

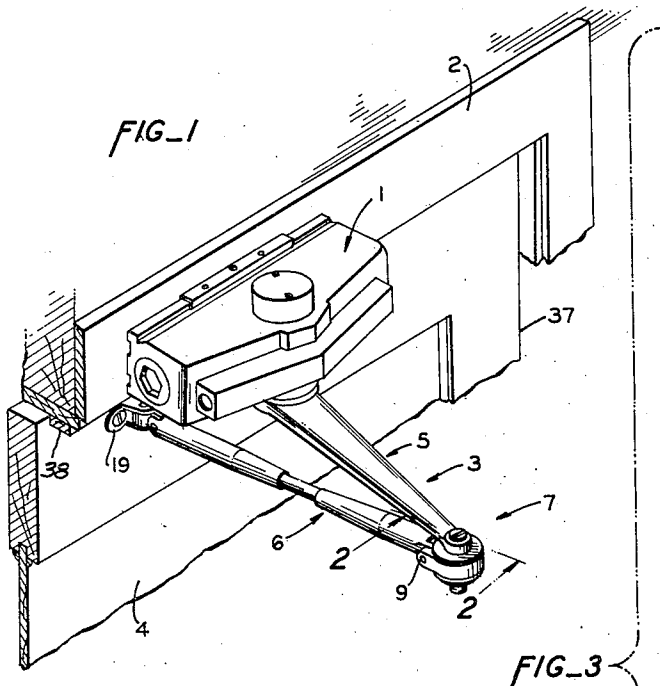
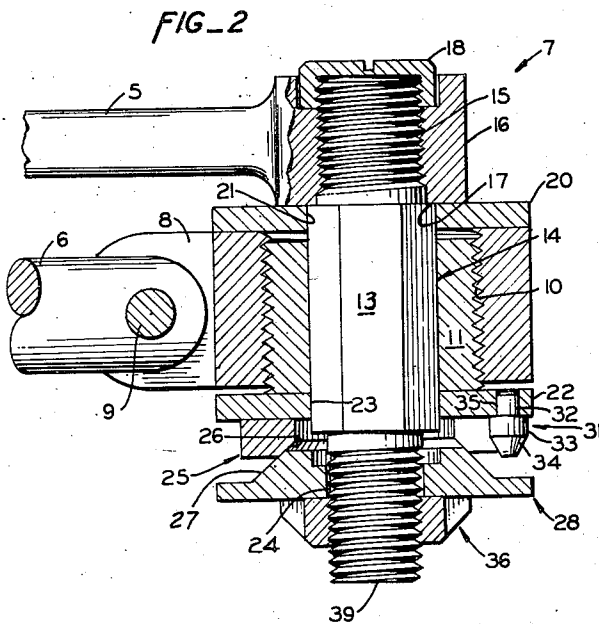
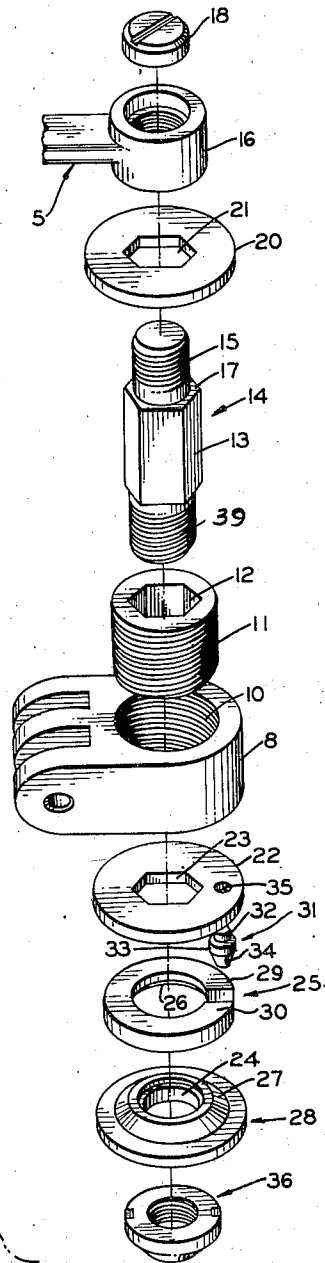
Jan. 21, 1958

E. L. SCHLAGE
HOLD OPEN SAFETY DEVICE

2,820,241

Filed Nov. 1, 1954

2 Sheets-Sheet 1



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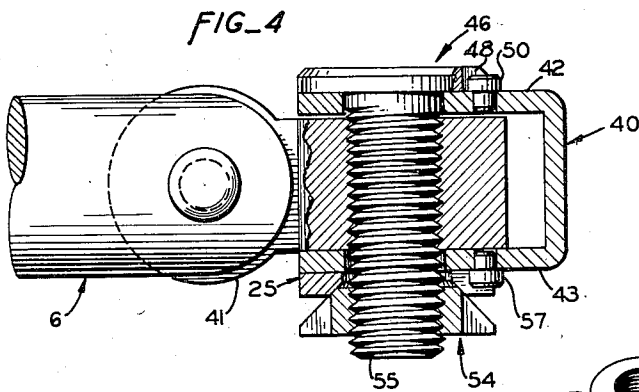
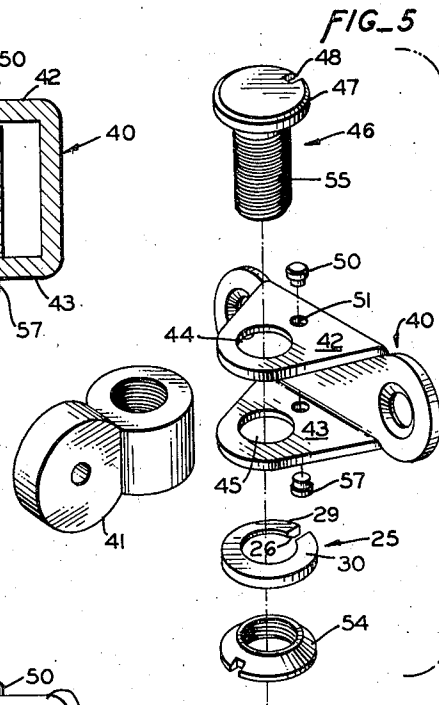
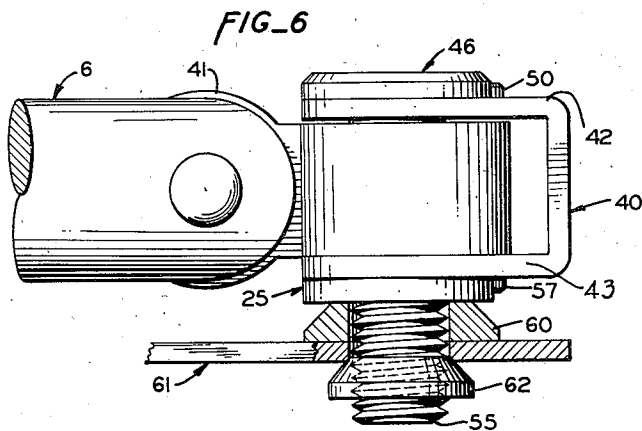
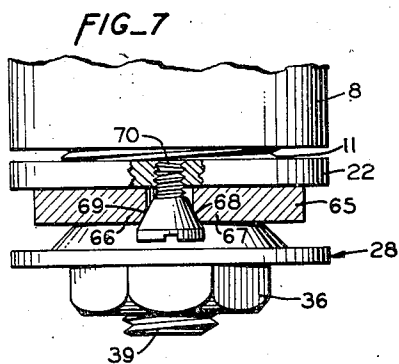
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HOLD OPEN SAFETY DEVICE

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Application November 1, 1954, Serial No. 466,126

4 Claims. (Cl. 16—49)

This invention relates to door closers, and more particularly to door closer linkages of the type provided with a hold open device. In general, hold open devices employ a plurality of frictionally engaging or wedging surfaces that are brought together in clamping relationship to hold the door open at a predetermined point in its swing. This type of device is well known and is disclosed in Patent No. 1,763,324, issued to Potter on June 10, 1930, and also in my co-pending application, Serial No. 451,852, filed August 24, 1954.

Inasmuch as the forces applied to the hold open elements are normally very severe, and especially since excessive loads may readily be applied by the user without great effort, there is always a danger of the hold open parts being overstressed causing failure of the device. The main object of the present invention is the provision of a hold open device in which there is incorporated means for preventing excessive stresses in the hold open parts. As will subsequently be seen, by the present invention it is possible for the user to apply excessive force on the door without injury to any of the parts of the hold open device, despite the fact that, without the present invention, such excessive loads on the hold open device would cause failure of one or more parts thereof.

Another object of the invention is the provision of a safety device for a hold open door closer linkage that is adjustable, so that not only may the degree of swing of the door before being held open be adjusted, but also the point at which the safety device goes into operation.

Still another object of the invention is the provision of a safety device for a hold open door closer linkage that is adapted for use in various installations and is formed so as to lend itself to use in any one of the door closer linkage joints.

Other objects and advantages will be seen in the following description and in the drawings:

Fig. 1 is a perspective view of a door closer and its associated linkage showing the safety device applied at the elbow.

Fig. 2 is a vertical section through the elbow joint of the door closer linkage as taken along lines 2—2 of Fig. 1, but showing the joint in hold open position.

Fig. 3 is an exploded view of the various parts of the joint shown in Fig. 2.

Fig. 4 is a section similar to the section shown in Fig. 2, but showing a modified form of the invention wherein the hold open mechanism is applied to the shoe bracket of the door closer linkage.

Fig. 5 is an exploded view of the parts of the joint shown in Fig. 4.

Fig. 6 is a side elevation of a door closer linkage joint showing the invention applied to a hold open joint provided with fusible linkage.

Fig. 7 is a side elevation of a joint similar to Fig. 2 and showing an adjustable form of the invention.

In detail and referring to Fig. 1, the invention is adapted to be employed with a door closer generally designated

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1, which in this case is shown applied to a door frame 2, and provided with an operating linkage generally designated 3, which is attached in the usual manner to the door 4. The door closer linkage comprises a pair of arms, generally designated 5 and 6 respectively, that are pivotally secured together at an elbow joint generally designated 7. The end of arm 6 opposite joint 7 is pivotally secured to a shoe bracket 19, which is in turn fastened to the door 4.

Referring now to Fig. 2 wherein the joint 7 is sectionally shown, the arm 6 is provided with a swivel link 8, which is pivotally secured to the arm 5 by means of a pin 9. Spaced from the pin 9 on link 8, and extending at right angles to said pin, is a threaded hole 10, which is adapted to receive a nut 11 (Fig. 3). Nut 11 is provided with a central noncircular hole 12 which is adapted to receive the complementarily shaped shank 13 of a pivot pin generally designated 14. Pin 14 is shown as having a hexagonal cross section intermediate its ends, but it will be obvious that the same may be square or of any other noncircular section.

Pin 14 is provided at one end with a threaded portion 15, which is adapted to be threadedly received in a boss 16 integral with the outer end of arm 5 of door closer 1. At assembly, the pin 6 is very tightly threaded into boss 16 so that the latter engages a shoulder 17, formed by the juncture between the threaded portion 15 and the noncircular portion 13 of the pin 14. In other words, the arm 5 including the boss 16 is secured as if integral with the pin 14. If desired, a locknut 18 may be applied to the end of the threaded portion 15 as seen in Fig. 2.

Adjacent the boss 16 is a thrust plate 20 which is provided with a central noncircular aperture 21 complementary to the noncircular portion 13 of pin 14. Spaced along the length of pin 14 from thrust plate 20 is a similar thrust plate 22 which is provided with a noncircular central aperture 23 adapted to be received on the noncircular portion 13 of pin 14. Between the two thrust plates 20 and 22 are received the arm link 8 and the nut 11 with the latter inserted in the former (Fig. 2). At this point it should be noted that the nut 11, although permitted to move axially on the pin 14, cannot rotate relative thereto because of its noncircular central aperture 12. However the link 8 is permitted to rotate relative to the pin 14, but such rotation is accompanied by relative axial movement with respect to the nut 11, inasmuch as the two elements are threadedly connected.

Against the outer side of thrust plate 22 a safety washer generally designated 25 (Fig. 3) is provided. This safety washer 25 is formed with a bevelled inner face 26 which is adapted to engage a complementarily formed bevelled face 27 on a pressure plate generally designated 28. Safety washer 25 is provided with a central aperture which is sufficiently large so as not to interfere with the pin 14. The safety washer 25 is split radially at a point along its circumferential extent so as to provide adjacent free ends 29 and 30 (Fig. 3). Said adjacent free ends are adapted to be urged apart so as to apply a bending stress throughout the length of the washer 25. In use, the safety washer 25 is inserted between the thrust plate 22 and the pressure plate 28, as best seen in Fig. 2. For the purpose of holding apart said adjacent ends 29 and 30 of the safety washer 25, a relatively small pin generally designated 31 is provided. As seen in Figs. 2 and 3, pin 31 comprises a shank portion 32, a larger cylindrical portion 33 and a tapered portion 34. Thrust plate 22 may be provided with an aperture of 35 for receiving the shank portion 32 of pin 31 therein as seen in Fig. 2. At assembly, as seen in Fig. 2, the cylindrical portion 33 spreads apart the two adjacent ends 29, 30 of

the safety washer 25 so as to hold the same at all times in its stressed condition.

It will be apparent that the stress in safety washer 25 corresponds to a strain which is determined by the spacing between the adjacent ends 29, 30. It will further be apparent that this same strain may be brought about by applying an axially directed load between thrust plate 22 and pressure plate 28. In other words, the strain in safety washer 25, represented by the spacing between adjacent ends 29, 30, may be brought about by a compressive force exerted on opposite sides of said washer as well as by oppositely directed tangential forces on the adjacent ends 29, 30. The pressure plate 28 may be positioned in a predetermined position relative to thrust plate 22 by means of an adjustment nut generally designated 36.

Referring to Fig. 1 and assuming that the door 4 is swung about its vertically extending edge 37 away from stop 38, it will be seen that the arm link 8 of Fig. 2 will tend to travel upwardly and at the same time the nut 11 will tend to travel downwardly. The result of this action is that the arm link 8 is wedged against the upper thrust plate 20 and the nut 11 is wedged against the lower thrust plate 22. By properly setting the spacing between thrust plates 20 and 22, it will therefore be apparent that the door may be held open at any predetermined point in its swing. The spacing between thrust plates 20 and 22 may be adjustably predetermined by means of nut 36. It will also be apparent from Fig. 2, that when the door is held in an open position there is a substantial pressure exerted on safety washer 25 which is positioned so as to resist said pressure. Inasmuch as washer 25 has been prestressed and therefore prestrained, no further strain can be applied to washer 25 until the compressive load exerted thereon exceeds a predetermined amount which corresponds to the tangentially directed forces on the adjacent ends 29, 30 of safety washer 25. In other words, in use, the presence of safety washer 25 makes no difference to the operation of the hold open device until the force applied to the door 4 is of such magnitude as to apply a pressure on safety washer 25 that is in excess of the pressure corresponding to the strain defined by the spacing between ends 29, 30. In other words, when an excessive load is applied to the door 4 the safety washer expands circumferentially thus permitting the thrust plate 22 and the pressure plate 28 to move slightly toward each other, thereby enlarging the effective spacing between thrust plates 20 and 22. In this manner the door is permitted to open wider than its normal amount and the additional load which would ordinarily deform one or more parts of the hold open device is absorbed by the yielding of safety washer 25. In this connection by making the fit between shank 32 of pin 31 and aperture 35 of thrust plate 22 a driving fit, the pin 31 remains in place, and, when the door is again closed said pin serves again to hold the ends 29, 30 of the safety washer apart a predetermined distance.

It will be noted that the pressure plate 28 is provided with a central aperture 24 which is somewhat larger than the outside diameter of the threaded shank 39 of pin 14 and on which shank the nut 36 is threadably secured. By adjustably positioning the nut 36 along the length of the threaded shank 39, the effective spacing between the thrust plates 20, 22 may be predetermined so as to maintain the door in its opened position at any desired degree of swing. Adjustment nut 36 also provides a means for spreading the adjacent ends 29, 30 of the safety washer 25 and it will be apparent that said nut may be employed, if desired, to apply a compressive load on said safety washer before the pin 31 is inserted in hole 35 of thrust plate 22.

The use of safety washer 25 is not restricted to the joint 7, but may be applied to a hold open device incorporated in the bracket 19, which is secured to the door 4 (Fig. 1).

A shoe bracket installation is shown in Figs. 4 and 5 wherein the arm 6 of the operating linkage is pivotally secured to a link 41 somewhat similar to link 8 hereinbefore described. Link 41 is received between the opposed plates or flanges 42, 43 of the shoe bracket, generally designated 40. In this case, inasmuch as the plates 42, 43 of bracket 40 are integral with said bracket, any adjustability residing in this form of hold open device depends on the resiliency of the bracket itself. The plates 42, 43 of bracket 40 are provided with apertures 44, 45 respectively (Fig. 5) for receiving therethrough a pin generally designated 46. The head 47 of pin 46 is provided with a notch 48 which is adapted to receive therein a pin 50 which in turn may be secured within an aperture 51 in the upper flange 42 of bracket 40. By this structure the pin 46 is prevented from rotating relative to the bracket 40.

Pin 46 is provided with a threaded shank 55 on the other end of which is received a nut 54, the hub of link 41 also being threaded on shank 55. Between the nut 54 and the lower flange 43 of bracket 40, the same safety washer 25 as above described may be applied, and a pin 57 may be driven into an aperture in the lower flange 43 of bracket 40 for holding the adjacent ends 29, 30 of the washer 25 apart. The various parts above described are oriented in such a way that when the door is opened, the link 41 will be wedged against the lower flange 43 of bracket 40 thereby flexing said flange and applying an axial load on washer 25 when the door has been swung to a predetermined open position. It will be understood that the operation of the safety washer 25 is exactly the same as above described. It will be further understood that the exact position of washer 25 is not critical and it may be applied in any position so as to take the entire axial load created by the wedging of the parts of the hold open device.

The present invention is also adapted to be employed with a hold open device equipped with a fusible link as disclosed in the copending application, Serial No. 451,852. Such an installation as shown in Fig. 6 showing the assembly is practically identical to that shown in Fig. 4 except that the nut 54 of Fig. 4 is replaced by centrally bored pressure plate 60 similar to the pressure plate 28 of Fig. 2. In abutment against the outer side of pressure plate 60 is the fusible linkage generally designated 61 which is urged against the pressure plate 60 by means of a tightening nut 62. It will be understood that nut 62 provides adjustment and has the function of impressing the bearing pressure, resulting from the wedging action of the hold open device, on safety washer 25. It will be noted that the presence of the fusible linkage 61 makes no difference to the operation of the device of Fig. 6 and upon release of fusible link 61 as described in said copending application, Serial No. 451,852, the door will be permitted to close.

The means for holding the opposite ends 29, 30 apart in safety washer 25 may be made adjustable as indicated in Fig. 7. In this modification, the structure is the same as that shown in Fig. 2 except that the safety washer 65 is provided with adjacent ends 66, 67 which in turn are bevelled as indicated at 69, 68 respectively. A screw 70 is provided having a tapered head formed complementarily to the bevelled sides of 69, 68 of the safety ring 65. This screw 69 is screw threadably received in a threaded hole 70 formed in thrust plate 22 above described. By this structure it will be apparent that the adjacent ends of safety ring 65 may be spread apart by screwing the screw 69 into or out of the thrust plate 22. This device permits the safety washer 65 to be prestressed to an amount commensurate with the severity of use which the door will experience.

It should be understood that the above very specific description of the invention is not to be taken as restrictive of the scope of the same, and it is obvious that various minor changes in design may be resorted to without de-

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parting from the spirit of the invention as defined in the following claims.

I claim:

1. In a door closer hold open linkage joint having a pair of axially movable wedging elements, a safety washer split to permit expanding the same circumferentially and means for holding said washer in said expanded condition, said washer being formed to expand circumferentially upon the application of an axial load thereon and being operatively associated with said wedging elements to receive the load created by relative axial movement of said wedging elements, whereby wedging loads less than a predetermined maximum cause no further expansion of said washer and loads in excess of said predetermined maximum resulting from said relative axial movement expand said washer preventing damage of associated parts.

2. A safety device for use with a door closer linkage joint of the type in which axially directed compressive loads are imposed upon relatively rotatable wedging elements and are resisted by an axially extending tension member, said safety device comprising: a washer applied to said joint whereby said compressive load is imposed thereon axially of the same, said washer being formed to expand circumferentially upon such relative rotation of said wedging elements imposing said compressive load to opposite sides thereof, thereby undergoing a strain, and means for holding said washer in such expanded condition.

3. A door closer linkage safety device comprising: a

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split ring adapted to be applied to the joint of a door closer linkage adapted to be connected to a door, a hold open device at said joint arranged to apply a compressive force to said ring when the associated door is opened, said split ring being resilient and adapted to be strained circumferentially by separation of its adjacent ends at the split portion thereof, means for holding said ring in such strained condition, said ring being formed to be strained circumferentially upon application of said compressive force by said hold open device.

4. A door closer linkage safety device comprising: a split ring adapted to be applied to the joint of a door closer linkage, a hold open device at said joint arranged to apply a compressive force to said ring when the associated door is opened, said split ring being resilient and adapted to be strained circumferentially by separation of its adjacent ends at the split portion thereof, means for holding said ring in such strained condition, said ring being provided with a bevelled portion, and said device including a complementarily bevelled element in engagement with the bevelled portion of said ring for applying said compressive force thereto.

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