

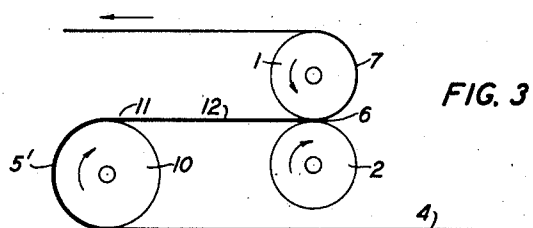
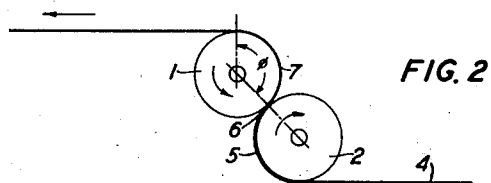
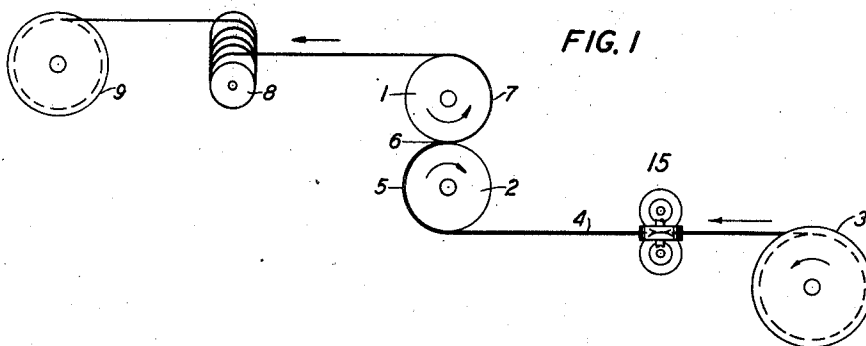
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METHOD OF THREADING ROLLING MILLS

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METHOD OF THREADING ROLLING MILLS

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1 Claim. (Cl. 80-60)

This invention relates to a method of threading rolling mill rolls.

In rolling metals, particularly in rolling tape or filamentary ribbon from wires, considerable difficulty is experienced in producing a perfectly straight product. It has been found that this is largely due to lack of control over the lateral movement of the material as it passes between the two work rolls of the mill. Straight tape of uniform dimensions is very important for many applications, among which magnetic recording tape is a notable example.

It is the object of this invention to provide a method of threading the material through the mill roll whereby the product therefrom is exceedingly straight and uniform in cross-sectional dimensions.

The foregoing object is attained by the method of this invention which comprises passing the material between the two work rolls and around at least one of said rolls and in continuous contact therewith throughout an appreciable arc.

The advantages of this invention may be better understood by referring to the drawing in which:

Fig. 1 schematically discloses a preferred method of threading the rolls in accordance with this invention;

Fig. 2 is a slight modification of Fig. 1; and

Fig. 3 illustrates the method of threading wherein an idler roll is employed.

Referring now to Fig. 1, rolls 1 and 2 comprise the usual two work rolls of a mill. A supply spool or reel 3 carries the material 4 which may be a rod or wire of any suitable shape. For the sake of a specific example material 4 may be assumed to be a flat tape of substantially rectangular cross-section which it is desired to roll to a smaller size between rolls 1 and 2. If desired, tape 4 may be passed through an edge-working device 15 of a type similar to that disclosed in U. S. Patent 1,793,247 to Piper, issued February 17, 1931. Thereafter it is passed under and around roll 2 and in continuous frictional contact therewith over an appreciable arc 5, in this specific case about 180 degrees. The material then passes between the rolls at 6 and about roll 1 at 7. Thereafter, capstan 8 may be provided to exert a uniform tension on the finished product and to deliver it to the take-up spool 9.

Rolls 1 and 2 may be of any size or material commonly used for such purposes but for accurate work on small tape they are preferably of the type and material disclosed in applicant's copending application Serial No. 280,043 filed on even date herewith.

The action of the material in so far as its lateral movement as it passes over the rolls is concerned is somewhat analogous to that of a belt passing over a straight or cylindrical pulley. It has been found that the stresses produced by any lateral flexing of the material as it leaves the work point 6 combines with the very high stresses exerted by the rolls to cause the product to have a permanent bend in the direction flexed. It should be kept in mind that the material at point 6 is already under stresses well above its normal yield point and as a matter of fact is actually flowing. When using power driven rolls of relatively small diameters with a relatively large capstan tension there is a combined drawing and rolling action continuously taking place at point 6.

To prevent the aforesaid undesirable permanent bend in the finished product it is essential that lateral flexing be eliminated. It has been found that if the rolls are threaded in the usual manner and capstan 8 is so positioned as to pull on the material exactly normal to the axes of the two rolls without any lateral displacement, the straightness of the finished product is greatly improved. However, in actual practice it is very difficult and requires a great deal of time to so accurately position the capstan, and even when the capstan is carefully aligned it is almost impossible to prevent some lateral displacement due to whipping. The most accurate control is attained by actively controlling the lateral movement right at the work point 6. This invention does this by virtue of the wrapped length of rolled material around one of the work rolls just as it leaves the work point. The frictional force caused to exist between the material and the roll so effectively prevents lateral flexure at the work point 6 that relatively severe misalignment of capstan 8 will in no way cause permanent curvature in the finished material.

Since roll 2 is running at the same peripheral speed as roll 1, material 4 is actually slipping on roll 2 at point 5. For some materials this slipping has been found in practice to have very little effect on the actual control over the point where it will enter between the rolls.

To summarize the actions above described, the passage of the materials in contact about roll 2 permits accurate control for most materials over the location of the work point 6 while the passage in contact about roll 1 prevents lateral flexure at work point 6.

It is not essential that the arc of contact be as much as 180 degrees as indicated for both

rolls in Fig. 1. It may be almost any appreciable amount which will insure stability of control depending upon the material handled, the angular velocity of the rolls, the diameters of the rolls and the tensions employed. Fig. 2 shows an arc of contact ϕ which is something less than 180 degrees. Although the same angle has been shown for each roll it is obvious that they may be different if the design of the machine is such as to require different angles.

Fig. 3 discloses a modification of Fig. 1 useful where the materials employed or other conditions prevent accurate control over the work point 6 or where the slipping of the work material on roll 2 causes excessive wear.

In this case an idler roll 10 is employed to provide the necessary control over the entrance of the material to the work point 6. The peripheral speed of roll 10 is the same as the velocity of the material 4 and hence there is no appreciable relative motion at contact point 5' to cause wear or disturb the accuracy of control. When using an idler roll the exit point 11 should be so located as to cause the length of material 12 to lie as nearly as possible between the tangents to the

two work rolls at the work point 6. The material 4 may pass about roll 10 from any direction.

It should also be noted that while in each of the figures material 4 is shown leaving the rolls via upper roll 1 this is not at all essential. It is only essential that the material leave in arcuate contact with at least one of the rolls which may be either roll.

What is claimed is:

10 In a rolling mill for rolling filamentary material into flat tape, said mill having at least two work rolls with a work point therebetween, the method of rolling said material into tape comprising the step of passing the material about one of said rolls and in frictional contact therewith throughout an appreciable length of arc, passing the material between the rolls at the work point, applying pressure to the material at the work point to reduce it to a smaller cross sectional area as it passes through, and upon leaving the work point keeping the material in constant substantially static frictional contact with one of the rolls throughout an appreciable length of arc.

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