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INSERTED BLADE CUTTER
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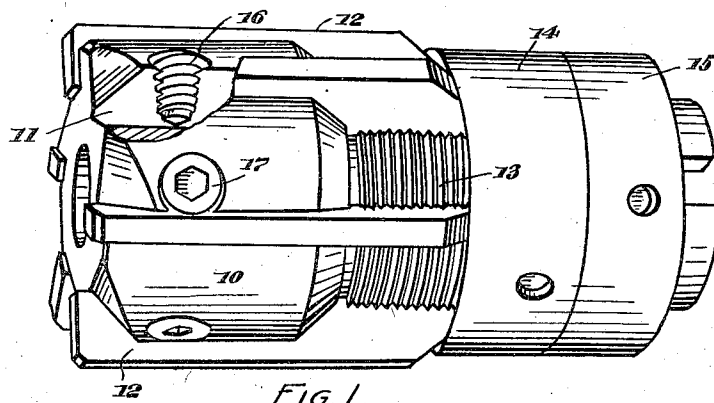


FIG. 1.

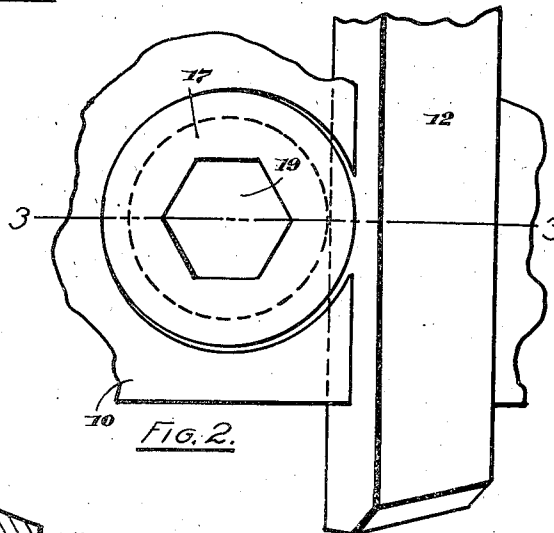


FIG. 2.

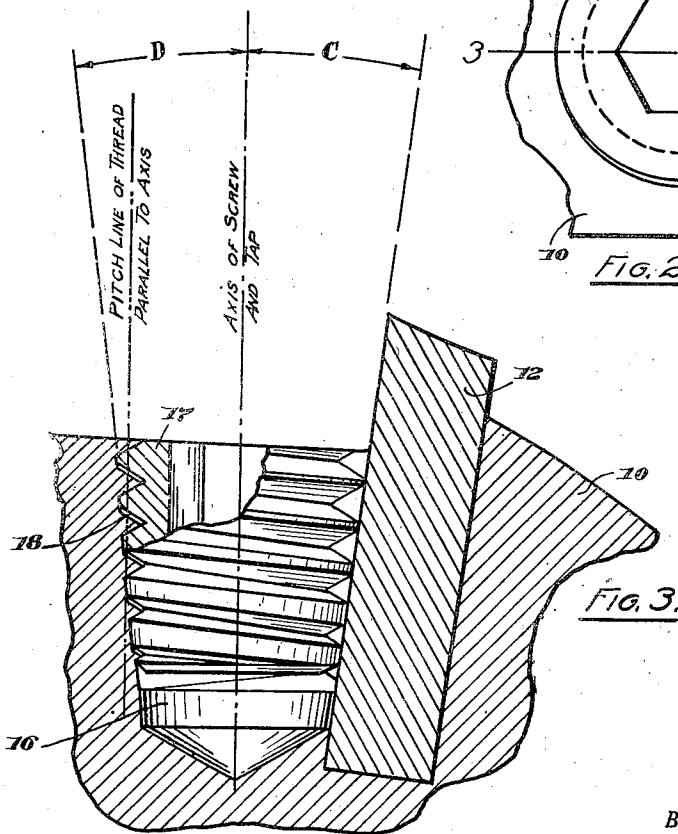


FIG. 3.

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INSERTED BLADE CUTTER

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11 Claims. (Cl. 77—75)

My invention relates to cutting tools of the inserted blade type and more particularly to an improved means to secure the blades in the tool body.

This invention has particular reference to tools of the type disclosed in prior Patent No. 1,951,100 issued to J. A. Spohr and myself, more particularly to the construction shown in Figures 11 and 12 of said patent, and is an improvement in the means for locking the blade in the body of the tool.

In the tools of the prior art difficulty has been encountered in obtaining the desired wedging angle between the blade and locking member and in obtaining the necessary bearing contact between the locking member and the body of the tool. An important object of the present invention is to provide a locking member of this character which will have an increased wedging angle with respect to the blade of the tool and which will have an increased bearing surface contact with the body of the tool.

Another object of my present invention is to provide a device of this character which will effectively secure the cutting blade to the tool against the stress and strain of use without impairing the action of the threads.

A further object of this invention is to provide an improved method of forming the locking member and its socket to produce the desired wedging angle without increasing the angle at which the locking member is tapered.

Still another object of my invention is to provide a device of this character which is inexpensive to manufacture, simple in construction and operation and which will have a long life.

Other objects and advantages of my invention will be apparent during the course of the following description.

In the accompanying drawing which forms a part of this specification and wherein like characters of reference denote like parts throughout,

Figure 1 is a perspective view of a tool embodying my invention, one of the blades of which is broken away,

Figure 2 is a plan view of the locking member and adjacent portions of the blade and tool body, and,

Figure 3 is a sectional view taken on the line 3—3 of Figure 2.

In the drawing, wherein for the purpose of illustration is shown a preferred embodiment of the invention, the numeral 10 designates the body of a tool such as a reamer, counterbore,

millling cutter, boring head, facing tool or the like which is provided with a series of circumferentially spaced, longitudinally extending slots 11 opening out through the periphery thereof and which receive the cutting blades 12. In the form of the invention illustrated, the rear ends of the blades are beveled and are engaged by a conventional form of threaded adjusting collar 14 which is locked in position on the threaded portion 13 of the tool body by a lock collar 15. The collars 14 and 15 prevent rearward movement of the blades 12 under the thrust of the cutting action and provide means for adjusting the blades quickly and uniformly.

It has been proposed to lock the blades 12 in position in the tool body by means of cylindrical threaded bores breaking into the blade slots 11 and receiving tapered threaded plugs or screws which are wedged against the blades. In one instance, for example as shown in Figures 11 and 12 of the aforementioned patent, the wedging screw was tapered on the tops of the threads in a manner similar to the screw in this application, but the socket which received the screw was tapped or threaded in the conventional manner and the screw and socket engaged each other on their pitch lines only. In order to obtain a sufficient wedging angle, it was necessary to remove the greater part of the threads adjacent the leading end of the screw, destroying the bearing surface between the screw threads and the socket threads and permitting the inner end of the screw to crowd away from rigid locking engagement with the blade.

I now propose to so form the locking screw and bore that a greatly increased wedging angle will be obtained and at the same time the bearing surface between the screw and socket will be increased, and an even greater bearing surface provided adjacent the leading end of the screw than at the rear end thereof.

The bores or sockets 16 are arranged generally radially of the tool body 10 and their axes are arranged at a slight angle to the surfaces of the blades, as indicated at C in Figure 3, and this angle is preferably from 3° to 5° although any desired angle may be employed. The socket is produced by a drill arranged with its axis at a slight angle to the blade 12, this angle being the same as angle C, the axis of the drill and the plane of the blade converging inwardly. The drill produces a cylindrical bore the sides of which are parallel. The next operation is performed with the conventional form of straight tap, the pitch line of which is parallel to the axis of the tap.

However, such taps are provided with the conventional taper lead to facilitate starting and operation of the tap, and this taper is represented by angle D in Figure 3 which is the same as angle C. The tap is fed into the drilled opening to a depth approximately the length of the tapered tap lead, and produces tapered thread grooves of uniform pitch, the bottoms of the grooves diametrically opposite the blade forming a bearing surface for the tops of the screw threads, this bearing surface being inclined to the surface of the blade at an angle equal to "C" plus "D", which is identical to the included angle of the taper formed on the tops of the screw threads. By reference to Figure 3 it will be seen that the tapped bore has a species of tapered thread, although the pitch line of the threads is parallel to the axis of the bore and of the tap. Otherwise expressed, the threaded bore is only tapered when the line of the bottom of the threads is considered in relation to the axis of the bore or recess. A line through the apices of the threads, however, is parallel to the axis of the bore. It will be seen that the taper of the tap lead, being produced by grinding away the tops of the threads on the tap produces grooves or threads in the bore having flat surfaces at their bottoms which increase in area approaching the inner end of the bore.

The screw 17 that is inserted in the bore 16 is of slightly less diameter than the bore to cause wedging of the screw against the blade instead of seating itself in the bore. The screw 17 is first formed as a straight screw with the pitch line of its threads parallel to its axis. Tapering is then produced by turning or grinding off the tops of the threads in increasing amounts as the leading end of the screw is approached to produce a taper on the tops of the screw threads corresponding to the taper of the tap used to produce the threads of the bore 16.

Referring to Figure 3 it will be seen that the threads of the screw and socket do not bear on the pitch line as is customary, but the tapered tops of the threads on the screw bear on the flattened taper surface at the bottoms of the threads in the socket. To insure a bearing contact at this point the threads of the screw are cut somewhat deeper than the threads of the socket and a slight clearance 18 is consequently produced between the threads of screw and socket. The screw may be rotated by a wrench or other implement engaging recess 19 in the top of the screw.

With this construction the effective wedging angle is the sum of angles C and D whereas in former constructions the effective angle is C only. By the construction shown, therefore, the effective wedging angle is doubled, the bearing surface between screw and socket is greatly increased and a positive locking engagement of the screw and blade results. Doubling the effective wedging angle also permits more generous tolerances in machining the blade slot, the blade, the socket, and the screw, because the screw moves laterally toward the blade twice as far with the same amount of axial travel and thus quickly offsets machining inaccuracies and simplifies the assembling of these parts into their proper relationship.

It will be noted that the screw 17 bears at diametrically opposite points on the blade 12 and socket 16. An important feature of the present invention is the bearing contact of the tapered tops of the threads of the screw and the flattened

bottoms of the socket threads. By reference to Figure 3 it will be seen that these bearing surfaces increase progressively approaching the leading end of the screw and the inner end of the socket. As a consequence, the improved construction provides double the effective wedging angle and greatly increases the bearing surface. This is in direct contrast to the former construction in which the desired wedging angle resulted in the cutting away of substantially the entire thread toward the leading end of the screw, destroying the bearing surface between the threads of the screw and socket. In the present construction the increased bearing surface towards the leading end of the screw is attributable to the fact that the bearing is on the top of the thread of the screw and not on the pitch line as formerly.

It will be seen that I have provided a simple and inexpensive construction in which a powerful wedging or locking pressure is brought to bear on the blade by the increased wedging angle provided, and in which this pressure is maintained due to the increased bearing surface between the threads of the screw and socket.

While I have shown and described the preferred embodiment of my invention it is to be understood that various changes in the size, shape and arrangement of parts may be resorted to without departing from the spirit of my invention or the scope of the subjoined claims.

Having thus described the invention, what is claimed is:

1. In an inserted blade cutter, a body having a slot and a socket breaking into the slot, a blade in the slot, the axis of the socket being at an angle to the plane of the blade, said socket having a thread tapering to the inner end thereof, the pitch line of said thread being parallel to the axis of the socket, and a screw adapted to be received in said socket to engage the blade, said screw having a thread tapered toward its leading end, the pitch line of the thread of the screw being parallel to the axis of the screw, said screw having a diameter sufficiently less than the diameter of the socket to move laterally therein, whereby the screw contacts the blade and socket at diametrically opposite points on the periphery of the screw.

2. In an inserted blade cutter, a body having a slot therein, a blade in said slot, said body having a socket breaking into the slot, the axis of the socket being arranged at an angle to the plane of the blade, said socket having a thread of progressively diminishing depth toward the inner end of the socket, and a screw adapted to be received in the socket and having a thread of progressively diminishing depth toward the leading end of the screw, the threads of the screw and socket having a uniform pitch, and the tops of the threads on the screw being adapted to have a bearing contact with the bottoms of the socket threads on one side of the socket.

3. In an inserted blade cutter, a body having a slot therein, a blade in said slot, said body having a socket breaking into the slot, the axis of the socket being arranged at an angle to the plane of the blade, said socket having a thread of progressively diminishing depth toward the inner end of the socket, and a screw adapted to be received in the socket and having a thread of progressively diminishing depth toward the leading end of the screw, said screw having a diameter sufficiently less than the diameter of the socket to move laterally therein whereby the screw contacts the blade and socket at diametri-

cally opposite points on the periphery of the screw.

4. In an inserted blade cutter, a body having a slot therein, a blade in said slot, said body having a socket breaking into the slot, the axis of the socket being arranged at an angle to the plane of the blade, said socket having a thread of uniform pitch and progressively diminishing depth toward the inner end of the socket, and a screw adapted to be received in the socket and having a thread of uniform pitch and progressively diminishing depth toward its leading end, said screw being forced against the blade by an effective wedging angle equal to the sum of the angle between the axis of the socket and the face of the blade and the angle between the axis of the socket and a line connecting the bottoms of the socket threads, said screw having a diameter sufficiently less than the diameter of the socket to move laterally therein, whereby the screw contacts the blade and socket at diametrically opposite points on the periphery of the screw.

5. In an inserted blade cutter, a body having a slot therein, a blade in said slot, said body having a socket breaking into the slot, the axis of the socket being at an angle to the plane of the blade, said socket having a thread of progressively diminishing depth toward the inner end of the socket, and a screw adapted to be received in the socket and having a thread of progressively diminishing depth toward the leading end of the screw, the threads of the screw and socket having parallel pitch lines, and the tops of the threads on the screw being adapted to have a bearing contact with the bottoms of the socket threads on one side of the socket, whereby the bearing surface between the screw and socket threads increases progressively towards the leading end of the screw.

6. In an inserted blade cutter, a body having a slot therein, a blade in said slot, said body having a socket breaking into the slot, the axis of the socket being at an angle to the plane of the blade, said socket having a thread of progressively diminishing depth toward the inner end of the socket, and a screw adapted to be received in the socket and having a thread of progressively diminishing depth toward the leading end of the screw, the threads of the screw and socket having parallel pitch lines, the tops of the threads on the screw being adapted to have a bearing contact with the bottoms of the socket threads on one side of the socket, whereby the bearing surface between the screw and socket threads increases progressively towards the leading end of the screw, and said screw having a diameter sufficiently less than the diameter of the socket to move laterally therein, whereby the screw contacts the blade and socket at diametrically opposite points on the periphery of the screw.

7. In an inserted blade cutter, a body having a slot therein, a blade in said slot, said body having a socket breaking into the slot, the axis

of the socket being at an angle to the plane of the blade, said socket having a thread of progressively diminishing depth approaching its inner end, and a screw adapted to be received in the socket and having a thread the top of which is cut away in progressively increasing amounts towards the leading end of the screw.

8. In an inserted blade cutter, a body having a slot therein, a blade in said slot, said body having a socket breaking into the slot, the axis of the socket being at an angle to the plane of the blade, said socket having a thread of progressively diminishing depth approaching its inner end, and a screw adapted to be received in the socket and having a thread the top of which is cut away in progressively increasing amounts toward the leading end of the screw, the threads of the socket and screw having parallel pitch lines, and the cut away tops of the threads on the screw being adapted to have a bearing contact with the bottoms of the socket threads on one side of the socket.

9. In an inserted blade cutter, a body having a slot therein, a blade in said slot, said body having a socket breaking into the slot, the axis of the socket being arranged at an angle to the plane of the blade, said socket having a thread of progressively diminishing depth approaching its inner end, and a screw adapted to be received in the socket and having a thread the top of which is cut away in progressively increasing amounts toward the leading end of the screw, said screw having a diameter sufficiently less than the diameter of the socket to move laterally therein whereby the screw contacts the blade and socket at diametrically opposed points on the periphery of the screw.

10. In an inserted blade cutter, a body having a slot therein, a blade arranged in the slot, said body having a socket breaking into the slot for the full length of the socket, the axis of the socket being disposed at an angle to the plane of the blade, and a screw received in said socket, the screw and socket having threads of uniform pitch and progressively diminishing depth toward their inner ends, the threads of the screw having a slightly greater depth than the corresponding threads of the socket, whereby the tops of the threads of the screw bear against the bottoms of the threads of the socket.

11. In an inserted blade cutter, a body having a slot and a socket breaking into the slot, a blade in the slot, the axis of the socket being arranged at an angle to the plane of the blade, said socket being provided with a thread tapering to the inner end thereof, the pitch line of said thread being parallel to the axis of the socket, and a screw adapted to be received in said socket to engage the blade, said screw having a thread tapered toward its leading end, the pitch line of the thread of the screw being parallel to the axis of the screw.

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