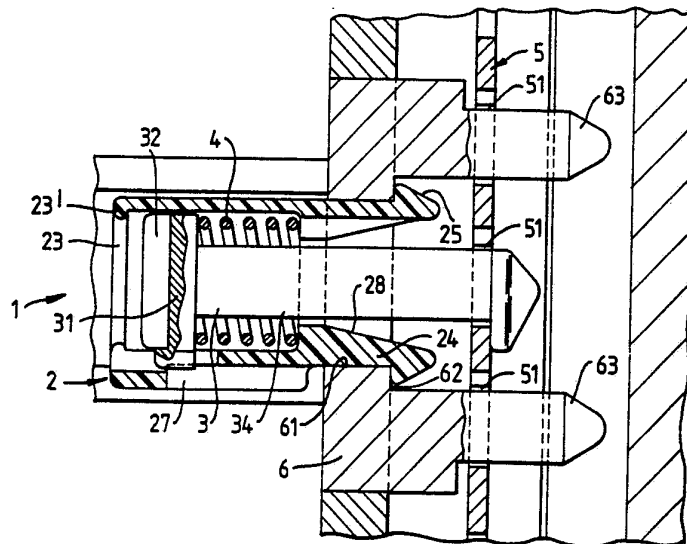




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/GB93/00083 (22) International Filing Date: 15 January 1993 (15.01.93) (30) Priority data: 9200947.1 17 January 1992 (17.01.92) GB (71) Applicant (for all designated States except US): DZUS FASTENER EUROPE LIMITED [GB/GB]; Farnham Trading Estate, Farnham, Surrey GU9 9PL (GB). (72) Inventors; and (75) Inventors/Applicants (for US only) : WRIGHT, Andrew, Charles, Walden [GB/GB]; Farnham Trading Estate, Farnham, Surrey GU9 9PL (GB). MONTFORT, Hervé [FR/FR]; Les Jardins de la Tamarissière, Bâtiment A, Appartement 7, F-34300 Agde (FR).</p>		<p>(74) Agent: BRUNNER, Michael, John; Gill Jennings &amp; Every, Broadgate House, 7 Eldon Street, London EC2M 7LH (GB). (81) Designated States: JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  Published With international search report.</p>

## (54) Title: QUICK RELEASE STUD FASTENER



## (57) Abstract

A quick-release stud fastener for fastening together a pair of members (6, 7), has a stud assembly (1) which has an elongate stud (3) having a head (31), a shank (34) depending therefrom, and a single, laterally extending pawl (37) at the end of the shank remote from the head. A stud retainer includes a housing (2) for mounting on the first member (6) and which has an elongate cross-section. The shank of the stud extends from the housing for engagement of the pawl with a receptacle (5) mounted on or an aperture in the other member (7) and the head (31) of the stud is constrained for relative axial and rotational movement in the housing. A compression spring (4) is disposed around the shank (34) of the stud within the housing, to bias the head of the stud away from the other member.

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QUICK RELEASE STUD FASTENER

The present invention relates to quick-release fasteners of the type comprising a stud assembly which has  
5 a part which latches into an aperture in order to fasten together a panel or first member to which the stud assembly is attached and a support or second member which contains the aperture or to which is attached a receptacle having the aperture defined therein.

10 Such a fastener is shown in GB-A-2134965, and the stud assembly includes a T-shaped fastening portion for cooperation with one of a plurality of rectangular slots formed in a metal strip which is retained in a generally T-shaped recess in the support. The stud is inserted through  
15 the aperture and then turned through 90° in order to locate the arms of the "T" behind the material surrounding the aperture, thus latching the fastener. It has previously been proposed that such fasteners include a fastening portion comprising a helical cam slot, but this may not  
20 provide sufficient strength in certain applications.

A particular problem arises when it is desired either to locate a fastener very close to the edge of the panel or support member or to locate plural such fasteners very close together, ie with a close pitch, whilst maintaining  
25 the fewest number of components in the stud assembly in order to simplify assembly of the components and, at the same time, ensuring that the stud assembly is still sufficiently strong.

According to the invention described in our copending  
30 application 9118609.8, there is provided a stud assembly for a quick-release stud fastener, the stud assembly having a stud retainer comprising a housing having an elongate cross-section and a pair of depending retainer legs, each of which has an outwardly directed retainer  
35 flange at its free end;

an elongate stud having a head, a shank depending therefrom, and a T-shaped fastening portion on the shank, remote from the head; and,

5 a coil spring having an oval cross-section, the maximum diameter of which is greater than the width of the T-shaped fastening portion (to allow the spring to be passed thereover), and less than the maximum but greater than the minimum internal diameter of the housing, and the  
10 minimum diameter of which is less than the diameter of the head of the stud, whereby the coil spring can be located, in use, around the shank of the stud and within the housing.

By such construction, the coil spring can be located around the shank of the stud by being slid axially over the  
15 T-shaped end of the stud, and the stud and spring can then be snap fitted into the housing over a step or other cross-sectional change in area. This avoids the need to separate the stud into two parts which have to be joined during putting together of the stud assembly, whilst still  
20 providing a fastener with a small footprint narrower in one dimension than the other.

However, for attaching printed circuit board cards into electronic equipment, an even narrower spacing of fasteners may be required than can be coped with by the  
25 above stud assembly and according to a first aspect of the present invention therefore, there is provided a stud assembly for a quick-release stud fastener, the stud assembly having

30 an elongate stud having a head, a shank depending therefrom, and a single, laterally extending pawl at the end of the shank remote from the head;

a stud retainer comprising a housing having an elongate cross-section, the shank of the stud extending from the housing for engagement of the pawl with a  
35 receptacle mounted on or an aperture in the other member, the head of the stud being constrained for relative axial and rotational movement in the housing; and,

a compression spring disposed around the shank of the stud within the housing, to bias the head of the stud away from the other member.

By this construction, a stud assembly can be used  
5 which has the same strength as the previous proposal (the same dimensions for the shank of the stud amongst other things), whilst being able to cooperate with a keyhole-shaped aperture in the receptacle or in the second member, so that the offset or pitch between adjacent fastening  
10 positions can be reduced. Plural apertures are usually arranged in a row, either in the other member itself or in a receptacle strip and a further reduction in pitch can be achieved by disposing the long dimension of the apertures into which the stud pawl fits at an angle to the  
15 longitudinal dimension of the row.

The compression spring is preferably a coil spring which can fit over the pawl and end of the shank in order to be disposed around the shank underneath the head of the stud.

20 According to a further aspect of the present invention there is provided a stud assembly for a quick-release stud fastener, for fastening together a pair of members, the stud assembly having

25 a stud having a head at one end of an elongate shank and a laterally extending pawl at the other end;

a stud retainer, which in use is mounted on a first of the members, comprising a housing retaining the head of the stud for axial and rotational movement therein, the shank of the stud extending from the housing for engagement of  
30 the pawl with a receptacle mounted on or an aperture in the other member, the head of the stud being constrained for relative axial movement in the housing in a first angular position, for relative rotational movement in the housing at an axial position at the end of its travel towards the  
35 other member, and for relative axial movement in the housing in a second angular position, spaced from the first angular position at the end of its rotational travel; and

a compression spring disposed around the shank of the stud within the housing, to bias the head of the stud away from the other member.

5 Preferably, the movement of the stud head within the housing is constrained by a laterally extending lug or protrusion on the head which fits within a pair of axially extending internally facing grooves in the wall of the housing and in an angularly extending arcuate slot connecting the axial slots at their ends closest to the  
10 other end of the stud.

By these constructions, the lateral dimensions of the stud assembly can be kept to a minimum.

The housing preferably has a pair of depending retainer legs, each of which has an outwardly directed  
15 retainer flange at its free end, for attachment of the stud assembly to the first member.

One example of a fastener according to the invention will now be described with reference to the accompanying drawings, in which:-

20 Figures 1 & 2 are end views of the the fastener, from the head end, with the fastener shown in unlocked and locked positions respectively;

Figures 3 & 4 are partial axial sections of the fastener corresponding to figures 1 and 2  
25 respectively;

Figure 5 is a diagrammatic perspective view of the housing of the stud assembly;

Figures 6 & 7 a fragmentary perspective views of parts of the housing; and

30 Figures 8 & 9 are views of a receptacle fo engagement with the stud assembly.

The stud assembly 1 of the fastener comprises a housing 2 which, as best seen in figures 1,2 and 5, has a wall 20 which is generally circular in cross-section, but  
35 which has a pair of protruding wall portions 21 which form internally facing axial grooves 26, and is formed of a synthetic plastics material such as an acetal copolymer.

The wall portions 21 extend into stiffening ribs 22 (best seen in figure 5) and the housing 2 has an open end 23 through which access is gained by a tool such a screwdriver or the like to the stud 3. The open end 23 has an internally facing rib 23' to retain the head 31 of the stud 3.

The housing also has a pair of depending legs 24 each of which carries an outwardly directed flange 25 at its free end. In order to provide sufficient strength against forces trying to separate the fastened components, the legs are thicker than the walls 22 of the housing from which they extend and, thus, the interior wall surface 28 is ramped as seen in figures 4 and 5.

To constrain the movement of the stud 3 (as will be described later), the housing has an arcuate slot 27, the ends of which connect with the ends of the grooves 26, thus defining a substantially U-shaped path.

Located within the housing as a snap fit are a die-cast zinc alloy stud 3 and steel coil spring 4. The stud 3 has a generally circular head 31 with a cross slot 32 for engagement by a screwdriver tip to rotate the stud and a radially protruding lug 33 extending from the head. The lug locates in one of the grooves 26 in the fastened position and in the other groove in the unfastened position, as seen in figures 1 and 2, and can move between the grooves 26 only by movement along the arcuate slot 27. In other words, the stud is constrained to move axially while the lug 33 is in the grooves 26 and arcuately while it is in the slot 27. The lug 33, grooves 26 and slot 27 thus provide stops to the rotation and axial movement of the stud within the housing 2.

The shank 34 of the stud extends from the underside of the head 31 and has a circular cross-section as best seen in figures 3 and 4. At the end of the shank remote from the head, a generally L-shaped fastening pawl 37 is provided, having chamfered engaging surfaces 38 and a generally conical nose portion 39 for guiding the stud

assembly into engagement with the opening in which it locates in use.

The coil spring 4 is disposed around the shank of the stud 3.

5 A receptacle 5 in the form of an elongate channel-sectioned steel or stainless steel strip with plural, closely spaced, keyhole-shaped apertures 51 of a size to allow the L-shaped pawl 37 to pass through in one orientation, completes the fastener.

10 The legs 24 are shown extending through an opening 61 in a first member 6, with the leg flanges 25 having been pushed through the opening 61 and then springing out to engage the rear face 62 of the member 6 to retain the housing in place on the member. The member 6 also has two  
15 location pins 63 which, being circular in cross-section and spaced appropriately, locate in the apertures 51 of the receptacle strip on each side of the aperture at which the fastener is located. The receptacle strip 5 is located in a generally T-shaped recess 71 in a support member 7, to  
20 which access is gained through a slit 72, and to fasten the first member 6 to the support member 7, the stud is presented to an aperture 51, through the slit 72, in the orientation shown in figures 1 and 3, is pushed through it, the lug 33 sliding along the groove 26, and is then rotated  
25 120°, the lug moving arcuately in the slot 27, in order to locate the fastening pawl 37 behind the front wall 52 of the receptacle strip 5 as shown in figure 3, the spring 4 being compressed between the head 31 of the stud 3 and the base of the housing 2, which in turn bears against the front face 64 of the member 6. The spring then pushes the  
30 head 31 outwardly slightly, the lug moving in the second groove 26, until the pawl 27 engages the rear face 62 of the member 6.

Releasing the fastening is the opposite, the spring 4  
35 pushing the head back towards the end wall 23 of the housing.

The stud 3 can be inserted as a snap fit in the housing 2 by being pushed through the open end 23, the head 31 being pushed over the rib 23', after the spring 4 has been located around the shank 3.

CLAIMS

1. A stud assembly (1) for a quick-release stud fastener for fastening together a pair of members (6,7), the stud  
5 assembly having

an elongate stud (3) having a head (31), a shank (34) depending therefrom, and a single, laterally extending pawl (37) at the end of the shank remote from the head;

10 a stud retainer comprising a housing (2) for mounting on the first member (6) and having an elongate cross-section, the shank of the stud extending from the housing for engagement of the pawl with a receptacle (5) mounted on or an aperture in the other member (7), the head (31) of the stud being constrained for relative axial and  
15 rotational movement in the housing; and,

a compression spring (4) disposed around the shank (34) of the stud within the housing, to bias the head of the stud away from the other member.

20 2. A stud assembly (1) for a quick-release stud fastener, for fastening together a pair of members (6,7), the stud assembly having

25 a stud (3) having a head (31) at one end of an elongate shank (34) and a laterally extending pawl (37) at the other end;

a stud retainer, which in use is mounted on a first of the members (6), comprising a housing (2) retaining the head of the stud for axial and rotational movement therein, the shank of the stud extending from the housing for  
30 engagement of the pawl with a receptacle (5) mounted in use on or an aperture in the other member (7), the head (31) of the stud being constrained for relative axial movement in the housing in a first angular position, for relative rotational movement in the housing at an axial position at  
35 the end of its travel towards the other member (7), and for relative axial movement in the housing in a second angular

position, spaced from the first angular position at the end of its rotational travel; and

5 a compression spring (4) disposed around the shank of the stud within the housing, to bias the head of the stud away from the other member.

3. A stud assembly according to claim 1 or claim 2 wherein the movement of the stud head (31) within the housing is constrained by a laterally extending lug or  
10 protrusion (33) on the head which fits within a pair of axially extending internally facing grooves (26) in the wall (20) of the housing and in an angularly extending arcuate slot (27) connecting the axial slots at their ends closest to the other end of the stud.

15

4. A stud assembly according to any of the preceding claims, wherein the housing (2) has a pair of depending retainer legs (24), each of which has an outwardly directed retainer flange (25) at its free end, for attachment of the  
20 stud assembly to the first member.

5. A stud assembly according to any of the preceding claims, wherein the compression spring (4) is a coil spring which fits over the pawl (37) and the end of the shank in  
25 order to be disposed around the shank (34) and underneath the head (31) of the stud.

6. A quick release fastener including a stud assembly (1) according to any of the preceding claims, and a receptacle  
30 (5) for the stud, wherein the receptacle is shaped so as to allow either the pawl (37) or a location pin (63) attached to the first member (6), to be received therethrough.

7. A quick release fastener according to claim 6, wherein  
35 the receptacle (5) has a plurality of spaced apart holes (51).

8. A quick release fastener according to claim 7, wherein the holes (51) are substantially keyhole shaped.
- 5 9. An assembly comprising a pair of members (6,7), a quick release fastener according to any of claims 6 to 8, and one or a number of locating pins (63) spaced laterally from the quick release fastener.
- 10 10. An assembly according to claim 9 when dependent on claim 7 or claim 8, wherein the locating pin or pins (63) are spaced at a distance equal to, or a multiple of, the spacing of the holes (51).

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Fig. 1.

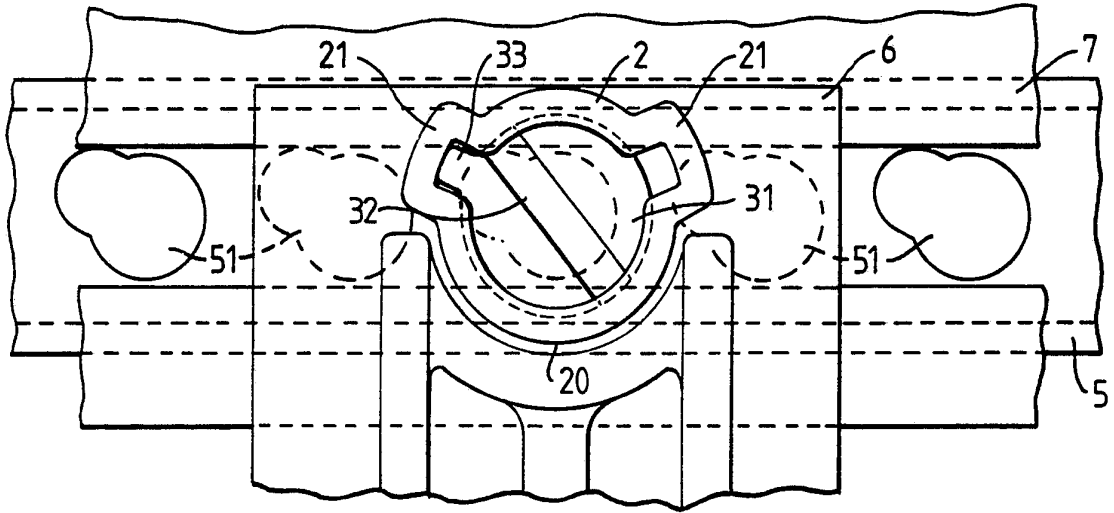
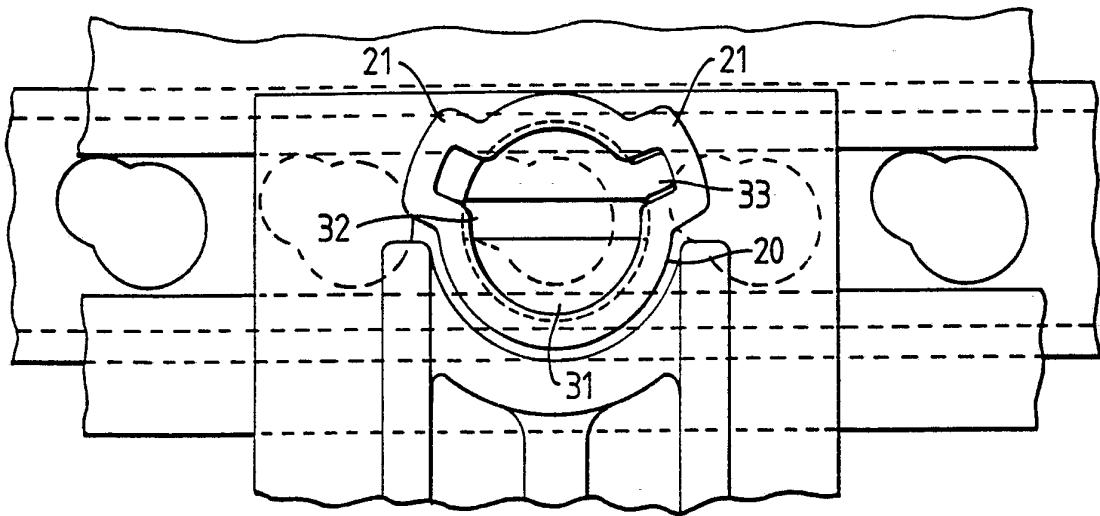


Fig. 2.



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Fig. 3.

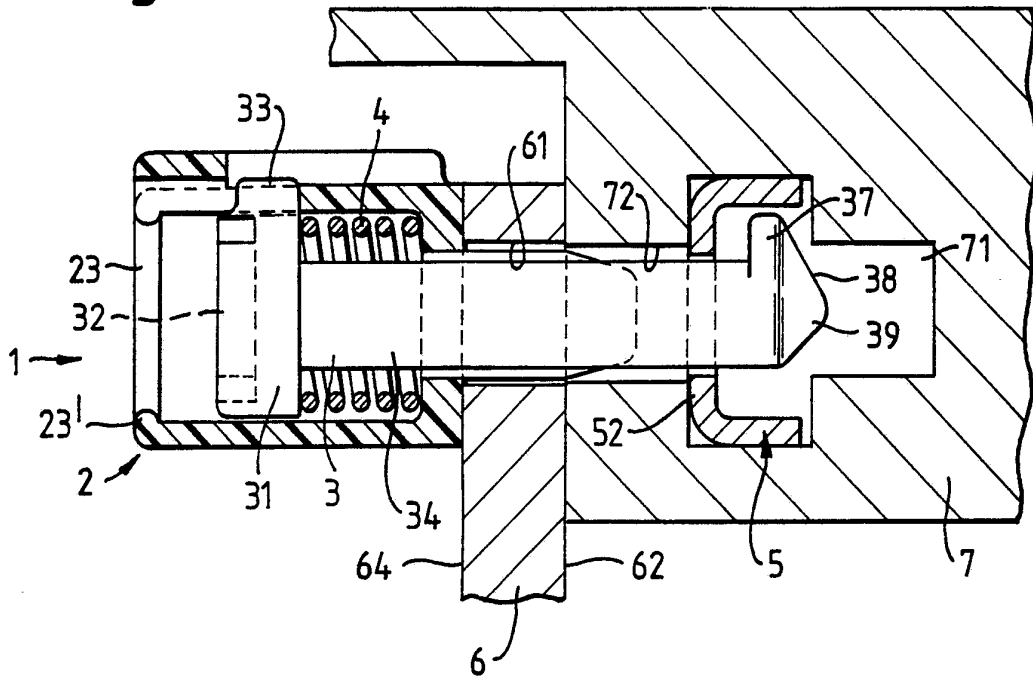
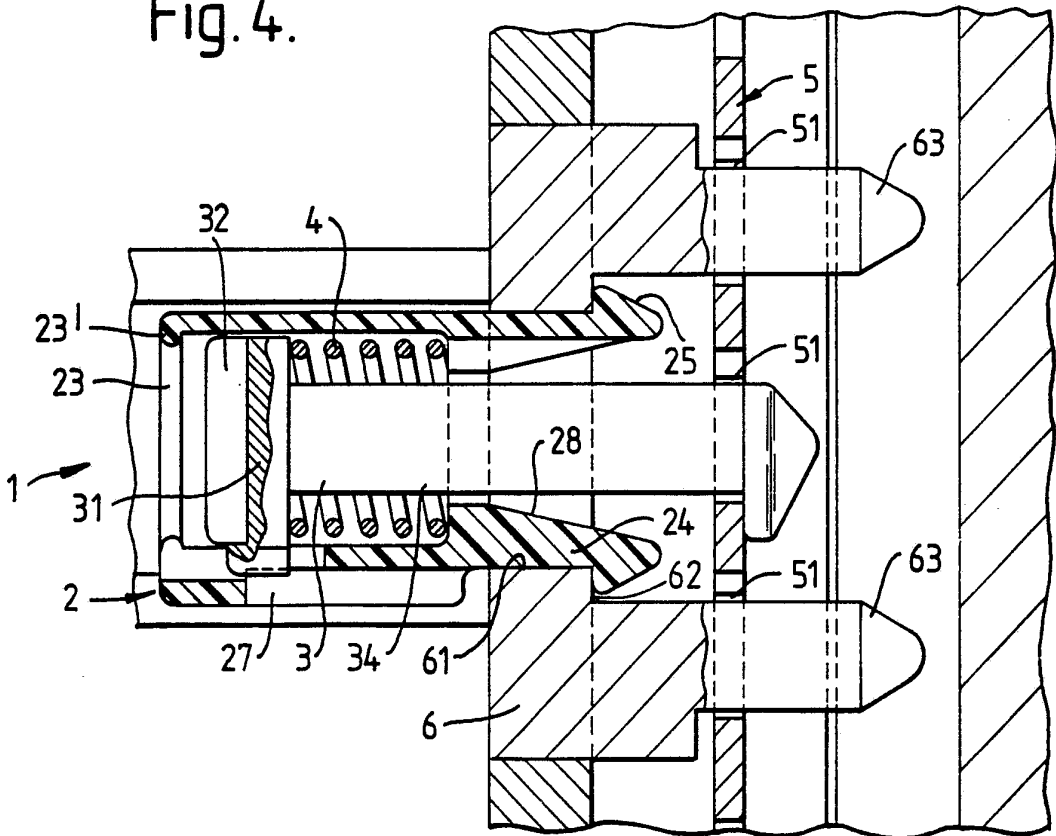


Fig. 4.



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Fig. 5.

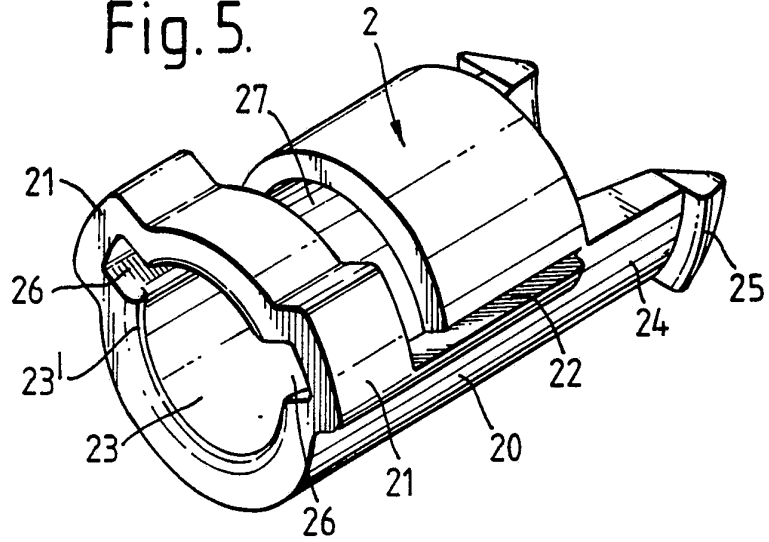


Fig. 6.

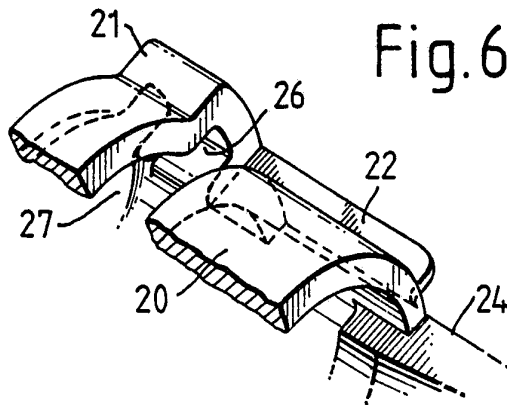
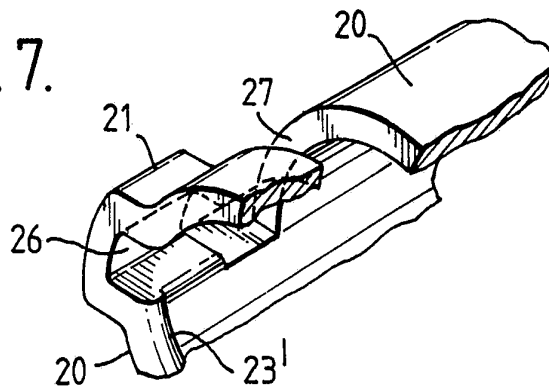


Fig. 7.

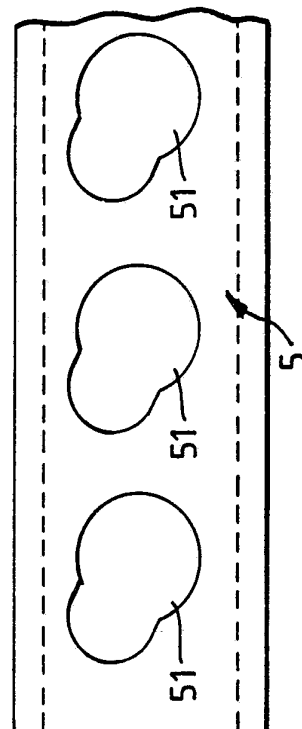


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Fig. 8.



Fig. 9.



**INTERNATIONAL SEARCH REPORT**

PCT/GB 93/00083

International Application No

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. 5 F16B21/04;                      F16B5/10;                      H05K7/14;                      F16B21/09		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
Int.Cl. 5	F16B ;                      H05K	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>		
Category <sup>10</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
P,X	WO,A,9 204 548 (DONALDSON COMPANY, INC.) 19 March 1992 see page 7, line 10 - page 8, line 10; figures 1-5	1,4,5
Y	---	
Y	GB,A,2 123 890 (AIRCRAFT MATERIALS LIMITED) 8 February 1984 see page 1, line 74 - line 86; figures 1-6	1-10
Y	---	
Y	FR,A,2 268 977 (DZUS FASTENER CO. INC.) 21 November 1975 see page 3, line 13 - page 5, line 34; figures 1-5	1-10
	---	
	-/--	
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<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search	19 MARCH 1993	Date of Mailing of this International Search Report
		01. 04. 93
International Searching Authority	EUROPEAN PATENT OFFICE	Signature of Authorized Officer
		CALAMIDA G.

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category °	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	DE,A,1 805 210 (MASCHINENFABRIK AUGSBURG-NÜRNBERG AG) 16 October 1969 see page 3, line 24 - page 4, line 12; figures 1-7 ---	8
Y	DE,U,9 106 714 (MANNESMANN KIENZLE GMBH) 18 July 1991 see page 6, line 21 - line 24; figures 3,6 ---	9,10
A	DE,A,3 612 199 (CAMLOC GMBH) 22 October 1987 see claim 1; figures 1-6 ---	1,2,4,5
A	GB,A,2 134 965 (DZUS FASTENER EUROPE) 22 August 1984 cited in the application -----	-

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.**

GB 9300083  
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information. 19/03/93

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		AU-A- 8219891	30-03-92
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		US-A- 3958308	25-05-76
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GB-A-2134965	22-08-84	None	

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