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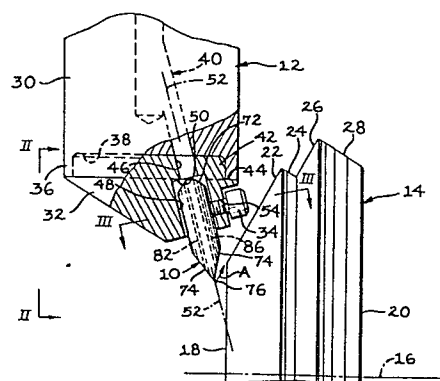
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54 Dressing tool.

57 A dressing tool (10) has an elongate body (58,60) one end of which is provided with a diamond cutting tip (78). An elongate lubricant-transmitting groove (82/84/86) extends substantially fully along the tool body (58,60), opens onto the outer surface (64,74) of the tool body, and terminates adjacent the cutting tip (78). With this construction lubricating and cutting fluid can be directed to the working region of the dressing tool (10) and greatly extend the service life thereof.

FIG. 1.



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DRESSING TOOL.

The invention relates to a dressing tool for reshaping, for example, the peripheral surface of a grinding wheel.

5 The reshaping of the peripheral surfaces of a grinding wheel to precise dimensions presents a number of problems. Typically, an insert type dressing tool having a shank of cylindrical or polygonal cross sectional configuration is used which has a converging tip with a diamond embedded therein. Such a diamond
10 dressing tool is releasably secured to a holder assembly and moved progressively across the grinding wheel, as the wheel is being rotated, to remove the desired amount of material from the wheel.

When the speed of the grinding wheel is increased
15 in order to increase productivity from about 5,500 surface feet per minute to about 8,500 surface feet per minute (about 28 to 43 m/s), so much heat is generated at the dressing tool interface that an undesirable tool service life is experienced. High
20 pressure tubes have been mounted on the dressing machine in order to flood continuously the work region with the cooling or lubricating fluid. However, the spinning wheel sets up an aerodynamic curtain that prevents the entry of the desired amount of lubricant
25 to the region of the diamond. It has been noted that

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the alignment and close placement of the tips of the tubes to the work region is critical, and that they are subject to performance deterioration due to a build-up of swarf around the nozzle tips. Moreover, 5 the tubes get in the way and are easy to bend out of proper alignment with the work region.

Water and lubricant passages in tool holders, drills, and reamers have heretofore been utilized in difficult operations to flood the work region and to 10 assist in removal of the chips or cutting debris.

In accordance with the present invention a dressing tool comprises an elongate body one end of which is provided with a cutting tip; and a first lubricant-transmitting groove which extends substantial- 15 ly fully along the tool body and opens onto the outer surface of the tool body, the groove terminating adjacent the cutting tip.

With this arrangement lubricating fluid may be more efficiently directed to the working region and 20 the service life of the tool is increased.

Preferably, the cutting tip comprises a diamond and the open groove or grooves serve efficiently to direct lubricant to the diamond. Advantageously, the open grooves are economical to manufacture, they can be 25 made larger in cross-sectional area for greater fluid-flow capacity, and they don't tend to plug up with swarf.

Apparatus incorporating two examples of a dressing tool in accordance with the present invention is 30 illustrated in the accompanying drawings, in which:-

Figure 1 is a diagrammatic, fragmentary, part sectional side elevation of a tool holder and a grinding wheel showing one example of a dressing tool;

Figure 2 is a diagrammatic, fragmentary, plan view 35 on the line II-II in Figure 1;

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Figure 3 is a diagrammatic, section taken on the line III-III in Figure 1;

Figure 4 is an enlarged perspective view of the dressing tool illustrated in Figures 1 to 3;

5 Figure 5 is a perspective view of a second example of a dressing tool; and,

Figure 6 is an enlarged diagrammatic, fragmentary cross-sectional view of the dressing tool shown in Figures 5 positioned in the tool holder of Figure 1.

10 Referring to Figures 1 - 3, a dressing tool 10 is illustrated in conjunction with a tool holder 12 and a grinding wheel 14 having a central axis 16.

The grinding wheel 14 has a front face 18, a rear face 20, and conical grinding surfaces 22, 24, 26, 15 and 28 which become worn as the wheel is urged against a workpiece, not shown. Movement of the tool holder 12 is programmed or set precisely to cause the dressing tool 10 to be fed progressively across the individual surfaces of the grinding wheel in a preselected route 20 to refinish it or to true it up to a desired configuration.

The tool holder 12 includes a depending arm 30, a holding member 32, and a set screw 34. The depending arm 30 has a distal lower end 36 with a countersunk 25 recess 38 therein, and a pressurized fluid passage identified generally by the reference numeral 40 is defined in the arm for the transmission of lubricant under a preselected pressure to the holding member 32 and to the dressing tool 10.

30 More specifically, the tool holding member 32 has an upstanding retaining boss 42 and a peripherally adjacent seat 44. With such construction the boss 42 is interlockingly received in the recess 38 of the depending arm 30, with the seat 44 being disposed in 35 load bearing relationship against the distal end of the arm. The tool holding member 32 has first and second cylindrical passages 46, 48 defining a thrust surface

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or seat 50 between them, and which passages are serially aligned on an axis 52. A threaded passage 54 is defined in the holding member which extends radially outwardly from the larger of the passages.

5 Turning now to the general construction of the dressing tool 10 shown in Fig. 4, it may be noted to include a proximal end portion 56, an elongate body portion 58, and a distal convergingly tapered end portion 60 arranged along a central axis 62. In the
10 instant embodiment the central body portion has a peripheral outer surface 64, and as shown best in Fig. 3 includes a pair of opposite planar side walls 66 parallel to a central plane 67, and a pair of opposite cylindrical surface portions 68. The proximal end
15 portion 56 includes a planar end surface 70 disposed in a plane normal to the central axis 62, and first, second and third planar inclined surfaces 72 that are disposed in planes sloped at an angle of about 45° from the central axis and at right angles to each other.
20 The opposite tapered end portion 60 has a chisel point construction defined by a pair of planar sloping end surfaces 74 that symmetrically converge toward the central plane 67 and terminate generally along a cutting edge 76.
25 A profiled cutting tip 78 is located centrally of the cutting edge 76 and we prefer that this be provided by an industrial, profiled, diamond cutting element 80 of preselected construction and orientation relative thereto. The diamond cutting element has an enlarged
30 base, not shown, and the material of the dressing tool overlaps the diamond cutting element to securely hold it in place. We prefer that the material of the dressing tool be beryllium copper to better transmit heat away from the cutting tip, and yet to also have good
35 holding power and strength.

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We advantageously provide first, second and third elongate lubricant-transmitting grooves 82, 84 and 86 in the dressing tool 10 which extend axially substantially fully therealong, which open radially outwardly onto the peripheral outer surface 64 of the body portion 58 and the tapered end portion 60, and which terminate adjacent the cutting tip 78. As shown best in Figure 3, the first, second and third grooves 82, 84, 86 are substantially centrally located on the respective surfaces 66, 68 and 66, with the second groove 84 being located on the central plane 67 of the chisel point and terminating at the leading cutting edge 76. The other two grooves are located on a second plane 88 through the central axis 62 and oriented at a right angle to the first plane 67.

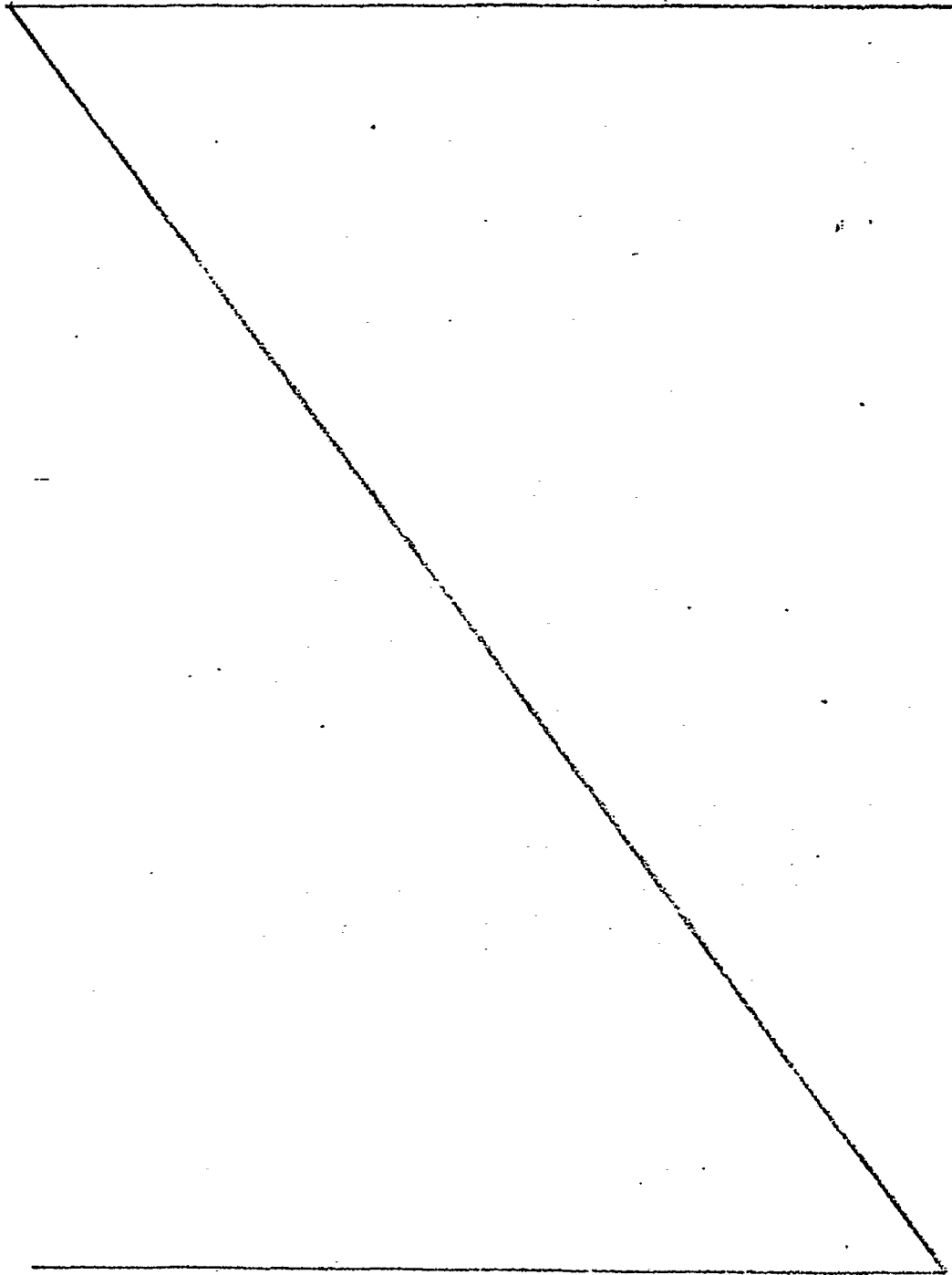
The dressing tool 10 is held in the holding member 32 by screwing the set screw 34 into the threaded aperture 54 to press the tool against an opposite side of the passage 48.

In operation, lubricating fluid particularly a fluid having a good cooling capacity for example a compounded or extreme-pressure oil containing an emulsifier that requires little energy to disperse in water to form a stable emulsion, is supplied under pressure to the passage 48 and to the proximal end portion 56 of the dressing tool 10 via the passage 40 in the depending arm 30. Because of the inclined surfaces 72 on the end of the dressing tool 10 the pressurized fluid is readily delivered to the proximal ends of the grooves 82, 84 and 86. The fluid continues to travel along the grooves even beyond the holding member 32 and impinges upon the grinding wheel 14 immediately adjacent the cutting tip 78. Because each groove is radially open at the tapered end portion 60 the fluid tends to maintain an axial flow

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direction beyond the dressing tool. In contrast, flow outwardly of a cylindrical comparison passage along the length of the tool undesirably tended to diverge away from the axis at the tapered end portion.

- 5 Referring to Figure 2, it can be noted that the grinding wheel 14 rotates in a clockwise direction about the axis 16 when viewing the front face 18. With



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the dressing tool 10 radially oriented as shown, and at a preselected angle of tip with respect to the axis as can be noted by reference to Fig. 1, the second groove 84 can particularly direct a relatively large amount of lubricating fluid to the working region. Note that the wheel rotation will carry the fluid from groove 84 generally rightwardly along the cutting edge 76 when viewing Fig. 2, and that there is no need for another groove at the trailing portion thereof. The grooves 82 and 86 will also direct fluid toward the work region, but are variously effective in accordance with the direction of cutting movement of the dressing tool across the wheel. Particularly, as the dressing tool moves in the upward direction of the arrow A as noted in Fig. 1 across the grinding surface 22 the groove 86 is effective because it lubricates the wheel immediately ahead of the cutting edge 76, and the groove 82 could probably be omitted. On the other hand if the direction of movement of the dressing tool is downward across the surface 22 the groove 82 becomes more important for directing fluid to the work region.

Thus, it is apparent that in specific working applications of the dressing tool 10 it is not mandatory that three grooves 82, 84, 86 be utilized, only that at least one of such grooves be utilized.

Experimental tests have indicated a life of about 8 service hours for the prior art dressing tools lubricated only by jets of fluid from one or more relatively remote tube locations. But the dressing tool 10 has achieved a service life in the order of about 15 times or more, indicating that an unexpectedly great improvement is achieved.

Another example of a dressing tool 10' is shown in figures 5 and 6. Elements similar to those shown in Figs. 1 - 4 are identified in Figs. 5 and 6 by like reference numerals with an added prime indicator. The dressing tool 10' differs by having an interrupted cylindrical peripheral outer surface 64', a conical distal end portion 60', a conical diamond cutting element 80', and four identical grooves 82'. Since four radially open grooves are utilized at right angles to each other as shown in the cross sectional view, a tang 90 is needed at the proximal end portion 56' to prevent the seat 50 from blocking the proximal ends of the grooves from the lubricant passage 46 as can be visualized with further reference back to Fig. 1. The operation of the dressing tool 10' is generally the same as described previously with respect to the dressing tool 10, except that since it is symmetrical it can be released from the associated holding member 32 and be resecured thereto at a slightly different angle of orientation relative to the grinding wheel or equivalent work piece to present an unworn portion of the cutting element 80 thereto and to thereby extend the service life of the dressing tool and increase cutting effectiveness.

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CLAIMS

1. A dressing tool (10) comprising an elongate body (58,60) having a tapered end portion provided with a cutting tip (78), characterised in that a first elongate lubricant-transmitting groove (82,84,86) extends
5 substantially fully along the tool body (58,60) and opens onto the outer surface (64,74) of the tool body including the tapered end portion (58,60), the groove terminating adjacent the cutting tip (78).
2. A dressing tool (10) according to claim 1,
10 characterised in that the tapered end portion (60) defines a chisel point incorporating the cutting tip, the base of the first groove (84) being substantially in a first axial plane (67) passing through the chisel point.
- 15 3. A dressing tool (10) according to claim 2, characterised in that a second elongate lubricant-transmitting groove (82/86) extends along the tool body (58,60) and opens onto the outer surface (64,74) of the tool body (58) including the tapered end portion (60),
20 the second groove being disposed in a second axial plane (88), normal to the first axial plane (67).
4. A dressing tool (10) according to claim 3, characterised in that a third elongate lubricant-transmitting groove (86/82) substantially identical to
25 the second groove (82/86) is located in the second

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plane diametrically opposite to the second groove.

5. A dressing tool (10) according to claim 1, characterised in that the tapered end portion (60) has a substantially conically shaped surface incorporating the cutting tip (78).
- 5 6. A dressing tool (10) according to claim 5, characterised in that the cutting tip (78) is substantially conically shaped.
7. A dressing tool (10) according to any of the
- 10 preceding claims, characterised in that the outer surface (64) of the elongate body (58) includes an opposed pair of planar sides (66), and an opposed pair of cylindrical surface portions (68), the first groove (82/86) opening onto one of planar sides (66).
- 15 8. A dressing tool (10) according to any of claims 1 to 6, characterised in that the outer surface (64) of the elongate body (58) includes an opposed pair of planar sides (66), and an opposed pair of cylindrical surface portions (68), the first groove (84) opening
- 20 onto one of the cylindrical surface portions (68).
9. A dressing tool (10) according to claim 8, characterised in that second and third elongate lubricant-transmitting grooves (82/86) extend along the tool body and open onto respective ones of the planar
- 25 sides (66).
10. A dressing tool (10) according to any of claims 1 to 6, characterised in that the tool body has a substantially circular cross-section, a plurality of the first grooves (82) being provided substantially
- 30 equally angularly spaced apart about the tool body (58,60).
11. A dressing tool (10) according to any of the preceding claims, characterised in that the tool body (58,60) is made of beryllium copper, and the cutting
- 35 tip (78) comprises a diamond cutting element (80)

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embedded in the tool body.

12. Apparatus for re-shaping the surface of a grinding wheel, the apparatus comprising a tool holder (12) having a passage (48) in which a dressing tool (10) in accordance with any of the preceding claims is received; and means (40,46) for supplying lubricating fluid under pressure to the passage (48) and hence to the first groove.

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FIG. 1.

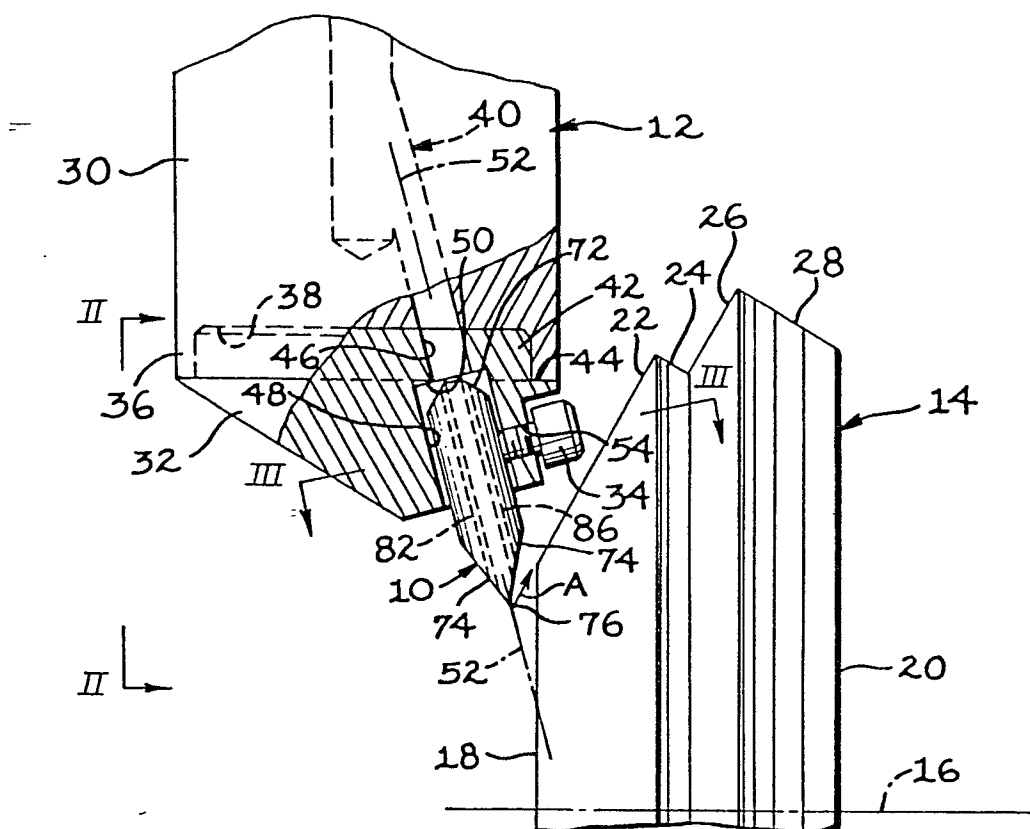


FIG.2.

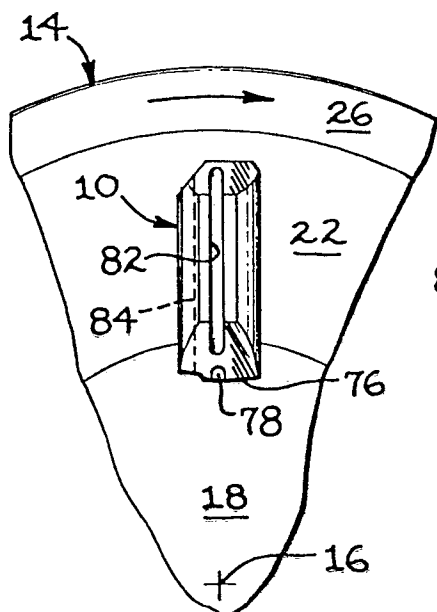


FIG. 3.

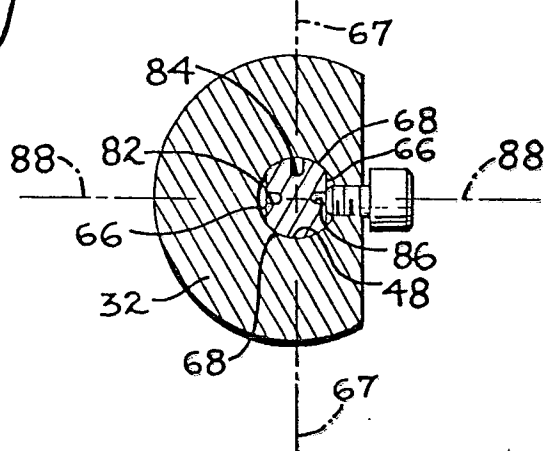


FIG. 4.

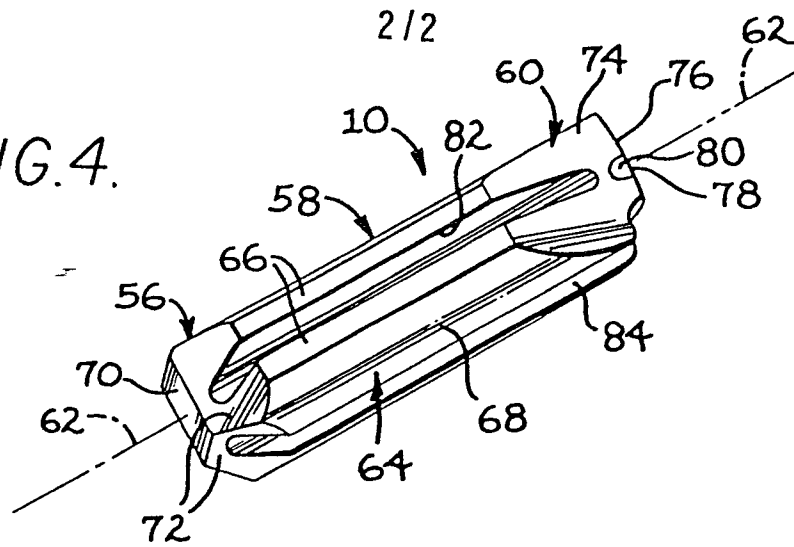


FIG. 5.

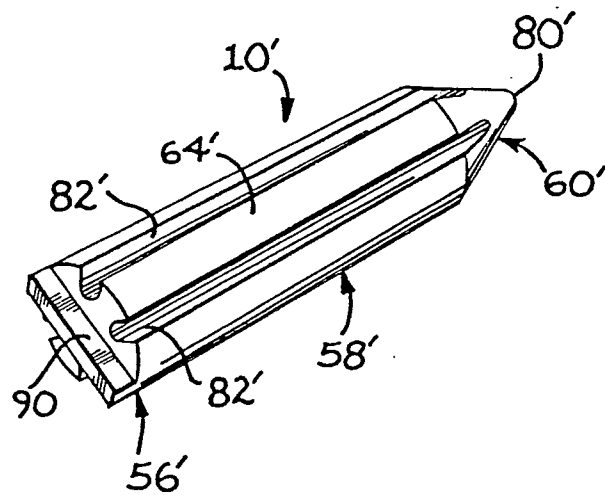


FIG. 6.

