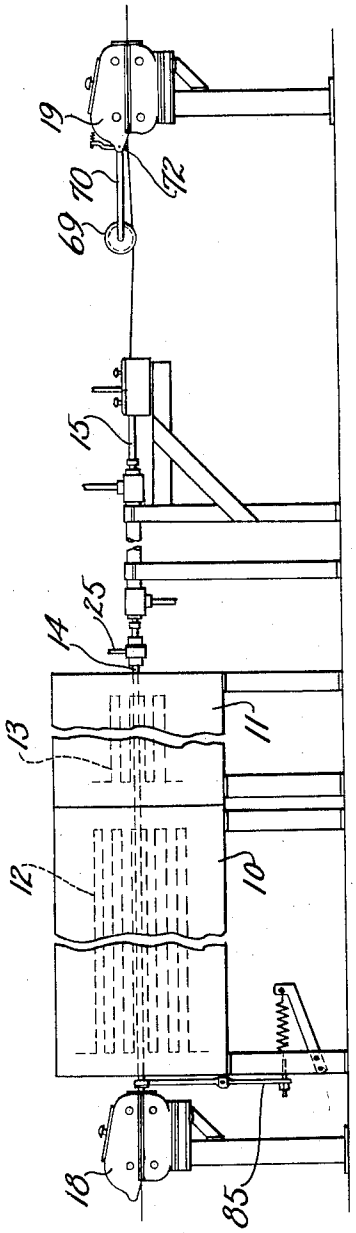
Dec. 20, 1927. 1,653,215

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APPARATUS FOR HEAT TREATING METALS

Filed Nov. 15, 1922 2 Sheets-Sheet 1

Fig. 1



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Fig. 2

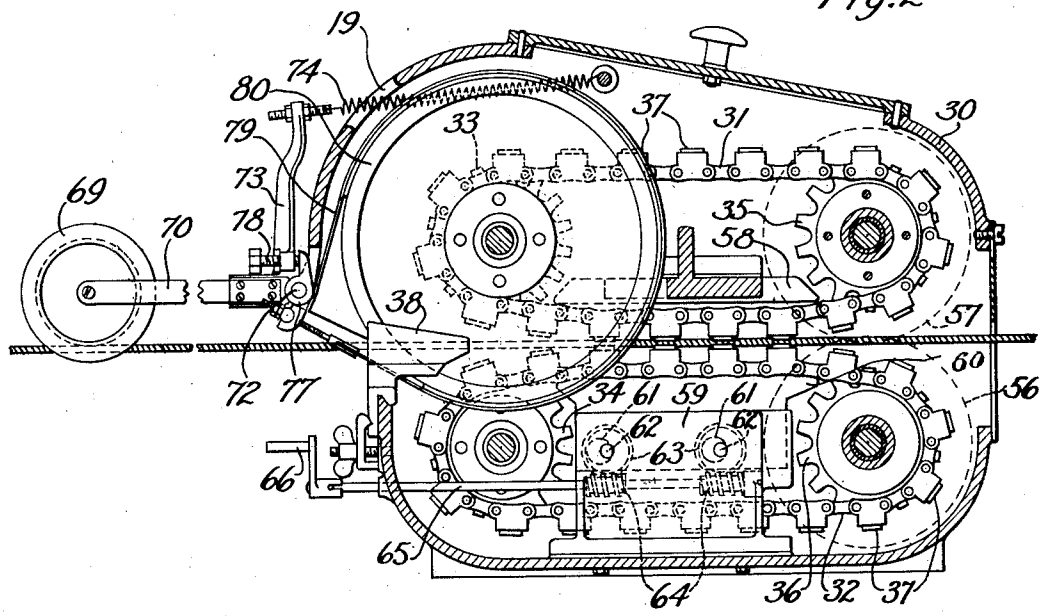


Fig. 4

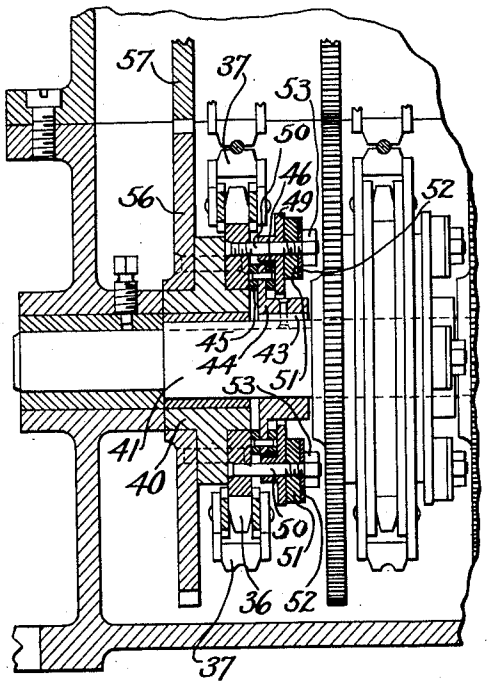
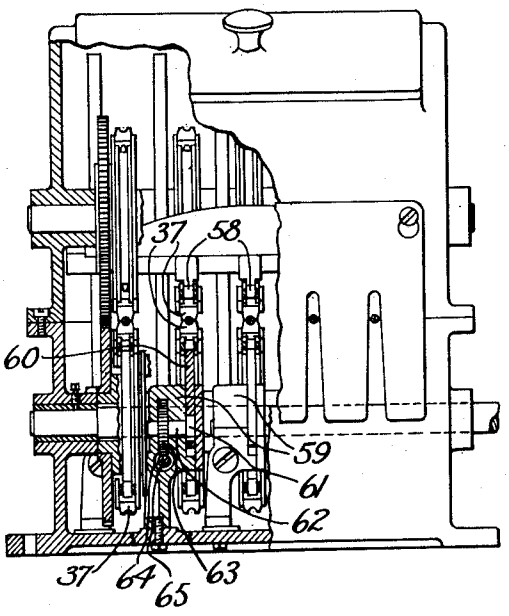


Fig. 3



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Patented Dec. 20, 1927. 1,653,215

UNITED STATES PATENT OFFICE.

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APPARATUS FOR HEAT-TREATING METALS.

Application filed November 15, 1922. Serial No. 601,008.

This invention relates to apparatus for heat treating metal, and more particularly to improvements in the mechanism employed for feeding metal in strand, strip or sheet form through the heat treating apparatus.

The object of the invention is to provide means for continuously feeding a metallic strand through the apparatus for administering the heat treatment without subjecting the strand to substantially any tension.

The apparatus herein disclosed is particularly adapted for heat treating a copper wire to be used as an electrical conductor for the transmission of intelligence, the conductor being wrapped with a metallic alloy tape having certain electrical characteristics which are controlled to some extent by the character of the heat treatment administered thereto. A full disclosure of the metallurgical constituency of the tape or of its electrical characteristics or of the specific heat treatment are not necessary to a complete understanding of the present invention which is not limited to this use but may be employed for other purposes and the invention is only to be limited by the spirit and scope of the appended claims.

Other objects, features, and advantages of the invention will be set forth in detail in the following description and particularly pointed out in the claims.

In the accompanying drawings which illustrate one embodiment of the invention,

Fig. 1 is a fragmentary side elevation of an apparatus for heat treating metals embodying the features of the invention;

Fig. 2 is an enlarged vertical sectional view showing the construction of the caterpillar feeding device at the take-up end;

Fig. 3 is a rear elevation partly broken away and also in vertical section, of the mechanism shown in Fig. 2, and

Fig. 4 is an enlarged vertical sectional view of the lower left hand corner of the mechanism shown in Fig. 3 showing the friction drive for the caterpillar grippers.

Although the apparatus disclosed in the drawing is particularly designed for heat treating and feeding metal in strand form, it is to be understood that the apparatus may be modified to treat metal in strip, plate or other forms, without departing from the spirit and scope of the invention.

Referring now to the drawings in detail in which like reference numerals designate similar parts throughout the several views, 10 and 11 indicate two furnaces which are in juxtaposition. These furnaces may be of any suitable type and heated in any desired manner. They are illustrated as being electric furnaces heated by coils diagrammatically illustrated at 12 and 13 respectively. The furnace 10 is longer than the furnace 11 and is maintained at a higher temperature, the purpose of which will be hereinafter explained. Instead of two furnaces, it is to be understood that a single furnace having two zones maintained at different temperatures may be utilized, or the heating means may be otherwise modified, without departing from the spirit and scope of the invention.

Suitably supported within the furnaces 10 and 11 is a metallic tube 14 which communicates with a cooling tube 15. For a detailed description and illustration of the construction of the cooling tube 15, reference is made to the patent to Frederic S. Kochendorfer, No. 1,624,668, issued April 12, 1927.

The strand to be heat treated is fed from a supply reel (not shown) and pushed through the tubes 14 and 15 by means of a caterpillar feeding mechanism 18 which will be hereinafter described in detail. As the strand passes from the discharge end of the cooling tube 15, it is acted upon by a second caterpillar feeding mechanism 19, which serves to take up any slack in the strand, in a manner hereinafter described, the heat treated strand being taken up on a storage reel, (not shown).

For the sake of simplicity the drawings only illustrate one heating tube and one cooling tube, but it is to be understood that in practice a plurality of tubes similar to the tube 14 may be mounted within the furnaces 10 and 11 and that a plurality of cooling tubes 15 may be utilized therewith. The caterpillar feeding mechanisms are designed to receive five strands so that this number of heating and cooling tubes may be utilized without necessitating any modification in the feeding mechanism.

In order to provide both a non-oxidizing and a non-reducing atmosphere in the heating tube 14, nitrogen under pressure is forced into the said tube through a pipe 25.

The nitrogen entering through the pipe 25 is forced into the heating tube 14, and provides both a non-oxidizing and non-reducing atmosphere, and in its passage through the tube sweeps out any other gases that may be present therein.

In the heat treatment of conductors of the type for which this apparatus is particularly designed it is very essential that substantially no tension be put on the conductor along its length while it is being treated. To insure this, the conductor is pushed through the furnace and the cooling apparatus by the caterpillar mechanism 18 at the forward end of the furnace which comprises a pair of chains carrying rubber gripping shoes. The chains are positively driven at a fixed speed in a direction which will push the conductor through the apparatus causing a certain amount of slack beyond the cooling tube.

The caterpillar mechanism 19 at the exit end of the heat treating apparatus functions to feed the treated strand to a storage reel, (not shown) under a certain substantially uniform degree of tension. Due to slippage between the gripping shoes of the caterpillar mechanisms 18 and 19, the slackness between the exit end of the furnace and the caterpillar mechanism 19 will vary. To maintain this slackness substantially uniform means is provided for varying the speed of the caterpillar mechanism 19, which means is responsive to the slackness in the strand.

The mechanism 19 (Figs. 2, 3, and 4) and its operation will now be described.

Within a housing 30 are chains 31 and 32 mounted one above the other at one end upon sprockets 33 and 34 respectively, and at the opposite end upon sprockets 35 and 36, and all of said sprockets being carried upon suitably mounted shafts. Each chain link is provided with a gripping shoe 37 composed of rubber which is recessed to conform to the shape of the strand being treated. The strand enters the housing 30, passes over a suitable stationary shoe 38, and then between the shoes 37. The sprocket wheel 36 (Fig. 4) is suitably secured on a collar 40 mounted to rotate freely upon a drive shaft 41 driven at a suitable speed. Adjacent the collar 40 and secured to the shaft 41 by a key 43 is a friction coupling ring 44 equipped with friction rings 45 and 46 one upon each side and at its peripheral edge. The rings 45 and 46 are preferably made of leather, but any suitable material will serve the purpose.

The friction ring 45 bears against one side of the sprocket 36 and the ring 46 bears against a ring 49 carried by a plurality of pins 50—50 suitably secured to the sprocket 36 and equally disposed radially about the axis thereof. The pins 50—50 project through the ring 49, and mounted thereon are compression washers 51 preferably composed of rubber. One face of the washer 51 bears against the face of the ring 49, the opposite face against a washer 52, on the the pin 50. Upon the end of the pin 50 is a screw threaded nut 53, and by turning it upon the pin 50, to the right or left it will readily be seen that the friction between the rings 45 and 46, and the faces of the sprocket 36 and the ring 49 respectively may be regulated.

Secured to the collar 40 by the same means securing the sprocket 36 thereto, is a gear 56 which meshes with a similar gear 57 suitably secured to the sprocket 35, directly thereabove for driving the chains 31 and 32 in unison.

To vary the pressure of the shoes 37—37 upon the strand, a stationary shoe 58 (Figs. 2 and 3) is suitably mounted between the sprockets 33 and 34 and engages the inside of the lower run of the chain 31. Adjustably mounted in a housing 59 is a shoe 60 which bears against the inside of the upper run of the chain 32. The shoe 60 is carried upon two cams 61 each secured to a separate shaft 62 having a bearing in the housing 59. The shafts 62 each carry a worm gear 63 which meshes with a worm 64 secured upon a shaft 65 supported at one end in the housing 59, with its other end projecting through the housing 30 and having a bearing therein. Upon this end of the shaft is a crank 66 and by turning this crank one way or the other the shoe 60 will be moved vertically either up or down to vary the pressure between the shoes 37—37 on the chains and the strand to give the required traction.

Bearing on the strand between the heat treating apparatus and the chains of caterpillar mechanism 19, is a roller 69 secured to the end of a tension lever 70 pivotally supported on the housing 30 at a point 72. The roller is allowed to bear on the strand with enough pressure to cause a certain amount of slackness at this point (Fig. 1) as will be hereinafter described. Adjacent the pivot point of the lever 70, the lever is provided with an upwardly extending arm 73, to the upper end of which is adjustably secured one end of a tension spring 74. The other end of the spring 74 is suitably secured to the housing 30. By adjusting the tension of the spring at its point of connection with the arm 73 it will readily be seen that the downward pressure of the roller 69 upon the strand, may be regulated to a nicety. Mounted on the pivot point 72 is a lever 77, the upper end of which engages an adjustable pin 78 mounted in the arm 73. Secured to the lever 77 in line with its pivot is one end of a brake band 79 preferably made of steel. The brake band 79 passes around a brake drum 80 with its other end adjustably secured to the lower end of the lever 77.

The brake drum 80 is secured to turn with the sprocket 33 and when the band 79 is tightened thereon the chains 31 and 32 are slowed up. When this happens a slippage occurs between the friction surfaces on the coupling ring 44 and the face of the sprocket 36 on one side and between the ring 49, carried by the sprocket 36 on the other side.

In starting the machine the end of the spring 74 is secured to the arm 73 under a desired tension which allows the roller 69 to bear on the strand with the desired pressure to allow an initial slackness therein at this point. The pin 78 is adjusted in the arm 73 to engage the upper end of the lever 77 and the end of the brake band 79 attached to the lower end of the lever 77 is adjusted to give correct contact with the brake drum 80. At times the strand will not be pushed by the mechanism 18 at the desired constant speed due to slippage between the shoes carried on the chains and the strand. This causes momentarily too much of the slack in the strand to be taken up by the mechanism 19 which draws the strand as fast as it is pushed by the mechanism 18. This causes the roller 69 to move upward due to the slackness in the strand being taken up by the mechanism 19. The roller 69 in moving up, rocks the lever 70 about its pivot point 72, thereby rocking the lever 77 about its pivot due to the upper end thereof engaging the pin 78. This movement of the lever 77 moves the lower end thereof upward and draws the brake band 79 tighter around the brake drum 80 thereby holding back the endless chains 31 and 32 from drawing the strand until the desired slackness again occurs in the strand which will allow the roller 69 to move down, thereby loosening the brake band upon the brake drum and allowing the chains 31 and 32 to draw the strand at their normal speed.

If slippage occurs between the strand and the shoes on the endless chains of the mechanism 19, an increase in the slackness of the strand will occur which will allow the roller 69 to move downward. The roller 69 in moving down rocks the lever 70 about its pivot 72 thereby allowing the lever 77 to move counter clockwise about its pivot, thereby decreasing the grip of the brake band 79 upon the brake drum 80. When this occurs the chains will be driven faster and when the excess slackness has been taken up, the roller 69 will have moved back to its normal position, thereby causing the brake band to grip the brake drum with the initial amount of friction.

Means is provided for taking care of the expansion and contraction of the furnace tube 14, to hold it straight and to prevent it curling. Were such means not provided the tube would bend causing the strand to be subjected to increased friction and consequently tension, as it was pushed through the tube. This means is indicated at 85. For a detailed description of this means, reference is made to the aforementioned patent to Frederic S. Kochendorfer.

What is claimed is:

1. In a heat treating apparatus for metals in strand form, a heating chamber, mechanism for feeding the strand through the heating chamber, friction driving means for said mechanism, and a brake device operated by the strand for controlling the effect of said driving mechanism.

2. In a heat treating apparatus for metals in strand form, a heating chamber, mechanism for feeding the strand through the heating chamber, friction driving means for said mechanism, a brake device controlling the effect of said driving mechanism, said brake device actuated responsive to the slackness of the strand.

3. In a heat treating apparatus for metals in strand form, a heating chamber, means for feeding the strand through the heating chamber and mechanism acting upon the strand to take up slack therein, friction disk driving means for said mechanism and a brake device responsive to the tension of the strand for controlling the effect of said driving mechanism.

4. In a heat treating apparatus for metals in strand form, a heating chamber, means for feeding the strand through the heating chamber and mechanism acting upon the strand to take up slack therein, friction driving means for said mechanism and a brake device controlling the effect of said driving mechanism, said brake device actuated responsive to the slackness of the strand.

5. In a heat treating apparatus for metals in strand form, a heating chamber, means for pushing the strand through the heating chamber, a caterpillar mechanism engaging the strand for taking up any slackness thereof, a friction driving mechanism for the caterpillar mechanism, and a brake device controlling the effect of said driving mechanism.

6. In a heat treating apparatus for metals in strand form, a heating chamber, means for pushing the strand through the heating chamber, a caterpillar mechanism engaging the strand for taking up slackness thereof, a friction driving mechanism for the caterpillar mechanism, and a brake device controlling the effect of said driving mechanism, said brake device actuated responsive to the slackness of the strand.

7. In a heat treating apparatus for metals in strand form, a heating chamber, a caterpillar mechanism for feeding the strand through the heating chamber, friction driving means for said mechanism and a brake device controlling the effect of said driving

mechanism, said brake device actuated responsive to the slackness of the strand.

8. In a heat treating apparatus for metals in strand form, a heating chamber, a caterpillar mechanism for pushing the strand through the heating chamber, a second caterpillar mechanism engaging the strand for taking up any slackness thereof, friction driving mechanism for said last mentioned caterpillar mechanism, and a brake device controlling the effect of said driving mechanism, said brake device actuated responsive to the slackness of the strand.

9. In a heat treating apparatus for metals in strand form, a heating chamber, means for feeding the strand through the heating chamber, mechanism engaging the strand at a plurality of points in the same plane for taking up any slackness thereof, friction driving means for said mechanism and a brake device acted on directly by the strand for controlling the effect of said driving means.

10. In a heat treating apparatus for metals in strand form, a heating chamber, mechanism engaging the strand at a plurality of points in the same plane for feeding the strand through the heating chamber, a second mechanism engaging the strand at a plurality of points in the same plane for taking up any slackness thereof, friction driving means for controlling the effect of said driving means, said brake device actuated responsive to the slackness of the strand.

In witness whereof, we hereunto subscribe our names this 4th day of November A. D., 1922.

FREDERIC S. KOCHENDORFER.
ARTHUR E. SCHULZ.