Sept. 16, 1941. A. STOLL 2,256,269

THREAD ROLLING DIE

Original Filed Dec. 4, 1936 2 Sheets-Sheet 1

Fig. 1.

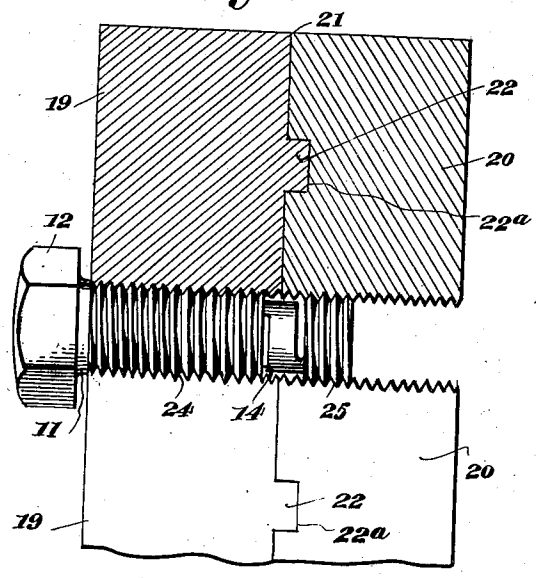

Fig. 2.

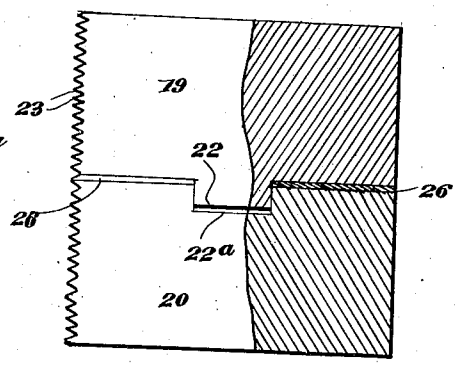

Fig. 3.

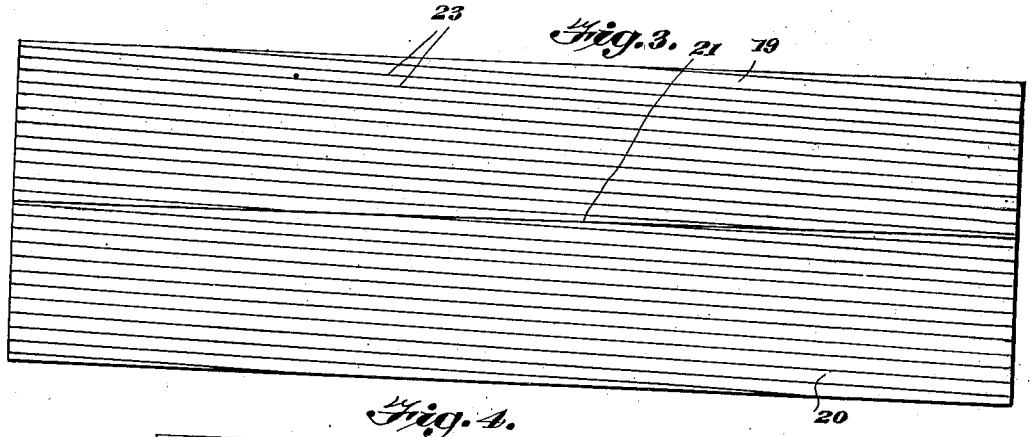

Fig. 4.

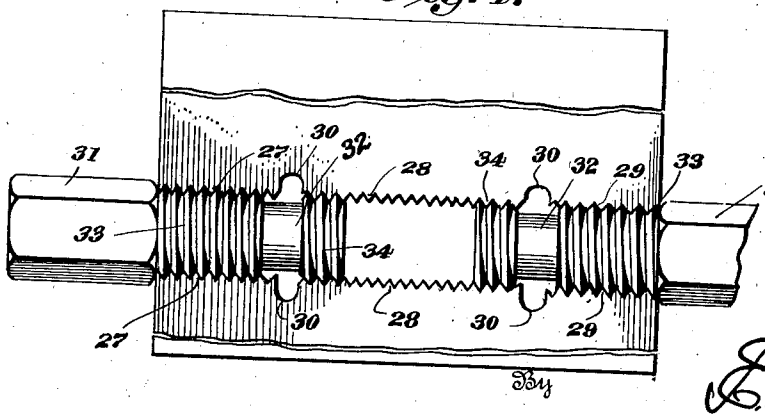

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Fig. 5.

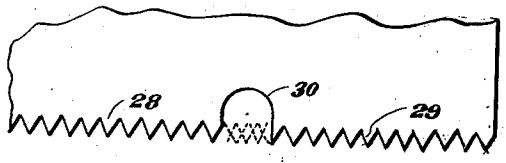


Fig. 6.

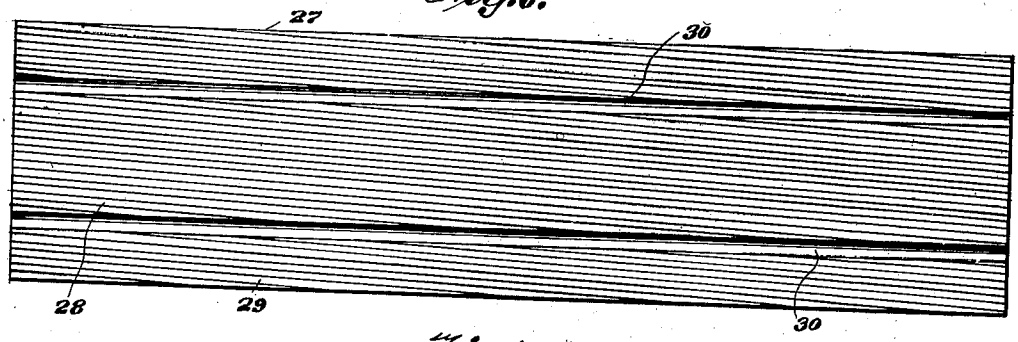


Fig. 7.

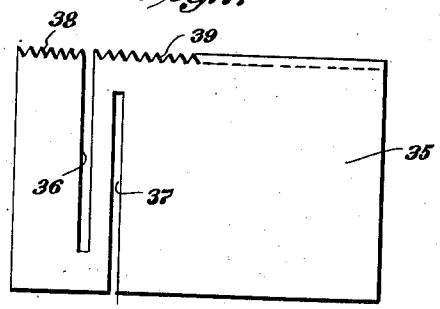
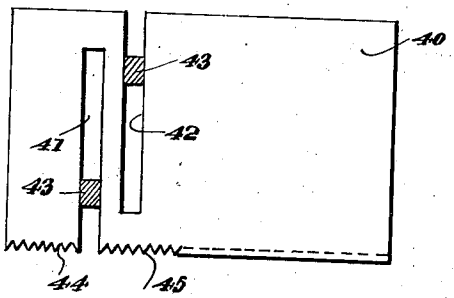


Fig. 8.



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UNITED STATES PATENT OFFICE

2,256,269

THREAD ROLLING DIE

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Original applications December 4, 1936, Serial No. 114,259, and January 27, 1937, Serial No. 122,629. Divided and this application August 3, 1937, Serial No. 157,195

4 Claims. (Cl. 80—9)

This invention relates to die apparatus for making self-locking screw-threaded elements. The present application constitutes a division of my prior copending applications, Serial No. 114,259, filed December 4, 1936, and Serial No. 122,629, filed January 27, 1937.

Self-locking screw-threaded elements, for example, valve tappet adjusting screws, are sometimes formed by providing two spaced threaded portions connected by a resilient portion whereof the threads of each are relatively offset in an axial direction. By this construction, insertion of the element in the threaded bore of a receiving member, such as a valve tappet bore or other device, places the resilient connecting portion under tension and locks the element in place against accidental displacement. The formation of screw-threaded elements of this character presents a difficult problem, particularly in the formation of the threads to produce the desired axial offset necessary to secure self-locking.

An object of the present invention is to provide a novel die apparatus for rolling offset screw threads on spaced threaded portions of screw-threaded elements.

Other objects and advantages will be apparent from the description.

While the present disclosure constitutes an exposition of embodiments by which the invention may be reduced to practice, it is to be understood that the same may be varied as desired within limits not inconsistent with the scope of the invention as claimed.

In the accompanying drawings which form a part of this specification and wherein like characters of reference denote like parts throughout the several views:—

Figure 1 is substantially an end elevation of a pair of dies in thread forming engagement with a screw blank, the upper die being shown in section.

Figure 2 is an end elevation of one of the dies as provided with spacer means for producing a desired thread offset, a portion being shown in section.

Figure 3 is a face plan view of a finished die as ready for use.

Figure 4 is an end elevation of an alternative embodiment of a pair of thread rolling dies for simultaneously rolling opposed pairs of blanks, as operatively engaged with such blanks.

Figure 5 is a fragmentary end elevation of one of the dies of Figure 4, illustrating by dotted line prolongation the offset of the adjacent thread forming portions.

Figure 6 is a face plan view of one of the dies of Figure 4.

Figure 7 is an end elevation of a further alternative embodiment of die.

Figure 8 is an end elevation of still another alternative embodiment of die, as provided with offsetting spacer means.

In the embodiment illustrated in Figures 1 to 3 each die is of compound construction, consisting of two parts 19 and 20, between which the dividing line 21 extends longitudinally of the die from end to end. Die part 19 is provided with a central longitudinal key rib or tongue 22 which fits in a longitudinal groove 22a in the meeting surface of die part 20 to maintain the die parts in parallel relation to each other. The faces of the two parts are provided with inclined serrations 23 which produce the screw thread in a rolling operation.

As shown in Figure 1, the dies are employed in pairs to roll threads 24 and 25 on a blank 11, headed as at 12, the threaded portions 24 and 25 being spaced axially of the blank by a circumferentially undercut unthreaded portion having slots 14 by which resiliency is imparted thereto, the threads 24 and 25 being staggered relative to each other by virtue of an axial offsetting.

In order to produce the desired axial offset in the screw thread when rolled on the blank the serrations 23 of the die part 19 are offset or staggered relative to the serrations 23 of the die part 20, as seen in Figure 3, so that when a blank is placed between a pair of such dies the threads 24 on the screw are formed by the serrations of the die parts 19 while the threads 25 on the leading end of the screw are formed by the serrations of the die parts 20.

The serrations 23 on the die parts 19 and 20 are of the same depth and pitch so that the threads 24 and 25 on the finished screw will have the same depth and pitch and will mesh with the threads of the element with which they engage in service, such as a tappet or socket having uniform and continuous threads. When the axially offset threads 24 and 25 engage such uniform and continuous threads the slotted resilient portion is distorted and consequently forces the threads 24 and 25 into frictional locking engagement with the threads of the tappet or socket.

As shown in Figure 2, the die parts 19 and 20 are assembled with spacers or shims 26 placed therebetween before the serrations 23 are cut into the die faces, the thickness of such spacing means determining the amount of axial stagger or offset in the serrations of the two die parts. The

serrations are then cut in the die faces in a single operation, as by a hob or the like, the method of cutting being disclosed in my copending application entitled Method of forming thread rolling dies, filed concurrently herewith.

After the serrations **23** are formed the spacers **26** are removed and the die parts heat treated for hardening. They are then assembled as shown in Figures 1 and 3, without the spacers, which results in the serrations of die part **19** being staggered or offset with respect to the serrations of die part **20**, as seen in Figure 3.

In the embodiment illustrated in Figures 4, 5 and 6 each die is of integral construction, having a plurality of thread forming face portions **27**, **28** and **29** comprising zones or bands disposed longitudinally of the die in parallel relation and spaced apart transversely of the die by defined areas **30**, each of which is incapable of formative engagement with a blank being rolled. These areas **30** are devoid of thread forming serrations and they may be provided in various ways as by gaps or plane surfaces. In the illustrated embodiment they constitute gaps, preferably formed by longitudinally grooving the die faces to an appropriate depth. The gaps are so located that when blanks **31** are engaged between a pair of the dies, as in Figure 4, they register with the undercut portions **32** of the blanks.

The thread forming serrations **27**, **28** and **29** on the respective die face portions are each offset with respect to those of the adjacent thread forming portion on the same die, so that on completion of a thread rolling operation each blank will have its threaded shank portions **33** and **34** formed with threads of the same pitch diameter and pitch but the threads on one portion will be offset axially of the blank relative to the threads on the other portion.

It should here be stated that due to the offset relationship of the threaded portions **33** and **34** an axial stress will be set up in the body of the screw as it is threaded home in a female member, whereby the reduced spacing portion **32** will be placed under tension, thus providing a highly effective self-locking means. The degree of tension varies with the amount of thread offset, so that any desired tension may be obtained.

The method of forming the serrations in the portions **27**, **28** and **29**, and of offsetting them, is disclosed in my aforesaid concurrently filed copending application entitled Method of forming thread rolling dies.

Also embodied in said application is a disclosure of the method employed in securing the desired thread forming offset in the alternative embodiments of dies shown in Figures 7 and 8.

In the form illustrated in Figure 7 the die **35** is formed with a pair of overlapping closely adjacent parallel slots **36** and **37** perpendicular to the die faces. The slot **36** opens to the working face of the die and extends nearly to its opposite face while the slot **37** opens to the die face opposite its working face and extends toward the working face. The slots are of equal length and extend longitudinally of the die for its full length, opening to its ends. In this embodiment the slots provide the gaps separating the thread forming face portions **38** and **39** on which the thread forming serrations are mutually offset.

The die **40** shown in Figure 8 is similar to the die of Figure 7, being likewise provided with slots **41** and **42** similar to the slots **36** and **37** except that they are of greater width due to the expanding action of spacer members **43** engaged in the slots to cause a transverse expansion of the die body which results in offsetting the thread serrations on the die face portions **44** and **45**.

Having thus described the invention, what is claimed is:

1. A thread rolling die for producing axially offset threads on spaced portions of a blank, comprising a one-piece die member having a plurality of thread forming face portions in spaced relation, each said face portion having thread forming serrations of equal pitch and form offset with respect to the thread forming serrations of the next adjacent face portion.

2. A thread rolling die for producing axially offset threads on spaced portions of a blank, comprising a one-piece die member having a longitudinal groove defining spaced parallel thread forming face portions, each said face portion having thread forming serrations of equal pitch and form offset with respect to the thread forming serrations of the next adjacent face portion.

3. A thread rolling die for producing axially offset threads on spaced portions of a blank, comprising a one-piece die member having a plurailty of thread forming face portions in spaced relation, each said face portion having thread forming serrations of equal pitch and form offset with respect to the thread forming serrations of the next adjacent face portion, and means for adjusting the spacing of said face portions to vary the offset of the thread forming serrations.

4. A thread rolling die for producing a self-locking screw with axially offset threads, comprising a one-piece body having a working face provided with thread forming serrations of equal pitch and form arranged as a plurality of spaced parallel zones, the body being cut away between said zones to provide the spacing therefor, and the serrations of each zone being offset relative to the serrations of the adjacent zones.

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