Aug. 23, 1960 A. M. TOHIR 2,950,097

CARBON-FACED CONVEYOR ROLL FOR SILICON STEEL STRIP

Filed Oct. 21, 1958

FIG. 1

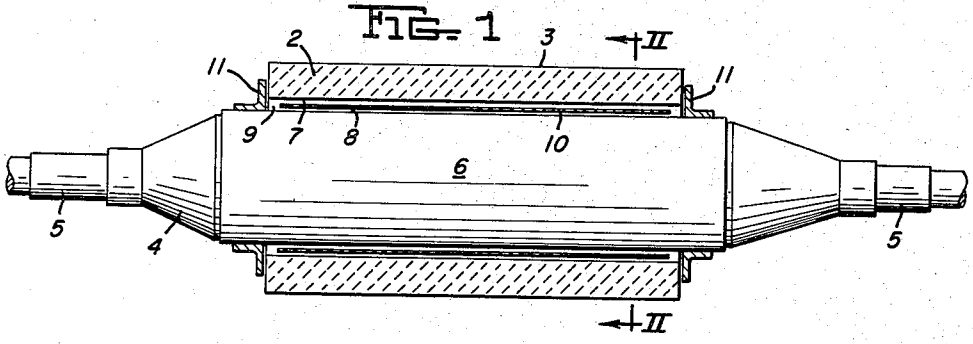


FIG. 2

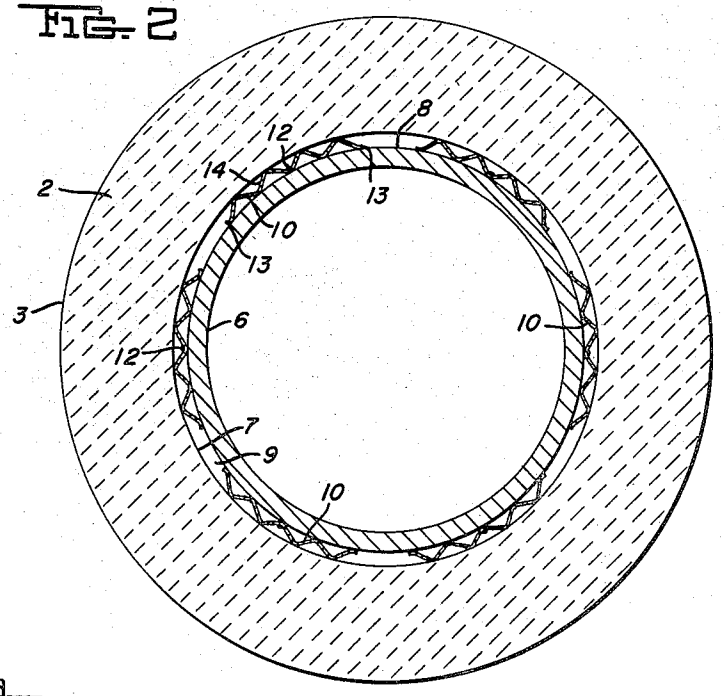


FIG. 3

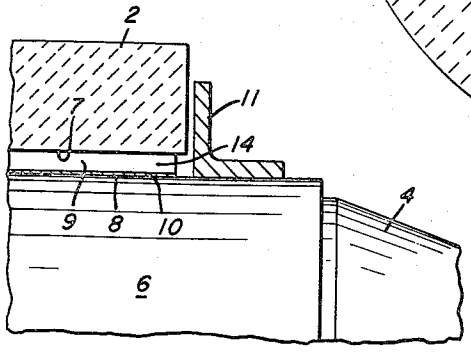
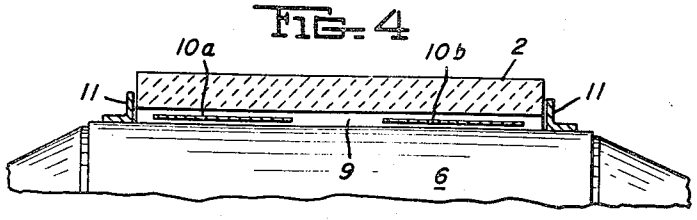


FIG. 4



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CARBON-FACED CONVEYOR ROLL FOR SILICON STEEL STRIP

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4 Claims. (Cl. 263—6)

This invention relates to continuous annealing apparatus for silicon steel strip and, as indicated, is directed to a carbon-sleeved conveyor roll of improved construction.

More specifically, the improvements of this invention reside in conveyor rolls of the type disclosed in United States Patent No. 2,603,578, issued July 15, 1952, to N. B. Ornitz. As explained therein, continuous heat treating apparatus for silicon steel has been subject to the problem of strip marring or deformation by accretions of material that collect on conventional steel rolls, which is eliminated by providing carbon-faced rolls for supporting the strip during its movement through the apparatus. Carbon-faced rolls of this character, generally stated, are comprised of a steel hub having a carbon sleeve mounted thereon for rolling engagement with strip being delivered through continuous heat treating apparatus. Since the carbon sleeve has a lower thermal coefficient of expansion, clearance must be provided between it and the hub on which it is mounted to allow for the relatively greater expansion of the hub under increasing temperatures. This clearance is designed for the maximum furnace temperature at which the hub is expanded into engagement with the sleeve and thus has direct driving engagement therewith. As lower temperatures, driving connection between the hub and the carbon sleeve is effected by end drive rings on the hub which have drive lugs projecting into slots formed in the ends of the carbon sleeve. During operation, particularly at the lower temperatures, the hub drive lugs in transmitting driving force to the carbon sleeve enlarge the slots in its ends thus permitting limited relative rotational movement between the hub and sleeve, and the clearance for thermal expansion of the hub enables the sleeve to take an eccentric position relative to the hub. Relative sleeve movement and eccentricity of this character has apparently contributed to operational problems from the standpoint of excessive strip vibration, tracking, and breakage which have been experienced with strip conveyors using carbon-sleeved rolls of the character mentioned above.

One of the principal objects of this invention is to provide an improved carbon-faced roll for transporting silicon steel strip through a heat treating furnace which will maintain the concentric relation of the carbon-sleeve and its mounting hub and provide a positive driving connection therebetween for all furnace operating temperatures. To this end, a plurality of corrugated stainless steel sheets are arranged in the annular space between the carbon sleeve and its steel mounting hub and operate, in a manner to be described, to maintain the sleeve and hub in concentric positions and to provide a driving connection therebetween.

Other objects and advantages of the invention will become apparent from the following description.

In the drawings, there is shown a preferred embodiment of the invention. In this showing:

Figure 1 is a view partially in elevation and partially in longitudinal section of a conveyor roll constructed in accordance with the principles of this invention;

Figure 2 is an enlarged sectional view taken substantially along the line II—II of Figure 1;

Figure 3 is an enlarged view of a fragmentary portion of the structure shown in Figure 1; and

Figure 4 is a fragmentary view similar to Figure 1 showing a modification of the invention.

The conveyor roll of this invention, as shown in the drawings, comprises a carbon sleeve 2 that has a cylindrical external surface 3 for supporting engagement with strip to be conveyed thereby, and a steel mounting hub 4 extending axially and concentrically of the sleeve 2. The hub 4 is constructed essentially as described in the above mentioned patent and is provided with journals 5 at opposite ends thereof by which it is supported and rotated in the sides of an annealing tower in the conventional manner. In accordance with the principles of this invention, the carbon sleeve 2 and the central portion 6 of the hub 4 are provided with radially spaced cylindrical surfaces 7 and 8 which define an annular space 9 therebetween. Corrugated stainless steel sheets 10 arranged in the space 9 serve to maintain the sleeve 2 in a concentric position relative to the hub 4 and operate to provide a driving connection between the hub 4 and sleeve 2. Endwise movement of the sleeve 2 on the hub 4 is prevented by a pair of stop rings 11 welded to the hub 4.

As best shown in Figure 2, a plurality of corrugated steel sheets, preferably six in number, are arranged at circumferentially spaced intervals about the external cylindrical surface 8 of the hub center portion 6. Each of the sheets 10 has a welded connection 12 at a point arranged centrally between its edges 13 with the external hub surface 8. The corrugations 14 in each of the sheets 10 extend axially with respect to the sleeve 2 and hub 4 and have a depth slightly greater than the radial dimension of the space 9 so that they are slightly compressed when the hub 4 is assembled in the sleeve 2 as shown in Figures 1 and 2.

Figure 2 shows the relative radial spacing of the sleeve and hub surfaces 7 and 8 when the sleeve and hub are at room temperature. When the roll is mounted in a heat treating furnace and its temperature elevated, the radial dimension of the annular space 9 is decreased by reason of the greater thermal expansion of the steel hub center portion 6. As the hub center portion 6 expands outwardly in response to increasing temperature, the corrugations 14 of the steel sheets 10 are flattened, this action being provided for by the axial arrangement of the corrugations 14 and the centrally located connections 12 between each sheet 10 and the hub portion 6.

Assembly of the rolls shown in Figures 1 and 2 of the drawings is effected by first welding one of the end rings 11 to the hub 4 and the corrugated sheets 10 in position on the external hub surface 8 as shown in Figure 2. The corrugations 14 are then flattened slightly by strip banding so that the hub 4 with corrugated sheets 10 thereon may be inserted by endwise movement into the space centrally of the sleeve 2, the banding being removed as the hub moves toward its fully assembled position shown in Figure 1. After final movement to this position, the remaining end ring 11 is welded to the hub 4.

The corrugated sheets 10 must be fabricated from metal that will not lose its resiliency at the maximum temperatures of 1800° F. to 2000° F. encountered in furnaces for heat treating silicon strip steel. For this purpose, 25% chrome-20% nickel stainless steel is preferred, although stainless steels having a nickel content in excess of 12% will be found satisfactory.

In the preferred embodiment of the invention, the corrugated sheets 10 extend the full length of the sleeve 2 and central hub portion 6 as shown in Figure 1 of the drawings. However, and in place of corrugated sheets

of this length, it will be understood that corrugated sheets of shorter length may be employed. A modification of this character is shown in Figure 4 wherein two axially spaced sheets **10***a* and **10***b* are shown in the space **9** between the sleeve **2** and center hub portion **6**. The sheets **10***a* and **10***b* are preferably positioned opposite the end quarter-points of the sleeve **2** as illustrated so that their combined sleeve centering and driving action will be symmetrically applied to the sleeve **2**, and their total length should be at least ⅓ to ½ the axial length of the sleeve **2**.

From the foregoing, it will be apparent that the corrugated sheets **10** operate to maintain the sleeve **2** in a concentric position relative to the hub **4** under all operating temperatures that are encountered in continuous heat treating furnaces for silicon steel strip. In addition, the corrugated sheets **10** operate to provide a driving connection between the sleeve **2** and its mounting hub **4** which is effective to prevent relative rotation between these parts under all operating temperatures. In this manner, it will be further apparent that the corrugated stainless steel sheets **10** in the roll of this invention prevent sleeve eccentricity with respect to the mounting hub **4**, as well as relative movement between the sleeve **2** and hub **4**, and thus operate to eliminate operational problems from the standpoint of strip vibration, tracking, and breakage during movement through an annealing furnace.

While a preferred embodiment of my invention and a modification thereof have been shown and described it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. A roll for conveying silicon steel strip through a heat treating furnace comprising a cylindrical carbon sleeve adapted to have rolling engagement with the strip to be conveyed, a cylindrical steel hub extending axially of and arranged concentrically in said sleeve, said sleeve and hub having facing cylindrical surfaces defining an annular space therebetween, and mounting means providing a driving connection between said hub and sleeve comprising a plurality of corrugated steel sheets extending axially of said annular space and arranged at circumferentially spaced intervals therein, said sheets having resilient engagement with said hub and sleeve along lines extending axially thereof and operating to hold said sleeve in a concentric position relative to said hub.

2. A strip conveyor roll as defined in claim 1 characterized by each of said sheets having a connection at a central point between its edges with said hub and securing it for rotation therewith.

3. A strip conveyor roll as defined in claim 1 characterized by the corrugations in said sheets having a depth greater than the radial dimension of said annular space such that said sheets are compressed between said cylindrical surfaces under all furnace operating conditions.

4. A conveyor roll for silicon steel strip comprising a steel hub, a cylindrical carbon sleeve arranged concentrically of said hub, said hub and sleeve having facing cylindrical surfaces that are spaced radially relative to each other, and a corrugated steel sheet secured to said hub for rotation therewith and mounting said sleeve in a concentric position relative thereto, said sheet having corrugations resiliently engaged with said hub and sleeve surfaces along lines extending axially thereof and providing a driving connection between said hub and sleeve.

References Cited in the file of this patent

UNITED STATES PATENTS

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2,603,578	Ornitz	July 15, 1952