

June 11, 1946.

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 DRIVE FOR THREADED BARS  
 Filed Aug. 25, 1941

2,401,757

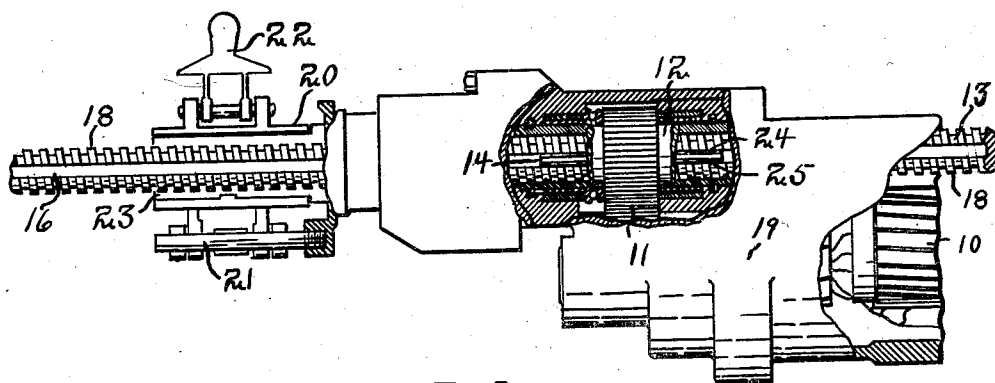


FIG. 1.

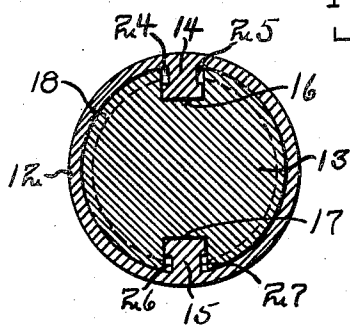


FIG. 2.

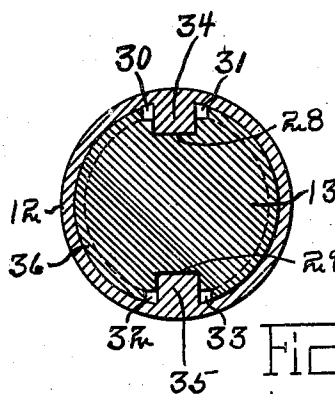


FIG. 3.

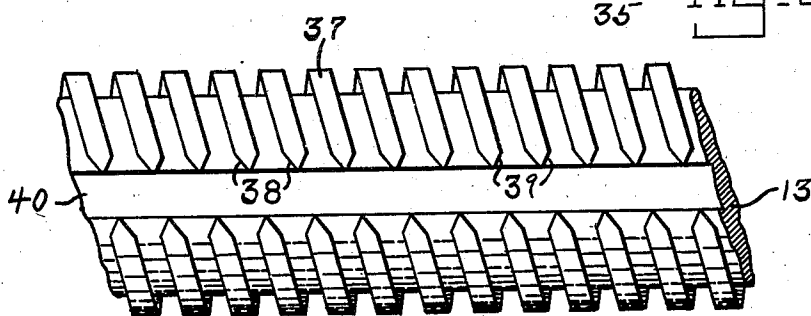


FIG. 4.

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## UNITED STATES PATENT OFFICE

2,401,757

## DRIVE FOR THREADED BARS

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Application August 25, 1941, Serial No. 408,220

13 Claims. (Cl. 74-459)

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This invention relates to driven shafts; more particularly it is concerned with rotatingly driven, longitudinally advancing shafts.

In the process of breaking loose the material being removed in mines, quarries, and the like it is customary to drill holes into the walls of the un-mined material. The most satisfactory equipment for such drilling consists of a suitable support carrying a prime mover operatively connected to an internally splined sleeve in which an elongated thread bar is received. The thread bar is provided with longitudinally extending channels or key-ways for engaging the splines of the aforesaid sleeve and a stationary drive or feed nut engages the threaded shaft or bar to propel the same longitudinally. The operative end of the thread bar is provided with a suitable drill point. When the wall of a closed mine is being drilled it is common practice to use as a supporting member a substantially vertical pipe or bar of such length that it presses firmly against both the ceiling and the floor of the mine or against suitable filler members placed between its upper or lower end and the ceiling or floor as the case may be. The vertical pipe or bar thus positioned serves as a rigid and rugged pillar upon which the drilling mechanism is mounted. Normally the prime mover is an electric motor and is connected to the splined sleeve, which drives the thread bar, by means of a speed-reducing gear train. Commonly a housing structure encloses the prime mover, the gear train, the splined sleeve, and the adjacent portion of the thread bar. It is this housing structure which is usually mounted directly upon the above described upright pillar by means of suitable adjustable and detachable attachments. The housing is of course so mounted upon the supporting pillar that the thread bar is disposed in a substantially horizontal plane. The feed nut above referred to is normally stationarily mounted at the forward end of the housing by means of a suitable split casting into which it is detachably secured. Rotation of the splined sleeve by the prime mover causes rotation of the thread bar causing the normal circular drilling motion. Due to its engagement with the feed nut the thread bar also moves forward as it rotates.

In the mechanisms presently in use and in those heretofore known it has been necessary to replace the feed nut driving the thread bar at frequent intervals for the same becomes so worn in a short time that it will not serve its purpose. The cause for the undue wear upon the feed nut has been undesirable burrs on the thread bar resulting from engagement of the bar with

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the splines of the sleeve. The thread bar is usually provided with at least two channel or key-ways extending along its length for engagement with the splines of the splined sleeve with the result that each complete turn of the thread is severed at two junctures by the said longitudinal channels so that the thread about the thread bar does not at any point extend continuously for more than somewhat less than one-half turn. Each end of each thread segment forms a portion of the side walls of a key-way for one of the aforesaid splines. In rotating the thread bar the splines necessarily press very severely against one of the side walls of each keyway and since that portion of the side wall which is formed by the ends of the thread segments is much weaker than the remainder of the wall due to the lesser amount of metal present there, a spline pressing against a given sidewall deforms that portion thereof made up by the thread ends, forcing these thread ends inwardly and causing a part of the displaced metal to form projections or burrs extending outwardly from the true circumference of the thread bar adjacent the ends of the thread segments. It is these burrs which act as a tap to chew into the feed nut until it is no longer serviceable.

It is an object of this invention to provide an improved thread bar.

Another object of this invention is to provide a thread bar in which no substantial amount of burrs which radiate from its true circumference are produced by its engagement with propelling splines.

Another object of this invention is to provide an improved splined sleeve.

Yet another object of this invention is to provide a splined sleeve which does not cause undesirable burrs which project from the outer surface of a thread bar which it engages.

Another object of this invention is to provide a novel method for rotating a thread bar.

Yet another object of this invention is to provide a novel construction for a power sleeve-thread bar combination.

A still further object of this invention is to provide novel methods for forming a thread bar.

It is an additional object of this invention to provide a novel method for forming a splined sleeve.

Broadly my invention consists in a splined power sleeve-channelled thread bar construction in which the splines of the sleeve do not engage the end portions of the thread segments of the thread bar to any substantial extent or at least

do not engage a sufficient amount thereof or do not engage them to such an extent that burrs are formed on the outer periphery of the thread bar by metal displaced from the ends of the thread segments. Clearly the widths of the splines on the sleeve are not material to my invention nor is it important whether the sleeve or the thread bar be considered to carry the splines. Several embodiments of my invention are possible. I may shorten the thread segments so that they do not border the main side walls of the channels of the thread bar or I may form indentations or recesses in the splines along their length on each side thereof adjacent their bases. Again I may reduce the ends of the thread segments so that only a very small portion of each thread end forms any part of those portions of the walls of the channels of the thread bar which the splines engage. Two or more of these modifications may also be used together.

In order that a more clear and concise understanding of my invention may be had reference should be made to the accompanying drawing forming a part of this specification in which

Fig. 1 is a side elevational view of equipment including one embodiment of my invention, portions being broken away in order to more clearly reveal the construction.

Fig. 2 is an enlarged cross-sectional view of the power sleeve and thread bar shown in Fig. 1.

Fig. 3 is an enlarged cross-sectional view of a power sleeve and thread bar illustrating another embodiment of my invention.

Fig. 4 is a fragmentary view of a thread bar incorporating yet another form of my invention.

Referring more specifically to Fig. 1 of the drawing I have used the numeral 10 to designate a prime mover which through a suitable gear train, not shown, drives the gear collar 11 locked to the sleeve 12 which receives the thread bar 13. Splines 14 and 15 are provided on the inner wall of the sleeve 12 for engagement with the key-ways or channels 16 and 17 on the thread bar 13. The key-ways 16 and 17 divide the thread of the thread bar into a multiplicity of thread segments which are designated herein by the reference character 18. Suitable bearing structure for the splined sleeve 12 is provided in the housing structure 19 which serves also to enclose the prime mover 10, a portion of the thread bar 13, the gear train, and other members not concerned by my invention. At the forward end of the housing 19 is a split casting 20 each half of which is pivotally mounted upon the pintle 21 which is operatively and stationarily connected to the housing 19. A latch 22 is provided for detachably maintaining together the two halves of the split casting 20. Within the casting 20 in operative engagement with the thread bar 13 is the split feed nut 23 each half of which is detachably connected to a half of the split casting 20. By releasing the latch 22 and swinging the sections of the casting 20 apart on the pintle 21 the sections of the feed nut 23 may be removed from the casting 20. The sections of the feed nut 23 are normally detachably retained in position in the casting 20 by means of two plow bolts, not shown, extending outwardly from a boss provided on each half of the feed nut for receiving the heads of said plow bolts and for holding the same against rotation while nuts are being applied to the outer ends of said bolts.

As appears clearly in Fig. 2 the splines 14 and 15 are provided with insets or recesses 24 and 25, and 26 and 27 respectively along their

lengths adjacent the splined sleeve 12. The insets 24, 25, 26, and 27 extend inwardly from the inner wall of the sleeve 12 a distance preferably at least as great as the depth of the threads on the particular thread bar being driven by said splined sleeve. While it is obvious that there is normally no need for more than one inset such as the insets 24, 25, 26, and 27 on each spline, the side of the spline on which it should be stationed depending upon the direction in which the sleeve is being rotated, yet it is preferable to provide these insets on each side of each spline in order that the sleeve may be reversed and to eliminate the necessity for caution in assembly. By this construction the splines are maintained in a spaced relationship to the ends of the thread segments of the thread bar.

In the embodiment of my invention shown in Fig. 3 the thread bar 13 is provided with channels or key-ways 28 and 29, for receiving the driving splines, which are broadened or widened adjacent the surface of the thread bar to form indentations 30, 31, 32, and 33 extending along the length of the thread bar and the channels 28 and 29 or at least along those portions of the length thereof which are at times engaged by the splines 34 and 35 of the sleeve 12. In this embodiment, the sidewalls of the splines 34 and 35 are not inset at their bases as are the splines 14 and 15 in Figs. 1 and 2. Of course they may be inset as in Figs. 1 and 2 if such is desired but that is not normally necessary for the indentations 30, 31, 32, and 33 are preferably of substantially the same depth as are the threads of the thread bar so that only the portions of the channels 28 and 29 which are further below the surface of the thread bar than are the bases of the thread segments 36, engage the driving splines of the sleeve 12. In other words the indentations 30, 31, 32 and 33 are caused by the fact that the thread segments 36 do not extend the entire distance between the channels 28 and 29 but rather each of their ends fails to reach to said channels. By this construction the ends of the thread segments 36 are maintained in spaced relationship to the splines 34 and 35 of the sleeve 12. If desired, instead of the indentations 30, 31, 32, and 33 being so formed that the ends of the thread segments form right angles with the thread bar, the ends of the thread segments may be simply bevelled toward the operative portions of the channels 28 and 29.

The species of my invention illustrated in Fig. 4 incorporates thread segments 37 having their end portions tapered toward the transverse centers of said thread segments as at 38 and 39. In this construction only a very small portion of each thread segment reaches the channel 40 so while the power splines do engage the ends of the thread segments somewhat the amount of metal present at each extreme end of each thread segment is not sufficient to cause burrs of such size as to be materially destructive to the feed nut. If desired the thread segment ends in Fig. 4 may also be bevelled toward the channel 40.

It is obvious that the various embodiments of my invention as described herein may all be incorporated in a single construction or that any two of them may be. The thread segments may be short at each end as in Fig. 3 and tapers as in Fig. 4 may be provided on the truncated ends of the thread segments. The form shown in Fig. 4 may clearly be employed with that shown in Figs. 1 and 2.

It is preferable that the indentations 30, 31, 32

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and 33 shown in Fig. 3 should be of a depth at least as great as that of the threads on the thread bar. However, such is not essential to a reasonably satisfactory functioning of my device for although only the outer portion of the extreme ends of the thread segments is eliminated space is thereby provided, within the outer circumference of the thread bar, for receiving and housing the burrs formed by the power splines on the inner portions of the ends of the thread segments. Similarly it is not absolutely necessary that the insets 24, 25, 26, and 27 be of a depth equal to that of the thread bar. They may be either lesser or greater in depth. Again the tapers in Fig. 4 need not bring the ends of the thread segments to sharp edges or points. The shapes of the insets 24, 25, 26, and 27 of the indentations 30, 31, 32, and 33, and of the end portions of the thread segments in Fig. 4 are immaterial. For example, any of these may be annular or their angles may be widely varied. If in any instance it is desirable that the members be of the same design or appearance as those presently in use, the portions which I have eliminated in my novel constructions may be fabricated from comparatively soft material instead of being dispensed with completely.

In preparing my novel splined sleeve as shown in Figs. 1 and 2 I first prepare the sleeve with the straight sidewalled splines in the usual manner and then subsequently mill the splines to the desired shape. When forming my novel thread bar I prepare a bar with threads in the well known manner and then if I wish such a bar as that shown in Fig. 3 I proceed to mill into this threaded bar which I have formed the desired number of elongated channels having broadened courses in their outer portions. If I wish a bar such as that shown in Fig. 4, I first mill elongated, substantially straight walled channels into the threaded bar which I have prepared and then proceed to mill away portions of the ends of the thread segments.

My invention includes constructions other than those described in detail for illustration, which are adapted for maintaining the power splines and the ends of the thread segments in spaced relationship to one another or in such controlled engagement with one another that no burrs are formed which project from the outer periphery of the thread bar or which obstruct the troughs between the thread segments, or in such controlled engagement that any such burrs formed are of such inconsequential size as to not subject the feed nut to very substantial excessive wear.

My novel method for driving a thread bar by a splined sleeve consists in applying nearly all, if not all, of the transmitted power to portions of the thread bar materially inside of the outer periphery thereof.

It is clear that the number of splines and spline channels or keyways employed is immaterial to my invention, and of course a portion of the full ends of the thread segments may engage the splines if a less effective device is satisfactory. My invention may be employed in any construction where a channeled thread bar is rotated by a splined sleeve or vice versa and is by no means limited to drills or mining equipment.

"Sleeve" as used in the ensuing claims is intended to include any device adapted to perform substantially the functions of the sleeve 12.

I have described certain aspects of my invention at length for the purpose of explanation. It is obvious, however, that one skilled in the art

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will be able to make modifications and alterations in the precise details described and this without departing from the spirit and scope of my invention. Also my invention has other applications than those to which I have specifically referred. I wish therefore to be limited herein only by the appended claims.

I claim:

1. In combination a thread bar, a sleeve about a portion of said thread bar, spline and channel structure on the adjacent faces of said thread bar and sleeve, and longitudinally extending indentation structure in at least one side wall of the channel structure adjacent the outer portions thereof.

2. In combination a thread bar, a sleeve about a portion of said thread bar, spline and channel structure on the adjacent faces of said thread bar and sleeve, and inset structure in the spline structure adjacent the anchor juncture thereof.

3. In a thread bar having longitudinally extending channel structure, indentation structure in at least one side wall of said channel structure adjacent the outer portions thereof.

4. In a sleeve having spline structure upon its inner periphery inset structure in said spline structure adjacent the sleeve.

5. In combination a thread bar comprising a multiplicity of thread segments with longitudinally extending channel structure disposed between ends of said thread segments, a sleeve about a portion of said thread bar and a spline on the inner periphery of said sleeve adapted to engage said channel structure and having inset structure in one of its longitudinal side walls at a position which is in substantial alignment with ends of those of said thread segments which said sleeve happens to embrace at the moment.

6. In combination a thread bar comprising a multiplicity of thread segments with longitudinally extending channel structure disposed between ends of said thread segments, a sleeve about a portion of said thread bar and a spline on the inner periphery of said sleeve adapted to engage said channel structure and having inset structure in both of its longitudinal side walls at positions which are in substantial alignment with ends of those of said thread segments which said sleeve happens to embrace at the moment.

7. In combination a thread bar comprising a multiplicity of thread segments with longitudinally extending channel structure disposed between ends of said thread segments, a sleeve about a portion of said thread bar and a plurality of splines on the inner periphery of said sleeve adapted to engage said channel structure and each having inset structure in at least one of its longitudinal sidewalls at a position which is in substantial alignment with ends of said thread segments which said sleeve happens to embrace at the moment.

8. In combination a thread bar comprising a multiplicity of thread segments with longitudinally extending channel structure disposed between ends of said thread segments, a sleeve about a portion of said thread bar and a plurality of splines on the inner periphery of said sleeve adapted to engage said channel structure and each having inset structure in both of its longitudinal sidewalls at positions which are in substantial alignment with ends of those of said thread segments which said sleeve happens to embrace at the moment.

9. In combination a thread bar comprising a

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multiplicity of thread segments with longitudinally extending channel structure disposed between ends of said thread segments, a sleeve about a portion of said thread bar and spline structure adapted to co-act with said channel structure, said spline structure being inset at a position which is in substantial alignment with ends of said thread segments.

10. In combination a thread bar having longitudinally extending channel structure, a sleeve about a portion of said thread bar, and spline structure on the inner periphery of said sleeve adapted to operatively engage said channel structure and being reduced in cross sectional breadth at a place which is in substantial alignment with those of said threads of said thread bar which said sleeve happens to embrace at the moment.

11. In a device of the type described a thread bar having a multiplicity of thread segments and a longitudinally extending drive portion disposed between ends of said thread segments and means for rotating said thread bar including a member having a bearing contact with said lon-

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gitudinally extending drive portion said member being reduced in size in a portion which is in substantial alignment with ends of said thread segments.

12. In a device of the type described a thread bar having a multiplicity of thread segments and a longitudinally extending drive portion disposed between ends of said thread segments, said ends of the thread segments being approximately parallel to radii of said thread bar which intersect substantially the longitudinally disposed center of said drive portion and means for rotating said thread bar including a member having driving contact therewith the construction being such that said latter member engages only portions of said thread bar other than the said thread segment ends.

13. In an internally splined sleeve for a device of the type described, spline structure which, adjacent said sleeve, is reduced in cross sectional breadth relative to portions of it which are spaced further from said sleeve.

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