July 17, 1962 H. F. SEIBERT 3,044,329

APPARATUS FOR MULTI-DIAMETER THREAD ROLLING

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FIG. 1

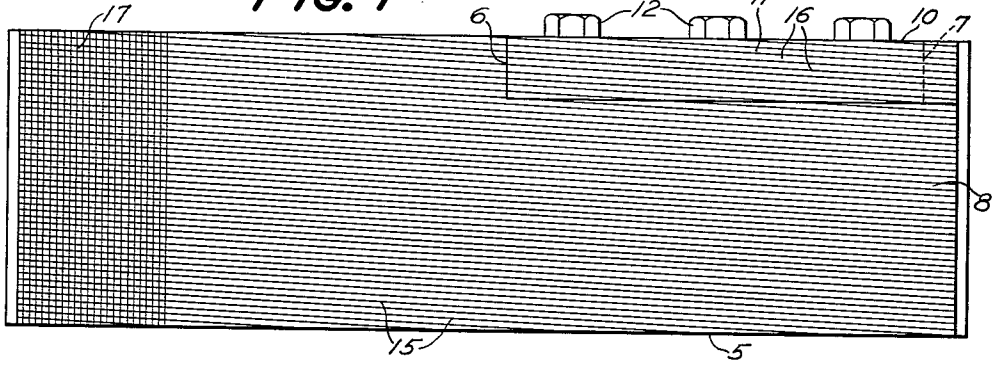


FIG. 2

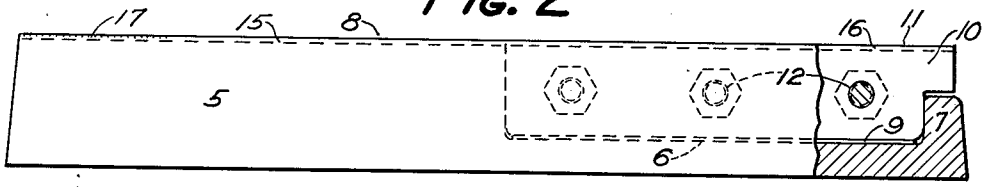


FIG. 3

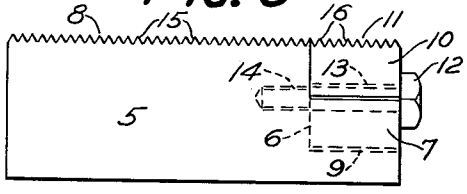


FIG. 4

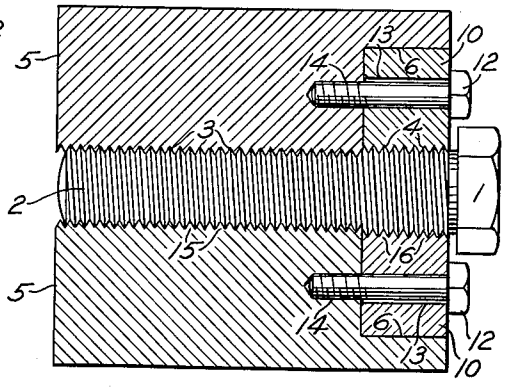
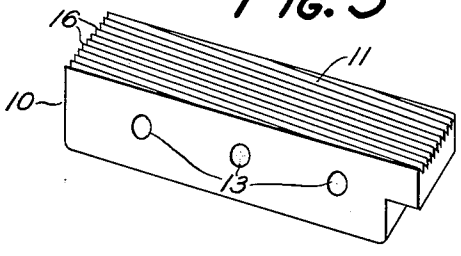


FIG. 5



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FIG. 6

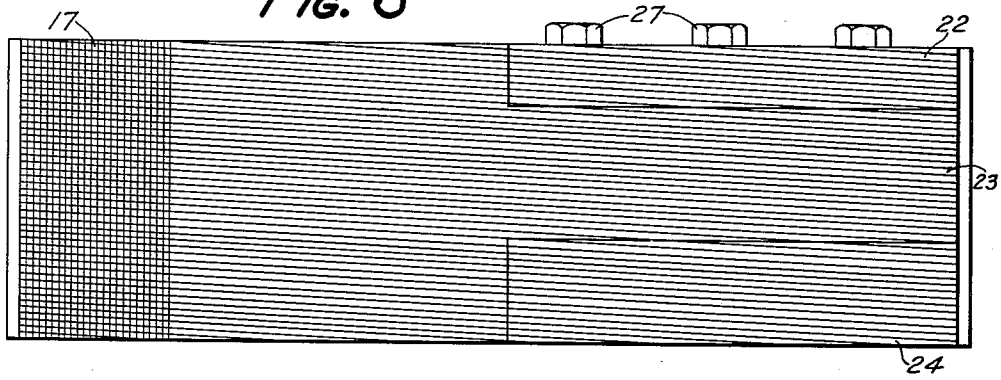


FIG. 7

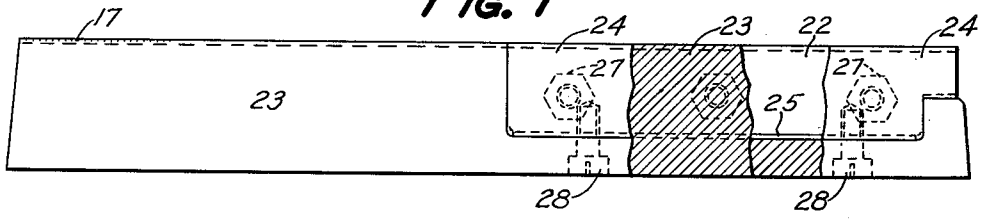


FIG. 8

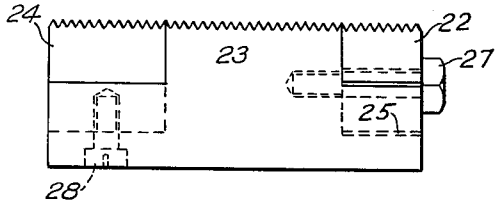


FIG. 9

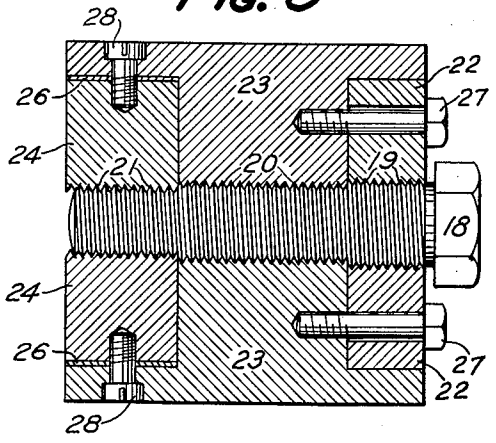
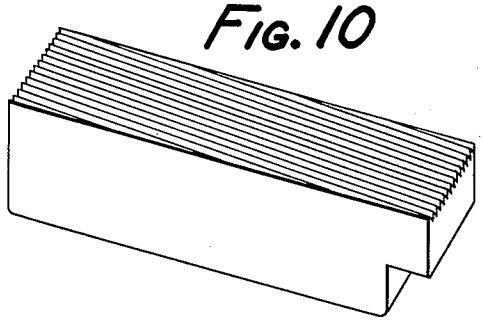


FIG. 10



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APPARATUS FOR MULTI-DIAMETER THREAD ROLLING

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Filed Apr. 11, 1958, Ser. No. 727,946
6 Claims. (Cl. 80—9)

This invention relates to an improved method and apparatus for rolling continuous male threads of more than one pitch diameter on the same workpiece.

In forming a standard thread of single pitch diameter on an ordinary bolt, stud or pin, the cylindrical blank is rolled between oppositely moving grooved straight dies which impress the desired threads. When it has been required to roll continuous threads with two or more pitch diameters on the same workpiece, the usual practice has been to roll each pitch diameter in a separate operation and utilize a different pair of dies for each pitch diameter. Although it is obviously desirable to be able to roll multi-diameter threads at one time and in one operation with a single pair of dies, the requirements of skill, difficulty and cost involved in cutting grooves of precisely the same form but very slightly and accurately differing depths on adjacent portions of one die face, and of duplicating such grooves on other dies, have been heretofore regarded as commercially insuperable. By means of my invention, however, I have been able to roll in one operation multi-diameter threads having very small differences in pitch diameter, e.g., on the order of .010" or .024" on a workpiece such as a stud or bolt of nominal ¾" diameter, and to form the necessary dies virtually as quickly and economically as the dies for threaded articles of a single pitch diameter.

One object of this invention is to provide apparatus for rolling continuous male threads of more than one pitch diameter on a workpiece.

Another object is to provide a method of producing dies for rolling diametrically offset threads on a round workpiece.

An additional object is to provide thread rolling dies in which certain portions of their working faces are precisely adjustable inwardly or outwardly in relation to other portions of said working faces.

Still other and further objects, purposes and advantages of the invention will appear hereinafter in the specification and claims, and also in the annexed two sheets of drawings, in which:

FIG. 1 is a plan view of a flat die with an insert for rolling two pitch diameter threads on a workpiece;

FIG. 2 is a side elevation, partly in section, of said die and insert while the thread rolling grooves are being cut;

FIG. 3 is an end view of said die showing the use of a shim behind the insert during the cutting of thread grooves;

FIG. 4 is a cross-sectional view of the operation of rolling a two pitch diameter thread on a workpiece;

FIG. 5 is an isometric view of the insert removed from the die;

FIG. 6 is a plan view showing the use of a die with two inserts and one shim for rolling three pitch diameter threads;

FIG. 7 is a side elevation partly in section of said three pitch diameter assembly during the step of cutting the thread forming grooves;

FIG. 8 is an end view of the three pitch diameter assembly showing a shim disposed behind one of the two inserts during the grooving step;

FIG. 9 is a cross-sectional view of the operation of rolling three pitch diameter threads, with one shim in place and one removed; and

FIG. 10 is an isometric view of one of the inserts used in rolling three pitch diameter threads.

Referring to FIGS. 1 to 5 of the drawings, and more particularly to FIG. 4, the typical workpiece shown has a hexagonal head **1** and a shank **2** upon which are to be rolled two groups of threads **3** and **4** of different pitch diameters. The ungrooved blank of each of the counterpart dies **5** is longitudinally recessed on its inner face to form a slot **6** extending from approximately the longitudinal center of the die to the shoulder **7** at the work exit end of the die above the main die face **8**. The width of this slot, as shown in FIG. 4, corresponds to the length of the larger threaded portion **4** of the workpiece. A shim **9**, of thickness equal to one-half the desired difference in pitch diameters, is placed within said slot **6**. An insert **10** is then seated against the shim **9** in said slot **6** with the exposed face **11** of the insert flush with the die face **8**, and secured by bolts **12** extending through insert holes **13** into threaded holes **14** in the die blank. The working faces of the assembled die blank **8** and insert **10** are then ground or milled together to form identical thread-rolling grooves **15** and **16** and work-gripping serrations **17** on the blank and insert. The shim **9** is then permanently removed, and the die and insert are conventionally hardened by heat treating or the like prior to thread rolling.

The above-described sequence of placing a shim **9** behind flush insert **10**, cutting the grooves **15** and **16** on die and insert simultaneously, and reassembling and using the die and insert without the shim, will obviously cause that portion of the workpiece which is rolled between the inserts to have a larger pitch diameter than the portion rolled between the main die portions. Conversely, if the portion to be rolled between the inserts is to be made smaller, the working faces of the flush insert **10** and the main part of the die may be ground without shims, which can be inserted later but before the rolling operation.

These operations may be very conveniently combined for the purpose of rolling three pitch diameter threads, as shown in FIGS. 6–10 of the drawings. In this situation, the workpiece may have a conventional hexagonal head **18**, a large upper threaded portion **19**, an intermediate sized middle threaded portion **20**, and a small end threaded portion **21**, on which the threads are formed by the working faces of the top insert **22**, main die portion **23**, and bottom insert **24** respectively. Before the inserts **22** and **24** and the main die portion **23** are ground, a shim **25** is placed behind the top die insert **22**, but not behind the bottom die insert **24**. After the dies and inserts have been ground, the shim **25** is removed, the dies and inserts are hardened, another shim **26** (or the first shim **25**) is placed behind the bottom insert **24**, and the assembly is fastened together by bolts **27** and **28**.

Although I have thus described my invention hereinabove in considerable detail, I do not wish to be limited narrowly to the exact and specific particulars disclosed, but I may also use such substitutes, modifications or equivalents as are included within the scope and spirit of the invention or pointed out in the appended claims.

I claim:

1. A thread rolling device including a die having thread rolling grooves across the face thereof, said die having at least one longitudinal slot on said face, a die insert in said slot having on its face thread rolling grooves of the same pitch and form as the grooves on the die face and continuous with the grooves on the die face, and means for laterally offsetting the face of the die insert in substantially fixed relation to the die face.

2. A device for forming spiral screw threads on a cylindrical blank, comprising a pair of cooperating rolling dies, each die having a series of angular grooves for forming one thread portion on the blank, and a laterally adjustable insert which is fixedly attached to said die dur-

ing operation and has a second series of identical grooves to form a diametrically offset thread portion on the blank continuous with the first such portion but of different pitch diameter therefrom.

3. A device for forming screw threads of more than one pitch diameter on a cylindrical blank, comprising a pair of parallel dies which are operationally arranged to be reciprocated solely endwise for simultaneously acting upon opposite sides of the blank, at least one die insert in the working face of each die, said dies and die inserts having parallel thread forming grooves, and a spacing member insertable between each die and die insert for laterally displacing the insert to a firmly fixed operating position in relation to the die so as to effect a radial offset between threaded portions formed on the blank by the working faces of said die and die insert.

4. A device for rolling a plurality of groups of screw threads of different pitch diameters on a cylindrical blank, comprising a pair of parallel dies upon opposite sides of the blank having their faces grooved to form a first group of spiral threads on the blank, each die face having at least one longitudinal slot, a shim in said slot of thickness equal to one-half the difference in pitch diameters between adjacent thread groups, and a die insert affixed in said slot and spaced outwardly by said shim, said die insert being grooved on its outer face to form a second group of spiral screw threads of equal pitch and shape but different pitch diameter relative to the first group.

5. A thread rolling device for simultaneously forming continuous spiral threads of like form and pitch but of different pitch diameters upon a cylindrical blank, comprising a pair of die sections having thread rolling grooves across their faces of the same form and pitch, said pair of die sections being tightly bolted to each other with their thread rolling grooves in continuous relationship and their respective faces offset from each other.

6. A thread rolling device comprising a die having thread rolling grooves across the face thereof, said die having a longitudinal slot on said face, a die insert fixed in said slot and having on its face thread rolling grooves of the same pitch and form as those of the die and continuous therewith, and a spacer member behind the insert whereby the face of said insert is offset from the face of said die.

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