March 22, 1949. A. E. NEUMANN 2,464,883

THREAD ROLLING MACHINE

Filed June 4, 1945

Fig. 6.

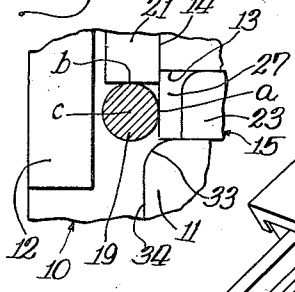


Fig. 1.

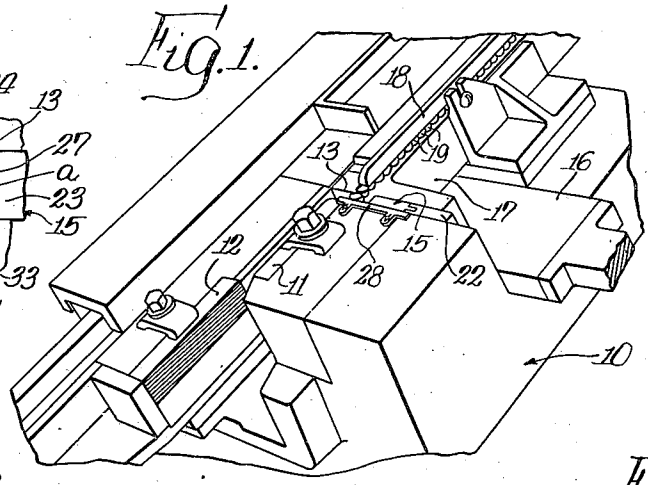


Fig. 2.

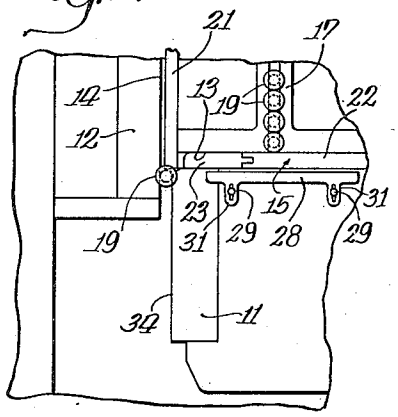


Fig. 3.

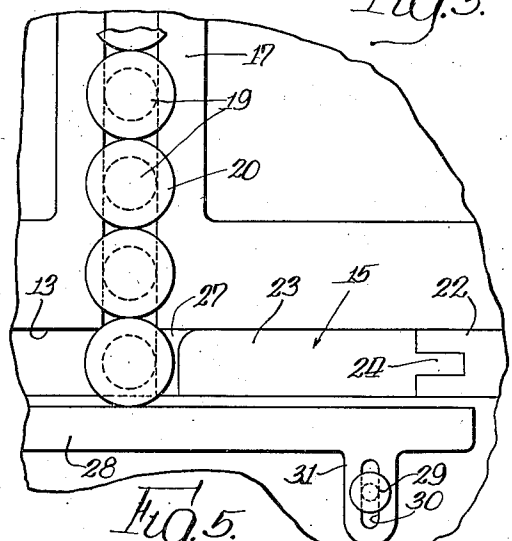


Fig. 4.

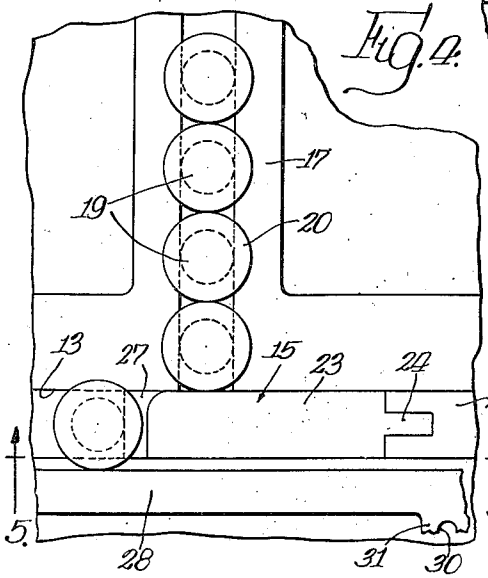
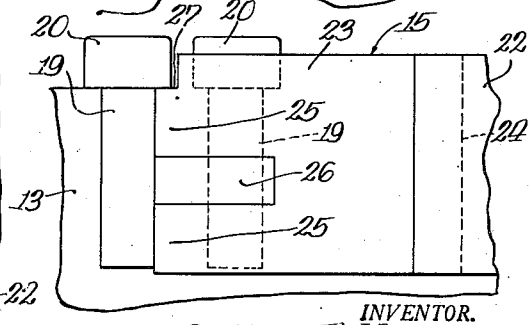


Fig. 5.



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THREAD ROLLING MACHINE

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5 Claims. (Cl. 80—8)

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This invention relates to machines for operating on blanks and analogous articles, and has to do with means for transferring the blanks or the like to the mechanism which operates upon them.

My invention is particularly applicable to thread rolling machines and will be described, in the first instance, as applied to such a machine, though it is to be understood that my invention in its broader aspects, is applicable to various other machines, as will be explained more fully later. In thread rolling machines as presently constructed the blanks are delivered by a chute to a reciprocating transfer finger having an associated register finger, by means of which the blank is held in position on the end of the transfer finger, and a starter finger removes the blank from the transfer finger and delivers it to the die opening in position to be gripped between the dies at the start of the operating stroke thereof. Thread rolling machines of this type are extensively used, and, in general, are capable of producing satisfactory work where precision is not required. In such machines, however, difficulty frequently is encountered in accurately positioning the blank in the die opening, with the result that inaccuracies in rolling of the thread on the blanks occur, such that precision in rolling of the thread is not possible. While such inaccuracies may be slight in some cases and such as not to render the threaded piece totally unfit for use, and more serious in other cases, they preclude precision rolling of the thread, and machines utilizing the transfer feed mechanism referred to are not suitable for precision work.

My invention is directed to a machine—for example, a thread rolling machine—having transfer feed mechanism whereby accurate positioning of blanks or analogous articles with respect to the dies or other operating mechanism is assured, whereby precision rolling of threads on the blanks is rendered possible. More specifically, I provide, in a thread rolling machine, a transfer finger having at its inner end means whereby the blanks delivered singly from the feed chute are held magnetically in position on the inner end of the transfer finger, the blanks being removed from the transfer finger by a starter finger of magnetic material movable across the inner end of the transfer finger so that, as the starter finger contacts the blank, the latter is erected in two planes substantially perpendicular to each other and is thereby accurately disposed for positioning in the die opening. In the movement of the starter finger across the inner end of the transfer finger, the starter finger becomes temporarily

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magnetized so that the blank is held accurately positioned thereon and is removed from the transfer finger by a rolling action, and is then accurately disposed by the starter finger in the die opening in position to be gripped between the dies at the start of the working stroke of the movable or reciprocating die. As a further assurance of accuracy when rolling threads on headed blanks, the inner end of the transfer finger is so formed as to provide a recess which receives the head of a blank, and a projection or shoulder contiguous to the recess disposed to contact the head of the lowermost blank in the chute as the transfer finger moves across the lower end thereof, thereby guarding against displacement of the blank held on the inner end of the transfer finger by pressure exerted on the head of that blank by the head of the lowermost blank in the chute, as the finger moves past the latter. Also, with a view to increased inaccuracy, the elements of the body or frame of the machine defining the guideways in which the transfer finger and the starter finger operate are formed of magnetic material, such as iron or ordinary steel, so that the small particles of metal or chips produced in the operation of the machine are moved to the outer side edges of the respective fingers, due to greater density of the magnetic flux at those areas, leaving the central areas of the ends of the fingers substantially free of metal particles which might interfere with accurate positioning thereon of the blanks. Further objects and advantages of my invention will appear from the detail description.

In the drawings:

Figure 1 is a fragmentary isometric side view of a thread rolling machine embodying my invention;

Figure 2 is a plan view of the transfer finger and starter finger and associated parts, with the starter finger in position disposing a blank between the dies at the throat of the die opening, this view being semi-diagrammatic and certain parts being omitted for clearness of illustration;

Figure 3 is a semi-diagrammatic plan view, on an enlarged scale, of the blank feed chute and the transfer finger and associated parts, with the finger in its outer position and a blank magnetically held in position on the inner end of the finger;

Figure 4 is a view similar to Figure 3 but with the transfer finger moved inward into position closing the lower end of the blank feed chute;

Figure 5 is a sectional view taken substantially on line 5—5 of Figure 4; and

Figure 6 is a fragmentary semi-diagrammatic plan view showing the positions of the parts when the starter finger contacts the blank on the inner end of the transfer finger, the head of the blank being omitted and the shank thereof being shown in section.

The transfer and feed mechanism of my invention is applied to a thread rolling machine which, except as to such mechanism, is of known construction and operation. Accordingly, I have illustrated only such portions of the machine as are necessary to an understanding of my invention. The machine comprises a body or frame 10, which may be considered as including the die holders, gate and gate cap, and other parts usual to such machines, a stationary die 11 and a cooperating reciprocating die 12 suitably spaced from die 11 and defining therewith a die opening for reception of the blanks to be threaded, the dies 11 and 12 being provided at their opposed faces with suitably disposed grooves and ridges for rolling the thread, as is well known. The frame 10 defines a transfer finger guideway 13 and a starter finger guideway 14 disposed substantially perpendicular to guideway 13 and intersecting the inner end thereof, guideway 14 substantially constituting a continuation of the opening between the dies 11 and 12. The parts of the frame structure defining the side walls of the guideways 13 and 14 are of magnetic material, such as iron or steel used in the construction of the frame. A transfer finger 15 is slidably mounted on guideway 13, this finger being carried by a reciprocating transfer slide 16 mounted in frame structure 10 and reciprocated in a known manner. A blank feed or delivery chute 17 is mounted on the frame structure 10 and opens at its lower end into guideway 13, this chute being inclined downward toward this guideway. A chute cover 18, suitably supported above the chute 17, holds the blanks properly positioned within the chute. I have shown a plurality of headed blanks 19 within chute 17, cover 18 contacting the upper faces of the heads of these blanks for the purpose stated, so that head 20 of each blank is confined between cover 18 and the side walls of the chute, which this head overlaps as shown more clearly in Figures 3 and 4. The blanks are supplied to the upper end of chute 17 in a known manner, and are delivered singly therefrom to the guideway 13 for contact by the inner end of the transfer finger, by which they are moved inward into position to be contacted by a starter finger 21 operating in guideway 14, defined in part by the movable die 12, starter finger 21 serving to remove the blank from the transfer finger 15 and position it in the inner end portion or throat of the die opening, where it is disposed to be gripped between the dies at the start of the working stroke of the movable die 12. The machine so far described is of known construction and operation and need not be described in greater detail, except with respect to the feeder transfer mechanism of my invention.

The transfer finger 15 comprises a body portion 22 formed of any suitable metal, which may be magnetic or not, as desired, and an inner end member 23 in the form of a permanent magnet, preferably of high flux density, such as an "Alnico" magnet of substantially U-shape, having at its outer end a reduced tongue 24 which is secured, conveniently by welding or brazing, in a corresponding slot in the inner end of body 22, with the shoulders at the outer end of magnet 23 seating accurately against the inner end of body 22. The magnet 15 is oblong in plan, and has its

arms 25 spaced apart, with the space therebetween filled with a non-magnetic material 26, for example lead. The magnet 23 thus presents two spaced apart pole ends of rectangular shape at the inner end of the transfer finger 15. The upper inner end portion of magnet 23 is cut away or reduced in height to provide a recess 27 for reception of the head 20 of a blank 19, the uncutaway upper portion of magnet 23 constituting with the upper portion of body or member 22 of transfer finger 15 a shoulder for contact with the head of the lowermost blank in chute 17.

When the transfer finger 15 is in its outer position shown in Figure 3, the lower or delivery end of chute 17 is uncovered and a blank 19 is discharged from this chute, by gravity, into guideway 13. Downward movement of the blank in guideway 13 is limited by a guide plate 28 adjustably mounted on the frame structure 10 by shouldered adjusting screws 29 threading into the frame structure and passing through slots 30 in spaced ears 31 integral with plate 28. This plate is so adjusted as to position the shank of blank 19 in guideway 13 in centered relation thereto. The blank thus delivered from the chute is held magnetically in position upon the spaced poles of magnet 23. The transfer finger 15, with the blank magnetically held in position upon its inner end, is then moved inward, and the upper portion of magnet 23 contacts the bottom edge of head 20 of the lowermost blank 19 in chute 17, the magnet 23 also closing the lower end of the chute, so as to preclude delivery of a second blank from the chute. Contact of the upper portion of magnet 23 with the head of the lowermost blank in the chute occurs immediately after the head of the blank on the transfer finger has been moved a short distance inward relative to the head of the lowermost blank in the chute, thereby preventing downward movement of the latter blank sufficiently to disturb the position of the blank on the transfer finger, such as might otherwise occur due to the pressure exerted by the superposed blanks in the chute 17. That is conducive to accuracy, since the blank delivered to the transfer finger from chute 17 is positioned centrally of the end of that finger, as noted. The transfer finger 15 continues its inward travel until the blank 19 carried thereby is disposed to be contacted by the starter finger 21, at which time this finger moves across the inner end of finger 13 into contact with the shank of blank 19. As previously noted, the starter finger 21 is formed of magnetic metal and is disposed perpendicular, or substantially so, to the inner end of transfer finger 15. When the starter finger 21 first contacts the shank of blank 19, the blank is disposed between two flat surfaces, one perpendicular to the other, as shown in Figure 6, and the end portion of finger 21 is then magnetized by the magnetic flux flowing therethrough from the magnet 23. The blank 19 is then erected in two planes perpendicular to each other, and is, therefore, accurately positioned for disposal in the die opening in proper position to assure precision rolling of the threads in the blank. In the continued movement of starter finger 21 toward the dies, the blank 19 is rolled off of the end of transfer finger 15, due to the fact that this blank is then in line contact at *a* with the end of transfer finger 15, and is also in line contact at *b* with the starter finger 21. As will be noted more clearly from Figure 6, the inner corner of die 11 is rounded at 33, providing a flaring throat leading to the die opening, the inner or operating face

34 of die 11 being offset inwardly relative to finger 21. In the continued travel of finger 21 across the inner end of transfer finger 15, the blank 19 contacts the rounded corner 33 of die 11 and is shifted thereby across the end of finger 21 into contact with the inner face of die 12, being thereby again erected in two planes substantially perpendicular to each other, whereby accuracy in positioning of the blank in the die opening is assured. When the blank 19 has been thus accurately positioned in the die opening, the movable die 12 starts its operating stroke and the blank is tightly gripped between the two dies in accurate position therebetween. During travel of the starter finger 21 across the transfer finger 15, into position to dispose the blank 19 accurately in the die opening in the manner stated, it passes somewhat beyond finger 15, and the flux density at the end of finger 21 is thereby materially reduced so that, when the blank is initially gripped between the dies, the magnetism of starter finger 21 offers no objectionable resistance to detachment of the blank therefrom, which is conducive to accurate positioning of the blank between the dies and precision rolling of the thread on the blank. Since the walls of the guideways for the transfer finger and the starter finger are of magnetic material, and the end faces of the respective fingers are rectangular with sharp side edges or corners, small particles or chips of metal occurring in the operation of the machine will tend to collect at the side edges of the fingers, in the areas of greatest flux density, maintaining the central areas of the ends of the fingers substantially free from chips, which is desirable and conducive to accuracy. In the operating stroke of the die 12 a thread is rolled on the blank, and it is then discharged from between the dies in a known manner. By positioning the blank accurately with respect to the dies in the manner above described, I render possible precision rolling of the thread which, so far as I am aware, has not heretofore been possible. It will be seen that by holding the blank in position on the end of the transfer finger magnetically I obviate the necessity for using a register finger, such as is commonly used in present thread rolling machines, while also rendering possible much greater accuracy in the rolling operation than is possible in present machines.

Referring further to Figure 6, it will be seen that the fingers 15 and 21 operate in intersecting planes passing through a common axis, i. e., the axis *c* of blank 19. That assures that the blank is erected in two planes, in the corner provided by the contiguous ends of the fingers, as the starter finger 21 crosses the inner end of the transfer finger 15. Preferably, the fingers 15 and 21 are disposed substantially at right angles to each other, but they may be disposed at any other suitable relative angle about the common axis *c*, within the concept of my invention. Also, within the broader aspects of my invention, the blank, during transfer and delivery thereof to the dies or other operating means, may be disposed in any suitable position other than vertical, so long as the transfer finger 15 and the starter finger 21 are so related as to provide a corner in which the blank is erected and thereby accurately positioned with respect to the mechanism for operating upon the blank, as for the reasons previously described.

I have described my invention as embodied in a machine used for rolling threads on headed blanks. When rolling threads on unheaded

blanks the operation of the machine is substantially the same as that above described, which need not be repeated here, the gauge plate 28 being, of course, appropriately adjusted to suit the blanks being threaded.

The use of a permanent magnet at the inner end of the transfer finger is particularly suited to known thread rolling machines and is advantageous in requiring no changes in the frame structure of such a machine. It is to be understood, however, that within the broader aspects of my invention the transfer finger may be provided with any suitable known type of magnet, such as an electromagnet, and means for energizing the latter, and other changes may be made in details of construction and arrangement of thread rolling machines embodying my invention. I have illustrated and described my invention, by way of example, as embodied in a thread rolling machine, to which it is particularly suited in certain of its more specific aspects. In its broader aspects, however, my invention is applicable to other machines in which a blank or analogous article to be operated upon is to be presented to operating means in predetermined relation thereto. The essential feature of my invention is that the blank or analogous article is erected in a corner provided by the transfer finger and the starter finger, or equivalent members, with respect to a common axis about which such members are disposed, the fingers being provided with means effective for holding the blank on the transfer finger, erecting the blank in two planes, and then delivering it to the operating means in proper relation thereto. Within the broader aspects of my invention, the blanks may be delivered to the transfer finger in any suitable manner other than from a chute, and any suitable means—suction, for example—other than magnetic means, may be provided for holding the blank to the transfer finger and erecting it in two planes in a corner provided by the contiguous ends of the fingers, preliminary to delivery of the blank by the starter finger to the dies or other operating mechanism.

It will be understood, as above indicated, that changes may be resorted to without departing from my invention, and I intend, therefore, to include in this application, in which the preferred form only of my invention has been disclosed, all such variations as fall within the scope of the appended claims.

I claim:

1. In means for transferring blanks from the blank supply point of a machine for operating upon blanks between two relatively reciprocating dies, a reciprocable transfer finger operable across the blank supply point for contact with blanks of magnetic material delivered thereto, said finger being magnetized at its inner end effective for magnetically holding a blank in position thereon, and a starter finger of magnetic material movable across the inner end of said transfer finger when the latter is in its inner position then defining therewith a corner in which the blank is erected magnetically in two planes by magnetic flux passing between the contiguous ends of said fingers through the blank, said starter finger in its continued movement across said transfer finger moving the blank therefrom and delivering it to the die throat while said starter finger remains magnetized by said transfer finger sufficiently to hold the blank magnetically on said starter finger until it is delivered thereby to the dies.

2. In means for transferring blanks from the

blank supply point of a machine for operating upon blanks between two relatively reciprocating dies, a reciprocable transfer finger operable across the blank supply point for contact with blanks of magnetic material delivered thereto, said finger being magnetized at its inner end effective for magnetically holding a blank in position thereon, and a starter finger of magnetic material movable across the inner end of said transfer finger in close proximity thereto into position to deliver a blank to the dies while said transfer finger is in its inner position, said starter finger when it reaches said transfer finger defining therewith a corner in which the blank is erected magnetically in two planes by magnetic flux passing between the contiguous ends of said fingers through the blank, said starter finger in its continued movement across said transfer finger moving the blank therefrom and delivering it to the die throat while said starter finger remains magnetized by said transfer finger sufficiently to hold the blank magnetically on said starter finger until it is delivered thereby to the dies.

3. In means for transferring blanks from the blank supply point of a machine for operating upon blanks between two relatively reciprocating dies, a reciprocable transfer finger operable across the blank supply point for contact with blanks of magnetic material delivered thereto, a permanent magnet mounted on the inner end of said transfer finger effective for magnetically holding a blank in position thereon, and a starter finger of magnetic material movable across the inner end of said magnet when said transfer finger is in its inner position then defining with said magnet a corner in which the blank is erected magnetically in two planes by magnetic flux between said magnet and the contiguous end of said starter finger through the blank, said starter finger in its continued movement across said magnet moving the blank therefrom and delivering it to the die throat while said starter finger remains magnetized by said magnet sufficiently to hold the blank magnetically on said starter finger until it is delivered thereby to the dies.

4. In means for transferring blanks from the blank supply point of a machine for operating upon blanks between two relatively reciprocating dies, a reciprocable transfer finger operable across the blank supply point for contact with blanks of magnetic material delivered thereto, a substantially U-shaped magnet mounted on the inner end of said transfer finger there providing two vertically spaced magnetic poles effective for magnetically holding a blank in position thereon, and a starter finger of magnetic material movable across the inner end of said magnet when said transfer finger is in its inner position then defining with said magnet a corner in which the blank is erected magnetically in two planes by magnetic flux between said magnet and the contiguous end of said starter finger through the blank, said starter finger in its continued movement across said magnet moving the blank therefrom and delivering it to the die throat while said starter finger remains magnetized by said magnet sufficiently to hold the blank magnetically on said starter finger until it is delivered thereby to the dies.

5. In means for transferring blanks from the blank supply point of a machine for operating upon blanks between two relatively reciprocating dies, a reciprocable transfer finger operable across the blank supply point for contact with blanks of magnetic material delivered thereto, a permanent magnet of substantially U-shape mounted on the inner end of said transfer finger effective for magnetically holding a blank in position thereon, and a starter finger of magnetic material movable across the inner end of said magnet when said transfer finger is in its inner position then defining with said magnet a corner in which the blank is erected magnetically in two planes by magnetic flux between said magnet and the contiguous end of said starter finger through the blank, said starter finger in its continued movement across said magnet moving the blank therefrom and delivering it to the die throat while said starter finger remains magnetized by said magnet sufficiently to hold the blank magnetically on said starter finger until it is delivered thereby to the dies.

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