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ROLLING DIES FOR THREADING, POINTING AND FINISHING SCREWS

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2 Sheets-Sheet 1

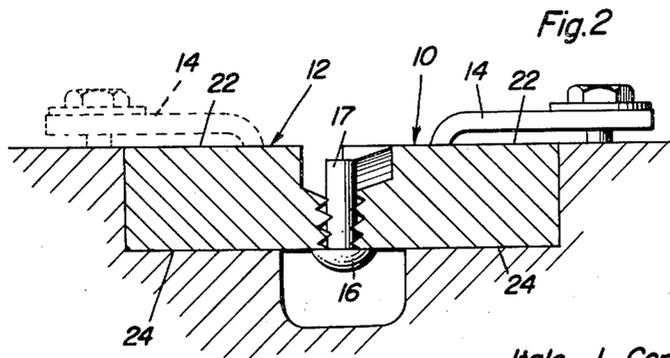
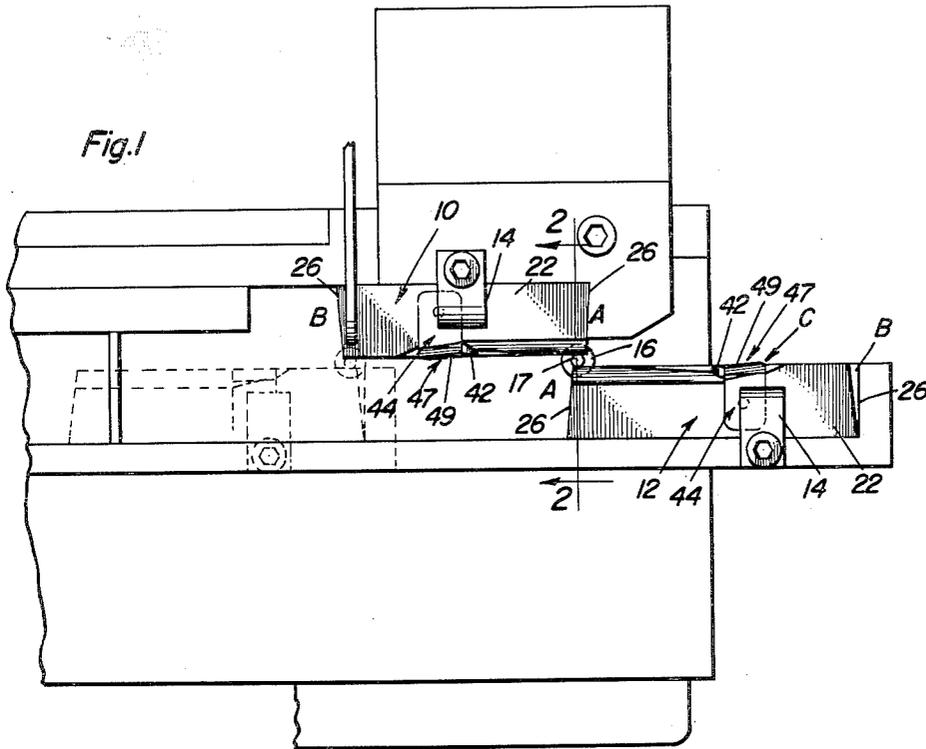
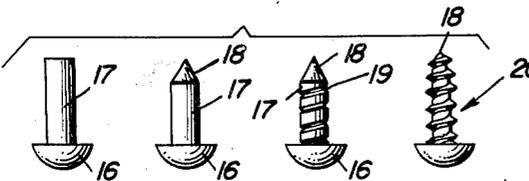


Fig. 8



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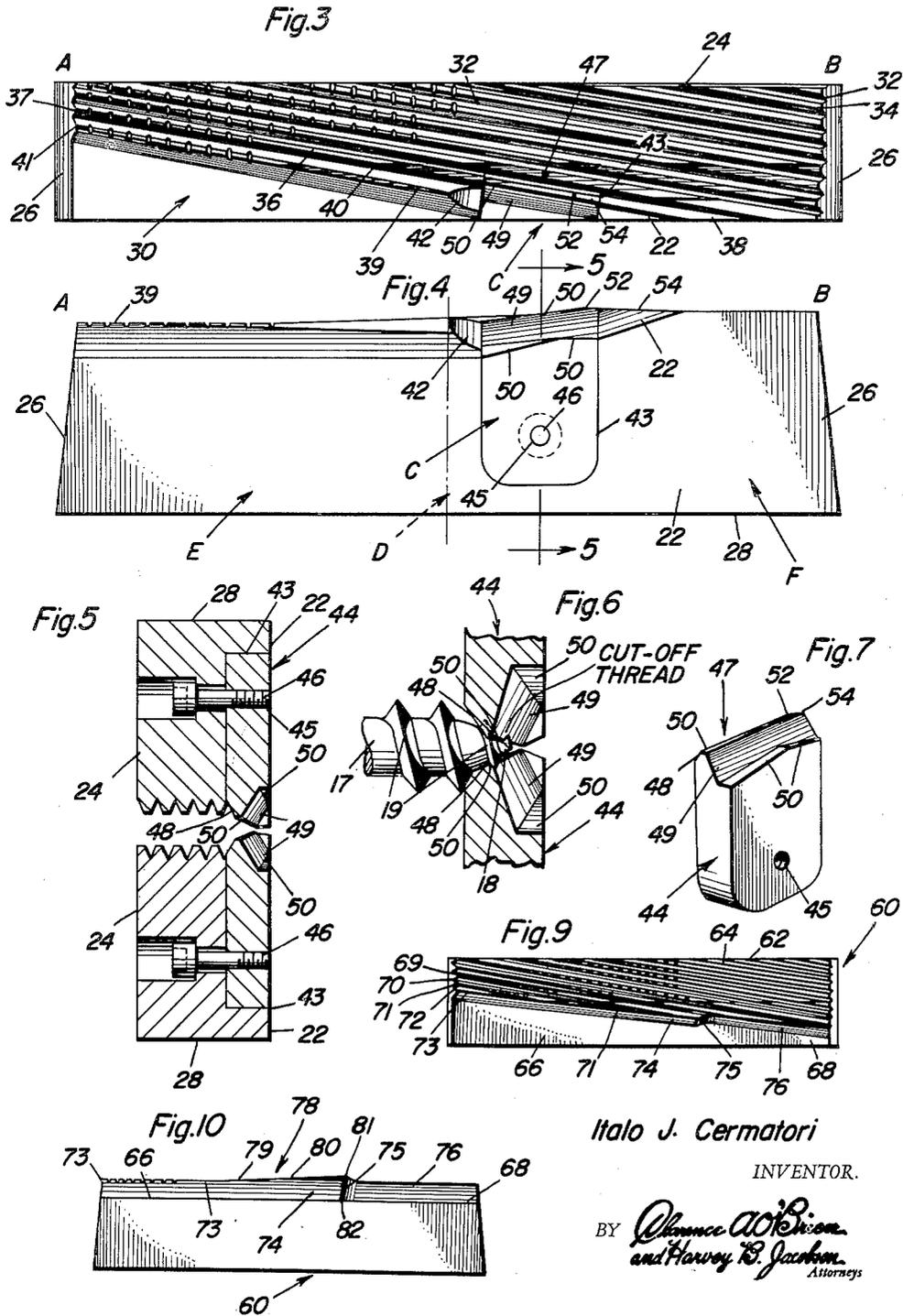
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2 Sheets-Sheet 2



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**ROLLING DIES FOR THREADING, POINTING
AND FINISHING SCREWS**

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4 Claims. (Cl. 80-9)

The present invention relates to relatively movable accurately paired and matched die blocks used in reciprocating thread rolling machines and has reference in particular to the precision-constructed working face of a thread rolling or swaging and pointing die, more particularly, a generally rectangular die block, the milled working face or surface of which is such in construction and adaptability that it functions to thread, point and finish the terminal thread of the point on the shank of a screw blank, the steps being progressively achieved in or during the course of a single operation.

A comprehensive survey of the prior art by one familiar with the thread rolling and die making problem and proposed solutions of the same would turn up prior patents revealing that numerous efforts have been made, along varying lines, to simultaneously thread and point screws, that is gimlet-point-screws. However, and for varying reasons, which need not be dwelled upon here, prior art dies have failed to come up to expectations and have not been acceptably endorsed and hence have not met with widespread adoption and use. It follows that it is an object of the instant endeavor to structurally, functionally and otherwise improve upon prior art thread rolling dies and having done so, to provide a suitable working surface which will meet with manufacturing requirements and economies of manufacturers and the needs of those engaged in the utilization of dies in reciprocating screw rolling and threading machines.

Another object of the invention is to provide a specially designed and reliable work surface on a screw thread rolling die which will produce perfect screw thread helixes free of often limitless trouble frequently encountered and which, using accurately milled grooves will act on the shank of the screw blank with such precision and certainty that the desired threading and pointing steps are satisfactorily carried out.

Of chief concern is the precise pattern which is employed on the work surface for pointing and threading a screw in one operation. Nevertheless, it is to be pointed out at the very outset that precise dimensions are applicable only to given die blocks, the factor of dimensions generally speaking being in proportion to a given block. Therefore, the concept has to do with all sizes, angles and degrees and the disclosure is to be interpreted accordingly.

Briefly summarized, the invention comprehends the use of an elongated rectangular metal block having a flat top and flat bottom parallel to each other, a flat rear surface, an opposed front surface, sloping transverse ends, as is common; and, an improved front or working surface.

It is highly desirable as can be full well appreciated, that the screws (or bolts) as they come from the thread rolling machine should be preferably finished, should require no additional manufacturing steps or operation and, what is important the pinnacle of the point should be sharp-pointed and free from burrs or, as is preferably the case, minus a slight cavity or recess which sometimes is present. It will be evident from the instant disclosure that the end result which has now been achieved is the essence of the improvement which characterizes and makes unique the improved area or desired focal point of the working face of the die block.

Also, and by way of preliminary explanation it is to be explained that many trial and error steps were taken

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and experience has now revealed that it is within the purview of the instant concept to utilize conventional rolling dies currently in use and to form a recess in a prescribed part of the block and to fill the recess with an insert and to so construct the insert and coating portions of the working face that the then converted die block is capable of producing the finished screw from the blank to the ready-for-use screw.

As will perhaps be also evident from the preceding explanation, it is within the purview of the inventive concept to mill the working surface of the block to embody the desired pointing and thread cutting or severing steps and to do so in what is then classed as a one-piece block.

Other objects, features and advantages will become more readily apparent from the following description and the accompanying illustrative, but not restrictive, drawings.

In the drawings, wherein like numerals are employed to designate like parts throughout the views:

FIG. 1 is a plan view showing a suitable screw thread rolling machine with a pair of the improved rolling dies or blocks mounted for operation therein and also showing the respective starting ends of the two blocks working on the inserted screw blank.

FIG. 2 is a section taken on the plane of the line 2-2 of FIG. 1, looking in the direction of the arrows.

FIG. 3 is an enlarged view of one of the blocks showing the improved working face or surface and how it is revised and thus improved in keeping with the underlying principles of the invention.

FIG. 4 is a top plan view of the same.

FIG. 5 is a section which may be said to be taken approximately on the plane of the line 5-5 of FIG. 4 looking in the direction of the arrows but actually showing the two cooperating or companion die blocks and with the die blocks around in positions at approximately right angles to the positions in which they are illustrated in FIGS. 1 and 2.

FIG. 6 is a view based on FIG. 5 and showing an oversize or exaggerated idea of the coaction of the improved portions of the inserts seen in FIG. 5.

FIG. 7 is a perspective view of one of the inserts showing the improved thread cut-off rib with which it is provided.

FIG. 8 is a group view showing progressively the screw in question ranging from the blank to the finished product.

FIG. 9 is a full size top plan view which shows the improved central portion of die block wherein the construction is of solid or one-piece form.

FIG. 10 is a view at right angles to FIG. 9 and which serves to clarify the thread cut-off ridge.

With general reference first to FIG. 1 this particular figure is utilized here to show a relatively stationary die block 10 at the left and a companion die block 12 at the right which is movable. The view also shows, in a manner of speaking, the mode of utilizing the screw blank and how it is rolled and threaded and prepared for use. The "machine" is of course no part of the invention and while the draftsman has taken the liberty to show sufficient of the machine to identify the same as conventional, and while two blocks 10 and 12 are shown and held in place by bolted clamps or clips 14, the invention resides in the work surface or face of a single die block for which reason the description of the invention will appear primarily in the singular.

Before taking up the die block (or blocks) reference may be made in passing to FIG. 8 which shows the group of "screws." In other words, the numeral 16 constitutes a so-called blank with a cylindrical stem or shank 17. The same numerals designate corresponding parts at the right except that the end of the shank has now

been provided with a conical penetrating point 18. The next step involves swaging the shank to provide the helical grooves and the "potential" threads 19. The numeral 20 designates the finished screw, the point 18 of which is "finished" in accordance with the accomplishments of the present invention. In working with a view toward providing a completely satisfactory die block it was found that threading and pointing a dummy shank or blank 17 and also threading the same could be accomplished. However, the difficulty has been in getting a sharp well defined pinnacle or point at the apex of the screw point. The terminal portion of the thread which is helically "wrapped" around the taper of the point is usually not well finished. Sometimes a fin-like burr exists in the so-called finished screw. In other instances, the burr breaks off in a jagged manner leaving a rough spot. In other instances the pinnacle itself may be mashed in or perhaps has a ragged-edge hole or cavity therein. Much time and experience has been put forth in attempting to not only provide the blank with a conical point and thread wrapped around the point but to cut the terminal portion of the thread off clean so that the threaded point is finished with requisite nicety as is emphatically illustrated for instance in FIG. 6. Actually to have accomplished this now turns out to be a relatively simple achievement although it seems not to have occurred to others before or to have been correctly located to do what is desired to be done. Not only this the die block seen for instance in FIGS. 3 and 4 is to an extent conventional in form. That is to say, it comprises a cast generally rectangular block the leading or screw intake end of which is conveniently denoted at A and the trailing end at B in relation to the position seen in FIG. 1 for instance. The generally flat top side of the block is denoted at 22, the opposed or bottom at 24, the inclined or slightly slanting ends at 25 and the remaining so-called rear or outer side at 28. It is as already mentioned the working inner or front surface denoted generally at 30 in FIG. 3 which is to be considered. The surface 30, somewhat as usual, is provided with a plurality of uniformly spaced diagonal or oblique angled lengthwise grooves 32 and intervening ribs 34. These ribs and grooves are gradually increased in depth and cross-section from end A to end B, that is from the intake to the discharge end and the number of grooves and ribs is about as is usually employed in a threading and pointing die block. In order to focus attention on the improvement it is designated as C. To further "pin down" the locale of the improvement and with reference to FIG. 4 the imaginary center line of the die block may be recognized as existing at D thus dividing, for purposes of explanation, the block into a left half E and a right half F. It is between the center D and the end B or in the area F that the improvement exists or resides. Further, "pinning down" the improvement which is primarily to cleave, clip or otherwise cutoff the terminal portion of the last winding of the thread around the point attention is invited to FIG. 3 wherein the lengthwise rib 36 is pointed out. This starts at 37 and terminates approximately at 38 being nearly the full range or length of the working face. The next companion rib is denoted at 39 and the intervening groove at 40. The rib 39 begins at 41 and ends in a chamfer or bevel at point 42. At this point 42 (which is at about the center line D) a cavity or recess 43 is formed in the block surface F. This recess opens through the surface 22 and also through the work surface 30. It may be said to extend transversely being located in the area between the center line and the end portion B, that is the area F. This cavity or recess serves to accommodate the relatively small block-like insert which is denoted at 44. This fits accurately into the recess and has a screw-threaded bolt hole 45 to accommodate the screw-threaded shank 46 as shown in the paired arrangement of spaced blocks in FIG. 5. In other words, the insert is put in the recess and then bolt-

ed in place. What is important about this "insert" is that the edge or part thereof which is coincident with the working surface 30 is milled so that a rib V-shaped in cross-section is provided the rib being denoted at 47. There is a relatively narrow bevel to the left at 48 and a broader bevel or slanted surface 49 on the opposite side and the portions 50 are merely ledges which are left as a result of the milling of the rib. This rib 47 is in alignment with the rib 36 and fills the gap between the broken median portions of the rib 36. In any event the crest or "ridge" has a major portion 50 (FIG. 7) and this slants to an outstanding or projecting prominent portion 52 and finally the finish 54 which lines up with the end portion 38. It follows that the rib 39 terminates at the point 42 where the insert fitting into the recess is located and the rib on the insert is so constructed and arranged in relation to the two ribs 36 and 39 and the chamfered or bevelled portion 22 that the high point or prominence 52 comes into play at the correct interval of travel of the blank screw so that while the shank is being pointed and also threaded, the very end or terminal portion of the thread is cutoff or cleaved with finesse and a truly "finished" threaded-pointed-screw is the result. It will also be apparent from FIGURE 6, that screw point cut-off is accomplished by the cutting action of the ribs 47 with the cutting edges being spaced from each other on the die blocks to prevent blunting of the cutting ribs and damage to the screw surfaces by the cutting.

It is important to stress the fact that the pointing ridge on my dies extends further than the other ridges. It is this feature that makes my dies completely different from any other dies in use today.

The features of the dies are the extended cutting ridges which point the screw as they are being threaded. The advantages are many, such as less men and machinery need to point the screws only and doing away with all of the space needed by same. The step-by-step mode of use or operation, is the same as the conventional dies. A set of dies are placed in the machine, a screw blank is placed between them and emerges a perfectly finished product, pointed and threaded.

As has already been revealed the invention is not to be construed as restricted to a die block with a pocketing recess and an insert in one side for obviously the die can be cast in one piece and the same fundamental characteristics embodied therein and thus sold as a "new" die. For example and with reference to FIGS. 9 and 10 the solid or one-piece embodiment is shown. Actually the two figures are based on a scale which justifies saying that the blocks depicted are full size. Whatever has been said about the already described blocks is applicable here except that there may be some slight deviation in the appearance. In fact there is bound to be a change in appearance where an old block is being converted as in the already described figures and a whole new block is being turned out as an original product. It is apparently not necessary to dwell on this modification to an extent insofar as the end, bottom and top surfaces are concerned. The numeral 60 conveniently represents the one-piece of solid block construction in both figures. The working base or surface is primarily made up of cooperating grooves 62 and ribs 64 and the surface portions 66 and 68 are cutaway. The ribs which are primarily under consideration here and which compare with the improvements already covered are designated at 69, 71 and 73 with the intervening grooves or channels 70 and 72 respectively. Actually the rib 73 is so thin and cutaway in the casting that only indefinite vestiges of a "rib" actually exists. Under the circumstances and since this rib merges at 74 into the right-hand end portion of the rib 71 these two ribs 71 and 73 are virtually one rib and this so-called "one" rib, at least at the portions 74 merge together and also merge into the adjacent cooperating end portion of the first named rib 69. It follows that the rib 69 is of high significance.

The several ribs terminate approximately just beyond the median central portion of the die or block where a cut-back or cutaway junctional portion 75 merges into the beveled side of that rib which extends the full length of the die block, this beveled surface being denoted at 76. Of high significance is that portion of the ridge of the rib 69 which is perhaps best shown in FIG. 10 and which is denoted at 78 and ranges from the low point 79, inclines at 80 and then stops at the high point or crest 81. It follows that this high point 81, the terminal junctional joining of the several ribs as at 82 and the fade-away at 75 into the surface 76 provides a combination of features which cooperate in not only threading the pointed end of the screw but terminating or cutting off the terminal end of this very last thread so that a more finished and perfect threaded point minus the aforementioned deformities is had.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A thread rolling and pointing die adapted to gently press, point and thread the shank of a screw blank in one operation comprising a block having a grooved main working surface, said grooves defining intervening ribs and said ribs and grooves extending lengthwise from one transverse end to the other transverse end and progressively increasing in depth and cross-section from the screw blank intake end to the screw blank finishing end, the crests of said ribs providing swaging ridges, the grooves and ribs being uniformly spaced from each other and one of said ribs having a ridge extending beyond said main working surface enabling it to cut off and finish off the terminal of the convolution formed on a screw blank, surrounding the pinnacle of the point formed thereon so that the pinnacle or any portion of the point adjacent the same will be finished and undamaged and so that the point is free of burrs and is less likely broken during final threading step.

2. The structure defined in claim 1 and wherein said block is provided to one side of the transverse center with a recess, said recess providing a pocket-like cavity, said cavity opening through one flat face of the block and through the working face of the block, and an in-

sert fitted into said recess, said insert being readily applicable and removable and having a working surface complementary to the main working surface of the block proper and said working surface being provided with a rib the ridge of which is in line with said one rib in the main work surface.

3. The structure defined in claim 1 and wherein said block is provided to one side of the transverse center with a recess, said recess providing a pocket-like cavity, said cavity opening through one flat face of the block and through the working face of the block, and an insert fitted into said recess, said insert being readily applicable and removable and having a working surface complementary to the main working surface of the block proper and said working surface being provided with a rib the ridge of which is in line with said one rib in the main work surface, said ridge having a prominent high point which is properly located to perform the desired terminal thread cut-off step.

4. The combination of a pair of thread-forming dies having opposed working faces spaced from each other throughout, each forming die having a beveled portion of its working face longitudinally smooth-faced to first shape a conical end portion on a screw blank being rolled between the working faces of said pair of dies, and then, by means of threading ribs formed in a continuation of said smooth-faced portion, to roll a screw thread on the screw blank conical end portion, and a cutting rib formed as a continuous portion of the threading ribs on each of said working faces projecting toward each other for cutting and finishing a point on the conical end portion of the screw blank while it is being threaded by the threading ribs, said projecting cutting ribs including high points defining the closest spacing between the working faces of the forming dies and transition portions on either side of the high points flush with said one of the threading ribs with which the cutting ribs are associated.

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