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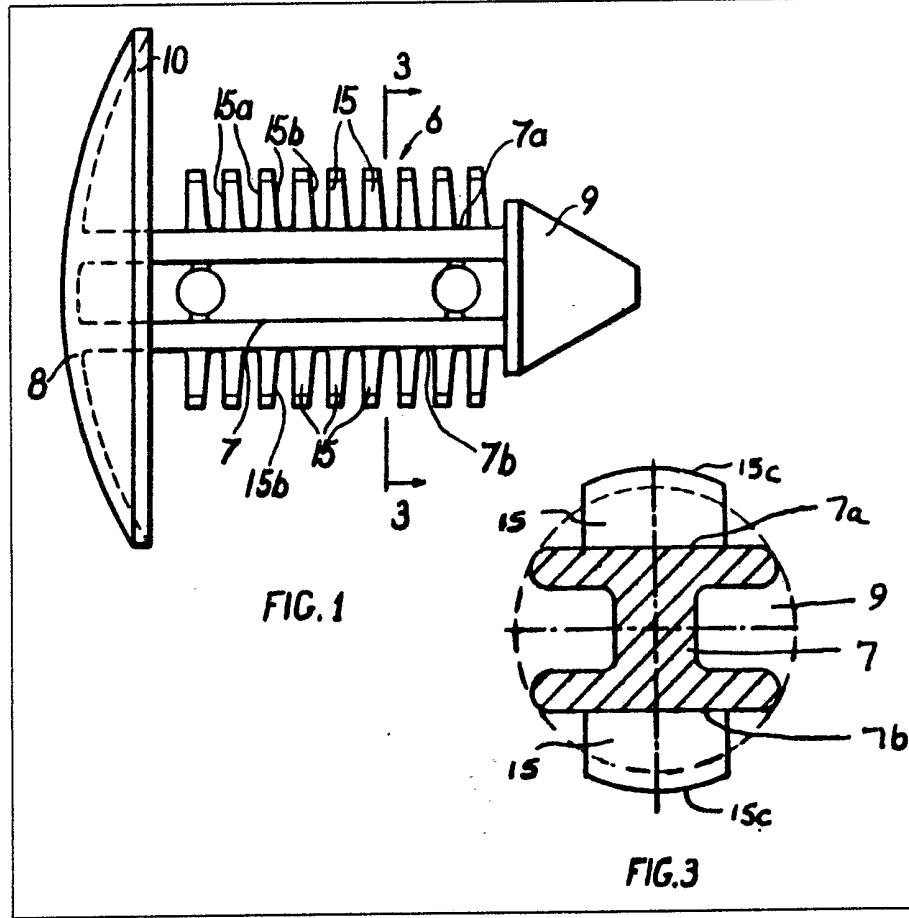
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## (54) Stud fasteners

(57) This invention relates to a fastener of the one-piece push-in type, the fastener (6) having side wings or fronds (15) on a shank (7) which are adapted to prevent withdrawal of the fastener (6) when inserted into a hole, the shank (7) being of H-shape in cross-section with the wings or fronds (15) being on opposite plane surfaces (7a, 7b) of the shank (7) and the front surface (15b) of each wing or frond (15) being curved at its inner end to lead to the inner end of the rear surface (15a) of the next adjacent wing or frond (15). (Fig. 5, not shown).



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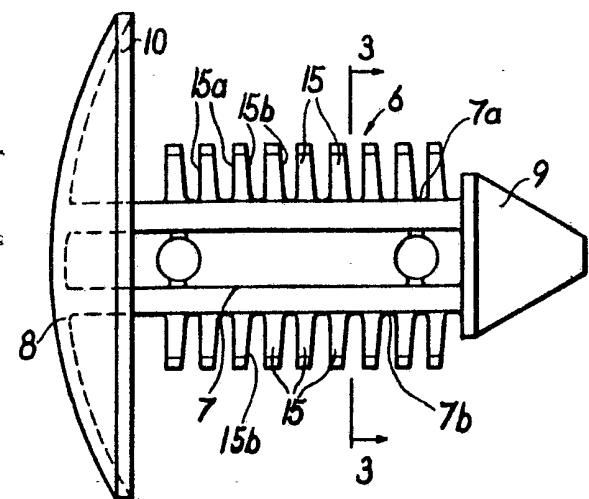


FIG. 1

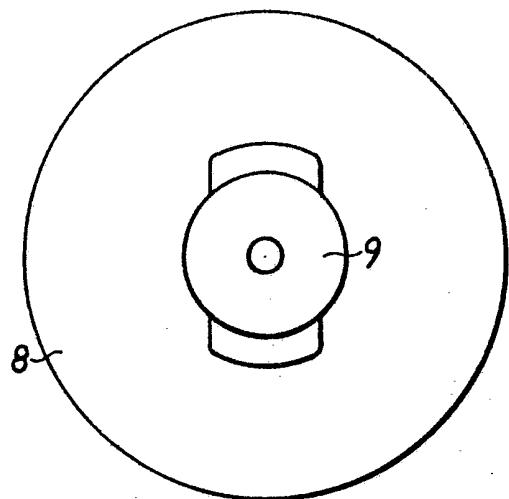


FIG. 2

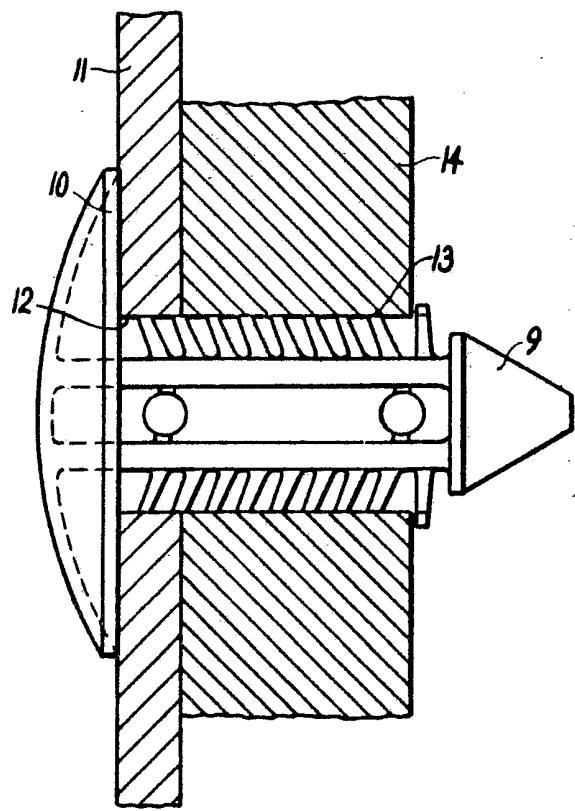


FIG. 4

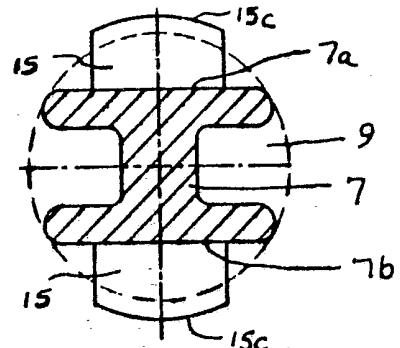


FIG. 3

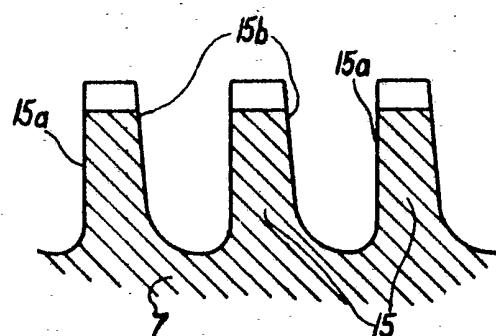


FIG. 5

## SPECIFICATION

## Fasteners

5 This invention relates to an improved fastener and it refers particularly to a push-in type of fastener which does not require a screw-threaded fitting, as a nut, to retain it in position. Furthermore the invention is directed 10 to that push-in type of fastener shown in Australian Patent Specification No. 470951 (corresponding to British Patent Specification No. 1 451 009) which discloses a fastener having a shank of generally cruciform section 15 to provide a multiplicity of flat, axially extending surfaces having a plurality of axially spaced resilient wings or fronds thereon adapted, upon insertion of the fastener shank into a hole, to bend rearwardly and to resist 20 withdrawal of the fastener from the hole. Fasteners of this type are particularly useful for retaining in assembled relationship two panels, such as a plastics interior trim panel to the body of an automobile.

25 It is known that close tolerances cannot be maintained easily in the construction of such trim panels and, indeed, they may be designed to be of different thicknesses at different locations for purposes of structural 30 strength or otherwise. Accordingly, to fasten them in position it is necessary to have either a range of fasteners of different lengths, which makes assembly difficult, or to have fasteners which are effective with panels of 35 different thicknesses. Thus, it is an object of the invention to provide a fastener which will accommodate a large range of panel thicknesses.

40 It is also desirable for the fastener to apply a retaining pressure which will tend to eliminate rattles.

45 Another object is to provide a fastener which will locate centrally in the holes into which it is fitted.

50 A further object is to provide a fastener which may be easily inserted into aligned holes of two or more panels so as to hold the panels together, which may be removed and re-used without loss of effectiveness, which 55 will apply a resilient pressure to the assembled parts so as to reduce likelihood of rattling, and which may be readily made by mass production methods.

60 According to the invention there is provided a fastener having a relatively rigid shank adapted to fit centrally in a hole or a pair of aligned holes and two longitudinally arranged rows of wings or fronds on the shank in opposed relationship, the wings or fronds being resilient and adapted to engage the inner wall of said hole or holes to resist withdrawal 65 of the fastener therefrom, and a head at one end of the shank.

In order that the invention may be more 70 readily understood reference will now be

made to the accompanying drawings illustrating a fastener made in accordance with the invention. In these drawings:

70 *Figure 1* is a side elevation of the fastener, *Figure 2* is an end elevation as viewed from the right hand side of *Fig. 1*,

*Figure 3* is a section on line 3-3 of *Fig. 1*,

*Figure 4* is a detail view of the fastener in operative position securing two panels of different thicknesses together and,

*Figure 5* is an enlarged detail view in section of the wings or fronds of the fastener.

As illustrated the fastener 6 has a shank 7 with a head 8 at one end and a tapered nose 80 portion 9 at the other end. The head 8 is of convex or domed shape—concave on the underside—so that its rim 10 is adapted to press on a panel 11 into which the shank 7 is inserted. As the material—a thermoplastic 85 such as a polyamide—is resilient the fastener may be applied in such manner that the head will exert a resilient pressure on said panel. The tapered nose portion 9 will assist in locating the shank 7 centrally in the hole 12 90 in the panel and aligned hole 13 in a second panel 14.

The shank 7 is made of somewhat H-shape in cross-section so as to fit neatly within a circumscribed circle of the same diameter as 95 the holes 12 and 13 into which the fastener is to be fitted. Thus, when the fastener is so engaged the central longitudinal axis of the shank will lie on the central axis of those holes and hold the fastener in that central 100 position.

On each of the two opposite plane faces 7a and 7b of the H-shaped shank 7 are a number of wings or fronds 15, and the wings or fronds on one side are directly opposite those 105 on the other side. Each of said wings or fronds has a rear surface 15a (facing the head) which is substantially at right angles to the longitudinal axis of the shank and a front surface 15b which is inclined outwardly and 110 rearwardly relative to the shank. That is to say, the outer end of each frond is thinner than its base. The front surface 15b of each frond (other than the two closest to the tapered nose portion) is curved at its inner end 115 and leads to the inner end of the rear surface 15a of the next adjacent frond.

Each frond 15 is of a radial length greater than said circumscribed circle and the outer end 15c of each frond is arcuate in shape, the 120 centre of curvature being the longitudinal axis of the shank. Thus, when the fastener is inserted in the aligned holes 12 and 13 in a pair of panels 11 and 14 the fronds 15, as shown in *Fig. 4*, will be caused to bend 125 rearwardly, to an extent depending upon the lengths of the fronds, until they can slide into said holes and then, being rearwardly-deflected, will resist the withdrawal of the fastener from the holes or either of them. It is 130 believed that a suitable radial length for the

fronds is about  $\frac{1}{3}$  greater than the distance from the adjacent side of the shank to the circumscribing circle on the radial line normal to said side through said longitudinal axis.

5 The side edges of said fronds may well be parallel.

If desired, the fronds on one side of the stem may be staggered in relation to the fronds on the other side instead of being

10 directly opposite them. Also, there may be any suitable number—such as nine—of said fronds on each side of the shank. The number of fronds will depend partly on the length of the shank outwardly from the perimeter of the

15 head—it is believed there is no necessity to form fronds on that part of the shank which extends within the concave inner part of the head. The front frond or pair of fronds may be close to the rear end of the tapered nose

20 portion.

By varying the geometry of the fronds—such as their thicknesses in relation to their radial length—the relative resilience of the fronds may be varied. The proportions shown

25 in the attached drawings is approximately 1:3 but that may be increased or decreased according to the degree of "grip" required. The "grip" of the fastener may also be varied by selection of different plastics materials for the

30 manufacture of the fastener.

It is believed the fastener provided by this invention has certain features, which may be considered individually and/or in combination, as follows: The relatively rigid shank is

35 constructed to provide for central location in the holes; the rows of fronds will accommodate a large range of panel thicknesses; the insertion and removal forces may be changed by relatively simple changes in geometry of

40 the fronds; the fastener may be used a number of times without any real loss of effectiveness; a resiliency of connection between the panels which should reduce rattling; convenience in manufacture due to the wings or

45 fronds being on two sides only of the shank.

#### CLAIMS

1. A fastener having a relatively rigid shank adapted to fit centrally in a hole or pair

50 of aligned holes and two longitudinally arranged rows of wings or fronds on the shank in opposed relationship, the wings or fronds being resilient and adapted to engage the inner wall of said hole or holes to resist

55 withdrawal of the fastener therefrom, and a head at one end of the shank.

2. A fastener as claimed in claim 1 and wherein the shank is of H-shape in cross-section and adapted to fit neatly within the

60 hole or holes into which the fastener is to be fitted, the wings or fronds being on opposite plane faces of the shank.

3. A fastener as claimed in claim 1 or

claim 2 and wherein a rear surface (being the

65 surface facing the head) of each wing or frond

is substantially at right angles to the longitudinal axis of the shank and the front surface of each frond is inclined outwardly and rearwardly relative to the shank and with the front surface of each frond curved at its inner end to lead to the inner end of the rear surface of the next adjacent frond.

4. A fastener as claimed in any one of the preceding claims and wherein each frond is of

75 a radial length greater than the radius of the hole or holes into which the fastener is to be fitted.

5. A fastener constructed and arranged to operate substantially as herein described and

80 with reference to the accompanying drawings.

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