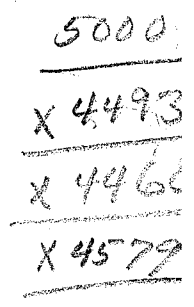


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REAMER

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This invention relates to reamers and more particularly to a reamer for reaming tapers in anchor bolt holes in stone formations or masonry and concrete structures.

It is among the objects of the invention to provide a reamer which can be mounted on and operated by a drill, such as a mine drill, to enlarge and taper a hole provided in a rock formation or masonry structure so that an anchor bolt having an enlarged, tapered head can be firmly secured in the hole, which reamer is effective to gradually enlarge the inner portion of the hole on a uniform conical surface as the reamer is progressively worked into the hole and is also effective to enlarge only a predetermined length of the hole at the inner end thereof, which firmly supports reaming bits which operate on the side surface of the hole, which is easily removed from the hole, and which is simple and durable in construction, efficient and positive in operation and easy to use.

Other objects and advantages will become apparent from a consideration of the following description and the appended claims in conjunction with the accompanying drawing wherein:

Figure 1 is a side elevational view of a reamer illustrative of the invention, the reamer being shown operatively engaged in a drill hole and mounted on a suitable drill structure;

Figure 2 is a view similar to Figure 1 showing the reamer in expanded condition;

Figure 3 is a longitudinal cross sectional view on an enlarged scale on the line 3-3 of Figure 2;

Figure 4 is a transverse cross sectional view on the line 4-4 of Figure 3;

Figure 5 is a transverse cross sectional view on the line 5-5 of Figure 3;

Figure 6 is a transverse cross sectional view on the line 6-6 of Figure 3;

Figure 7 is a longitudinal elevational view of a fragmentary portion of an expander constituting and operative component of the reamer; and

Figure 8 is a view similar to Figure 4 showing a somewhat modified form of reamer.

With continued reference to the drawing, the reamer comprises an elongated tubular barrel, generally indicated at 10 and including three separate sections 11, 12 and 13, disposed in end to end relationship. The section 11 has slits 14 therein which extend entirely through the wall of the barrel section 11 and from one end to a location intermediate the length of this section. These slits are spaced apart at substantially equal angular intervals around the corresponding barrel

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section to provide therebetween elongated, contiguous tongues 15. The barrel section is formed of a suitable resilient material, such as tempered steel, so that the tongues can be forced outwardly relative to each other and will return to their original position when the expanding force thereon is released.

In the form of the invention illustrated in Figure 4, there are four tongues 15 and the bore of the barrel section 11 is of substantially square cross sectional shape.

Each of the tongues 15 has a flat surface on the side thereof disposed inwardly of the tube section and a longitudinally extending guide rib 16 on such flat side, such guide rib being preferably disposed along the mid-width location of the flat inner face of the tongue. Each tongue has in its outer surface at least one longitudinally extending groove 17 extending from the end of the tongue at the corresponding end of the tubular section 11 longitudinally of the tongue for a fractional portion of the length of the latter.

A cutting bit 18 of a hard metal alloy is carried by each of the tongues 15. Each bit 18 comprises an elongated body having substantially parallel side faces and having one edge beveled to provide a cutting edge, as indicated at 19. Each bit 18 is received at its edge opposite the beveled edge thereof in a corresponding groove 17 and is welded or otherwise firmly secured in the groove. At its end at the corresponding end of the tubular body each bit has an inwardly directed portion 20 which extends across the end of the corresponding tongue 15 and has at this end a rounded corner 21. With this construction the bits will cut away the material along the side surfaces of a hole into which the reamer is inserted as the reamer is forced into the hole and its bit carrying end expanded.

In the modified form of the invention illustrated in Figure 8, the construction is the same as that described above, except that the barrel section 11 is provided with three slits 22 spaced apart at substantially equal angular intervals of 120 degrees and providing three contiguous tongues 23. In this case, the bore of the barrel section within the tongues 23 is triangular in shape and each tongue is provided on its face disposed inwardly of the tubular member with a longitudinally extending guide rib 24. Two longitudinally extending grooves 25 are provided in the outer side of each tongue and open to the corresponding end of the corresponding barrel section and cutting bits 26 are secured, one in each of the grooves 25. This form of the inven-

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tion provides six cutting bits instead of the four cutting bits 15 illustrated in Figure 4, and the bore of the tubular section is triangular rather than square in cross sectional shape.

A flat tang structure 27 is secured to the end of the barrel section 13 opposite that to which the intermediate section 12 is secured, this tang having an elongated stem 28 received in the corresponding end of the barrel section 13 and firmly secured therein. The tang 27 is receivable in a socket 29 secured on one end of a screw threaded drill stem 30 and may be rotated by suitable means such as the handle 31 secured to the socket 29. The tang may be secured in the socket by a locking pin 32 extending through a hole in the socket and through an aperture 33 provided in the tang 27.

Near the end thereof receiving the tang 27 the section 13 is provided with two oppositely disposed, elongated slots 34 and 35 for a purpose to be presently described, and the bore of this section is noncircular, preferably square, in cross sectional shape.

The intermediate section 12 may conveniently comprise a piece of stock tubing of proper length, diameter and wall thickness and having a circular bore. This intermediate section has at its opposite ends screw threaded formations 36 and 37 which engage with complementary screw threaded formations on the adjacent ends of the end sections 11 and 13 respectively.

An elongated expander 38 is telescopically received in the section 11 and comprises an elongated shank 39 of substantially uniform diameter and an elongated head 40 which extends from one end of the shank substantially coaxially with the latter and is tapered from its larger end remote from the shank to its smaller end joined to the corresponding end of the shank. The shank is made in two pieces threaded together at their adjoining ends and a block 41 of a size and shape to fit the bore of the end section 13 is threaded onto the end of shank 39 opposite head 40.

In the form of the invention illustrated in Figure 4 the expander head 40 is of square cross sectional shape and has four flat faces each provided with a longitudinally extending groove 42 slidably receiving a corresponding guide rib 16.

In the form of the invention illustrated in Figure 8 the expander head 43 is triangular in cross sectional shape and is provided in each face thereof with a longitudinally extending groove 44 slidably receiving a corresponding guide rib 24.

Obviously, the number of tongues and the corresponding shape of the expander may be varied, as may be desired, within any reasonable limits.

The smaller end of the tapered expander head is of substantially the same size as the bore of the intermediate section 12 of the reamer barrel 10, but the larger end of the expander head 40 is materially larger than this bore so that when the expander is forced inwardly of the tubular member the free ends of the tongues 15 are forced outwardly relative to each other to expand the cutting end of the reamer barrel.

A cap 45 is rotatably secured on the larger end of the expander head 40 by suitable means, such as the screw 46 which extends through a bore in the cap and is threaded into a tapped hole in the larger end of the head. A scale 47 is provided along at least one side of one of the slots 34 or 35 and cooperates with the end of the block 41 to indicate the position of the expander head in the expandable section 11 of the reamer barrel

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and consequently the extent to which the cutting end of the reamer barrel has been expanded.

In using the reamer, a hole having a substantially uniform diameter which is the same as the diameter of a circle touching the cutting edges of the reamer blades 18 when the tongues 15 are in unexpanded condition is provided in the rock formation or masonry structure to which an anchor bolt is to be secured. The cutting end of the reamer is then inserted into the open end of this hole with the expander in the reamer barrel and the smaller end of the expander head 40 at the bit carrying end of the barrel section 11. The reamer is then moved into the hole until the cap 45 comes into contact with the bottom of the hole, as is clearly illustrated in Figure 1.

The reamer is then continuously rotated and progressively forced inwardly of the hole, forcing the expander head 40 inwardly of the bore between the free ends of the tongues 15. This movement of the expander head inwardly of the cutting end of the reamer barrel gradually expands the cutting end of the barrel as the reamer is forced inwardly of the hole to provide at the closed or bottom end of the hole a portion of inverted taper having its larger end at the bottom of the hole and its smaller end intermediate the length of the hole.

As the expander head is forced inwardly of the reamer barrel the shank 36 moves the block 41 along the slots 34 and 35 past the scale 47 and when the desired expansion of the cutting end of the reamer has been obtained, rotation and feeding of the reamer into the hole is discontinued.

In order to remove the reamer from the hole a triangular wedge is inserted through one of the slots 34 or 35 between the end of the expander shank block 41 and the adjacent end of the tang pin 28 and the wedge is tapped or otherwise forced inwardly to move the expander outwardly relative to the barrel 10. The cutting end of the barrel then moves along the tapered portion of the hole until it reaches the smaller end of the expander head at which time the reamer is fully contracted and may be withdrawn from the hole. The block 41 has a beveled end adjacent the tang pin 28 to facilitate entry of the wedge between the block and the tang pin and the block restrains the shank 39 against lateral movement in the bore of the reamer barrel.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are, therefore, intended to be embraced therein.

What is claimed is:

1. A reamer comprising an elongated tubular barrel having longitudinally extending slits angularly spaced therearound and extending from one end of said barrel to a location intermediate the length of the latter to provide a plurality of contiguous tongues terminating at said one end of the barrel, a tang structure secured to the other end of said barrel, guide ribs disposed one on the side of each tongue disposed inwardly of said barrel, at least one cutting bit secured to each tongue at said one end of the tubular member, said cutting bits being disposed

on the outer sides of said tongues and extending longitudinally of the latter, and an expander received in said tubular member and having a tapered head provided with grooves slidably receiving said guide ribs, said expander head being effective to expand the reamer by moving said tongues outwardly at said one end of the barrel when said expander is forced inwardly of the barrel.

2. A reamer comprising an elongated tubular barrel including a plurality of sections secured together in end to end relationship, one of said sections being formed of resilient material and having therein angularly spaced apart slits extending from one end to a location intermediate the length thereof to provide a plurality of contiguous tongues, at least one cutting bit secured to each tongue at said one end of said one barrel section, each of said bits extending longitudinally of the outer side of the corresponding tongue and projecting outwardly of the outer side and the free end of the tongue, a tang structure secured to the other end of said barrel, and an elongated expander received in said barrel and comprising an elongated shank, a tapered head extending from one end of said shank substantially coaxially therewith and having its end remote from said shank larger than its end joined to said shank, and a cap rotatably mounted on the larger end of said expander head, said expander head being disposed between said tongues at the free ends of the latter and effective to move the free ends of said tongues and said cutting bits outwardly as said head is forced inwardly of said tongues by pressure on said cap.

3. A reamer comprising an elongated tubular barrel having therein angularly spaced apart slits extending from one end of said barrel to a location intermediate the length of the latter to provide a plurality of contiguous tongues, at least one cutting bit secured to each tongue at said one end of the barrel, each of said bits extending longitudinally of the outer side of the corresponding tongue and projecting outwardly of the outer side and the free end of the tongue, a tang structure secured to the other end of said barrel, and an elongated expander received in said barrel and comprising an elongated shank, a tapered head extending from one end of said shank substantially coaxially therewith and having its end remote from said shank larger than its end joined to said shank, and a cap rotatably mounted on the larger end of said expander head, said tongues having flat sides disposed inwardly of the tubular member and said expander head having flat sides contacting the flat inner sides of said tongues.

4. A reamer comprising an elongated tubular barrel having therein angularly spaced apart slits extending from one end of said tubular member

to a location intermediate the length of the latter to provide a plurality of contiguous tongues, at least one cutting bit secured to each tongue at said one end of the barrel, each bit projecting outwardly of the outer side and the free end of the corresponding tongue, a tang structure secured to the other end of said barrel, and an elongated expander received in said barrel and comprising an elongated shank, a tapered head extending from one end of said shank substantially coaxially therewith and having its end remote from said shank larger than its end joined to said shank, and a cap rotatably mounted on the larger end of said expander head, said expander head being receivable between said tongues to expand the bit carrying end of said barrel, said barrel having oppositely disposed elongated slots therein adjacent said tang structure for the insertion of a wedge between said tang structure and the adjacent end of said expander shank to force said expander outwardly of said barrel.

5. A reamer comprising an elongated tubular barrel having therein angularly spaced apart slits extending from one end of said barrel to a location intermediate the length of the latter to provide a plurality of contiguous tongues, at least one cutting bit secured to each tongue at said one end of the barrel, each of said bits projecting outwardly of the outer side and the free end of the corresponding tongue, a tang structure secured to the other end of said barrel, and an elongated expander received in said barrel for expanding the bit carrying end of the latter, said expander comprising an elongated shank, a tapered head extending from one end of said shank substantially coaxially therewith and having its end remote from said shank larger than its end joined to said shank, and a cap rotatably mounted on the larger end of said expander head, said tubular member having oppositely disposed elongated slots therein adjacent said tang structure for the insertion of a wedge between said tang structure and the adjacent end of said expander shank to force said expander outwardly of said tubular member, and a scale disposed along one side of one of said slots for indicating the position of said expander relative to said tubular member.

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