July 4, 1939. H. ROSENBERG 2,165,007

ART OF FORMING RIBBED FASTENERS

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FIG. 1.

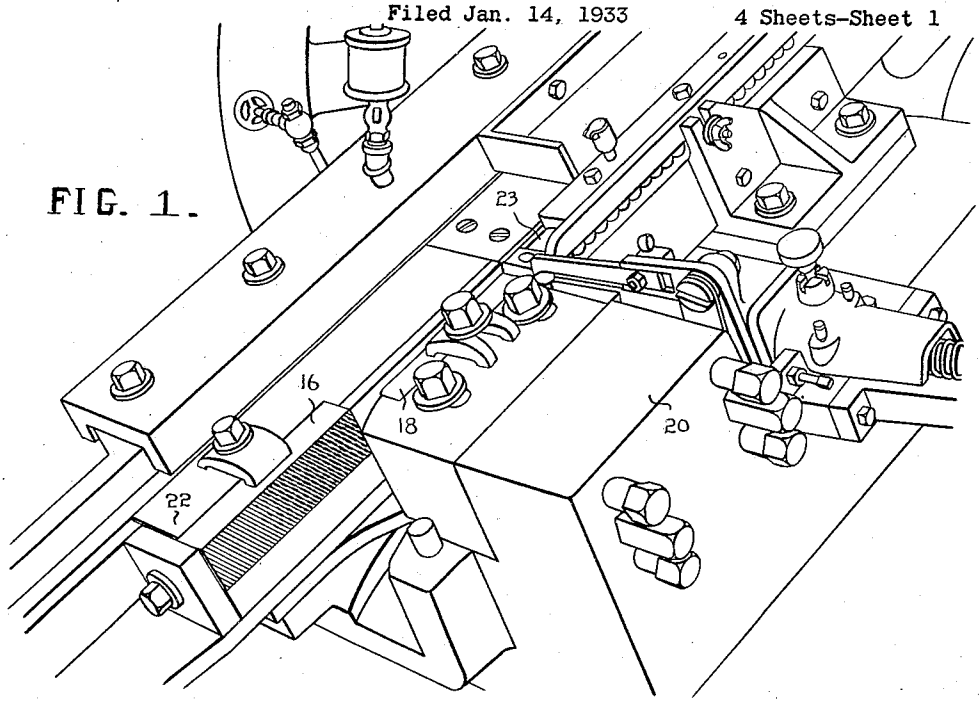
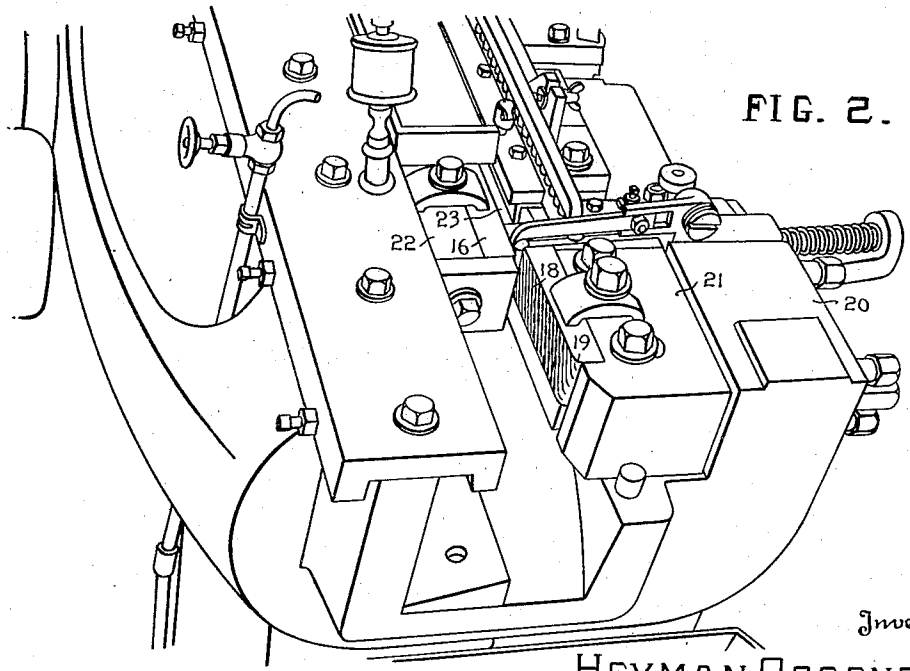


FIG. 2.



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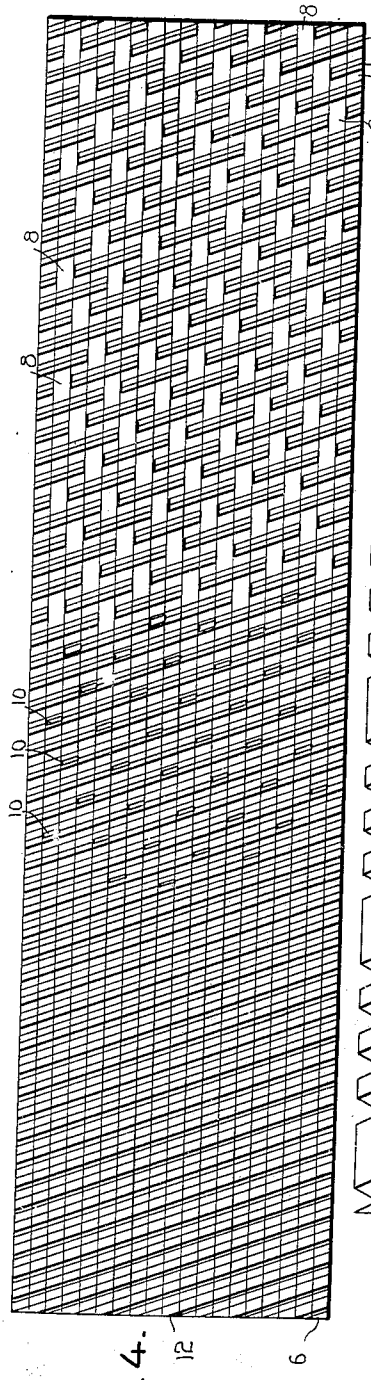


FIG. 4.

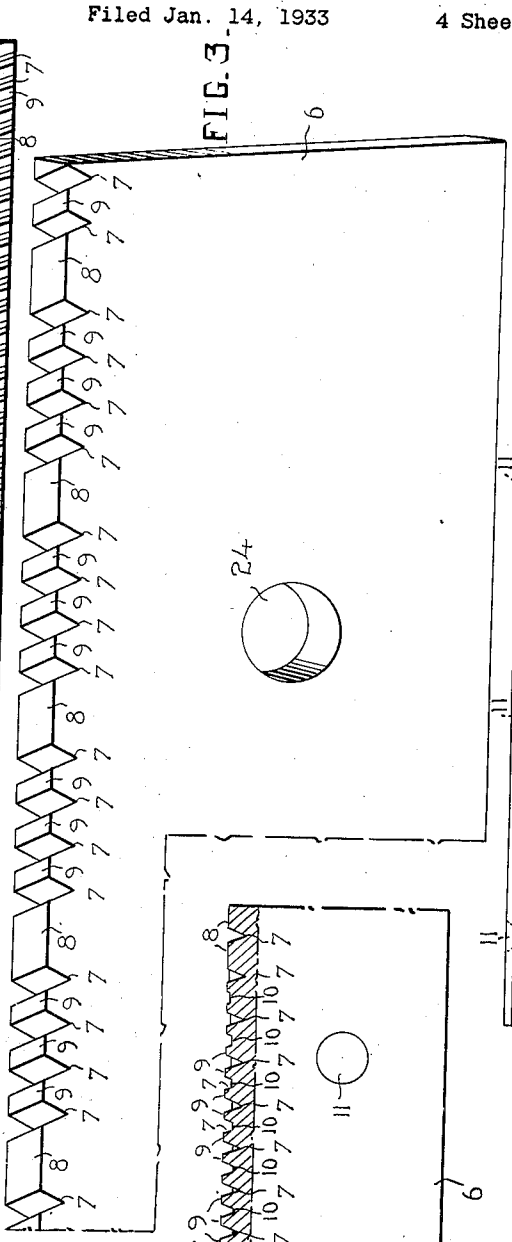


FIG. 3.

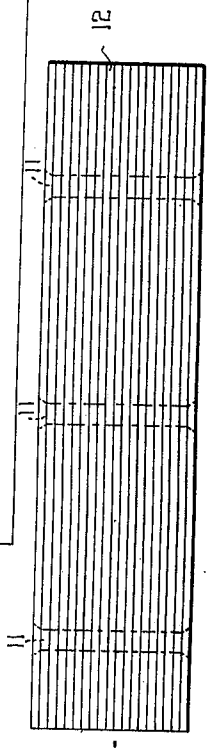


FIG. 5.

FIG. 13.

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ART OF FORMING RIBBED FASTENERS

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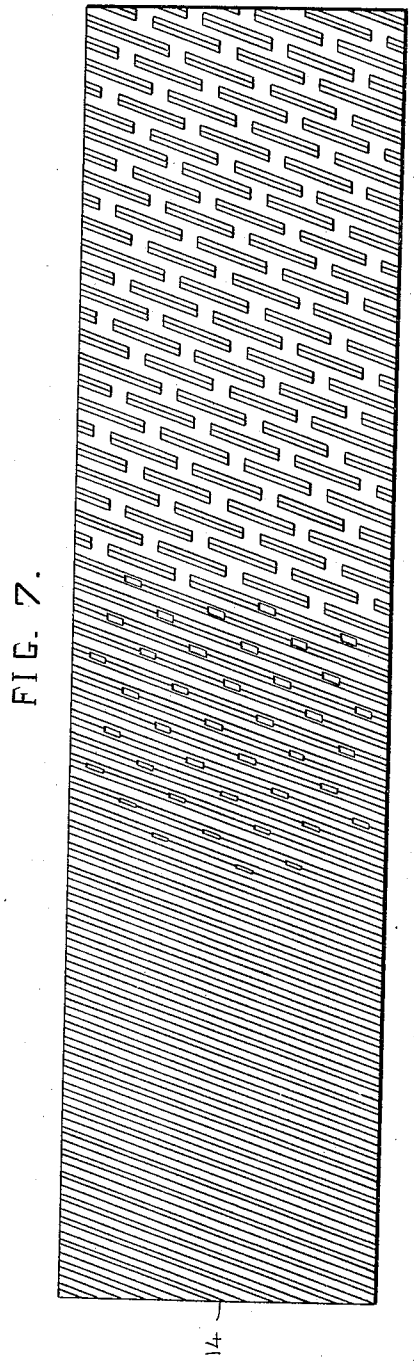


FIG. 7.

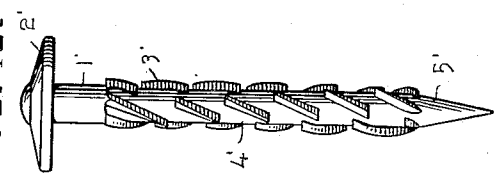


FIG. 12.

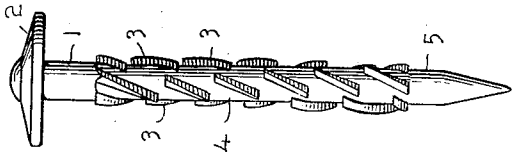


FIG. 11.

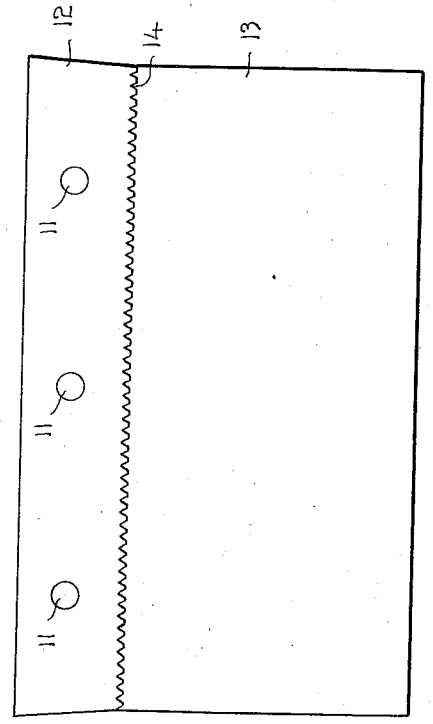


FIG. 6.

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ART OF FORMING RIBBED FASTENERS

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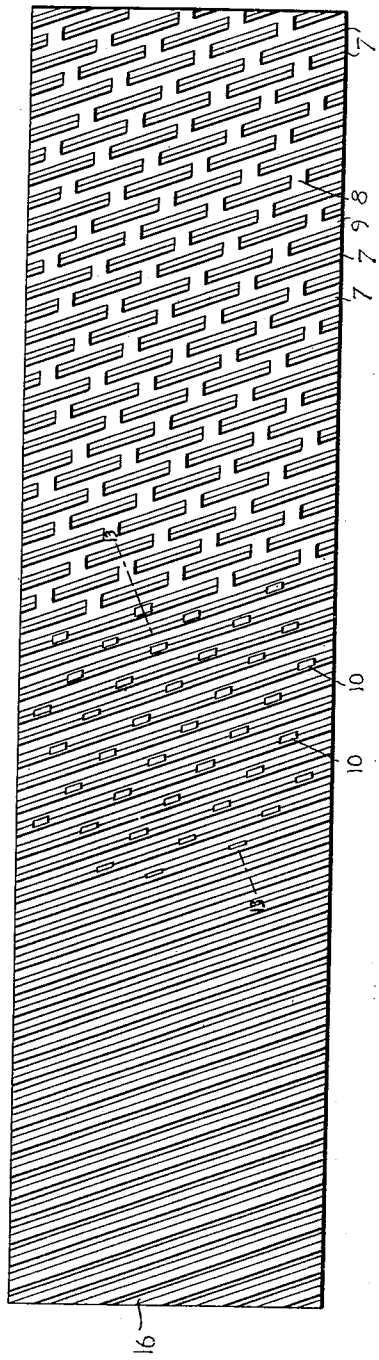


FIG. 9

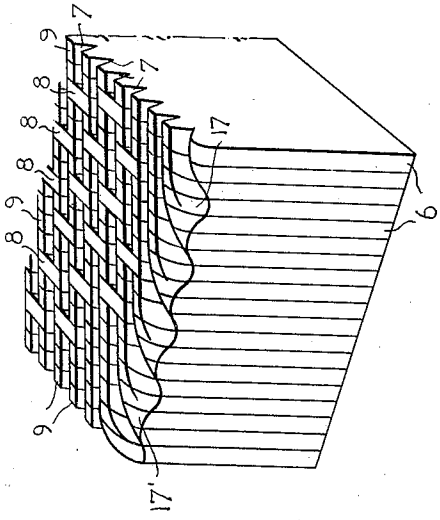


FIG. 10.

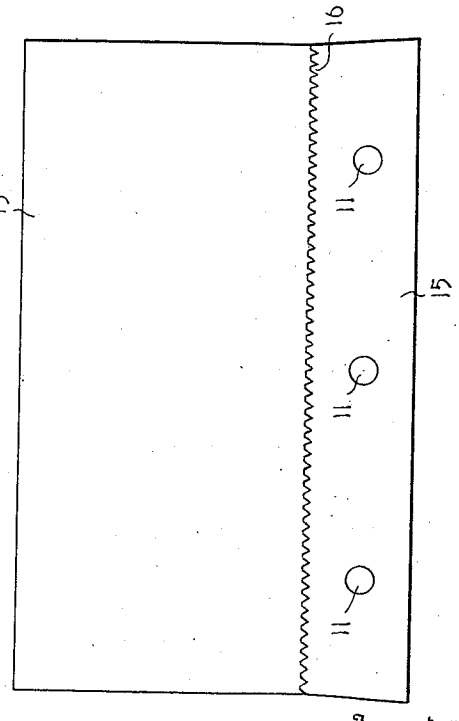


FIG. 8.

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Patented July 4, 1939 2,165,007

UNITED STATES PATENT OFFICE

2,165,007

ART OF FORMING RIBBED FASTENERS

Heyman Rosenberg, New York, N. Y.

Application January 14, 1933, Serial No. 651,783

4 Claims. (Cl. 80—61)

Previously known and used parts and operations are hereinafter mentioned as standard practice to differentiate from the present invention.

It is common in standard practice to roll threads and other ribs on fasteners such as wood screws and drive pins, but it has not been possible heretofore to roll a thread or other rib with an interruption or space between alined or otherwise disposed sections of the rib.

Also, it is standard practice to make rib-rolling dies by milling with a standard universal milling machine, and steel blocks thus milled to provide a die face are afterward hardened to enable the die face in each instance to stand up under the strain of thread or other rib rolling; but it is not feasible to produce by such milling operation a die face having obstructions in the rib-forming grooves of the die, and, of course, it is not possible to provide by such milling operation obstructions of different widths and heights or with abrupt ends; and it is further not feasible to roll a longitudinal rib of no pitch or of relatively high pitch on a fastener blank except by insuring such gripping action between the blank and die as to insure rotation of the blank with the relative movement of one die with respect to the other, and such gripping action is in standard practice assured by providing nicks in the ridges between rib-forming grooves in the dies, and of course by making the initial grooves full length, that is as long as the finished rib is to be. If an interruption or fill should be provided in the initial grooves, the resulting reduction in gripping action of the dies against the fastener blank would tend to cause slipping and failure of the blank to roll with the stroke of the movable die, and if the fill were of sufficient size such failure would surely occur.

One of the essential objects of the present invention is the rolling of a fastener and thereby forming thereon a rib, such as a thread or the like, outstanding from the body and having an interruption in its length, and in greater detail a further object is forming on a fastener body a plurality of such ribs each with an interruption, and in still greater detail a still further object is the forming of such interruptions with the interruptions of one rib staggered relative to those of another.

A more specific and detailed object is the successful and commercial rolling of fasteners such for instance as disclosed in my Patent No. 1,686,468, dated October 2, 1928, and also such as shown in my Patent No. 1,545,471, dated July 7, 1925.

While the inventions of my said patents were conceived and practiced by me prior to the respective filing dates of the applications on which the patents issued, such practice was accomplished through hand operations, and though the fasteners of the said patents proved themselves of unusual merit in use both in metal and in wood, and of great value whether hardened or not, the cost of production by other means than rolling proved substantially prohibitive; that is to say, the fasteners produced otherwise than by rolling were so expensive as to cause consumers to prefer less efficient substitutes at less cost.

The present invention overcomes the difficulties to the rolling of the type of fastener referred to, and enables its production by a rolling process carried out in the operations of a standard thread-rolling machine.

Numerous, expensive, and carefully conducted tests from the time of my production of the invention of my said Patent No. 1,545,471, to the time of the production of the present invention have demonstrated that the rolling of such a fastener as shown in my said patent was previously utterly impossible, and this fact is generally known and recognized in the industry, but this impossibility is overcome by the present invention.

With the above indicated and other objects in view, the invention comprises the art of rolling ribbed or threaded fasteners characterized by rolling interruptions in such ribs or threads, and it is a further object of the invention to accomplish this result though the interruptions of one rib or thread be staggered with respect to those of another on the same fastener, so that an uninterrupted portion of an adjacent rib or thread overlies an interruption of another rib or thread.

A more detailed object is the accomplishing of the last-named object while producing curved or cylindrical portions of the body of the fastener laterally between ribs or threads.

The invention also comprises the art of forming dies destined to and capable of accomplishing the objects above recited.

The invention also comprises certain novel features of construction, combination, and arrangement of a die face for enabling the carrying out of said object.

The invention also comprises certain other novel steps and features of construction as hereinafter in detail specified and subsequently specifically pointed out in the appended claims.

In the accompanying drawings,—

Figure 1 is a fragmentary, perspective view of

a standard rolling machine equipped with dies incorporating an embodiment of the die face feature of the present invention made according to the art of die making incorporating a specific embodiment of the present invention and adapted for practicing the art of rolling fasteners according to the present invention.

Figure 2 is a view of the same parts as seen in Figure 1 looking from a different plane of observation.

Figure 3 is an enlarged, detailed, fragmentary perspective of one of the laminations of the initial die detached, the enlargement being a magnification of the customary or normal size of lamination for clearness of disclosure.

Figure 4 is a top plan view of the completed initial or laminated die, the parts being shown on a reduced scale relative to Figure 3, but still substantially enlarged with respect to the ordinary, commercial die.

Figure 5 is a view similar to Figure 4 of the back face of the same parts, the parts being shown on a scale substantially that of normal, commercial working size.

Figure 6 is a diagrammatic showing of the formation of a hob from the die seen in Figure 4.

Figure 7 is a top plan view of a hob or negative of a die embodying the face formation of the parts seen in Figure 4.

Figure 8 is a view similar to Figure 6 showing the formation of a solid die from the hob.

Figure 9 is a face plan view of the die formed as indicated in Figure 8, and corresponding in enlarged showing to that of Figures 4 and 7.

Figure 10 is an enlarged, fragmentary perspective view of the discharge end of the stationary laminated die.

Figures 11 and 12 are front elevations of fasteners made in accordance with the present invention.

Figure 13 is a detailed, fragmentary section taken diagonally of that part of the die having the reduced obstructions or flat portions leading toward the completed interruption-forming obstructions or flat portions, the section being taken approximately on line 13—13 of Figure 9.

It will be observed that the fasteners seen in Figures 11 and 12 correspond substantially to the fastener seen in my Patent No. 1,545,471, except that the structure seen in Figure 12 is ribbed or threaded to the tapering portion of the entering end, and it is obvious, of course, that the ribs or threads might extend to the very entering tip where such a construction is found desirable; whereas the structure seen in Figure 11 is provided with a pilot characterized by being of sufficiently greater length than the pilot shown in my said patent to insure the formation of a cylindrical burr from a sheet of metal, as distinguished from a mere flared or bell-shaped burr.

Referring to Figures 11 and 12 in detail, 1 indicates the body of a fastener which is shown as having a head 2 of the type commonly employed for engaging sheet metal, such as galvanized iron sheeting, but, of course, the fastener body 1 may have any desired shape of head or no head at all. Outstanding from and extending in the general direction of the length of the body are ribs or threads 3, 3, interrupted at 4, and so arranged that the uninterrupted portions of the threads or ribs overlap and are thus staggered with relation to the interruptions of adjacent threads or ribs. An advantage of this staggered relationship resides in the fact that, when the fastener is driven into wood or other supporting material, the ends of the thread sections afford a better anchorage by virtue of engaging spaced and different parts of the supporting material. Withdrawing stresses are greatly resisted by the fact that the ends of the thread sections, and particularly the outer or upper or last entering ends thereof at the places of the interruptions, are abrupt or squared off so as to present abrupt shoulders to overlying material which has sprung into the path of such shoulders, if the material be wood or the like, or has flowed into such path if the material be metal, such as soft iron or soft steel. When the fastener is to be used in metal, the ribs or threads 3 are preferably hardened, as by a case-hardening process, so that the said ribs or threads will be sufficiently hard to enter metal, such as soft iron or soft steel substantially without injury to such ribs or threads. The hardening operation may be that of the well known cyanide case-hardening, or any other appropriate or desirable tempering may be utilized.

The body 1 is preferably provided with rounded surfaces so as to be substantially cylindrical throughout the places where the threads or ribs do not appear.

The entering end portion of the body 1 may assume any desired shape or contour, but is preferably pointed for facility of entry either in the "finding" of an opening in metal, or the easy entry into wood or the like. A pilot 5 may be provided when and as desired, according to the use to which the fastener is to be put. The pilot results from using fastener blanks of greater length than the effective width of the dies and from properly locating the blanks in engaging the dies.

It should be borne in mind that the fastener, such as seen in Figure 11, is formed with the ribs or threads rolled in place from the material of the original blank body, and that the term "rib" is utilized to include an outstanding ridge similar to a thread whether possessed of pitch or merely parallel to the longitudinal axis of the fastener body, while the term "thread" is intended to include some degree of pitch, variation in which may occur to any desired extent, as, for example, if a wood screw type of fastener is to be provided with interruptions in the thread, the pitch will be much lower than that seen in Figure 11, and the pitch shown in Figure 11 is indicated as preferable where the fastener is to be hammer-driven or otherwise inserted by direct axially-delivered force.

Thus, the term "rib" is employed as generically descriptive of various forms of ridges, while the term "thread" is specific to a ridge having pitch or inclination about the body of the fastener.

In Figure 12 the fastener 1' has the head 2', ribs or threads 3', interrupted at 4', and the entering end portion 5' which, as seen, is preferably without the pilot, the structure shown in Figure 12 being thus substantially identical with that seen in Figure 11, except for the absence of the pilot in the former.

It was readily recognized by me when producing the fastener in the first place, such as seen in Figure 11, that a die could not be produced for rolling the fastener by the usual milling operation, because of the interruptions in the die grooves necessary to produce the interruptions in the threads or ribs, and the fact that such interruptions must be abrupt, not rounded out, and must be staggered with respect to uninterrupted

portions of adjacent ribs created a problem incapable of being overcome by a mere milling operation on an ordinary die blank.

Without attempting to review the extensive experimentations and efforts made by me to discover a means of successfully rolling the type of fastener illustrated in Figures 11 and 12 and in my above-identified patents, among other things I produced what for the sake of a descriptive name I call a laminated die. In other words, I divided the die face into as many parts, sections, fragments, or laminations as necessary to leave in any one part, section, or lamination only the character of depressions capable of being produced by a milling operation, with the result that I secured a series of plates or laminations 6, as seen in Figure 4, and one of which is seen in enlarged detail in Figure 3. Each of these laminations is formed with depressions or V-shaped grooves 7, 7, and with intervening obstructions or flat portions 8. It should be observed that the grooves 7 need not necessarily be V-shaped but will have that transverse contour corresponding to the form of the rib or thread to be rolled, and, since the edge type of rib or thread is illustratively selected and shown in Figures 11 and 12, the V-grooves 7 are necessarily required. As will be plain from Figure 4, some of the die fragments or laminations or plates 6 do not have the flat surfaces 8, such, for example, as the two marginal laminations of Figure 4, but each of the laminations does have flat areas 9, 9, between each two of the grooves 7 so that, during the rolling operation, the cylindrical form of the body of the fastener will be maintained cylindrical while material is flowed out into the grooves 7, and the flat portions 8 serve to finish off those portions of the body 1 cylindrical between the sections of the interrupted thread or rib. Thus, each lamination 6 must have its own peculiar contour to dispose the flat surfaces 8 in the right relation to the grooved portions 7 not only of the particular lamination, but relative to all the other laminations making up the entire die, whereby the flat portions 8 appear scattered and staggered over the face of the die properly to register relative to each other and to the final area of the root diameter or reduced body portion of the body after the rib or thread sections have been flowed out into place.

It is standard practice for rib rolling purposes, particularly where the rib is without pitch or is a high pitch thread, as with a drive screw or pin, that the initial end of each die, that is, the end beginning the rolling operation, or first engaging the blank, will have its ridges between grooves nicked or roughened to assure sufficient frictional engagement to insure rolling of the engaged pin blank or body. This practice is carried out with the present invention, though not illustrated to avoid confusion in the showing.

It is not practicable and probably not feasible to roll a rib to a completed condition with interruptions maintained from the first, and therefore the grooves 7 in the initial development, that is at the starting end of each die, are full length and uninterrupted, so that in operating, ribs are rolled that are full length initially; but after the dies have gotten the rolling operation well under way, it has been found by me to be entirely possible to flow away parts of the initial rib to produce interruptions in its length. It is of course best, if not absolutely necessary for nicely finished work, that this suppression or flowing away of intermediate parts of an already developed rib should occur gradually, so that the metal will move either over into the retained sections of the rib or back into the body of the fastener smoothly and without too much resistance or causing roughness of finish.

Accordingly the obstructions or flat portions 8 are developed in the length of the die face at a substantial distance from the beginning or initial end of the die, and the development of these flat portions 8 is accomplished by graduated steps or in gradual manner, by providing obstructions or flat portions 10 in grooves 7 (see Figures 9 and 13) which start a substantial distance from the initial end of the die as very low flat portions, and gradually increase in height until graduating into the full height flat portions 8. Naturally, flat portions 10 widen as they increase in height so as to transversely fill the respective grooves 7 at the place of their location; but each flat portion 10 from the very beginning is of a length the same as a flat portion 8, whereby a straight shoulder is developed for each flat portion 8, and the ends of the preserved sections of rib at the interruptions are correspondingly flat and outstand straight so as to present abrupt shoulders.

Thus, in the actual rolling operation, the ribs or threads as they are formed in the initial end portion of the die, seen at the left-hand side of Figure 4, are actually full length without interruption in their initial form, but are first slightly interrupted by the first of the reduced flat portions 10 and then by the graduation of said reduced portions 10 the interruptions are step by step enlarged in width and depth to the size of the obstructions or flat portions 8. Thus, each fragment, section, or lamination 6 has its initial grooves 7 varied according to variation to be caused in the flowed rib, whereby certain parts are flowed out to rib form and then back on being engaged by the obstructions or flat portions 10 and 8 until certain parts of the initially formed threads are restored to the body of the fastener 1 or flowed into the retained rib sections.

Naturally, the fragments or pieces or laminations 6 can best be accurately produced by a carefully prepared diagram to be followed both in the forming of the laminations as to thickness and edge contour so that the edge contour of each coordinates with that of the other laminations to be used. When all of the laminations have been completed accurately, as from following a diagram, they are ready to be assembled. By dividing up the die into such fragments or laminations, the milling operation can be carried out on an ordinary standard universal milling machine, and when the several laminations or fragments are ready they are brought together to correspond with the provisions of the guiding diagram and are fastened together, as by rivets 11, 11, seen in dotted lines in Figure 5, to produce the completed, laminated die 12. Laminations 6 are preferably formed with registering apertures 24 to receive the rivets 11. Of course, each lamination 6 is preferably of soft steel or the like while being milled, and is effectively tempered and hardened before being assembled and secured together by the rivets 11. Also, other means of attaching the laminations together, such as welding, may be utilized, but if welding be employed, the tempering operation must either be carried out after the die is assembled or the temper

restored so far as varied by the heat of the welding.

In actual practice, however, I find that this laminated die does not completely solve the problem of rolling interrupted threads. Those familiar with thread rolling will recognize the thread-rolling machine shown in Figures 1 and 2 as of standard type, and will be familiar with the fact that in the use of such machines it is customary to carefully block and clamp in the two cooperating dies which are to produce the ribbed product. This blocking in and clamping operation is accomplished with the greatest available facility for holding the dies as rigid as possible and allowing no relative movement whatever thereof, since even the slightest movement would destroy the satisfactory condition of the finished rib, or render the rib defective. However, notwithstanding most careful efforts to block and clamp the laminated dies against the slightest movement, the several laminations do actually move relative to each other under the strain of rolling fasteners, and thus produce defective fasteners of a character undesirable for marketing purposes.

Without detailing the further experiments conducted by me, except to say that no method of fastening the laminations together satisfactorily overcame their tendency to and capacity of individual movement, I eventually found that such a die as seen in Figures 4 and 5 made up of laminations or fragments secured together while incapable of successful use for direct rolling purposes was, under proper conditions, capable of use for the forming of a die hob. Die hobs are, as is known in the art, the negatives of dies, and are customarily produced by being pressed against the die face with sufficient pressure to cause the metal of the hob to assume the negative contour coinciding with the positive contour of the die. Standard practice includes use of such enormous pressure for this work as one hundred tons per square inch, and even then repeated impressions with interspersed annealing of the die being formed are necessary to produce a completed die face from a die hob. Standard practice was followed by me to produce a hob from the laminated die after the manner indicated in Figure 6.

When the hob block 13 has its negative die face 14 completed, the block is carefully hardened, and then according to standard practice dies 16 are made therefrom, as from die blocks 15. When the die 16 is completed, the block 15 being integral is free from possibility of any portion of it giving or moving relative to any other portion thereof. The die face 16 is, of course, identical with the die face of die 12 except that the lamination lines do not exist, and, therefore, the same reference numerals have been applied to the die 16 and the same description will apply.

As will be readily recognized by those familiar with the art, the laminated die seen in Figure 4 is the reciprocating one when considered in its relationship to the thread-rolling machine, and the stationary die, considered with respect to the thread-rolling machine, will be identically the same in contour and manner of construction except that, as seen in Figure 10, the discharge end of the laminated die is rounded off, as at 17, as by being filed off before hardening, so that the stationary, completed die 18 corresponding to the die 16, has its discharge end rounded off, as at 19, so that the discharging fasteners will not have their ribs or threads injured by being forced across an abrupt angle.

In rolling ribbed fasteners, such as screws of the wood screw type, as seen in my Patent No. 1,411,184, it is now standard practice to clamp the rolling dies in such a rolling machine as seen at 20 in Figures 1 and 2, which machine is provided with a support 21 for the fixed die and a reciprocating slide 22 for the moving die, so located and related to each other that, when the dies are mounted, blanks may be fed thereto. The last step of the feeding consists of a thrust of the starter finger 23 which pushes the blank between the dies while the reciprocating die is in its retracted or rear position. The dies are, of course, spaced apart a distance with respect to the thickness of the body of the blank such that, when the blank is forced between the dies, the material of the blank is cold flowed into the grooves of the dies. The initial grooves of the fixed die are at the rear end portion of the die, while the initial grooves of the reciprocating die are at the forward end, so that the initial grooves of the two dies receive the first flowed metal as the starter finger 23 pushes the blank into engagement between the dies. Then the slide 22 moves forward, so that the reciprocating die causes the blank to roll between the two dies, and as it rolls its material is flowed into the die grooves until reaching the finally finished condition of the rib or thread, and then the reciprocating die moves beyond the fixed die and thus drops the fastener into the chute below. This is standard practice and is carried out in the practicing of the present invention.

Of course, the actual process varies in that the flowing of the metal to form the ribs is not a continuous, uniform, advancing process. The fixed die is seen at 18 in Figures 1 and 2, while the reciprocating die 16 is carried by the slide 22. When the blank is thrust by the finger 23 between the rear end of die 18 and the forward end of die 16, as seen in Figure 2, the initial grooves of the two dies begin to receive the metal which begins to flow from the body of the blank, and thus as the die 16 advances, rolling the blank along, the ribs are formed full length on the body of the blank until they reach the first of the reduced flat portions 10, and these portions begin to cause the material of the newly formed ribs to flow away to accommodate such flat portions 10, and the material thus flowed away may flow longitudinally of the ribs into the materials of the ribs themselves or back into the body of the blank, and, as the reduced flat portions 10 increase both in width and height, the material is caused to further flow step by step increasingly until the full width and full height flat portions 8 are reached, when the flowing away of parts of the ribs is completed and produces interruptions 4 and leaves the sections or fragments of the ribs 3 outstanding spaced by said interruptions. After the blank has made one complete revolution past the place where the full height flat faces 8 begin, the rib rolling is completed, except that the further portions of the dies engaging the fastener finish off the parts in case of any slight irregularity, and then the reciprocating die 16 passes beyond the forward end of the fixed die 18 and allows the fastener thus rolled to drop into the chute. The rounded portion 19 of die 18 insures against injury to the threads or ribs as the rolled fastener leaves the dies.

Thus, I am able to produce threaded or ribbed fasteners, such as seen in Figures 11 and 12, or any other ribbed fasteners with interruptions in

the length of the ribs, and with those interruptions staggered when desired with practically the same facility, speed, and inexpensiveness as the rolling of ordinary rolled thread wood screws.

The dies and the art of making dies herein disclosed are claimed respectively in my copending patent applications filed June 2nd, 1933, one designated by Serial No. 674,087 and the other by Serial No. 674,086.

What is claimed is:—

1. In the art of rolling screws and the like ribbed fasteners, rolling a plurality of ribs on a fastener body, and rolling interruptions in the length of the ribs, the interruption in the length of one rib being staggered with respect to the interruptions of adjacent ribs, whereby an uninterrupted portion of a rib laps an interrupted portion of an adjacent rib.

2. The art of forming fasteners comprising rolling a fastener body by rotating the body about its major axis and thereby flowing material of the body into a plurality of outstanding ribs having interruptions forming spaced sections, the interruptions in one rib being staggered with respect to the interruptions of another.

3. In the art of making screws and like fasteners, forming a rib on a fastener body, and rolling away successive portions of the rib across and through the rib, the successive rolled-away portions being rolled from the same area of the rib in regularly graduated amounts.

4. The art as claimed in claim 3 wherein the successive rolled-away portions are rolled from the same area of the rib in regularly graduated amounts and in the direction of the outstanding dimension of the rib.

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