

Oct. 27, 1936.

H. E. SIPE

2,058,520

ROLLING MACHINE FOR ROLLING DRIVE RIVETS AND SCREW THREADS

Filed May 1, 1933

3 Sheets-Sheet 1

Fig.1.

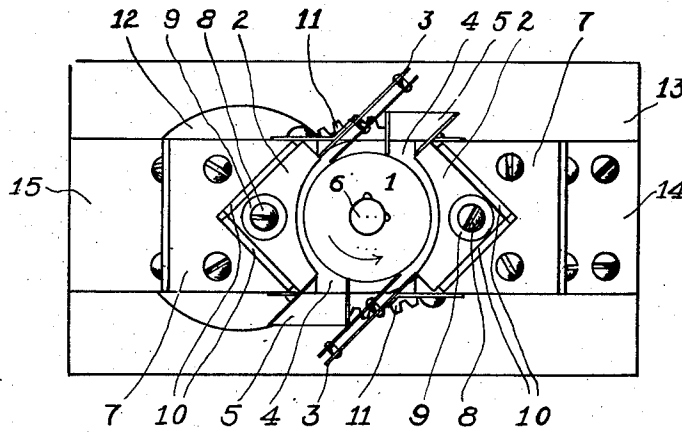


Fig.2.

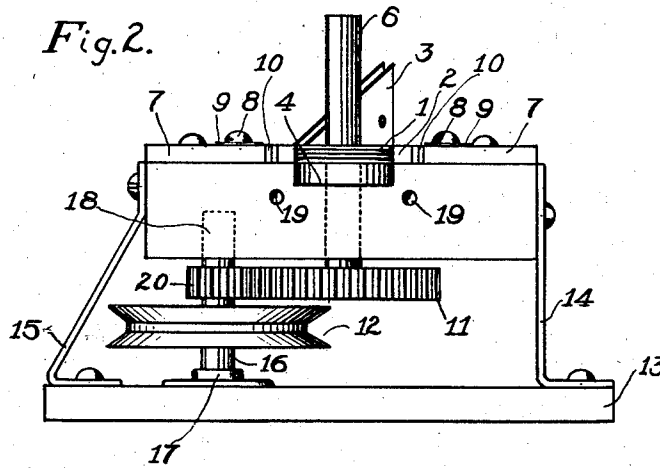
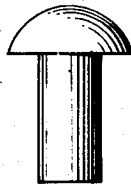


Fig.3.



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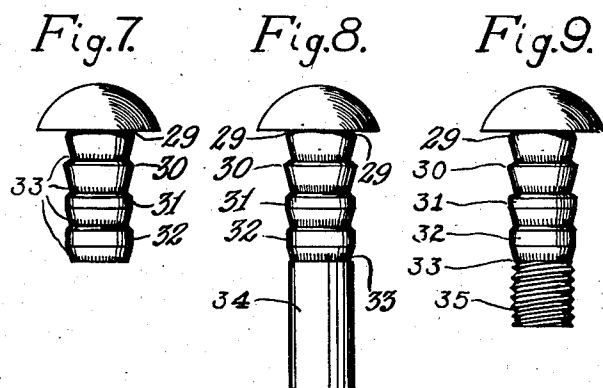
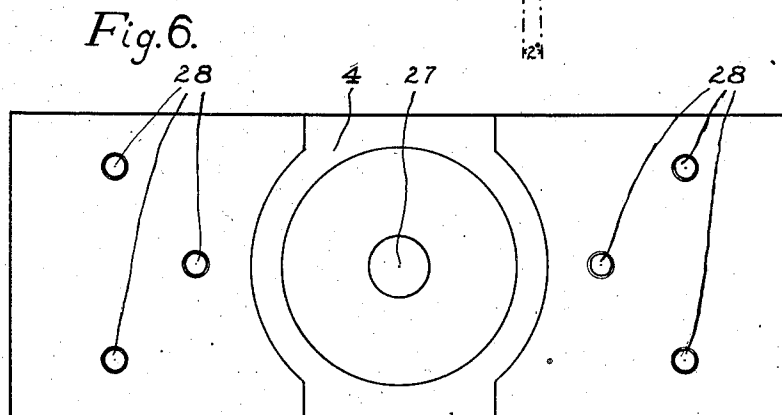
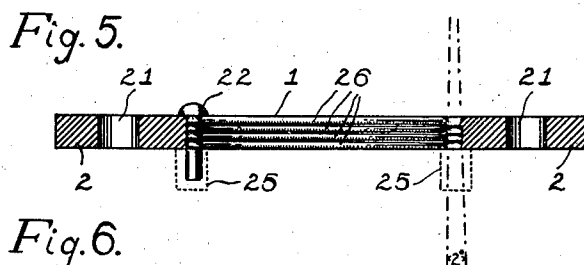
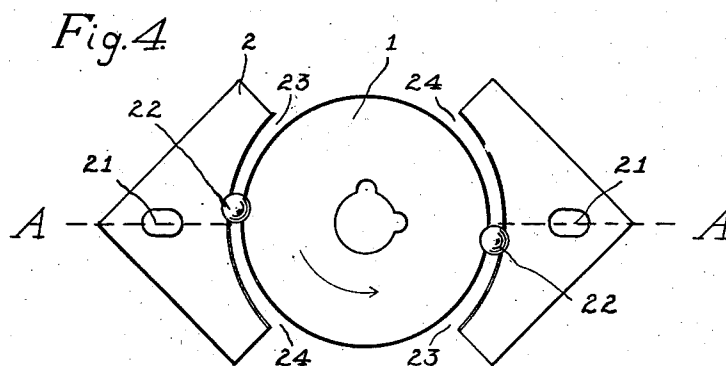
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3 Sheets-Sheet 2



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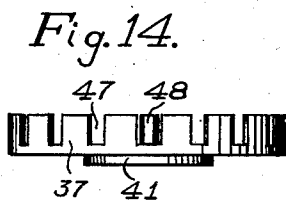
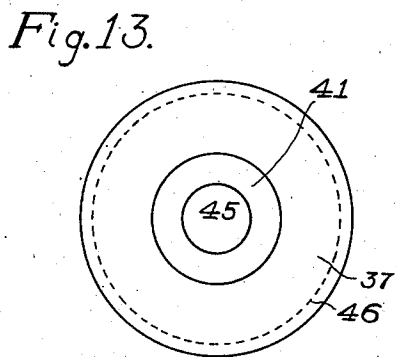
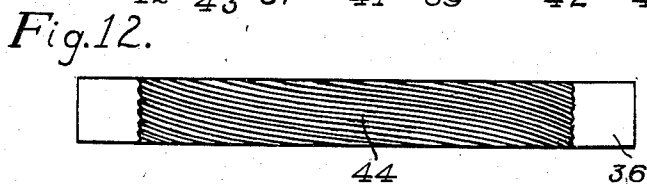
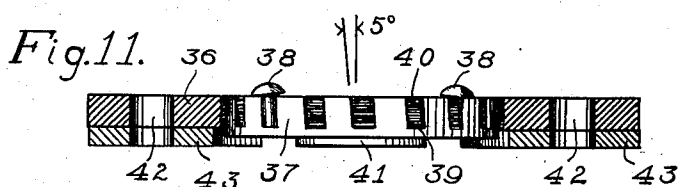
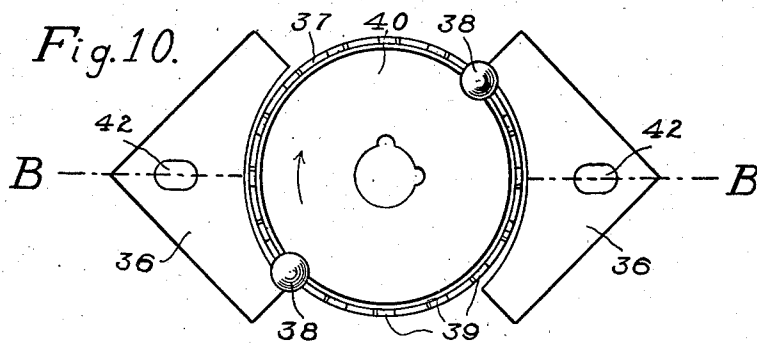
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2,058,520

ROLLING MACHINE FOR ROLLING DRIVE RIVETS AND SCREW THREADS

Filed May 1, 1933

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,058,520

ROLLING MACHINE FOR ROLLING DRIVE
RIVETS AND SCREW THREADS

Harry E. Sipe, New York, N. Y.

Application May 1, 1933, Serial No. 668,799

5 Claims. (Cl. 80—7)

My invention relates to rolling machines for rolling drive rivets and screw threads and particularly for rolling circumferential ridges on drive rivets, pins and dowels as revealed in my application for patent Serial Number 622,601 of July 15, 1932 which has become Patent No. 2,028,528 of January 21, 1936. The machine illustrated herein is of a rotary type which makes possible uninterrupted feeding of the blanks into the machine, which has great advantages in comparison with the reciprocating type of rolling machine, in which a single blank, only, can be fed at each reciprocation, including the number that can be rolled in a given time and in the lesser die surface speed in my machine. In the conventional reciprocating type about 6,000 blanks can be rolled per hour with a die surface speed of about 1000 inches per minute, while my machine, as herein shown, will roll 60,000 blanks per hour with a die surface speed of less than 300 inches per minute. The figures before given contemplate the use of automatic feed in both machines. The slower die speed insures greater perfection in the product and also does not tend to crystallize or otherwise unduly disturb the metal of the blanks.

A further advantage of my machine is its lesser weight and greater simplicity. As the blanks are rolled simultaneously on opposite sides of the central die, wear and pressure on the drive shaft bearing are greatly reduced and perfect dimension is insured in the rolled product. This rolling on opposite sides greatly reduces the necessary weight of the machine and makes for an exceedingly simple and economical construction.

Other objects and advantages will appear to those skilled in the art upon reading the following specification.

In the drawings:

Fig. 1, on a reduced scale, is a plan view of the machine.

Fig. 2, on a reduced scale, is a side elevation of the machine with the feed tracks removed from one side to better show the dies.

Fig. 3, on an enlarged scale, is a side elevation of a blank.

Fig. 4 is a plan view of the dies in operative position.

Fig. 5 is a partial cross section of the dies as shown in Fig. 4 along line A—A.

Fig. 6 is a plan view of the block as prepared for assembly of dies.

Fig. 7, on an enlarged scale, is a side elevation of a drive rivet.

Fig. 8, on an enlarged scale, shows a pintle pin.

Fig. 9, on an enlarged scale, shows a special bolt.

Fig. 10 is a plan view of thread rolling dies with cage.

Fig. 11 is a partial cross section of dies as shown in Fig. 10 at B—B.

Fig. 12, on an enlarged scale, is a view of the face of one of the thread rolling dies.

Fig. 13 is a bottom view of a cage.

Fig. 14 is a side elevation of a cage.

In Fig. 1 is shown the rotary die 1 keyed to the shaft 6 and the direction of rotation is indicated by an arrow. The two dies 2 on opposite sides are set in eccentric relationship to the die 1 so that the centers of the arcs of the surfaces facing die 1 are nearest to the periphery of die 1. This position is maintained by use of shims 10 and machine screws 8 with washers 9. The blanks are placed in inclined tracks 3 between the sides of which they are suspended by their heads which slide on the top edges of the track. The blanks sliding down the track enter the dies and are carried forward by the moving die 1 and, as the die faces approach one another, are rolled and carried out of the dies onto tracks 5. Two metal pieces 7 are attached to the block to form a backing for the dies 2. A gear keyed to shaft 6 is shown at 11 and a drive pulley at 12. The block is attached to a base 13 by means of legs 14 and 15.

Fig. 2, a side elevation similarly numbered, shows the inclined track at 3 and the shaft 6 which is extended for attachment of pulleys for actuating an automatic feed when same is used, which feed is not shown.

The gear 11 is shown in mesh with pinion 20 keyed to shaft 16, the upper bearing of which is indicated by dotted lines at 18 and the lower bearing is shown at 17. A cone pulley for drive is shown at 12. Two tapped holes 19 are for use in attaching feed tracks 3 and 5. These tracks have been removed to show die 1 and slot beneath it in block at 4.

Fig. 3 shows a blank before rolling to form a drive rivet as shown in Fig. 7.

Fig. 4 shows dies in relative position, set so that blanks 22 enter freely between them at 23 and are rolled as they are carried between them in the direction indicated by the arrow and are released at 24. Slots 21 in the outer dies 2 permit adjustment when screwed to block.

The outer dies 2 are set so that the center of their circular faces along the line A—A, facing the

center die 1, are slightly nearer to the periphery of die 1 than are the ends at 23 and 24 thus forming a channel between the opposed die faces the sides of which are in eccentric relationship. For example, if a $\frac{1}{4}$ " diameter blank is to be rolled, the radii of the curved faces of the outer dies 2 are $\frac{1}{8}$ " greater than the radius of central round die 1. The outer die faces are adjusted to form a channel .22" wide at its narrowest point, along the line A—A. So adjusted the channels are slightly wider than the diameter of the blanks ($\frac{1}{4}$ " at 23 and 24. The $\frac{1}{4}$ " blank is introduced between the dies at 23, is rolled through and formed by the narrow portion of the channel and released at 24. The walls of the channel gradually narrowing to width of .22" at the central point press a groove .015" deep into the blank and as the rotation continues the blank is rolled through the gradually widening channel and released at 24. So rolled the variation in roundness of the drive rivet is but .0005". Blanks as small as $\frac{1}{8}$ " in diameter may be rolled with these same dies by closer adjustment with a slight increase in variation in roundness, .001". Dies for rolling larger sizes are made by increasing the radii of the outer dies 2 in the same relative proportion.

Fig. 5 shows the dies 2 in cross section taken along line A—A of Fig. 4 and the center die 1. The center die face is tapered slightly as are the faces of the outer dies so that there is a relative difference of about 2 degrees in the inclination of their faces as is indicated in the drawings. The center die is first tapered and then the periphery is knurled before machining the grooves in its face. This knurling remains on the tops of the ridges as indicated at 26 and insures the turning or rolling of the blanks when they are pressed between the dies. A pintle pin is shown at 22 similar to that shown in Fig. 8 for the purpose of showing the relative position of the slot 4 in the block which permits the passage of the pin through the dies. The slot is here indicated by dotted lines at 25.

Fig. 6 is a plan view of the block showing the contour of the slot 4, the bearing 27 for the shaft and tapped holes 28 for the assembly of the dies and parts.

Fig. 7 shows a drive rivet with impressions of the knurling at 33 and a taper which has been attained by the inclination of the die faces before described. The top ridges of the die faces being closer together have rolled the ridge 30 completely filling the adjoining grooves of the dies by the displacement of the metal of the blank. The ridge 31 is of slightly less diameter as the second ridges of the dies are not as close together and do not as completely displace the metal into the adjoining groove. The ridge 32 is of still less diameter as the third ridges of the die faces are still further separated and therefore displace still less metal. By this means the ridges 30, 31, and 32 are made successively smaller in diameter producing a tapered drive rivet. Another valuable attribute of this form is the greater amount of material presented for compression in the ridges of less diameter, which in use are subjected to less compression. This adds materially to the holding power of the rivet when it is driven into a hole. The metal immediately under the head is bulged at 29 by the displacement of the adjoining metal.

Fig. 8 is a pintle pin used in hinges and shows the same contour with the extended smooth end 34. The ridges 30, 31 and 32 are from .005 inch to .015 inch greater in diameter than the diam-

eter at 34 and when the pin is driven into a hinge the portion 34 forms a bearing on which the hinge may move while the rolled portion of pin engages the other part of the hinge.

Fig. 9 is similar to Figs. 7 and 8 except that a thread has been machined on the end at 35 thus forming a bolt which engages the hole into which it is driven without injury to the thread. This also avoids slotting of the head as the compressed portion prevents turning.

Fig. 10 shows thread rolling dies in relative operative position with a cage 37 surrounding the central die 40 and rotatable between the periphery of the central die 49 and the faces of the dies 36. This cage has notches 39 into which the blanks are inserted as shown at 38. The direction of rotation is indicated by an arrow.

Fig. 11 shows the dies 36 in cross section along the line B—B in Fig. 10 and the central die 40 is shown with the cage 37 surrounding it. The notches 39 are here shown inclined at an angle of 5 degrees toward the direction of proposed rotation. The central die 40 is circumferentially grooved and ridged, which grooves and ridges are of the contour of the thread to be rolled in the blanks 38. The blanks are thus inclined in the cage at an angle corresponding to the proposed inclination of the thread to be rolled in the blanks as presented to the surface of the central die 40. This cage is made with a lesser bearing at 41 adapted to rotate against the block of the machine, so that the greater bearing of the inside of the cage against the die 40 causes the cage to rotate with the die 40 but permits its independent and slower movement when blanks are being rolled.

Fig. 12 shows the face of one of the dies 36 and shows the inclination of the grooves and ridges 44 in relation to the plane of the die. In this case it is 10 degrees which is equal to the pitch of the screw to be rolled. These ridges and grooves are of the same contour as those of the central die. By use of circumferential grooves on the central die and the inclination of the grooves on the outer dies it is possible to feed blanks continuously as the outer dies are adjusted, by means of shims, to the proper position in relationship to the central die and the blanks as they are carried into contact with the opposed die faces.

Fig. 13 shows the bottom of the cage with the lesser bearing 41 and the bearing of the inner die against the opposite face is indicated within the dotted line 46. The hole 45 is larger than the shaft which passes through it in assembled relationship thus permitting the free movement of the cage.

Fig. 14 is a side elevation of a similar cage in which the notches 47 are not inclined. This type of cage is for use in rolling pins, dowels and countersunk head blanks, thus holding the blanks in proper position during the rolling. These notches are slightly wider than the diameter of the blanks to be guided as shown by pin 48 to permit the free entrance and rolling of the blanks.

In Fig. 11 spacers 43 are shown under the dies 36 which are thus held in proper alignment with the central die 40. The holes 42 through the dies 36 also continue through the spacers 43 to permit the passage of the fastening screws.

While the machine herein shown has two oppositely disposed outer dies it can be operated with but one outer die though the opposed dies are preferred. Also a greater number of outer dies may be arranged around a central die of larger

diameter preferably in pairs set diametrically opposite one another. The greater number of outer dies makes possible increased production and also by different adjustment of the outer dies different diameters of blanks may be rolled simultaneously. This form of machine would also have the advantage of not requiring as frequent adjustment of the dies for rolling different diameters. Different lengths can also be rolled simultaneously and also the different forms shown in Figs. 7, 8 and 9. When a cage is used pins and counterstunk head blanks can be rolled simultaneously with round head blanks. The round head blanks can be fed into the dies without the use of the cage as their touching one another does not, in practice, throw any of them out of proper alinement for rolling.

The taper produced on the drive rivet cannot be easily attained by inclining the die faces in a direction corresponding with the resultant taper desired as the opposite effect will obtain if the dies are not set as closely as possible together. In this case it becomes necessary to displace the material of the blank endwise, thus elongating the drive rivet, to attain the taper. This action is very much limited as too great a pressure of the blanks between the dies causes them to slide instead of rolling. For this reason the dies tapered as I have shown produce the desired taper much easier.

The dies for rolling thread must be made especially for each different diameter and different thread.

When the cage is used the feed tracks are set so that the blanks pass into the notches as they are presented successively to the open end of the track. The walls between the notches prevent the blanks from passing out of the feed track.

Various other changes and modifications of the construction herein shown and described may be made within the scope of the following claims without departing from the spirit of my invention or sacrificing its advantages.

What I claim as my invention is:

1. In a machine for rolling screw threads the combination of a rotatable round die the periphery of which is formed with a series of continuous circular grooves and a stationary arcuate die the face of which is diagonally grooved and a cage operating between the die faces with means thereon to hold the work angularly with respect to the dies.

2. In a machine for rolling screw threads the combination of a rotatable round die the periphery of which is formed with a series of continuous circular grooves and a stationary arcuate die the face of which is diagonally grooved and a notched carrier adapted to guide blanks into a channel formed between the grooved die faces angularly with respect to the dies.

3. In a machine for cold rolling a tapered drive rivet the combination of a rotatable round die and an arcuate die forming a channel between them through which rivets are adapted to be rolled, the die faces having a series of circumferential ridges and being transversely inclined apart toward the bottom of the channel so that the ridges are pressed completely into the rivet adjacent its upper end and to a graduating lesser depth toward the point of the rivet thus increasing the diameter adjacent the upper end of the rivet by the greater displacement of metal at said upper end.

4. In a machine for rolling screw threads the combination of a rotatable round die the periphery of which is formed with a series of continuous circular grooves and a stationary arcuate die the face of which is diagonally grooved and means for introducing blanks into the channel formed between the grooved die faces and a cage operating between the die faces with means thereon to hold the work angularly with respect to the dies.

5. In a machine for rolling screw threads the combination of a rotatable round die the periphery of which is formed with a series of continuous circular grooves and a stationary arcuate die the face of which is diagonally grooved and means for adjusting the width of a channel formed between the grooved die faces and a cage operating between the die faces with means thereon to hold the work angularly with respect to the dies.

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