(12) UK Patent Application (19) GB (11) 2 288 000 (13) A

(43) Date of A Publication 04.10.1995

(21) Application No 9405655.3

(22) Date of Filing 22.03.1994

(71) Applicant(s)
Avdel Systems Limited

(Incorporated in the United Kingdom)

Mundells, WELWYN GARDEN CITY, Hertfordshire, AL7 1EZ, United Kingdom

(72) Inventor(s)
Jonathan Lee Brewer
Keith Denham

(74) Agent and/or Address for Service
A L Treacher
PO Box 154, WELWYN GARDEN CITY, Herts, AL7 1LW, United Kingdom

(51) INT CL^6
F16B 19/10

(52) UK CL (Edition N)
F2H HARX H11B11 H11B22A H16F1 H16F4 H16F5

(56) Documents Cited
GB 2264545 A **GB 2069089 A** **GB 2051288 A**
GB 0855285 A **GB 0845205 A** **GB 0335508 A**

(58) Field of Search
UK CL (Edition M) **F2H HARL HARM HARN HARX HL**
INT CL^5 **F16B 19/10**

(54) Expansible socket for screws

(57) An expansible socket (11) for installation in a panel to receive a screw, comprises a shank (12) of uniform square external cross-section and comprises four legs (14) joined to the head (13). Each leg (14) progressively increases in radial thickness in the direction away from the head (13), so that the bore (16) between the legs (14) progressively reduces in cross-section. When a screw (22) is driven into the bore (which may be unthreaded), the legs are forced apart to anchor the socket (11) in the panel. The socket (11) is made by deforming the legs (14) inwards.

The socket (11) may be pre-assembled with a suitable screw (22) to form a fastener which enables one installation operation to both anchor the socket (11) to a first panel (26) and removably secure a second panel (27) to the first by means of the screw (22).

Fig.1.

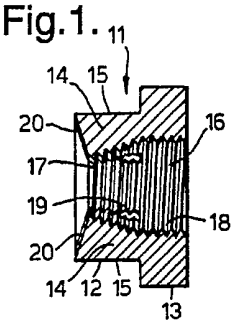
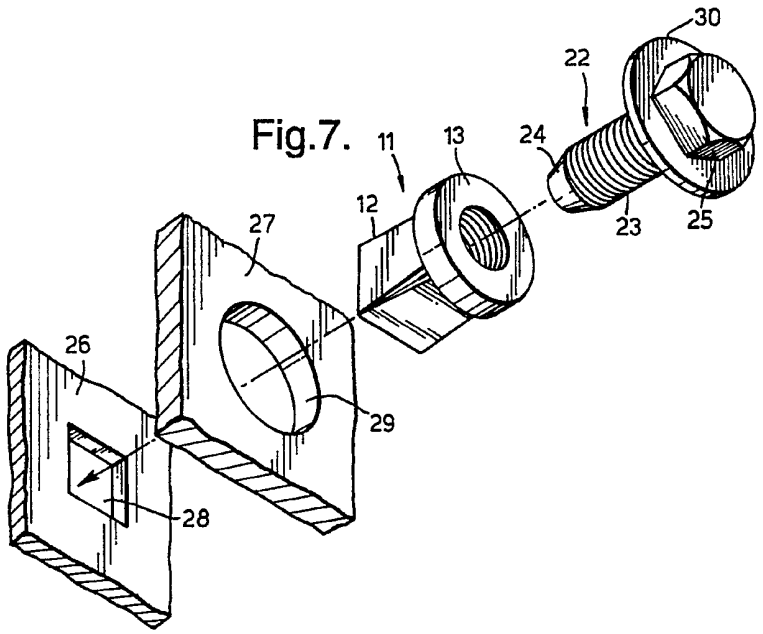


Fig.7.



GB 2 288 000 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

Fig.1.

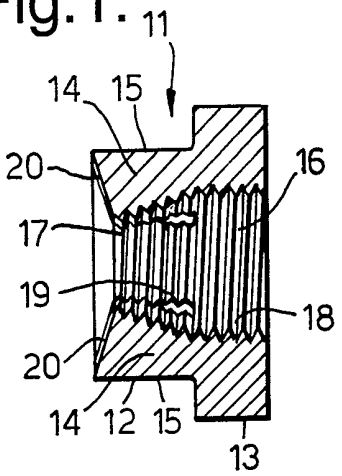


Fig.2.

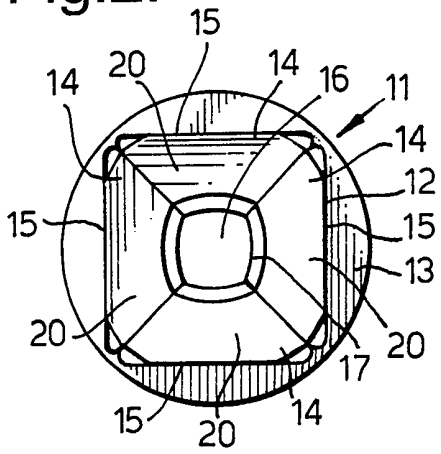


Fig.3.

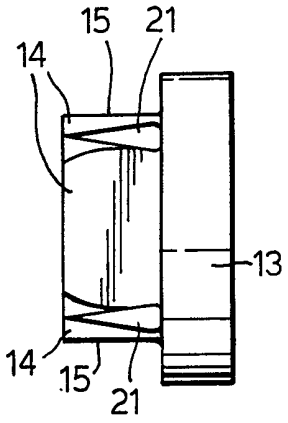


Fig.4.

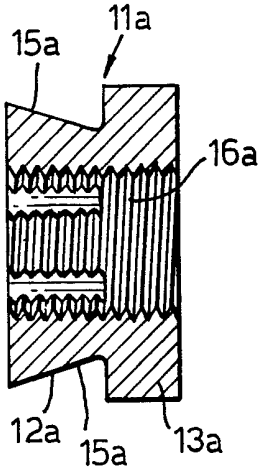


Fig.5.

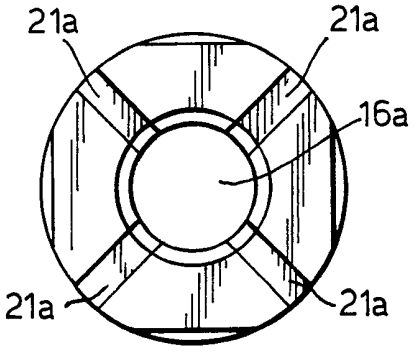


Fig.6.

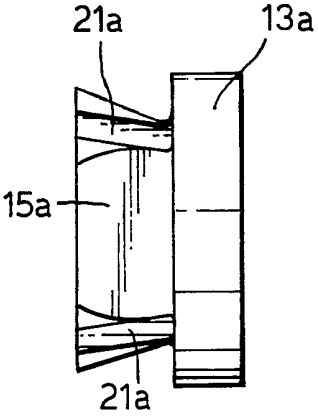


Fig.7.

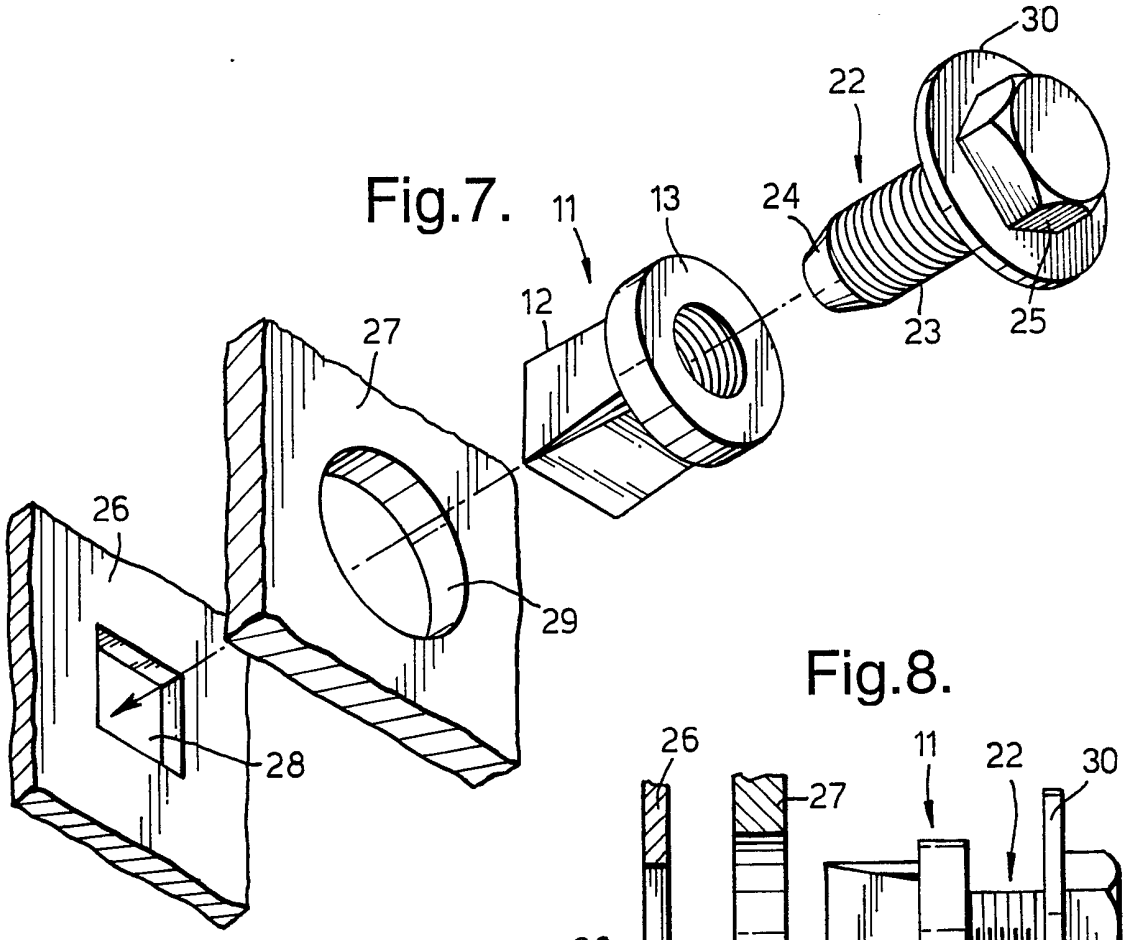


Fig.8.

Fig.9.

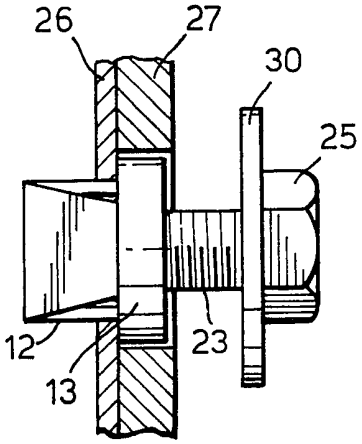
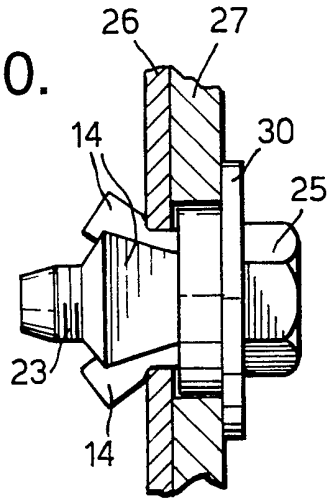


Fig.10.



2288000

INSERT NUT AND FASTENER

For the purpose of facilitating assembly together of members such as, for example, metal panels, it is known to provide a threaded hole in a thin metal panel by installing a so-called insert nut or threaded insert in a suitable hole in the panel. A bolt or screw may then be used in conjunction with the installed threaded insert to secure a second member to the first.

Where a high torque is needed to be applied to the screw, and particularly where the screw needs to be removed and replaced, it is necessary to provide a high resistance to relative rotation between the insert and the first member. It is known to make the exterior of the insert, and the hole in the member, of polygonal shape, e.g. hexagonal or square.

The problem is to provide an insert which is simple (and hence economical) in design and manufacture, easy to instal, robust, and allows the screw to be removed and replaced without significant loss of retention.

Furthermore, in the past it has been necessary first to instal the insert in the first member in one operation, secondly to apply a second member, and thirdly to drive a screw through the second member into the insert.

The invention provides an insert nut for use in a relatively thin panel, which insert nut comprises a shank

and a radially enlarged preformed head, the shank having a plurality of longitudinally extending legs each joined at one end to the head and together providing the shank with a substantially uniform polygonal external cross-section;

The insert having a bore extending along the length of the shank and through the head, the interior of the bore being formed with thread-engaging surfaces, and least the portions of the legs remote from the head being of increased radial thickness so that the bore is thereby constricted;

whereby, when the shank is inserted through a corresponding polygonal hole in a panel so that the head abuts one face of the panel and the major part of the length of the shank protrudes beyond the other face of the panel, and a suitable screw is threaded into the bore from the head end thereof and between the aforesaid thickened parts of the bore, the legs are forced radially apart thereby to form a blind head so that the panel is clamped between the two heads and the insert nut is thereby secured to the panel.

Preferably the radial thickness of each leg increases progressively, from a position at the root of the leg adjacent the preformed head, towards the remote end of the leg.

The thread-engaging faces of the bore may be pre-formed with suitable screw-threads, or this may be omitted and a self-tapping screw may be used.

According to a further feature of the invention, an insert nut as aforesaid is formed from an intermediate blank which had a plurality of legs spaced apart circumferentially by radially and axially extending slots, the radially inner faces of the legs carrying parts of a screwthread of substantially uniform diameter throughout its length and the radially outer faces of the legs sloping outwardly progressively from their head ends to the ends remote therefrom,
the legs then having been deformed radially inwardly about their ends adjacent the head until the exterior of the shank is of substantially uniform cross along its length.

The invention includes a fastener comprising an insert nut as aforesaid, in combination with a screw which is engaged with the thread-engaging surfaces of the nut to such an extent that the screw and nut are in interference fit but the legs are not significantly forced apart.

Preferably the head of the screw, or a washer assembled on the screw adjacent to the head, projects radially substantially beyond the head of the insert, whereby the fastener may be used to attach to a panel having a polygonal hole as aforesaid a second member

having a hole, which hole overlies the polygonal hole and has a size and shape such as to allow the head of the insert to enter it but not to allow the aforesaid screw head or washer to enter it, attachment of the member to the panel being achieved by inserting the shank of the insert through the two holes until the head of the insert abuts the panel, and then rotating the screw to secure the insert in the panel as aforesaid and also to clamp the member to the panel.

A specific embodiment of the invention will now be described by way of example and with reference to the accompanying drawings, in which:-

Figure 1 is an axial longitudinal section through an insert;

Figure 2 is an end elevation of the insert in the direction of the arrow II of Figure 1;

Figure 3 is a side elevation of the insert in the direction of the arrow III of Figure 2;

Figures 4, 5 and 6 correspond to Figures 1, 2 and 3 respectively but show the intermediate blank from which the insert of Figures 1, 2 and 3 was formed;

Figure 7 is a perspective exploded view of a fastener comprising the insert and a screw, and two panels which are to be secured together by means of the fastener;

Figure 8 is an elevation showing the two panels and the fastener about to be inserted through them;

Figure 9 is similar to Figure 8 but shows the fastener inserted in the panels and about to be installed; and

Figure 10 is similar to Figure 9 but shows the installed fastener securing two panels together.

Referring first to Figures 1 to 3, the insert 11 of this example is made of zinc-plated steel and comprises a shank 12 and a radially enlarged head 13 at one end of the shank. The head 13 is in the form of a flange of uniform thickness and circular plan. The shank comprises four longitudinally extending legs 14 each joined at one end to the head. The exterior face 15 of each leg is substantially flat and at right angles to the head 13 and also at right angles to the adjacent exterior faces 15 of the two adjacent legs. These four faces 15 thus provide the shank with a substantially uniform square external cross-section.

The insert has a bore 16 extending throughout its length i.e throughout both the head 13 and the legs 15. The interior of the bore 16 is provided with thread-engaging surfaces. In this example these thread-engaging surfaces are pre-formed with screw-threads 17, for threaded engagement with a suitable screw or bolt as will be described later. However, alternatively the screw-threads 17 could be omitted, the thread-engaging surfaces

of the bore 16 being unthreaded but engageable by a suitable self-tapping screw.

The portion 18 of the bore within the head 13 is of uniform diameter. However, the radial thickness of the legs 14 is increased progressively so that the bore 16 is thereby constricted. Thus the portion 19 of the bore within the legs 14 progressively reduces in diameter from the junction with the shank 13 to the remote free end of the shank, as is illustrated in Figure 1. The outerface 15 of each leg is substantially trapezoidal in shape, its width at its free end being greater than its width where it joins the head 13. The end face 20 of each leg is also trapezoidal in shape, its width at its radially outer edge (where it meets the outerface 15) being greater than its width at its radially inner edge (where it meets the end of the bore 16). Each end face 20 is inclined slightly to a plane at right angles to the bore, as illustrated in Figure 1. Each leg 14 is separated from the next by a tapering gap 21, which is of maximum width at the head 13 and progressively reduces in width towards the free ends of the legs, where adjacent legs meet along line contact.

The insert is formed from an intermediate blank which is illustrated in Figures 4, 5 and 6, in which corresponding parts of the intermediate blank have corresponding reference numerals with the suffix "a". The blank 11a is generally similar to the insert 11 in

that it has a head 13a, a bore 16a and four legs 14a. However, in the blank 11a the bore 16a is of uniform diameter throughout its length so that the thread-engaging faces of the legs are substantially uniformly spaced apart throughout their length. The four legs 14a are spaced apart each from the next by a slot 21a of uniform thickness which extends radially of the bore 16a. Since the thickness of each leg 14a of the blank progressively increases away from the head 11a (as in the insert 11), the exterior face 15a of each leg 14a slopes outwardly progressively from their head ends towards the ends remote from the head. The blank is manufactured in this shape is since it is relatively easy to make the bore 16a of uniform cross-section throughout its length. The blank 11a is formed into the insert 11 by deforming the four legs 14a radially inwardly about their ends adjacent the head 13a until their exterior faces are at right angles to the head and the exterior of the shank formed by the legs is substantially uniform along its length, and the side faces of adjacent legs meet at the free ends. The blank is then zinc plated (or given other appropriate surface treatment).

The insert 11 illustrated in Figures 1, 2 and 3 can be used by inserting into a suitable square hole (in which the shank is a clearance fit) in a panel until the head 13 abuts the rear face, and driving a suitable screw into the bore. This would re-form the bore 16 to a

substantially uniform diameter, thus forcing the legs 14 radially apart to form a blind head. The panel is thus clamped between the two heads of the insert, so that the screw can be unthreaded so that the installed insert provides a threaded hole in the panel. The insert can also be used to join together two or more panels of suitable total thickness.

Advantageously the insert can be pre-assembled with a suitable screw to provide a fastener which can be handled and used as a convenient unit. An example is illustrated in Figures 7 and 8. A suitable screw 22 having a shank 23 (which is suitably threaded to engage the thread in the insert bore) is pre-assembled with the insert by screwing one into the other until the leading end of the screw is in interference fit with the threaded surfaces of the insert legs to such an extent that the screw is retained in the insert but the legs are not significantly forced apart (Figure 8). The shank 23 of the screw 22 has its leading end tapered as at 24 (Figure 7) to assist in such engagement and in the subsequent driving of the screw to force the legs apart.

In this example, the screw 22 has a head which, in addition to having a hexagonal wrenching or driving portion 25, is also formed with an enlarged flange 30 adjacent the shank 23. (Effectively the flange 30 is a washer integral with the screw head, and could alternatively be provided as a separate washer, if

desired). The important point is that the diameter of the screw head flange 30 is substantially larger than the diameter of the head 13 of the insert 11. The fastener can thus be used to releasably join together two panels 26, 27 as illustrated in Figures 7, 8, 9 and 10, in a single installation action, as will now be described.

The rear panel 26 is provided with a square hole 28 which is a clearance fit on the square shank 12 of the insert 11. The front panel 27 is provided with a circular hole 29 of a diameter which is larger than that of the head 13 of the insert 11 but is smaller than that of the flange 30 of the screw 22. The front panel 27 is also slightly thicker than the thickness of the insert head 13. As illustrated in Figures 8 and 9, the panels 26 and 27 are arranged (maybe initially spaced slightly apart) with the two holes 28, 29 in alignment. The fastener is then inserted through the holes so that the insert shank 12 enters the square hole 28 and protrudes behind it, with the insert head 13 in contact with the front face of the back panel 26 and inside the hole 29 on the front panel 27, as illustrated in Figure 9. The screw 22 is then rotated by a suitable tool, such as an air-driven torque wrench, applied to its hexagonal head 25. This action both instals the insert 11 permanently in the back panel 26 (in the way previously described), and drives the screw into the insert to secure the front panel 27 to the back panel 26, as illustrated in Figure

10. The front panel 27 can be removed from the back panel by removing the screw 22 from the insert 11, after which the screw can later be re-inserted into the insert.

The invention is not restricted to the details of the foregoing example.

(A)

CLAIMS

1. An insert nut for use in a panel, which insert nut comprises a shank and a radially enlarged preformed head, the shank having a plurality of longitudinally extending legs each joined at one end to the head and together providing the shank with a substantially uniform polygonal external cross-section;

the insert having a bore extending along the length of the shank and through the head, the interior of the bore being formed with thread-engaging surfaces, and least the portions of the legs remote from the head being of increased radial thickness so that the bore is thereby constricted;

whereby, when the shank is inserted through a corresponding polygonal hole in a panel so that the head abuts one face of the panel and the major part of the length of the shank protrudes beyond the other face of the panel, and a suitable screw is threaded into the bore from the head end thereof and between the aforesaid thickened parts of the bore, the legs are forced radially apart thereby to form a blind head so that the panel is clamped between the two heads and the insert nut is thereby secured to the panel.

2. An insert nut is claimed in claim 1, in which the radial thickness of each leg increases progressively, from a position at the root of the leg adjacent the preformed head, towards the remote end of the leg.

3. An insert nut as claimed in claim 2, which is formed from an intermediate blank which had a plurality of legs spaced apart circumferentially by radially and axially extending slots, the radially inner thread-engaging faces of the legs being substantially uniformly spaced apart throughout their length and the radially outer faces of the legs sloping outwardly progressively from their head ends to the ends remote therefrom, the legs then having been deformed radially inwardly about their ends adjacent the head until the exterior of the shank is of substantially uniform cross-section along its length.

4. An insert nut as claimed in any of claims 1 to 3, in which the thread-engaging faces of the bore are pre-formed with suitable screw threads.

5. An insert as claimed in any of claims 1 to 3, in which the thread-engaging faces of the legs are not pre-formed with screw threads but can be threadedly engaged by a suitable self-tapping screw.

6. A fastener comprising an insert nut as claimed in any of the preceding claims, in combination with a screw engaged with the thread-engaging surfaces of the nut to such an extent that the screw and nut are in interference fit but the legs are not significantly forced apart.

7. A fastener as claimed in claim 6, in which the head of the screw, or a washer assembled on the screw adjacent to the head, projects radially substantially beyond the head of the insert, whereby the fastener may be used to attach to a panel having a polygonal hole as aforesaid a second member having a hole, which hole overlies the polygonal hole and has a size and shape such as

to allow the head of the insert to enter it but not to allow the aforesaid screw head or washer to enter it, attachment of the member to the panel being achieved by inserting the shank of the insert through the two holes until the head of the insert abuts the panel, and then rotating the screw to secure the insert in the panel as aforesaid and also to clamp the member to the panel.

Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report)

Application number
GB 9405655.3

Relevant Technical Fields

(i) UK Cl (Ed.M) F2H (HARN HARL HARM HARX HL)

(ii) Int Cl (Ed.5) F16B 19/10

Search Examiner
P M WELLER

Date of completion of Search
24 MAY 1994

Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii)

Documents considered relevant following a search in respect of Claims :-
1-7

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2264545 A	(RAYMOND) All Figures	1,5
X	GB 2069089 A	(DEUTSHER) Figures 1-4	1,5
X	GB 2051288 A	(ITW) All Figures	1,4,5,6
X	GB 0855285 A	(UNITED-CARR) All Figures	1,5
X	GB 0845205 A	(PLUMMER) Figure 4	1,2,5
Y	GB 0335508 A	(WAGNER) All Figures	1,4,5

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).