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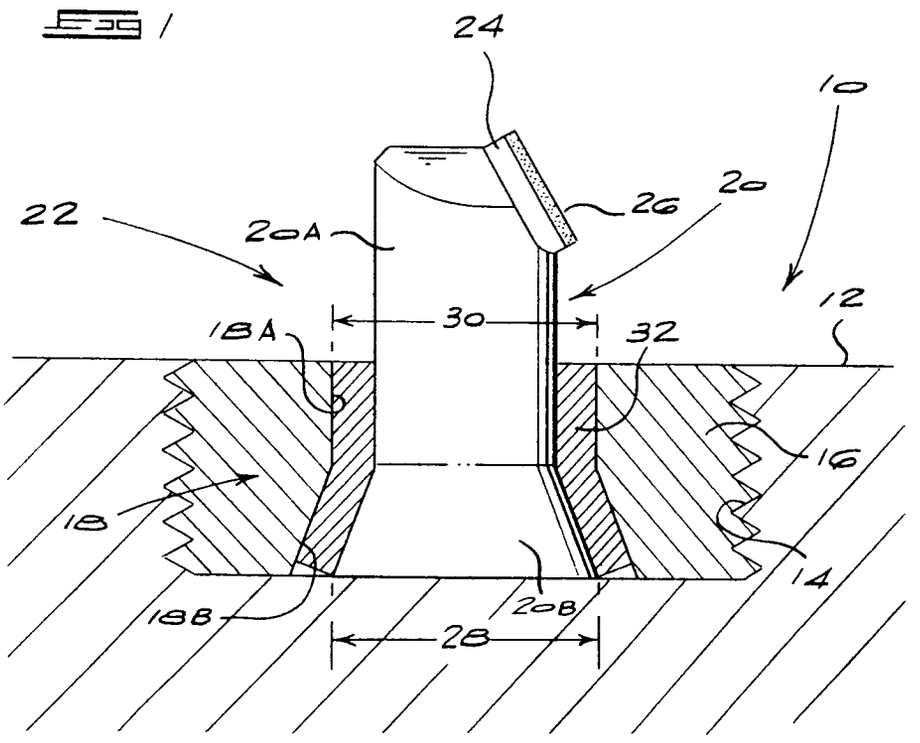
(54) Cutting insert for an abrasive tool and method of mounting.

(57) The invention concerns a method of mounting a cutting insert (22), such as a studcutter, in the working face (12) of an abrasive tool, such as a drill bit. In the method an externally threaded plug (16), formed with a recess (18) therein, is screwed into a complementally threaded socket (14) in the working face. The cutting insert (22) is secured in the recess (18) in the plug (16). The cutting insert (22) has a transversely extending formation (20B) which locates in an undercut (18B) in the recess (18) in the plug with a gap between the formation and the recess. A locking insert (32) is located in the gap in such a manner as to anchor the cutting insert relative to the plug. The locking insert is typically of malleable material and is deformed into the gap.



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BACKGROUND TO THE INVENTION

THIS invention relates to abrasive tools.

Abrasive tools are known which comprise a body in which are mounted cutting inserts which have a wear-resistant or abrasive cutting layer. It is this layer that is used to perform a cutting or abrading action. The support for the wear-resistant layer may be in the form of a post, normally of squat proportions. The mounting of the post in the working face of the tool body can present problems to the manufacturer and the user of the abrasive tool. With conventional insert fixing methods, the subsequent replacement of worn inserts can also be a problem.

SUMMARY OF THE INVENTION

According to a first aspect of the present invention, there is provided a method of mounting a cutting insert in the working face of an abrasive tool body, the method comprising the steps of providing an externally threaded plug formed with a recess therein, screwing the plug into a complementally threaded socket in the working face of the tool body, and securing the cutting insert in the recess in the plug, the cutting insert having a transversely extending formation which locates in an undercut in the recess in the plug with a gap between the formation and the recess, and secural of the cutting insert in the recess being achieved by means of a locking insert located in the gap in such a manner as to anchor the cutting insert relative to the plug.

In some cases, the insert is secured to the plug and the plug is thereafter screwed into the socket. In other cases, particularly where there is a preferential orientation for the cutting insert, the plug is first screwed into the socket and the cutting insert is thereafter secured to the plug. In all cases, it is preferred that the locking insert is deformed into the gap.

In one application of the method it is used to mount a studcutter in the working face of a drill bit.

According to another aspect of the invention, there is provided an abrasive tool having a working face, a threaded socket in the working face, a complementally threaded plug screwed into the socket, a recess in the plug, an undercut in the recess, a cutting insert and a transversely extending formation on the cutting insert, the cutting insert being located in the recess with the formation in the undercut, and the cutting insert being secured in the recess by a locking insert which locates in a gap between the formation and the undercut.

In one version, the cutting insert has a post with a conically flared foot and the undercut is conical in shape, the foot locating in the undercut and the cutting insert being secured in the recess by a locking insert, initially of tubular shape, deformed into the gap between the foot and the undercut. The locking insert may have slots formed in one end thereof.

In another version, the cutting insert has a post with an enlarged waist and the recess includes an annular undercut, the waist locating in the annular undercut and the cutting insert being secured in the recess by a locking insert, initially of tubular shape, deformed into the gap between the waist and the annular undercut.

In yet another version, the cutting insert has a post with a projection extending therefrom in one radial direction and the recess includes an undercut enlargement and a groove extending from a face of the plug to the enlargement, the radial projection being inserted through the groove and locating in the enlargement and the cutting insert being secured in the recess by means of an insert inserted through the groove and deformed into the gap between the projection and the enlargement.

The abrasive body may be that of a drill bit and the cutting insert may then be a studcutter.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings in which:

Figure 1	illustrates a first embodiment of the invention in a cross-sectional view;
Figures 2a and 2b	illustrate a second embodiment in an exploded state and an assembled state respectively;
Figures 3a and 3b	illustrate a third embodiment in an exploded state and an assembled state respectively; and
Figures 4a and 4b	illustrate a fourth embodiment in an exploded state and an assembled state respectively.

DESCRIPTION OF THE DRAWINGS

Figure 1 shows an abrasive tool 10, in this case a drill bit, having a working face 12 formed with a series

of threaded sockets 14, only one of which is visible. Screwed into the socket 14 is a complementally threaded plug 16. The plug 16 has a central recess 18 in which the post 20 of a cutting insert 22, in this case a studcutter, is fixed.

The studcutter 22 has a post 20 to which a diamond compact 24 is secured in a conventional manner. The compact 24 includes a PCD (polycrystalline diamond) layer 26 forming a cutting surface of the studcutter. As illustrated, the post 20 has a round cylindrical portion 20A and a conically flared foot 20B. The maximum diameter of the foot 20B is indicated by the numeral 28.

The recess 18 in the plug 16 is of undercut configuration with a round cylindrical portion 18A having a diameter 30 and a conically tapering portion 18B providing the undercut. The maximum diameter 28 of the foot 20B is less than the diameter 30 so that the post 20 can be located loosely in the recess 18 with a gap between the post and the recess.

The post 20 is secured in the recess 18 by means of a locking insert in the form of a shim or sleeve 32. The shim 32 is of malleable material such as steel and is initially of round tubular form. In order to secure the post 20 in the recess 18, the shim is forced downwardly into the gap between the post and the recess, so that the lower end of the shim flares outwardly, guided by the shape of the gap, to the illustrated configuration. It will be appreciated that with the shim deformed into the gap in this manner, the post 20 cannot be withdrawn from the recess 18 and the studcutter 22 is effectively secured to the plug 16.

The plug 16 may, for instance, be of a sintered carbide material, but is preferably of steel. With the post 20 secured in the recess 18 as described above, the plug can be screwed into the socket 14, thereby fixing the studcutter 22 into the working face 12 of the drill bit 10 as seen in Figure 1.

In the preferred implementation of the embodiment of Figure 1, the plug 16 is initially screwed home tightly into the socket 14 and the studcutter 22 is thereafter secured in place in the recess 18, by means of the deformable shim. In this way, the studcutter can be correctly orientated relative to the direction in which it will perform a cutting action in practice.

In cases where the studcutter 22 is subject to rotational forces in use of the drill bit 10, the hand of the threaded connection between the plug and the socket 14 may be chosen to be self-tightening under such rotational forces.

If the studcutter 22 should wear and require replacement, it is a relatively simple matter to unscrew the plug 16 and replace it with another identical plug into which a fresh studcutter is secured. To facilitate the screwing and unscrewing of the plug 16 relative to the socket 14, suitable spanner-engagable depressions or the like (not illustrated) can be provided in the exposed surface of the plug.

Reference is now made to Figures 2a and 2b which illustrate, in exploded and assembled views respectively, a slightly modified version of the invention. In this case, after the plug 16 has been screwed home in its socket 14, a studcutter 22 is secured in the recess 18 in the plug by means of a shim 32 in the form of a tubular sleeve which has slots 40 extending from its lower edge to facilitate outward flaring of the shim as it is driven downwardly into the gap between the post 20 and the recess 18. It will also be noted in Figure 2 that the studcutter 22 has an arcuately shaped working end 42 of wear resistant material on the post.

In Figures 3a and 3b, the post 20 of the studcutter has a thickened waist portion 44 but is otherwise of cylindrical shape. Once again, there is an arcuately shaped working end on the post. The recess 18 is formed with an undercut shape as illustrated. The post 20 can be slipped into the recess 18 and is secured there, as in the previous embodiments, by means of a deformable shim or sleeve 46 which is driven into the gap between the post and the recess.

In Figures 4a and 4b, the post 20 has an arcuate working end 48 and includes a radial projection 50. The recess 18 in the plug 16 includes a groove or keyway 52 leading from the surface of the plug to an undercut 54. The post can be slipped into the recess with the projection 50 moving along the groove 52 and finally locating in the undercut 54. The post is secured in position in the plug by means of a deformable strip 56, typically of malleable metal, which is forced down the groove 52 and into the gap between the projection 50 and the undercut 54, as illustrated.

It will be appreciated that the location of the projection 50 in the undercut 54 in Figure 4b prevents the post 20 from rotating with respect to the plug 16. This type of secural system may thus be used in situations where there has to be high torsional resistance to rotation of the studcutter or other cutting insert with respect to its mounting. It will be appreciated that various other non-rotation measures can be taken and that a system such as that illustrated in Figure 4 could be used with the other embodiments.

As stated above, it is preferable with an embodiment such as that of Figure 1 to screw the plug home into the socket before the studcutter is secured to the plug. In the case of the studcutter 22 of Figure 1, this is because the studcutter has a preferential cutting or working direction and it is accordingly important for the studcutter to be properly orientated when the abrasive tool is assembled. In the case of studcutters such as those seen in the other Figures, there is no preferred working direction, so in these cases it is possible to secure the studcutter to the plug first and only then screw the plug into its socket.

It should also be noted that the invention is not limited to the mounting of studcutters whether having one of the illustrated shapes or otherwise. In the case of studcutters, various other cross-sectional post and working end shapes are possible. Apart from studcutters, it is anticipated that the invention will find application in the mounting of a wide variety of different cutting inserts in abrasive tools.

Claims

1. A method of mounting a cutting insert (22) in the working face (12) of an abrasive tool body, characterised in that the method comprises the steps of providing an externally threaded plug (16) formed with a recess (18) therein, screwing the plug (16) into a complementally threaded socket (14) in the working face (12) of the tool body, and securing the cutting insert (22) in the recess (18) in the plug (16), the cutting insert (22) having a transversely extending formation (20B, 44, 50) which locates in an undercut (18B, 54) in the recess (18) in the plug (16) with a gap between the formation (20B, 44, 50) and the recess (18), and secural of the cutting insert (22) in the recess (18) being achieved by means of a locking insert (32, 46, 56) located in the gap in such a manner as to anchor the cutting (22) insert relative to the plug (16).

2. A method according to claim 1 characterised in that the insert (22) is secured to the plug (16) and the plug (16) is thereafter screwed into the socket (14).

3. A method according to claim 1 characterised in that the plug (16) is screwed into the socket (14) and the cutting insert (22) is thereafter secured to the plug (16).

4. A method according to any one of the preceding claims when used to mount a studcutter (22) in the working face (12) of a drill bit.

5. A method according to any one of the preceding claims including the step of deforming the locking insert (32, 46, 56) into the gap.

6. An abrasive tool having a working face (12), characterised by a threaded socket (14) in the working face (12), a complementally threaded plug (16) screwed into the socket (14), a recess (18) in the plug (16), an undercut (18b, 54) in the recess (18), a cutting insert (22) and a transversely extending formation (20B, 44, 50) on the cutting insert (22), the cutting insert (22) being located in the recess (18) with the formation (20B, 44, 50) in the undercut (18B, 54), and the cutting insert (22) being secured in the recess (18) by a locking insert (32, 46, 56) which locates in a gap between the formation (20B, 44, 50) and the undercut (18B, 54).

7. An abrasive tool according to claim 6 characterised in that the cutting insert (22) has a post (20) with a conically flared foot (20B) and the undercut (18B) is conical in shape, the foot (20B) locating in the undercut (18B) and the cutting insert (22) being secured in the recess (18) by a locking insert (32), initially of tubular shape, deformed into the gap between the foot (20B) and the undercut (18B).

8. An abrasive tool according to claim 7 characterised in that the locking insert (32) has slots (40) formed in one end thereof.

9. An abrasive tool according to claim 6 characterised in that the cutting insert (22) has a post (20) with an enlarged waist (44) and the recess includes an annular undercut, the waist (44) locating in the annular undercut and the cutting insert (22) being secured in the recess (18) by a locking insert (46), initially of tubular shape, deformed into the gap between the waist (44) and the annular undercut.

10. An abrasive tool according to claim 6 characterised in that the cutting insert (22) has a post with a projection (50) extending therefrom in one radial direction and the recess (18) includes an undercut enlargement (54) and a groove (52) extending from a face of the plug to the enlargement (54), the radial projection (50) being inserted through the groove (52) and locating in the enlargement (54) and the cutting insert (22) being secured in the recess (18) by means of an insert (56) inserted through the groove (52) and deformed into the gap between the projection (50) and the enlargement (54).

11. An abrasive tool according to any one of claims 6 to 10 characterised in that it is a drill bit.

12. An abrasive tool according to claim 11 characterised in that the cutting insert (22) is a studcutter.

FIG 1

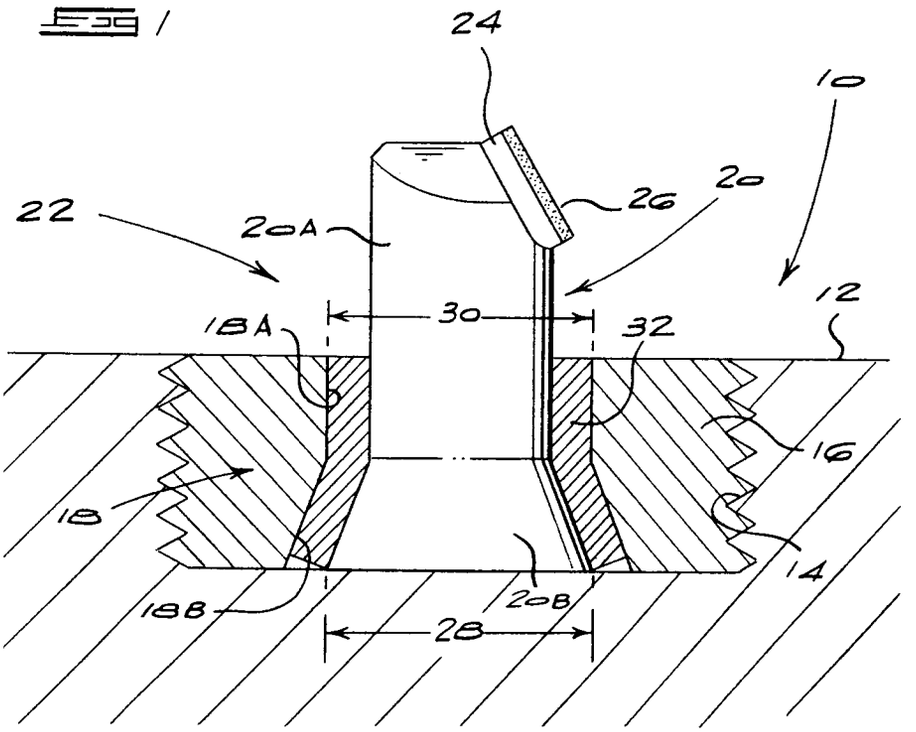


Fig 2a

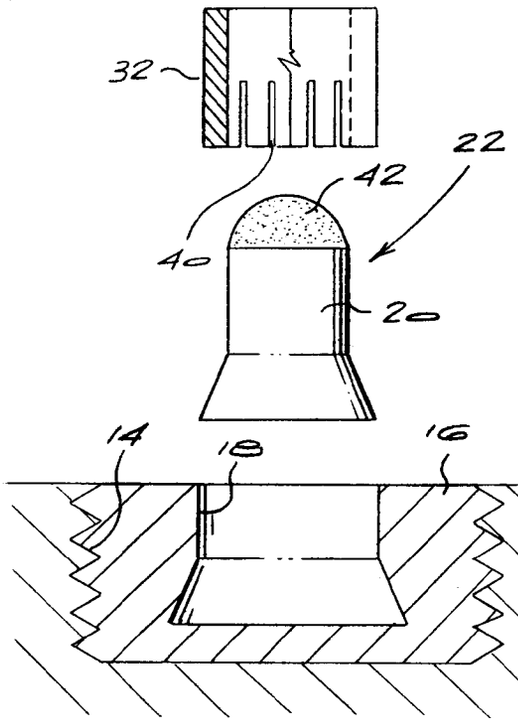
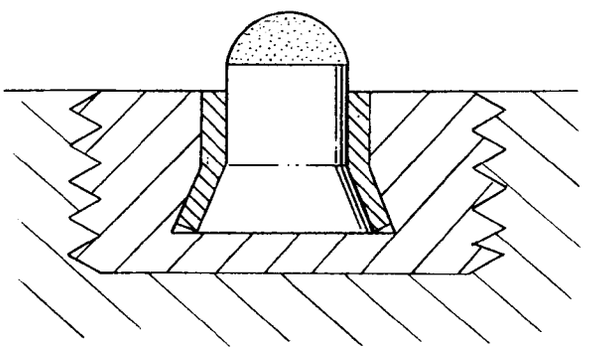


Fig 2b



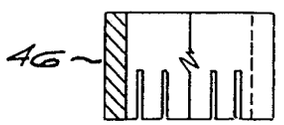


Fig 3a

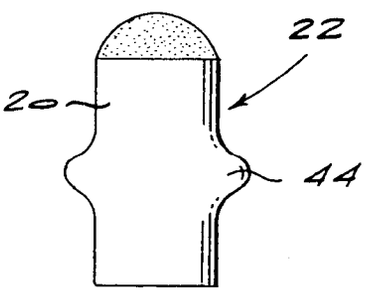


Fig 3b

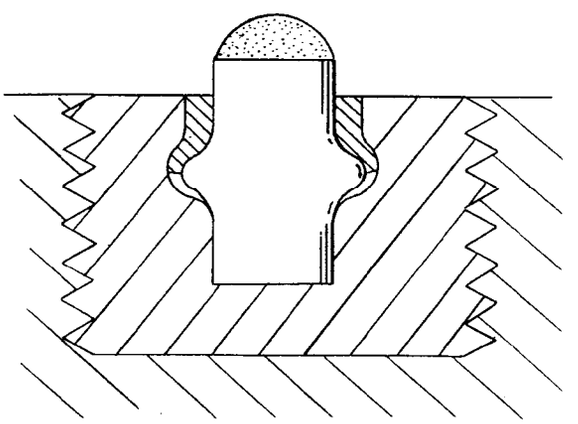


FIG 4a

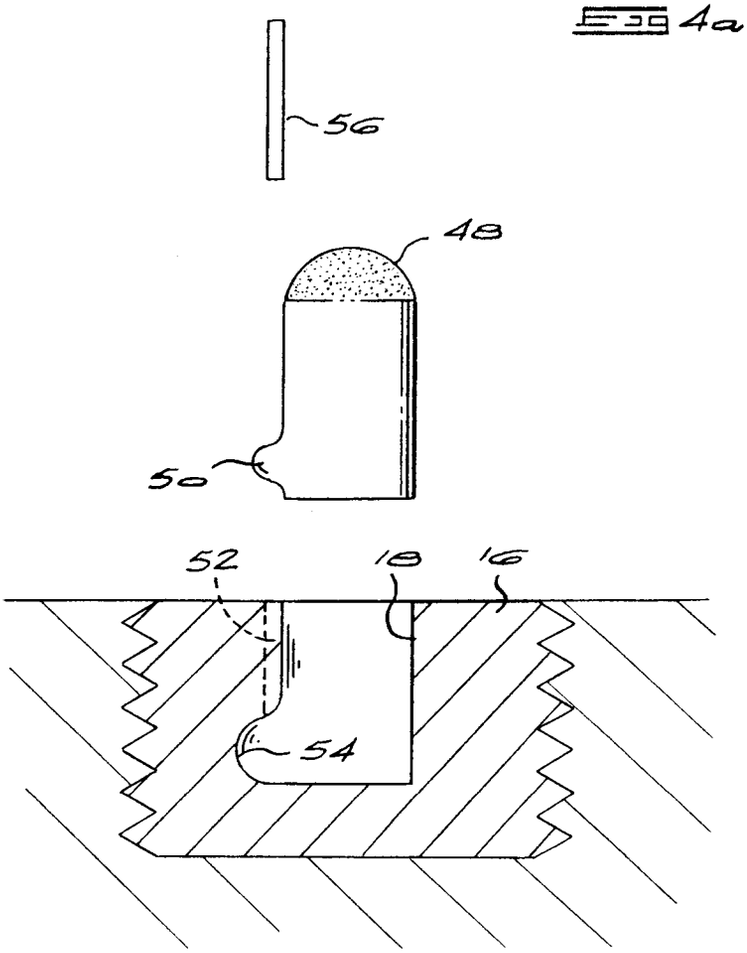
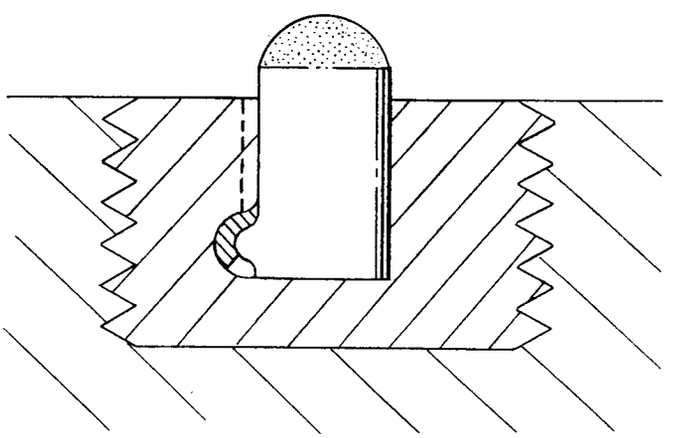


FIG 4b



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 30 5796

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X Y	US-A-4 199 035 (THOMPSON) * the whole document *	1-4,6, 11,12 5,7,8	E21B10/56 E21B10/62
Y	US-A-3 749 190 (SHIPMAN) * the whole document *	5,7,8	
Y	GB-A-2 159 857 (BELZER) * figure 3 *	8	
A	US-A-4 381 825 (RADTKE) * column 6, line 50 - line 59; figure 8A *	1,6	
A	US-A-4 323 131 (ALLE) * figures 2,3,8 *	1,6	
A	US-A-2 614 813 (SHEPHERD) * figure 3 *	9	
A	EP-A-0 211 642 (NL INDUSTRIES)		
A	DE-A-35 00 931 (TANK)		TECHNICAL FIELDS SEARCHED (Int.Cl.5)
A	FR-A-2 609 750 (VENNIN)		E21B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 November 1993	FONSECA FERNANDEZ, H

CATEGORY OF CITED DOCUMENTS

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