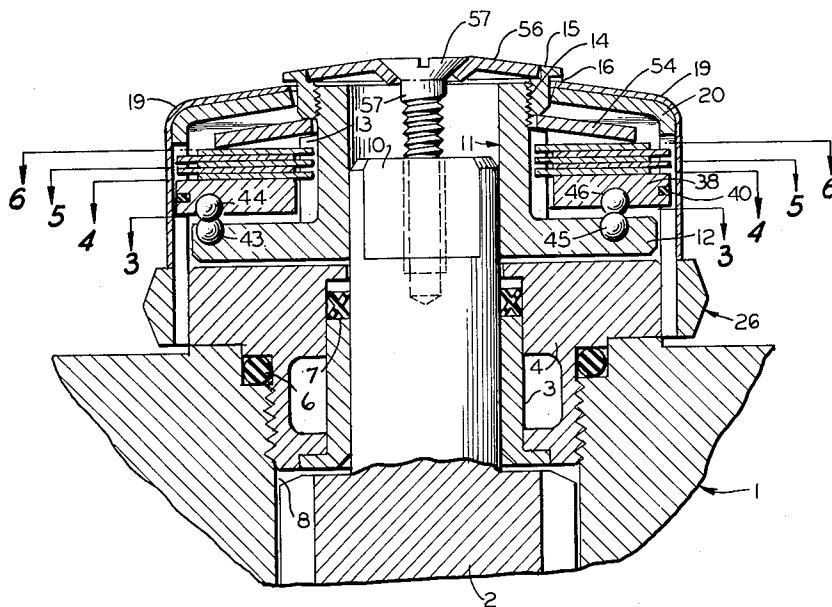


FIG. 3

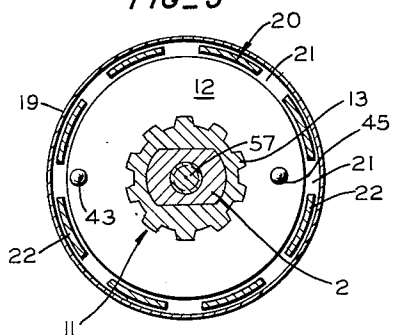


FIG. 4

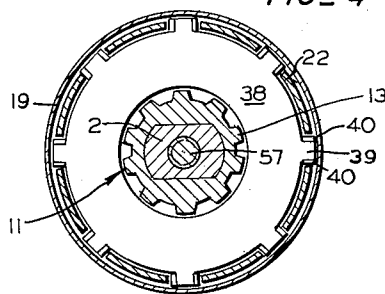


FIG. 5

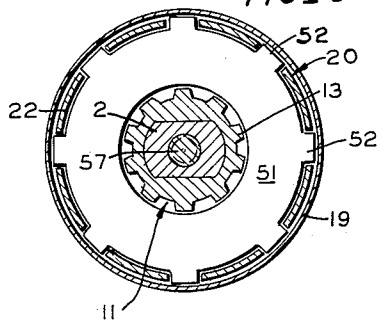
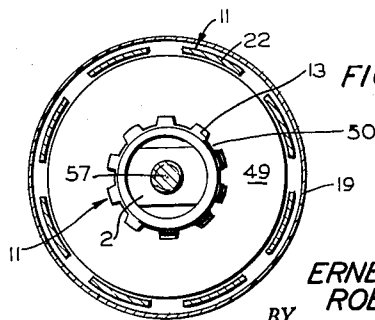


FIG. 6



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HOLD OPEN DEVICE FOR DOOR CLOSER

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6 Claims. (Cl. 16-49)

This invention relates to a hold open device for automatically holding a door open.

The invention is particularly adapted for use in conjunction with a door closer device to prevent closing of the door under the urgency of the closer when the door is swung to a predetermined open position.

The main object of the invention is the provision of a novel hold open device which is inexpensive, compact in construction and effective in operation.

Another object of the invention is the provision of a hold open device that is adapted for use with a door closer of the type in which the pinion shaft projects through opposite sides of the door closer body. An example is the type disclosed in United States Patent No. 2,723,416.

Still another object of the invention is the provision of a hold open device which is reversible, that is, one that can be employed on either right or left hand doors, such as the type shown in the above-noted patent.

Yet another object of the invention is the provision of a door closer that is readily adjustable, both as to the hold open position and the amount of resistance to closing movement of the door.

Other objects and advantages will be seen in the following specification and the drawings.

FIG. 1 is an exploded perspective of a hold open device embodying the invention showing the various parts thereof in spaced relation relative to the door closer on which they are mounted.

FIG. 2 is a vertical cross section of the hold open device embodying the invention showing the portion of the door closer to which it is secured.

FIGS. 3-6 inclusive are horizontal cross sections taken at the corresponding section lines indicated in FIG. 2.

The invention is illustrated in connection with a door closer having a body generally designated 1 which is adapted to be secured to a door or a door frame (not shown). The door closer illustrated is the type having a pinion shaft 2 rotatably supported at its upper end in bearing 3. Only one end of the shaft 2 is shown, it being understood that the opposite end is similarly supported in a bearing in the bottom of the closer body 1 and is secured to the door closer linkage by which swinging movement of the door is converted to rotation of shaft 2. This general construction is similar to that shown in the above-noted patent No. 2,723,416.

The bearing 3 shown in FIG. 2 is held by a sealing cap 4 which in turn is threadedly secured to body 1.

Seal 6 is interposed between body 1 and cap 4 and seal 7 is interposed between shaft 2 and cap 4 to prevent oil leakage from the pinion chamber 8 (FIG. 2).

The outwardly projecting end of shaft 2 is provided with flats 10, and a sleeve 11, having a bore complementarily formed relative to shaft 2, is slidably received over said shaft so as to rotate therewith. As best seen in FIG. 1 sleeve 11 is provided with an integral radially outward-

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ly extending flange or plate 12 and a hub which is externally splined by means of axially extending teeth 13.

The end of sleeve 11 opposite plate 12 is threaded as at 14 to receive a hollow nut 15 (FIG. 1) which is provided with a peripheral flange 16 in covering relation with a dust cap generally designated 19.

Cap 19 merely serves as a cover to prevent entrance of dust and dirt into the device and the actual outside strength member is a housing generally designated 20 over which the cap 19 fits.

Housing 20 is generally cylindrical but is formed with a plurality of axially extending slots 21 thus forming fingers 22. The top 24 of housing 20 is provided with a central opening 23 permitting the nut 15 to pass there-through. Dust cap 19 is provided with a corresponding opening for the same reason. Housing 20 is open at its end opposite top 24 and the ends of fingers 22 are adapted to be slidably received against the outer periphery of cap 4 of the door closer and tightened thereagainst by a clamping plate 26 (FIG. 1).

Clamping plate 26 is provided with a circular opening 27 the side wall of which snugly engages the outer sides of fingers 22 when the latter are against cap 4. A slot 28 is formed in plate 26 from opening 27 to the side edge 29 thus forming a pair of clamping jaws 30, 31. A clamping screw 32 (FIG. 1) extends through jaw 31 and is received in a threaded hole in jaw 30 to permit tightening the plate 26 around housing 20 for clamping the latter to the door closer cap 4. A set screw 34 passing through a notch 35 in plate 26 removably secures plate 26 to the door closer body 1.

At this point it may be noted that housing 20 may be adjustably rotated to various positions relative to the body 1 by loosening clamping screw 32. However, in use, housing 20 is fixedly secured to body 1 by means of said clamping plate 26 and clamping screw 32.

An annular thrust plate 38 (FIG. 4) surrounds sleeve 11 in face to face relationship relative to plate 12. However, plate 38 is not connected to sleeve 11 but is secured to housing 20 by means of a plurality of radially outwardly projecting teeth 39 which are received within the slots 21 of housing 20. Rotation of plate 38 relative to housing 20 is thus prevented but axial movement is permitted. In order to prevent noise as the plate 38 tends to rotate relative to housing 20 a plastic insert 40 of nylon or the like is integrally secured to each of the teeth 39. This may be accomplished by peripherally slotting each tooth 39 to receive an H-shaped insert of such plastic.

As best seen in FIGS. 1, 2 and 3, plate 12 is provided with a ball 43 that is rotatably supported in a socket in said plate. This may be accomplished by drilling a hole in said plate and peening the plate adjacent said hole over the ball 43 inserted therein. The adjacent face of thrust plate 38 is similarly provided with a ball 44 that is at the same radius relative to the axis of shaft 2 as the ball 43 on plate 12. In use, the circumferential spacing between balls 43, 44 is predetermined so that when the door is swung to open position said balls engage each other when the door has reached the point at which it is desired to hold the door open. As best seen in FIG. 2 balls 43, 44 thus tend to urge plates 12, 38 away from each other.

In order to provide symmetrical loading on plates 12,

38 another set of balls 45, 46 are provided on plates 12, 38 respectively at diametrically opposite points relative to balls 43, 44. However, balls 45, 46 are at a different radius relative to the axes of shaft 2 so that ball 43 does not interfere with ball 46, and ball 44 does not interfere with ball 45.

On the opposite side of plate 38 from plate 12 is a centrally apertured friction disk 49 (FIG. 1) that is provided with teeth 50 in mesh with teeth 13 on sleeve 11, so that said disk turns with shaft 2, and in face to face engagement with disk 49 is another centrally apertured disk 51 provided with peripheral teeth 52 received within the slots 21. It will be understood that as many pairs of friction disks as desired may be used although only three disks 49 and two disks 51 are shown in the drawings.

The above described stack of disks and plates are axially compressed by means of a spring washer 54 which is frusto-conical in shape and adjustably positioned by nut 15 on sleeve 11.

As best seen in FIG. 2 the flats 10 on shaft 2 form upwardly directed shoulders which engage the lower side of plate 12 thereby determining the position of plate 12 relative to cap 4 of the door closer. Preferably plate 12 and cap 4 are spaced apart slightly as shown in FIG. 2. A washer 56 fitted within nut 15 is tightened against said nut by means of a screw 57 which is threadedly received in the end of shaft 2. In this manner the internal elements carried by sleeve 11 are securely held together as a unit while the external elements carried by housing 20 are held together as a unit by clamping plate 26.

In operation, no resistance to opening the door is offered by the device until balls 43, 45 engage balls 44, 46 respectively at which point balls 44, 46 ride up on balls 43, 45 causing plate 38 to clamp the friction disks 49, 51 between said plate 38 and spring washer 54. The relatively large friction area of the coacting friction disks 49, 51 creates a large frictional load resisting closing movement of the door under the urging of the door closer spring. It should be noted that it is not necessary for the engaging balls to pass each other in order to create the desired holding effect. However, the device may be operated in this manner if desired.

When it is desired to close the door it is merely necessary to push the door toward closing position with sufficient force to overcome the friction of the disks and the door is then closed by the door closer in the usual manner. The balls 43-46 of course function as cams for axially moving the friction disks toward each other.

An important feature of the invention resides in the fact that it is not necessary for the coacting balls to pass each other in order to create the desired holding effect. This permits the door to be held open as closely as possible to a stationary obstruction such as a wall. If it were necessary for the balls (or camming elements) to pass each other a certain amount of closing movement would be required to urge the disks toward each other.

To adjust the hold open point of the device it is merely necessary to loosen screw 32 to release clamping plate 26 so that the housing 20 may be rotated to position balls 44, 46 at whatever spacing relative to balls 43, 45 is required to effect the desired angle of door opening. In other words, with the door positioned at the point at which it is to be held open, the housing 20 is merely rotated to bring the balls into camming engagement. Screw 32 may then be tightened.

It is unnecessary for the friction disks 49, 51 to exert any more load than is necessary to overcome the force of the door closer spring. In order to obtain such a loading the relative position of the disks may readily be adjusted by turning nut 15 which of course has the effect of determining the effective spacing between spring washer 54 and plate 38.

Spring washer 54 functions as a protection against

overloading because of its resiliency which permits the balls to pass each other before undue stresses are set up in the parts.

Additional pairs of balls may obviously be provided if desired.

Dust cap 19 is provided with one or more indentations 18 adapted to be received in one of the slots 21 of the housing 20 so as to prevent relative rotation between the cap 19 and housing 20. In this manner adjustment of the hold open point may be made simply by turning dust cap 19 which turns housing 20 with it. Such operation is, of course, performed after clamping jaws 30, 31 have been loosened as described above.

The device may of course be installed on either end of shaft 2 which permits it to be used on left or right hand doors.

The very specific description given above is not to be taken as restrictive of the invention as it is apparent that various modifications may be resorted to without departing from the spirit of the invention as defined by the following claims.

We claim:

1. A hold open device for use with a door closer having a shaft rotatable relative to the body of said closer comprising: a first friction disk carried by said shaft for rotation therewith and supported for axial movement relative thereto, a second friction disk carried by said shaft and secured to said body against rotation relative to said body, a first cam plate carried by said shaft and provided with a first camming element, a second cam plate carried by said shaft and secured against rotation relative to said body, said second cam plate being provided with a second camming element adapted to be engaged by said first element at a predetermined point in the rotation of said shaft for urging one of said disks axially toward the other into frictional engagement to resist rotation of the shaft.

2. In a hold open device, a housing, a shaft rotatable in the housing, a pair of friction disks, one being anchored to the housing and the other to the shaft, means at circumferentially spaced apart points relative to said shaft actuated by rotation of the shaft for urging said disks relatively toward each other into frictional engagement for preventing rotation of said shaft, said means being operative for causing relative movement of said disks only after a predetermined rotation of the shaft.

3. In a hold open device, a housing, a shaft rotatable in the housing, a plurality of friction disks, each alternate disk being anchored to the housing and the other disks to the shaft, means at circumferentially spaced apart points relative to said shaft actuated by rotation of the shaft for urging said disks relatively toward each other into frictional engagement for preventing rotation of said shaft, said means being operative for causing relative movement of said disks only after a predetermined rotation of the shaft.

4. In a hold open device, a housing, a shaft rotatable in the housing, a plurality of friction disks, each alternate disk being anchored to the housing and the other disks intermediate the alternate disks being anchored to the shaft, means at circumferentially spaced apart points relative to said shaft actuated by rotation of the shaft for frictionally engaging the disks at a plurality of predetermined shaft positions during rotation of said shaft, and means for adjusting said last mentioned means for changing the predetermined shaft position at which said disks engage.

5. In a hold open device, a housing, a shaft rotatable in the housing, a plurality of friction disks, each alternate disk being anchored to the housing and the other disks to the shaft, a camming disk secured to the shaft, a camming disk secured to the housing, said camming disks respectively provided with interengaging elements for urging said disks axially apart for applying pressure to

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the friction disks after a predetermined rotation of the shaft to prevent further rotation of said shaft.

6. In a hold open device, a housing, a shaft rotatable in the housing, a pair of friction disks, one being secured against rotation relative to the housing and the other secured against rotation relative to the shaft, means for urging said disks into face to face frictionally engaging relationship at a predetermined point in the rotation of said shaft relative to said housing, said means comprising camming elements respectively carried by said shaft and housing so urging said disks and adapted to be engaged at one point only in the rotation of said

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shaft, said camming elements carrying a pair of balls adapted to be engaged in wedging relationship at said predetermined point in the rotation of said shaft.

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