May 29, 1956 C. S. KYSER 2,747,440

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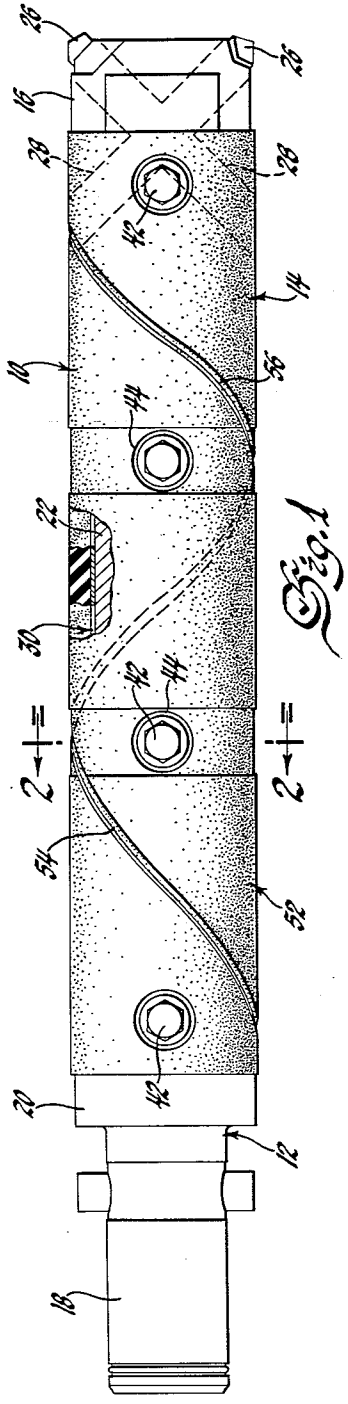


Fig. 1

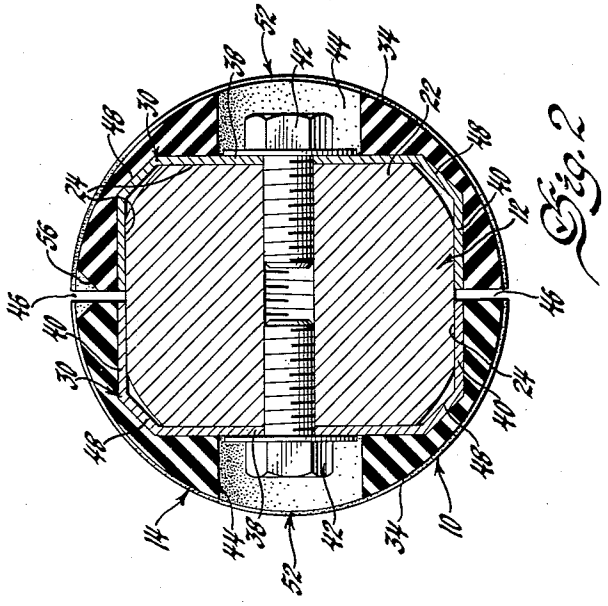


Fig. 2

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The present invention relates to reaming means and more particularly to means for reaming the interior surface of gun barrels and other tubular members requiring precision finishing of the interior surface.

In order to provide the interior of a tubular member such as a gun barrel with a surface having a finish of the required quality, it is necessary to employ a reamer of this type in the rough and finish stages of the machining process. In the past it has been extremely difficult to perform this operation with the required degree of accuracy particularly in bores having a large length to diameter ratio. As the machining operation proceeds longitudinally of the bore, the reamer may become out of axial alignment which will result in a curved bore. In order to maintain axial alignment, numerous attempts have been made to devise a satisfactory reamer which employs an elongated "pack." These packs are rigidly secured to the shank of the reamer so as to rotate therewith. Due to the length of the pack, the reamer will be maintained in alignment. To allow the pack to fit tightly in the bore but still rotate, they are generally made of wood, Babbitt metal or some other suitable bearing material. Although this has tended to increase the accuracy of the reamer, such packs are heavy and produce a great deal of friction. The friction not only results in excessive wearing of the pack but also in generating excessive amounts of heat during the reaming operation. As a result of the rapid wearing, the pack quickly becomes a loose fit in the bore and has to be replaced. Reamers have been devised which employ resilient means for maintaining the pack in tight contact with the barrel. However, these packs have a discontinuous surface and therefore suffer from having a limited amount of the pack in contact with the surface of the bore. Moreover, the resilient construction allows "chatter" to develop during the reaming operation which results in a non-circular bore.

It is therefore proposed to provide a reamer having a substantially continuous cylindrical pack which is adapted to resiliently engage the machined surface of the bore at all times. The reamer employs a pair of rigid members, each of which has a resilient member bonded to the exterior thereof. The resilient members are shaped to form a substantially continuous cylindrical surface which is compressed in the bore of a gun barrel to thereby maintain the reamer in accurate alignment at all times.

In the drawings:

Figure 1 is a side elevational view of a reamer embodying the present invention, a portion thereof being broken away.

Figure 2 is a cross-sectional view taken substantially along the plane of line 2—2 of Figure 1.

Referring to the drawings in more detail, a reamer **10** which is adapted to ream the bore of a gun barrel includes a frame **12** fabricated from metal or any other suitable material. A pack **14** embracing the present invention is rigidly mounted on the frame **12**. The pack **14** is positioned between tool holding means **16** on one end of the frame **12** and a tank **18** on the other end.

The frame **12** has a cylindrical collar **20** intermediate the ends thereof. The tank **18** is positioned adjacent the collar **20** and projects outwardly to be locked in a rotating member suitable for driving the reamer **10**. The frame **12** has a shank **22** that is disposed on the opposite side of the collar **20** from the tank **18**. Although the shank **22** may be of any desired shape, the present embodiment employs a shank having flat sides **24** that form a substantially rectangular cross-section. The tool holding means **16** for retaining a set of bits **26** in position include a pair of diagonally disposed passages **28**. The passages **28** are adjacent the outer end of the shank **22** and have set screws or other retaining means which permit easy removal or adjustment of the bits **26**. The outer ends of the bits **26** are provided with cutting edges suitable for reaming or otherwise machining the interior surface of a tubular member such as a gun barrel.

The pack **14** which is secured to the frame **12** includes a pair of rigid members **30** and a pair of resilient members **34**. Each of the rigid members **30** have a base **38** with a pair of parallel arms **40** positioned substantially normal to the base **38**. The rigid members **30** may be secured to the frame **12** so as to embrace approximately one half of the shank **22**. Thus when both of the members **30** are in position, they form a box-like structure which completely encloses the shank **22**. It is desirable that the rigid members **30** be small enough to be a "squeeze fit" on the shank **22**. If the bases **38** and arms **40** of the rigid members **30** bear directly against the flat sides **24**, the rigid members **30** will be reinforced by the shank **22** and the pack **14** will maintain its desired shape at all times.

The pair of resilient members **34**, which may be fabricated from an elastic material that is resiliently compressible, is bonded to the exterior of the rigid members **30** by any suitable means such as vulcanizing. Since the exterior of the pack **14** formed by the resilient members **34** must be in sliding contact with the surface of the bore, the elastomer employed must create a minimum amount of sliding friction and be capable of immersion in lubricating fluids. The elastomer 2-chloro-1,3 butadiene, commercially available under the trade name of neoprene, has been found to be well adapted for this use. It is preferable when molding and bonding the resilient members **34** onto the rigid members **30** to make the resilient members **34** larger than required and then grind them to the desired size. To secure the pack **14** to the frame **12**, a plurality of bolts **42** are countersunk into the resilient members **34** and threadably engage the shank **22**. The bolts **42** are countersunk by means of openings **44** that extend completely through the resilient members **34**. This allows the heads of the bolts **42** to act directly on the rigid members **30** and draw the rigid members **30** tightly onto the shank **22**. A small mechanical clearance **46** may be provided between the arms **40** of the rigid members **30** and the ends of the resilient members **34** to eliminate any interference when the bases **38** engage the sides **24** of the shank **22**. It should be noted that by beveling the corners **48** of the shank **22** and the rigid members **30**, the thickness of the resilient members **34** may be increased in the vicinity of the corners **48**. It will be observed that the exterior of the resilient members **34** form a substantially continuous or unbroken cylindrical surface **52** which can not be distorted into an out-of-round shape as it slidably engages the surface of the bore.

The life of the reamer **10** may be greatly increased and the operation thereof made considerably easier by means of lubrication. To insure an adequate delivery of lubricants to the surface of the resilient members **34**, a lubricating passage **54** may be provided in one or more of the members. In the present instance this passage **54** comprises a helical groove or channel **56** that is recessed in the cylindrical surface **52**. It will be observed that

lubricating oils may flow axially of the pack **14** through the clearance space **46** between the resilient members **34** and into the helical groove **56**. The combination of rotation and the shape of the helix will cause the lubricants to flow through the groove **56**. As the reaming operation progresses through the bore, the helical groove **56** will be in wiping contact with the gun barrel, and the lubricants will flow axially of the pack **16**. This will maintain a film of lubricants between the resilient members **34** and the gun barrel at all times.

To utilize the reamer **10**, the rigid members **30**, with the resilient members **34** bonded thereto, are secured to the shank **22** of the frame **12** and the bits **26** are adjusted to provide the desired cutting action. The resilient members **34** are then ground or otherwise formed to the desired shape. It is desirable that the normal or uncompressed diameter of the pack **14** be greater than the diameter of the cutting circle of the bits **26**. Thus when the pack **14** is in the bore, the resilient members **34** will be compressed to act like a solid. This will maintain the reamer **10** in alignment at all times, but it will not interfere with the operation of the reamer. The reamer **10** and gun barrel are then placed in a lathe or other machine suitable for supplying the power for rotating the gun tube. The reamer is then started in one end of the bore as the tube rotates. As the tube rotates, the reamer is advanced through the bore thus machining the interior surface of the bore.

While but one embodiment has been illustrated and described, it will be apparent to anyone skilled in the art that the invention may be embodied in numerous other specific forms than that described without departing from the spirit thereof. It is, therefore, desired that the present embodiment be considered in all respects illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to determine the scope of the invention.

What is claimed is:

1. Tube reaming means comprising a frame adapted to engage a rotating drive member, a shank on said frame having one end thereof adapted to support tool means, said shank having planular surfaces thereon, a pair of rigid members having parallel arms thereon adapted to embrace said shank and engage said planular surfaces, a semi-cylindrical resilient member bonded to each of said rigid members, the exterior of said resilient members being shaped to form a substantially unbroken cylindrical surface when said rigid members are secured to said shank, said cylindrical surface being adapted to rotate with said tool means.

2. Tube reaming means comprising a frame member adapted to engage a rotating drive member, a shank on said frame having one end thereof adapted to support tool means and having planular surfaces thereon, a pair of rigid members having parallel arms thereon adapted to embrace said shank and engage said planular surfaces, a semi-cylindrical resilient member bonded to each of said rigid members, said resilient members having countersunk openings therethrough communicating with said rigid members, and bolt means engaging said rigid members and being disposed in said countersunk openings to secure said rigid members on said shank and the exterior of said resilient members forming a substantially unbroken cylindrical surface when said rigid members are secured to said shank.

3. Tube reaming means comprising a frame member adapted to engage a rotating drive member, a shank on said frame having one end thereof adapted to support tool means, a pair of rigid members having arms thereon adapted to embrace said shank, a pair of semi-cylindrical resilient members having the ends thereof disposed adjacent said tool means, each of said resilient members being bonded to one of said rigid members, bolt means countersunk in said resilient members to secure said rigid members to said shank for rotation with said tool means, the exterior of said resilient members forming a substantially continuous cylindrical surface when said rigid members are secured to said shank, and a recessed groove positioned on said cylindrical surface to form a helical passage extending axially along said cylindrical surface.

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