April 5, 1966 R. H. BISBING 3,244,444

PUSH BUTTON FASTENER

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FIG. 1

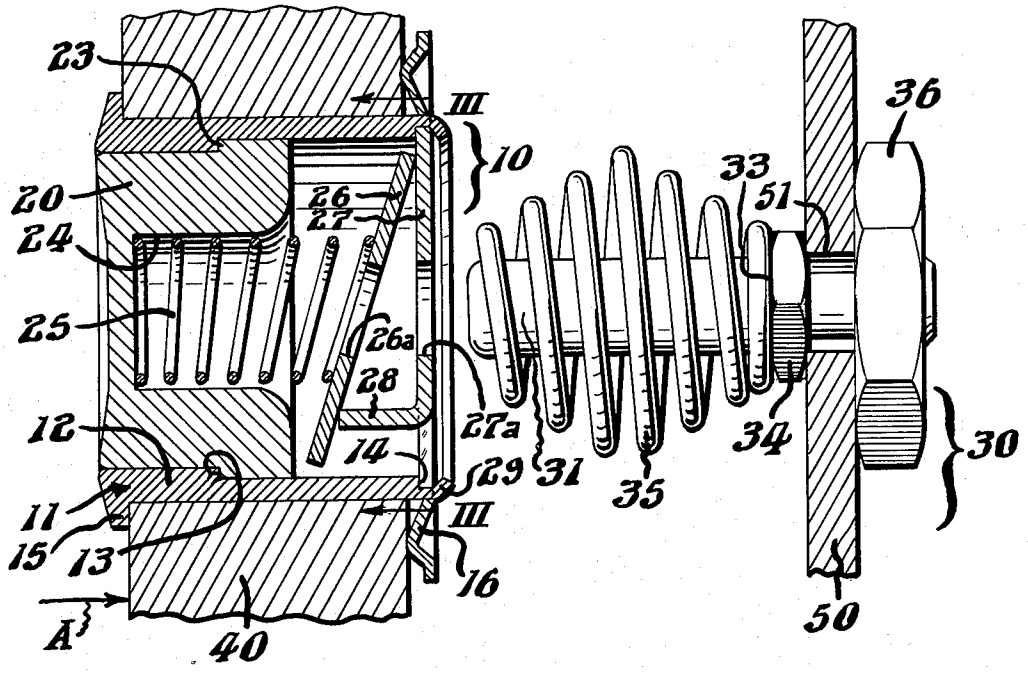


FIG. 2

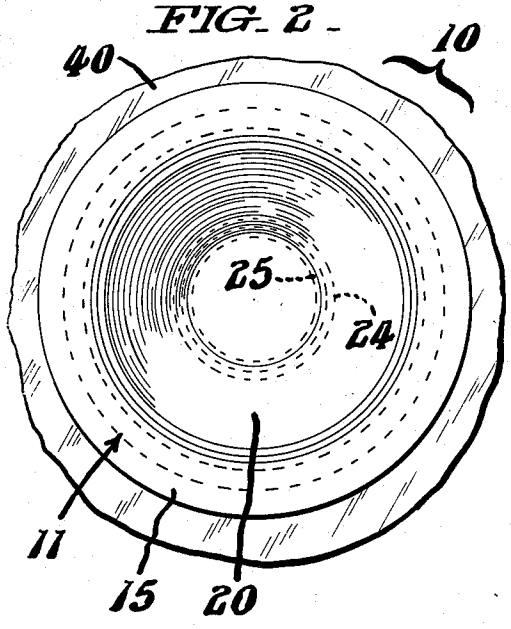
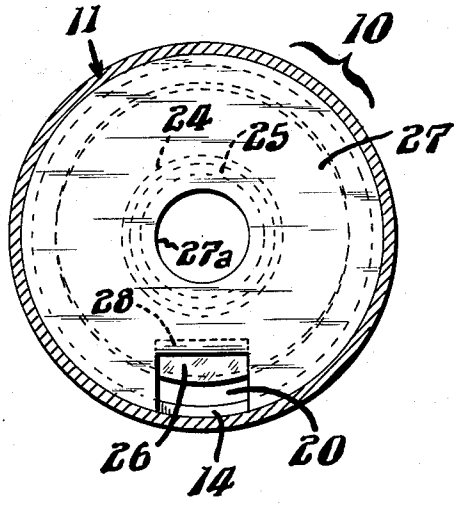


FIG. 3



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FIG. 4

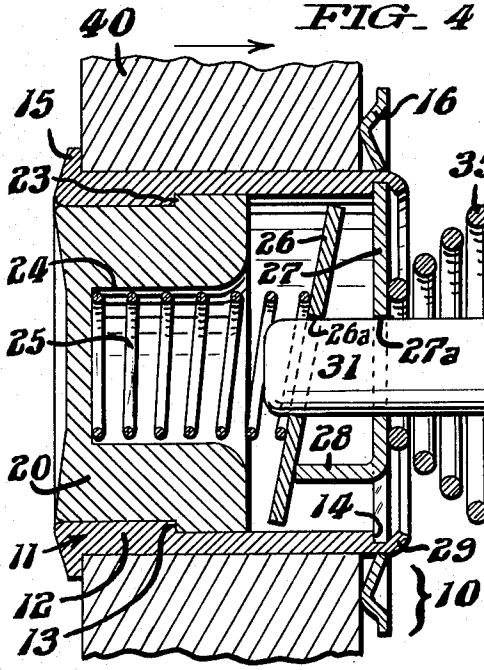


FIG. 6

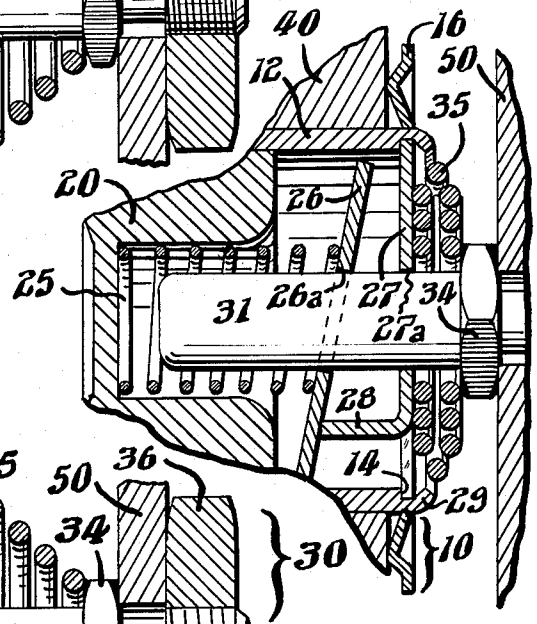
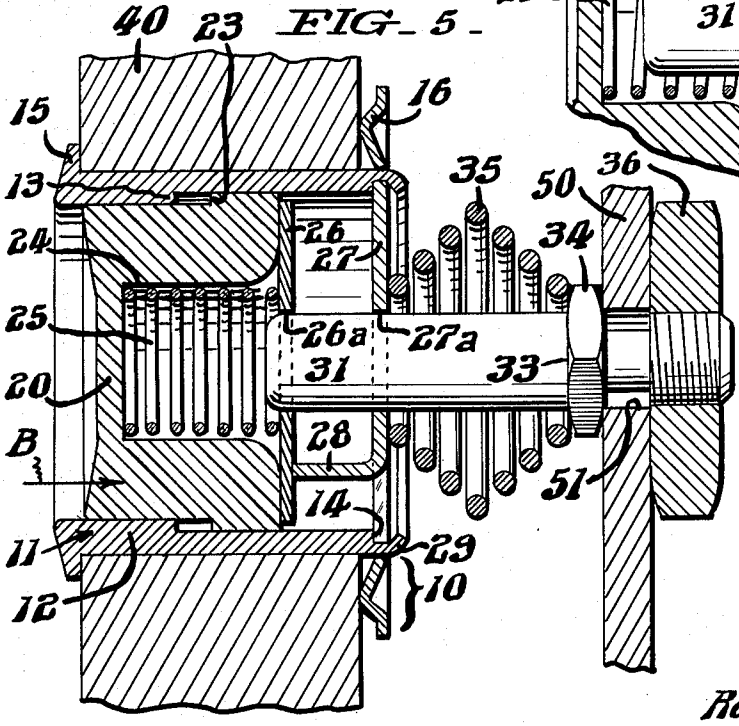


FIG. 5



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3,244,444

Patented Apr. 5, 1966

3,244,444

PUSH BUTTON FASTENER

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Filed May 8, 1964, Ser. No. 366,105
10 Claims. (Cl. 292—306)

This invention relates to fastening devices, and particularly to a push button type of releasable fastener for doors and panels.

The object of the invention is to provide, for doors and the like, a fastening device having a push button type of release. It is a feature of the invention that the fastening device is able to lock the door in any position (within a range) in which it is closed.

In the drawing:

FIG. 1 is a side elevation, partly in section, showing a preferred form of the push-button sub-assembly at the left and a preferred form of stud sub-assembly at the right, the two sub-assemblies being separated from each other, as when the door is open;

FIG. 2 is a front view of the fastener looking in at the push-button;

FIG. 3 is a view at the rear of the push-button sub-assembly looking in along the line III—III of FIG. 1;

FIG. 4 is a side elevation, partly in section, showing the relationship of the push-button and stud sub-assemblies when the door is fastened but not fully closed;

FIG. 5 is a side elevation, partly in section, showing the relationship of the sub-assemblies when the push button is depressed to release the door; and

FIG. 6 is a side elevation similar to FIG. 4 but showing the door fully closed.

Referring now to the drawing, the fastening device of my present invention, in its preferred form, comprises two sub-assemblies, a female sub-assembly indicated generally by the reference numeral **10** and a male sub-assembly indicated generally by the reference numeral **30**.

The female sub-assembly **10** includes the push button release mechanism and is installed on the door **40**. The male sub-assembly **30** is a forwardly-projecting stud assembly and is installed on the frame **50** in a position to mate with the push-button assembly when the door is closed. Unless the door has a natural or built-in tendency to spring open, the stud assembly **30** may be provided with a helical spring **35** to provide the force for the initial opening movement of the door when the push button is depressed to release the fastening device. When fully compressed, spring **35** is a two-layer flattened spiral, as illustrated in FIG. 6.

Female sub-assembly **10** comprises a tubular housing or shell **11** having a wall **12** whose thickness is abruptly reduced at an intermediate point, forming the annular shoulder **13**. At the rearward end, the wall **12** of shell **11** is again reduced, forming the annular shoulder **14**.

The front end of the shell **11** is provided with an outward flange portion **15** adapted to abut against the face of the door **40** when the shell **11** is inserted into the cylindrical hole which is bored through the door to receive the push-button sub-assembly. The shell **11** has a length which is greater than the thickness of the door, so that when the shell **11** is inserted into the door and the flange **15** abuts the face of the door, the rear end of the shell **11** extends sufficiently beyond the rear surface of the door to receive the annular retaining ring **16**. This retaining ring **16** functions to retain the shell **11** in the door against the pressure exerted thereagainst by the stud assembly **30**, as will be described later.

The assembly of the push-button sub-assembly **10** will now be described.

The cylindrical push button **20** is inserted into the shell **11**, entering through the rearward end of the shell. The push button **20** has a smaller diameter at its forward end substantially equal to the smaller diameter of the bore at the forward portion of the shell **11**; and button **20** has a larger diameter at its rearward end forming an annular shoulder **23** adapted to abut against the shoulder **13** of the shell **11**. These shoulders, on the button and shell, prevent the push button from being pushed forwardly out of the shell by a rearwardly applied force.

Push button **20** has an axial recess **24** at its rearward end. A compression spring **25** is inserted into the recess **24** and tends to protrude rearwardly therefrom. A first annular disc or washer **26** is inserted into the bore of the shell **11** behind the spring **25**, and, rearwardly of the washer **26**, a second annular disc washer **27** is inserted. The apertures **26***a* and **27***a* of the washers **26** and **27**, respectively, may be of substantially equal diameter. The rearward washer **27** is provided with a forwardly extending tab **28** which abuts against the rear face of the forward washer **26**. The rearward washer **27**, which has a larger outside diameter than the forward washer **26**, abuts against the shoulder **14** at the rearward end of the shell **11**.

After the push button **20**, the spring **25**, the forward washer **26**, and the rearward tab washer **27**, have been inserted into the shell **11**, the rearmost end of the shell is turned in to form the retaining flange **29** which retains the aforementioned parts of the push-button sub-assembly in the shell. The spring **25** exerts a force rearwardly against the forward washer **26** and, since rearward movement of washer **26** is prevented at tab **28**, the washer **26** is forced into the angularly inclined position illustrated in FIG. 1, in which the upper part of washer **26** (as viewed in FIG. 1) abuts against the upper portion of the rearward washer **27**.

The stud sub-assembly **30** comprises a stud **31** which has a diameter slightly smaller than that of the apertures **26***a* and **27***a* of the washers **26** and **27**, respectively. In a preferred embodiment of the stud sub-assembly **30**, the stud **31** and the hexagonal collar **34** are integral, i.e., the stud **31** is machined from hexagonal stock, leaving a collar at **34**. The rearward end portion of stud **31** is of reduced diameter and is threaded for receiving the nut **36**. Secured, as by welding to collar **34**, or by a press fit on the portion of stud **31** adjacent the forward face of collar **34**, is a helical compression spring **35**. The rearward reduced-diameter end portion of the stud **31** is inserted through a hole **51** bored through the frame **50**, and the nut **36** is applied to secure the stud assembly to the frame.

The push button fastening device of the present application operates as follows:

To close the door, the door (not the push button **20**) is pushed in the direction of the arrow A in FIG. 1. No pressure is applied to the push button **20**. When the door **40** is first pushed, the various parts of the push-button sub-assembly **10** occupy the positions indicated in FIG. 1.

As the door **40** moves toward the closed position, the forwardly projecting stud **31** on the frame **50** first enters the aperture **27***a* of washer **27** and then the aperture **26***a* of the washer **26**. In so doing, the stud **31** clears the peripheral edge of aperture **27***a*, but when the stud **31** enters the aperture **26***a* of the inclined washer **26**, the upper, and then the lower, edges of the aperture **26***a* are frictionally engaged by the stud. This, of course, is due to the fact that aperture **26***a* presents a reduced opening to the stud **31**, resulting from the inclined position of plate **26** shown in FIG. 1. As the door **40**

continues to close, the stud 31 moves into the push-button sub-assembly and forces the washer 26 into a more erect position, thereby compressing the spring 25.

With respect to the stud spring 35, it will be seen that when the spring 35 is fully compressed, as in FIG. 6, the three turns of the spring nearest to the collar 34 form a single pancake layer, and the outer three layers form a second layer. Thus, spring 35 does not become fully compressed until tab washer 27 and hexagonal collar 34 are separated by a space equal to twice the diameter of the wire of spring 35. The closed position of the door may be as in FIG. 6; or the closed position may be as represented in FIG. 4; or it may be any position between these two extremes. The exact closed position is governed, not by the fastener, but by the door and frame arrangement. The door is "closed" when some part of the door abuts the frame; the fastener of the present invention then locks it there. The ability of the fastener to lock the door in any position (within a range) in which the door is closed, as determined by the door and frame arrangement, is an important feature of the fastener of the present application.

Consider now the door in closed position in FIG. 6. The spring 35 tries to push the door 40 open by applying its compressive force against the rear surface of tab washer 27. The inclined forward washer 26, however, is in tight frictional engagement with the stud 31, and this prevents the washer 26 from moving forward on the stud. It will be seen that if, in response to the pressure applied by the compressed spring 35, there were any forward opening movement of the door whatsoever, the tab 28 of washer 27 would move forward relative to the stud 31 and would push forward the lower portion of washer 26. This would serve to increase the inclination of the forward washer 26, and would lock the washer 26 more firmly to the stud. It will be seen then, that, in FIG. 6, the fastening device functions to retain the door 40 firmly fastened to the frame 50 through the stud 31. The action just described also applies to the partly closed condition of FIG. 4. The fastener locks the door in the position shown.

To open the door, the push button 20 is depressed, as by a force applied in the direction indicated by the arrow B in FIG. 5. When the push button 20 is depressed, its rear surface contacts the lowermost edge of washer 26. Sufficient pressure on this edge will rotate the washer 26 out of frictional engagement with stud 31. As soon as the frictional engagement with the stud 31 is broken, washer 26 snaps into coplanar contact with the rear surface of push button 20. The contact is coplanar because the washer is being squeezed between the button 20 and the tab 28. The force of spring 35 (which in FIG. 4 is transmitted through tab washer 27, tab 28, washer 26 and then back through the stud 31) is in FIG. 5 being transmitted straight through tab washer 27, tab 28, washer 26 and button 20 to the operator's finger. Spring 25 cannot tilt washer 26 because spring 35 is much stronger. As the finger is removed from the button, the button sub-assembly follows the finger until spring 35 is relaxed. This relaxes the squeeze on the washer 26 and spring 25 tilts it to the position shown in FIG. 1. At this point, stud 31 is substantially clear of washer 26 and the door may be pulled open.

Having described my invention, I claim:

1. A releasable fastening device for doors and the like, comprising: female and male sub-assemblies adapted to be mounted on door and frame in mating relationship, said female sub-assembly comprising; a tubular shell having a push button captive in the forward end of the shell bore, a pair of apertured washers in the rearward end of the shell bore, the rearward of said washers having a forwardly-extending tab adapted to abut against a portion of the rear surface of the forward of said

washers, a compression spring axially disposed in said shell bore rearward of said push button and forward of said forward washer, said compression spring tending to force said forward washer rearwardly against said tab and into an inclined position relative to the axis of said shell bore, means retaining said rearward washer in fixed position in said shell bore, and retaining means for retaining said female sub-assembly in said door; said male sub-assembly including a stud of a diameter to be slidable freely through the apertures of said pair of washers when both washers are perpendicular to the stud axis but adapted to be tightly gripped by said forward washer when said forward washer is inclined, the rearward movement of said push button in response to a rearward force applied thereto pressing said forward washer rearwardly against said tab and forcing said forward washer from an inclined to a perpendicular position relative to the sud axis.

2. A fastening device as claimed in claim 1 characterized in that said push button is provided with a recess for receiving said spring.

3. A fastening device as claimed in claim 2 characterized in that said male sub-assembly includes a second helical compression spring surrounding said stud and having an axis coinciding with that of said stud, said second spring being heavy relative to said first spring.

4. A releasable fastening device for doors and the like, comprising: female and male sub-assemblies adapted to be mounted on the door and frame in mating relation, said male sub-assembly comprising a projecting stud; said female sub-assembly comprising a tubular shell having a forward reduced bore and a rearward enlarged bore, forming an annular shoulder at the junction; a push button having a reduced diameter at the forward end and an enlarged diameter at the rearward end, forming a shoulder adapted to abut against the annular shoulder of the shell; said push button having an axial recess at the rearward end; a helical compression spring within said push button recess; first and second axially apertured washers in said shell rearward of said push button, said second washer having a forwardly extending tab against which said first washer is pressed by said push button compression spring, forcing said first washer into an inclined position relative to the axis of said shell; the aperture of said first washer being of such diameter relative to the diameter of said stud that the stud will pass freely through said aperture when said first washer is perpendicular to the axis of said stud, but will be tightly gripped by said first washer when the first washer is inclined from the perpendicular.

5. A fastening device as claimed in claim 4 characterized in that a helical compression spring surrounds said stud and is coaxial therewith, said last-named stud spring being substantially heavier than said first-named push-button spring.

6. A releasable fastening device for doors and the like, comprising: female and male sub-assemblies adapted to be mounted on the door and frame respectively in mating relation; said male sub-assembly comprising a forwardly projecting stud; said female sub-assembly comprising: a tubular shell having a push button in the forward portion thereof, a disk-like washer rearward of said push button and having a center aperture slightly larger in diameter than the diameter of said stud, a helical compression spring coaxially disposed between said push button and said washer, stop means rearward of said washer adapted to abut against a small angular sector of said washer, said washer being normally forced by said coaxial spring and stop means into an inclined position relative to said stud, whereby said washer grips said stud, said washer being forced by the depression of said push button to assume a perpendicular position relative to said stud, whereby said washer is released from said stud.

7. A fastening device as claimed in claim 6 characterized in that said stop means comprises a tab extending forward from an apertured closure plate adapted to receive and pass said stud.

8. A fastening device as claimed in claim 7 characterized in that said push button is provided with a recess for receiving said spring.

9. A fastening device as claimed in claim 8 further characterized in that a helical compression spring surrounds said stud and is coaxial therewith.

10. A fastening device as claimed in claim 9 further characterized in that said stud spring is heavy relative to said push-button spring.

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