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U1S S1770

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UK CL (Edition J) E2A AGLC AGLD, F2H HR  
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(54) Washer for releasing bolted connections

(57) A washer for facilitating release of a bolted connection comprises wedge elements 2 (Fig 2) or 8, 9, 10 (Fig 3) interposable between confronting parts forming the connection, and held in position by a retainer ring 3 or bolts 11 or annular clamp. Release is effected in Fig 1 by cutting the retainer ring 3 with a hammer and chisel, and in Fig 3 by slackening the bolts 11, or by releasing the annular clamp. The bolts 11 are received in holes in the central wedge element 9 which is in the form of an open yoke.

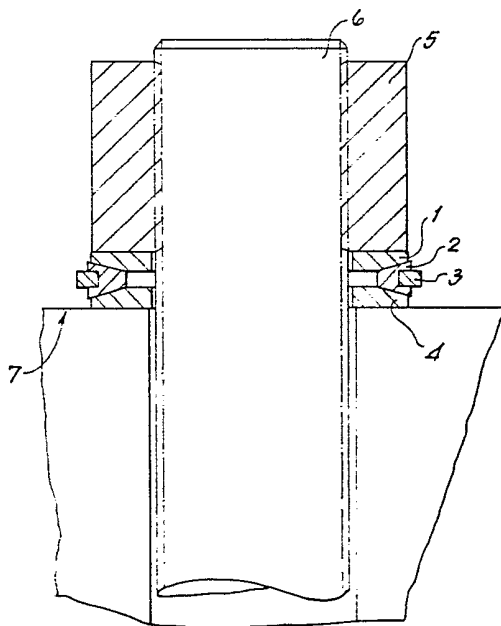


FIG.2

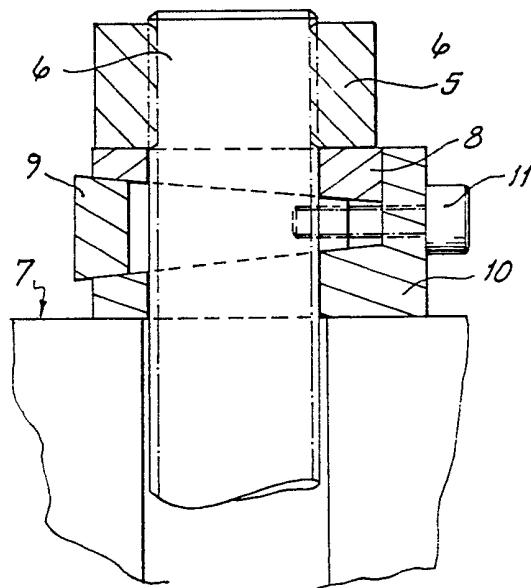


FIG.3

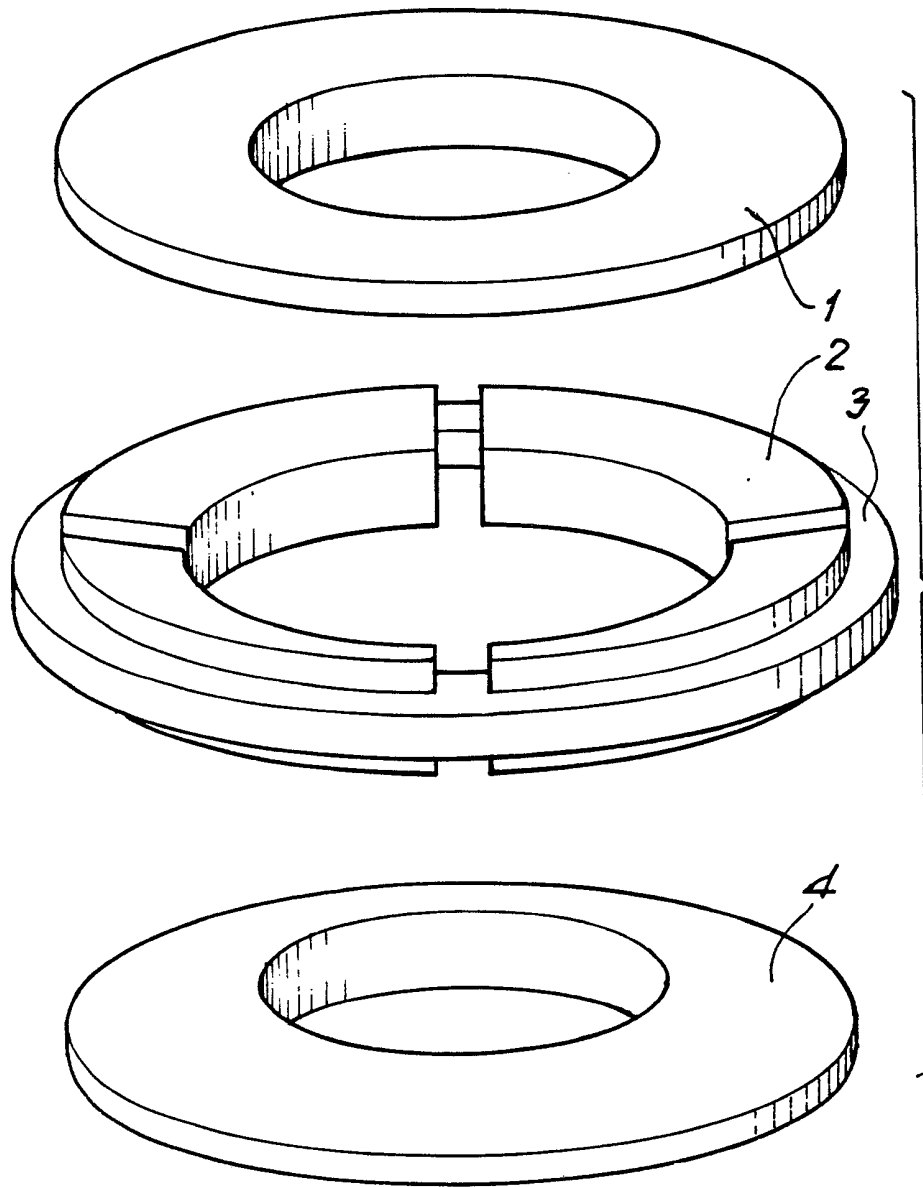


FIG.1

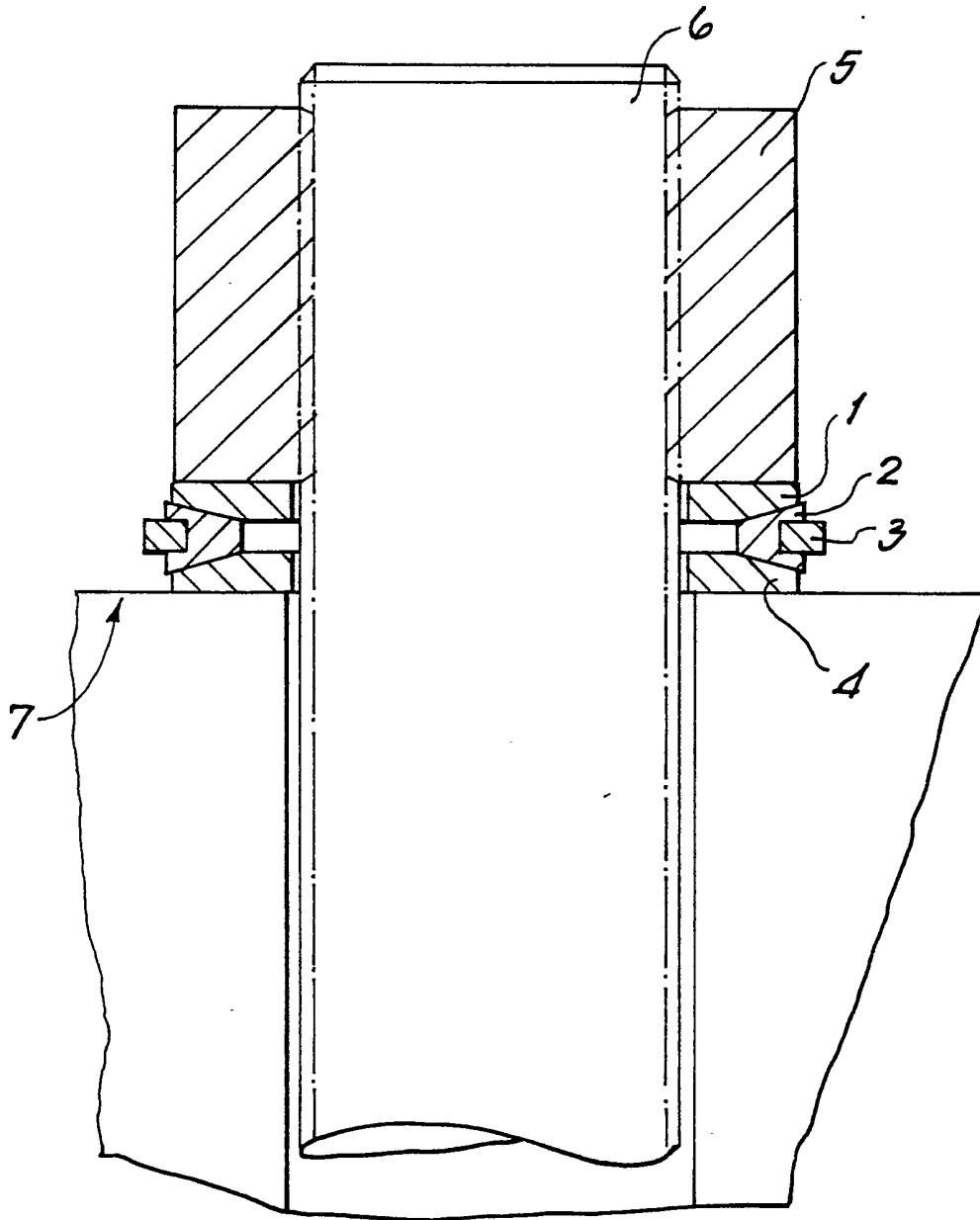


FIG. 2

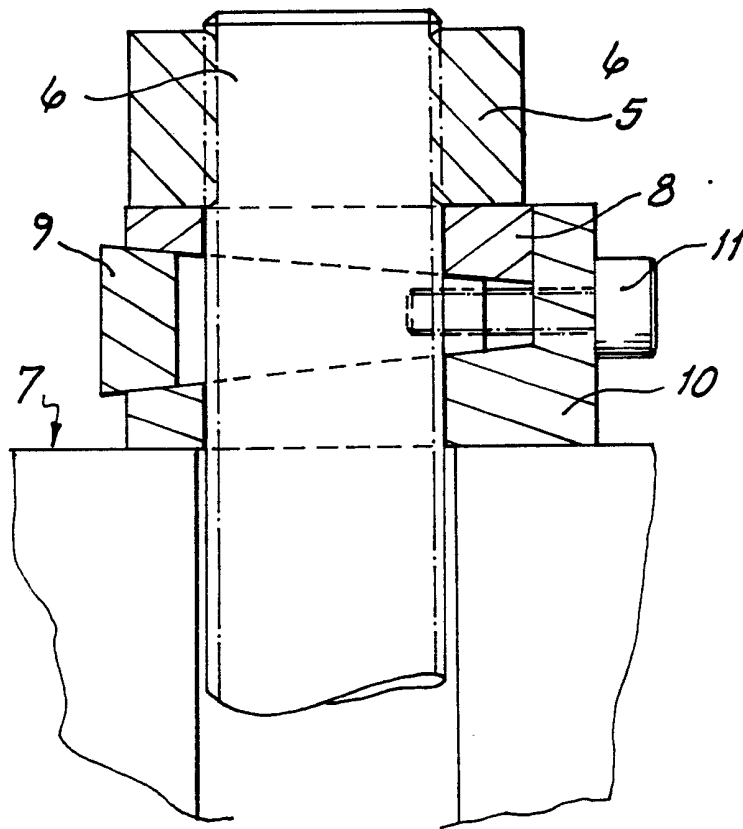
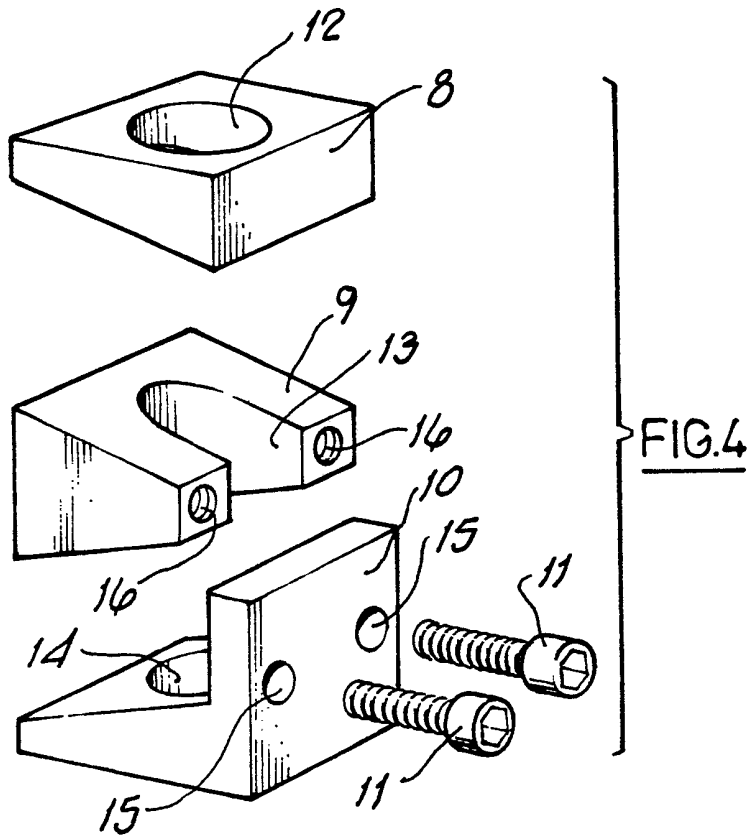


FIG. 3



Improvements in and relating to bolted connections

This invention relates to bolted connections. It is common for such connections to be highly torqued, for example by use of power wrenches or hydraulic bolt tensioners. It can be difficult to unfasten a bolted connection after it has been tightened in this way, even using power tools. This is particularly true where the connection has been exposed to the elements for a period of time.

It is an object of the present invention to facilitate disassembly of bolted connections.

Accordingly to this invention, a washer for use in a bolted connection comprises at least one wedge shaped element interposable between abutting parts forming said connection, together with retaining means operative to hold said wedge shaped element at a controlled radial spacing with respect to the centreline of the bolted connection.

Preferably at least two such elements are used, equally spaced around said centreline. The retaining means may be an annular ring engaged with or in the radially outermost portions of the elements, or it may be at least one bolt disposed generally tangentially with respect to the connection and disposed to draw the elements radially inwardly with respect to the centreline.

It is particularly preferred that the washer comprises upper and lower rings whose confronting faces are conical about the said centreline, together with a plurality of equally spaced correspondingly wedge shaped elements engaged between the conical faces, the wedge shaped elements being retained by an external annular ring engaged in radially outwardly facing recesses defined in the wedge shaped elements. The ring may also be a removable annular clamp.

Where the retaining means are constituted by at least one bolt, there are preferably two wedge shaped elements connected together by a pair of bolts, one at each side of the bolted connection. For example the connecting bolts may straddle the main bolt, generally tangentially at either side, with the wedge shaped elements disposed diametrically spaced apart on a common diameter of the bolted connection.

Installation of the connection, with the washer in place, can take place using normal techniques such as hydraulic bolt tensioning. In the case of a construction using confronting wedge shaped elements connected by bolts, the latter may also be employed to develop tension in the bolted connection.

Release of the connection after service or for maintenance purposes is readily accomplished by rupturing or otherwise removing the retaining ring, or in the case of the alternate embodiment using retaining bolts, by removing or slackening the latter. In many cases, even a very heavily stressed connection can be freed to the point of being manually removable, by simply cutting the retaining ring with a hammer and chisel, or by slacking the bolts.

Further aspects of the invention will be apparent from the following description, by way of example, of some preferred embodiments which are illustrated in the accompanying drawings, in which

Figure 1 is a perspective side view of a washer according to the invention shown separated into its component parts,

Figure 2 is a cross-sectional side view of the washer of Figure 1 installed in a bolted connection,

Figure 3 is a cross-sectional side view of another bolted connection, featuring a different washer construction, and

Figure 4 is a perspective side view of the washer of Figure 3 shown separated into its component parts.

Like parts in all four Figures bear like reference numerals, as far as practicable. Referring to Figures 1 and 2, a washer comprises an upper, conical part 1 and lower, conical part 4, and an intermediate part. The intermediate part comprises four separate sections, 2, held together by an annular ring 3. The ring 3 is engaged in a recess formed in the outer rim of each section 2.

In Figure 2, the assembled washer is installed in a bolted connection comprising a stud bolt 6, a nut 5 and some hardware 7 (not shown in detail). The washer is interposed between the nut and the hardware, the nut having been tightened hydraulically to achieve a desired axial stress in the bolt. The washer is thus also subjected to axial stress. To release the bolted connection without using



power tools, it is only necessary to cut the ring 3, whereupon the sections 2 are free to move radially outwardly. This releases the axial stress in the bolt and the nut may then be removed relatively easily, in many cases by hand.

Referring now to Figures 3 and 4, the washer comprises an upper, wedge-shaped part 8 with a bolted-encircling aperture 12. Below it (in use) is a complementary wedge-shaped part 9 having a U-shaped slot 13 defined in it. The third element of the washer is a base part 10 having a bolt-encircling aperture 14 and an upstanding flange with a pair of apertures 15 extending through it in a direction and disposition generally tangential to the apertures 12, 13 and 14. Set screws 11 extend through the apertures 15 and are received in screw threaded bores 16 in the wedge shaped part 9. The assembly is best seen in Figure 3, where the action of the set screws to draw the wedge shaped parts together can be clearly seen.

In Figure 3 the bolted connection may be stressed by tightening the set screws 11, by hydraulically tightening the nut 5, or by a combination of these. This construction therefore permits a number of methods to be used, ranging from use of the washer itself to stress the bolt, to use of the washer as as a passive element during

stressing by conventional means. However, in either case, release of the connection is readily accomplished by releasing the set screws 11.

It will be appreciated that the two examples just described are merely illustrative of a number of possible ways of implementing the present invention.

CLAIMS

1. A washer for use in a bolted connection comprising at least one wedge shaped element interposable between abutting parts forming said connection, together with retaining means operable to hold said wedge shaped element at a controlled radial spacing with respect to the centreline of the bolted connection.
2. A washer according to claim 1 having at least two wedge shaped elements equally spaced about said centreline.
3. A washer according to claim 1 or claim 2 wherein the retaining means is constituted by an annular ring engaged with the radially outermost portions of the elements.
4. A washer according to claim 1 or claim 2 comprising upper and lower (in use) rings whose confronting faces are conical about said centreline, together with a plurality of equally spaced correspondingly wedge shaped elements engaged between the conical faces, the wedge shaped elements being retained by an external annular ring engaged in radially directed outwardly facing recesses in the wedge shaped elements.

5. A washer according to claim 4 wherein said ring is of unitary construction.
6. A washer according to claim 4 wherein said ring is constituted by a removable annular clamp.
7. A washer according to claim 3 having two confronting wedge shaped elements connected together by a pair of bolts, one at each side of the bolted connection.
8. A washer according to claim 7 wherein the bolts are received in screw threaded bores in a wedge shaped member which is (in use installed between complementary abutting surfaces defined on upper and lower wedge shaped elements, the bolts being arranged to draw the wedge shaped member into tighter engagement with said elements.
9. A washer according to claim 8 wherein said upper and lower elements have bolt encircling apertures therein and the wedge shaped member has a slot to receive the shank of said bolt.
10. A washer for a bolted connection substantially as hereinbefore described with reference to and as illustrated by the accompanying drawings.