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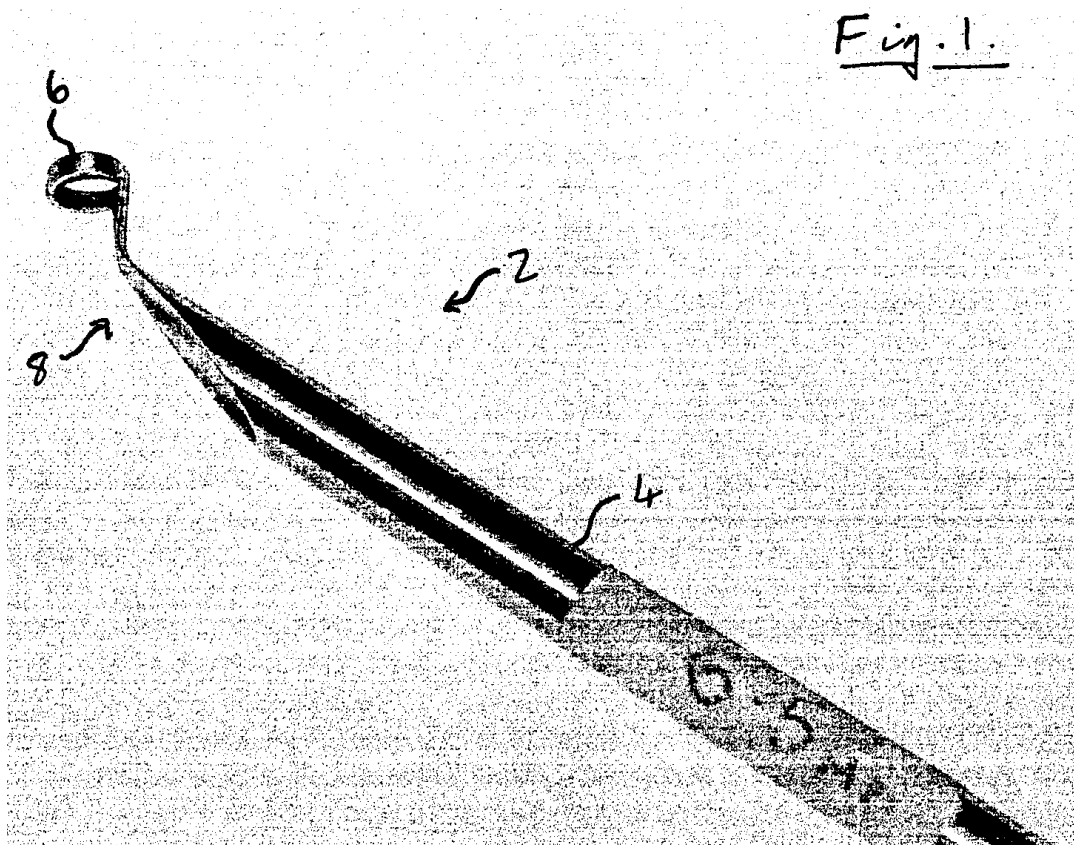
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Remarks:

Amended claims in accordance with Rule 86 (2) EPC.

(54) **Over-sealing**

(57) A tool (2,2a,2b) for over-sealing rivet heads comprising an annular collar (6,6a,6b) formed by notching (8,8a,8b) the end of a cylinder (4,4a,4b) of appropriate diameter. The collar is dipped into the liquid sealant to pick up some and then placed over the rivet head to as to encapsulate it with liquid sealant, which then sets.



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Description

[0001] This invention relates to the over-sealing of the heads of fasteners, particularly to the over-sealing of aircraft electrical bond rivets.

[0002] To meet electrical earth bond requirements on aircraft, one in every 10 or so rivets or fasteners is an earth bonding point. This is so that minimum resistance is achieved between mating panels forming the outer surface of the aircraft, allowing any external current such as a lightning strike to pass freely through the aircraft and mitigating the damaging effects of electrical discharge. Once the correct low resistance is achieved the whole fastener (rivet or bolt) is covered, where they are visible on the surfaces of the panels, both head and tail, in a liquid rubber solution. This sealant is an electrically conductive corrosion inhibitive material, and it encloses the fastener earth point from the atmosphere, which otherwise could contact and corrode the joint. Corrosion increases electrical resistance; an increase in resistance would not allow unwanted current to pass freely and could result in serious electrical malfunctions within the aircraft. This is known as "over-sealing". Conventional practice is to apply a liquid rubber solution referred to as "PRC" ("polysulphide rubber compound" - PRC is a trademark of PRC-DeSoto International, Inc) by hand; the solution is applied to the head of the rivet and the immediately surrounding area, so as to encapsulate the rivet head, using a wire, stick or brush. The solution is built up by swirling the solution over the rivet head to completely encapsulate it. This is a time-consuming and messy task, which often results in an untidy result.

[0003] The present invention provides a tool for applying sealant to cover a fastener head on the surface of a workpiece, the tool comprising a cylindrical member having an internal diameter greater than the diameter of the fastener head, the member having a notch in its circumference and near to one end to form a collar.

[0004] Such an arrangement provides a cheap and easy-to-use tool which saves time compared with conventional practice and which results in a far neater and more accurate job (accuracy being especially important in aerospace applications). The tool is used by immersing at least the collar in a liquid sealant long enough for the collar to pick up by the action of surface tension an amount of sealant, and placing the edge of the collar over and around the fastener head so as to deposit the sealant thereover. This is fast and produces reliable and neat, accurate encapsulation, enabling multiple rivet heads to be covered far more effectively than with known methods.

[0005] Preferably, at least a part of the notch adjacent the said end of the member is substantially parallel to the said end. This creates an annular collar, so that in use a consistent amount of sealant is picked up and deposited over each rivet head. The height of the collar relative to its circumference is preferably determined by several factors, such as the viscosity and surface tension of the sealant and the amount of sealant required, so as to ensure the rivet head is covered effectively.

[0006] Once the sealant has been deposited, the tool is easily cleaned by brushing or wiping, and the notch assists in this process by allowing access to the inside of the collar. Preferably the side of the notch distant from the said end of the member is at an acute angle to the longitudinal axis of the cylindrical member. This creates a wide notch so as to facilitate easy cleaning of the tool. Additionally or alternatively the central axis of the collar is at an angle to the longitudinal axis of the cylindrical member. This further facilitates cleaning, as it effectively "opens up" the notch if the member is bent somewhere along the length of the notch, it also enables the tool to access rivets which are in awkward, difficult to access, locations.

[0007] The invention will now be described by way of example and with reference to the accompanying drawings, in which:

Figure 1 shows an embodiment of a tool in accordance with the invention, and

Figure 2 shows the tool of Figure 1 with other embodiments of the tool in accordance with the invention.

[0008] The tool 2 shown in Figure 1 comprises a hollow cylindrical shank 4 and an annular collar section 6, which has been formed by cutting a notch 8 into the cylinder. In addition, the resulting structure has been bent so that the axes of the collar 6 and shank 4 are inclined. The tool is cheap and easy to fabricate from a cylinder of suitable diameter. Use of this tool is also very simple: the collar 6 is dipped into a liquid sealant solution (not shown) so that it "picks up" an amount of the sealant by surface tension (in much the same way that a child's bubble-blowing ring pick ups soap solution for blowing a soap bubble). The tool is then moved and the collar 6 placed over a rivet head (not shown, but which in aircraft applications is usually countersunk so as to be flush with the aircraft surface, but which could equally be rounded flat or pan-shaped). As the collar 6 contacts the surface the liquid solution adheres to the surface and the rivet and, as the tool 2 is removed, is deposited there, neatly encapsulating the rivet.

[0009] Figure 2 illustrates the tool 2 of Figure 1 together with two other tools, 2a and 2b (in which equivalent elements to those of the tool 2 are identified by the suffixes "a" and "b"). Tool 2a is similar to tool 2, but has been bent adjacent the end of the notch 8a distant from the collar 6a. Tool 2b has been bent at a point along the shank 4b, so that the notch 8b is substantially undistorted (and resembles the cut out position of a whistle, or organ pipe).

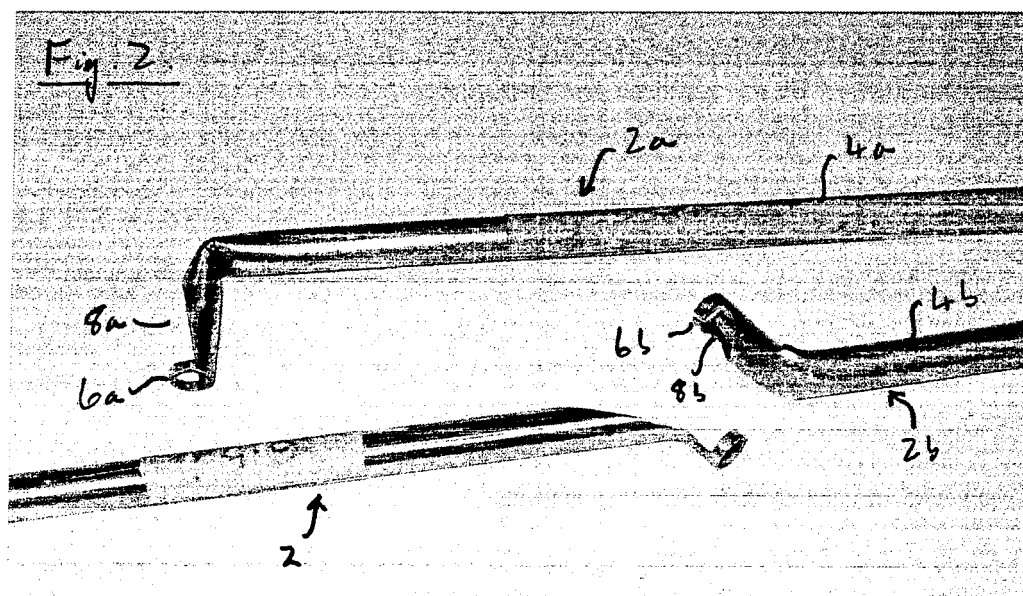
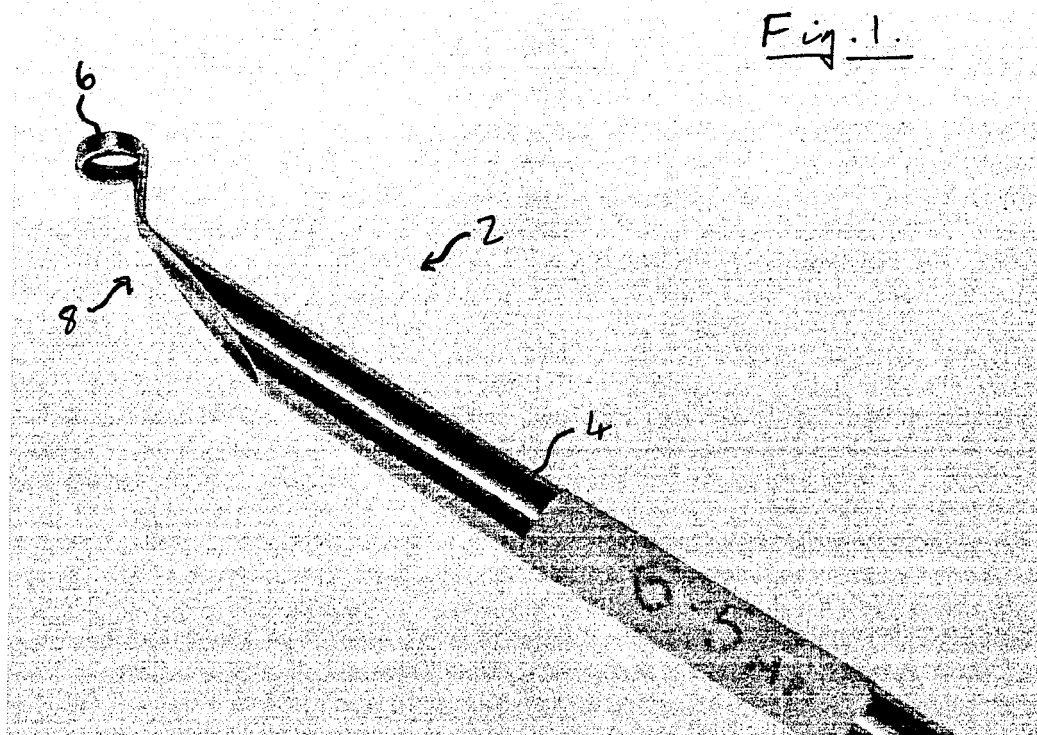
[0010] Although described in relation to the application of a sealant to fastener heads, it will be appreciated that principles of the present invention have other applications, where there is a requirement to encapsulate something with a liquid, setting solution, such as in certain medical applications.

Claims

1. A tool for applying sealant to cover a fastener head on the surface of a workpiece, the tool comprising a cylindrical member having an internal diameter greater than the diameter of the fastener head, the member having a notch in its circumference and near to one end to form a collar.
2. A tool according to claim 1 wherein at least a part of the notch adjacent the said end of the member being substantially parallel to the said end.
3. A tool according to Claim 1 or 2 wherein the side of the notch distant from the said end of the member is at an acute angle to the longitudinal axis of the cylindrical member.
4. A tool according any of claims 1 to 3 wherein the central axis of the collar is at an angle to the longitudinal axis of the cylindrical member.
5. A tool substantially as hereinbefore described and with reference to the accompanying drawing.
6. A method of applying sealant to cover a fastener head on the surface of a workpiece using a tool according to any preceding claim, the method comprising immersing at least the collar in a liquid sealant long enough for the collar to pick up by the action of surface tension an amount of sealant, and placing the edge of the collar over and around the fastener head so as to deposit the sealant thereover.

Amended claims in accordance with Rule 86(2) EPC.

1. A tool for applying sealant to cover a fastener head on the surface of a workpiece, the tool comprising a hollow cylindrical member having an internal diameter greater than the diameter of the fastener head, the member having a notch in its circumference and near to one end to form a collar.
2. A tool according to claim 1 wherein at least a part of the notch adjacent the said end of the member is substantially parallel to the said end.
3. A tool according to Claim 1 or 2 wherein the side of the notch distant from the said end of the member is at an acute angle to the longitudinal axis of the cylindrical member.
4. A tool according any of claims 1 to 3 wherein the central axis of the collar is at an angle to the longitudinal axis of the cylindrical member.
5. A method of applying sealant to cover a fastener head on the surface of a workpiece using a tool according to any preceding claim, the method comprising immersing at least the collar in a liquid sealant long enough for the collar to pick up by the action of surface tension an amount of sealant, and placing the edge of the collar over and around the fastener head so as to deposit the sealant thereover.





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EUROPEAN SEARCH REPORT

Application Number
EP 05 10 2047

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.7)
X	EP 1 136 259 A (ADVANCED SENSING DEVICES GMBH) 26 September 2001 (2001-09-26) * paragraph [0011]; figure 1 *	1-6	B21J15/38 B05C17/00 B64C1/00
A	US 2003/015278 A1 (FISHER DAVID ET AL) 23 January 2003 (2003-01-23) * paragraphs [0019], [0035]; figures 1-4 *	1,6	
A	US 6 461 458 B1 (FISHER DAVID ET AL) 8 October 2002 (2002-10-08) * column 2, lines 10,11; figures 1-4 * * column 2, line 66 - column 3, line 7 *	1,6	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B21J B64C B05C C12M
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 22 July 2005	Examiner Augé, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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22-07-2005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1136259 A	26-09-2001	DE 10014869 A1	27-09-2001
		EP 1136259 A2	26-09-2001

US 2003015278 A1	23-01-2003	AU 3980300 A	02-11-2000
		DE 60007623 D1	12-02-2004
		DE 60007623 T2	17-06-2004
		EP 1171342 A1	16-01-2002
		ES 2214264 T3	16-09-2004
		WO 0063070 A1	26-10-2000
		JP 2002542104 T	10-12-2002
		US 6461458 B1	08-10-2002

US 6461458 B1	08-10-2002	AU 3980300 A	02-11-2000
		DE 60007623 D1	12-02-2004
		DE 60007623 T2	17-06-2004
		EP 1171342 A1	16-01-2002
		ES 2214264 T3	16-09-2004
		WO 0063070 A1	26-10-2000
		JP 2002542104 T	10-12-2002
		US 2003015278 A1	23-01-2003
