July 21, 1953 E. T. LORIG 2,646,161

TRANSVERSELY SLOTTED METAL BELT FOR CONVEYING AND GUIDING STRIP TRAVELING AT HIGH SPEED

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FIG. 1.

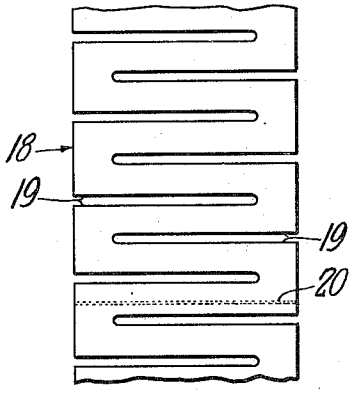


FIG. 2.

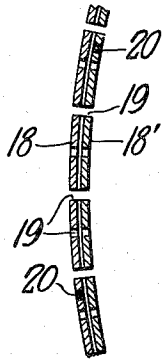


FIG. 3.



FIG. 4.

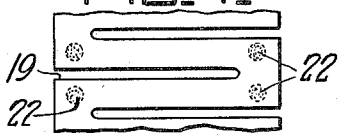


FIG. 5.



FIG. 9.

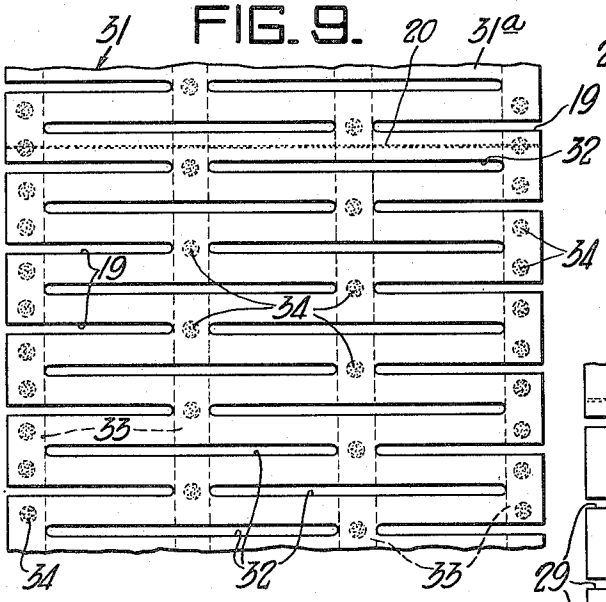


FIG. 6.

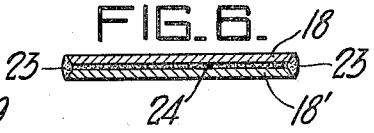


FIG. 7.

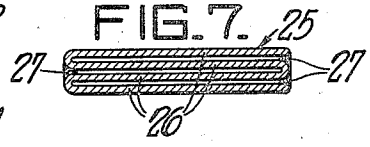


FIG. 8.

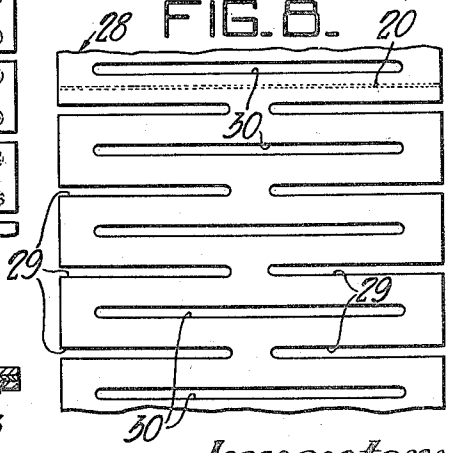
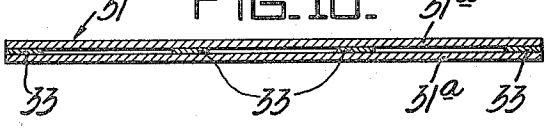


FIG. 10.



Inventor:
EDWIN T. LORIG,
by: Donald G. Dalton
his Attorney.

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FIG. 13.

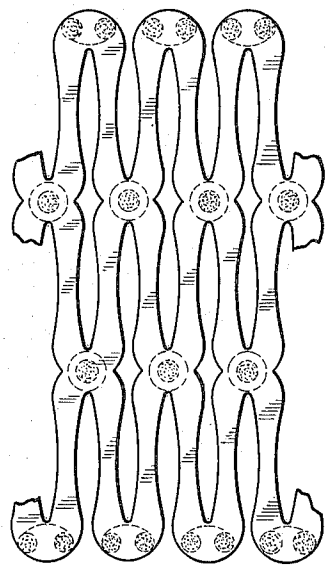


FIG. 12.

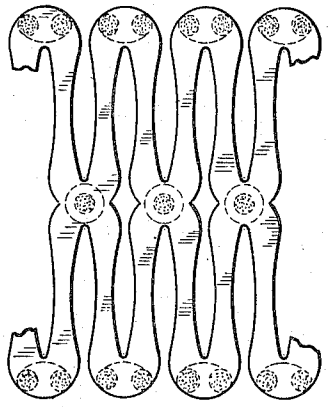


FIG. 11.

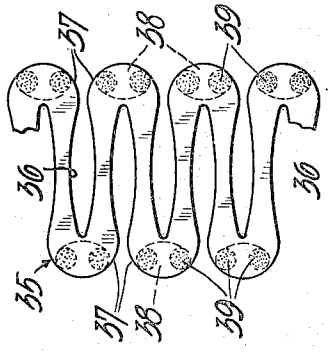
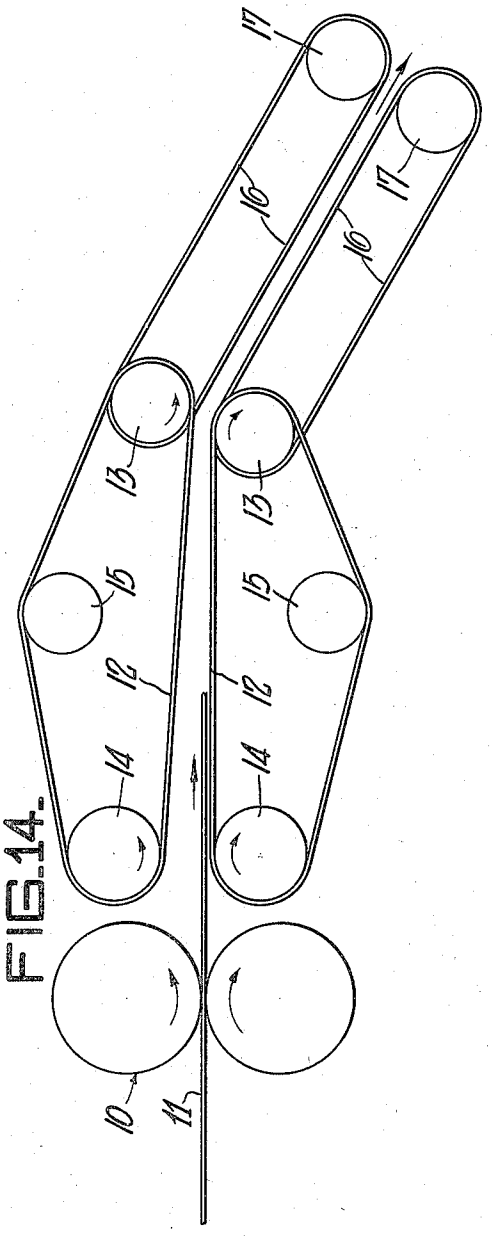


FIG. 14.



Inventor:
EDWIN T. LORIG,
by: Donald G. Dalton
his Attorney.

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UNITED STATES PATENT OFFICE

2,646,161

TRANSVERSELY SLOTTED METAL BELT FOR CONVEYING AND GUIDING STRIP TRAVELING AT HIGH SPEED

Edwin T. Lorig, Ross Township, Allegheny County, Pa., assignor to United States Steel Corporation, a corporation of New Jersey

Application September 29, 1950, Serial No. 187,542

6 Claims. (Cl. 198—193)

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This invention relates to a metal conveying and guiding belt adapted to be driven at high speed, e. g., 4,000 or 5,000 F. P. M.

It has been proposed to hot-roll steel strip to gauges as low as .025'' or even .018'' This necessitates a very high speed of delivery from the last stand of a continuous mill if the speed of the strip in the earlier stands is maintained at the values now customary. Such delivery speeds introduce serious complications into the problem of coiling the finished strip. Ordinary coilers are not suitable for such speeds, particularly when light gauges are to be handled. It appears likely that it will be necessary to guide the leading and trailing ends of the lengths of strip onto the coiler by confinement in a chute composed of spaced conveying belts traveling at substantially the same speed as the strip, and using a belt wrapper for starting the leading end on the coiler mandrel. The object of my invention is to provide a belt suitable for such use.

The aforementioned application obviously involves severe service conditions and rough usage. In the first place, the speeds necessary require repeated flexing of the belt at high frequency if the size of the drums on pulleys over which it travels is to be kept within reasonable limits. The belt must also be capable of withstanding the temperature at which the hot-rolled strip is finished or a somewhat lower temperature if artificial cooling of the strip is practiced. The belt must also be little affected either physically or metallurgically by repeated heating and cooling such as results from contact with each length of hot strip followed by an idle period. In addition, the belt is subjected to heavy shock loads particularly when struck by the leading or trailing end of the strip length and to considerable centrifugal force in passing around the pulleys, thereby increasing the tension in the belt.

I have invented a belt particularly adapted for conveying and guiding hot-rolled strip traveling at high speed but useful also in other applications. In a preferred embodiment a metal band of suitable composition, width and gauge has its ends welded together forming an endless loop. The band has transverse slots closely spaced therealong, at least some of which extend inwardly from opposite edges, with adjacent slots overlapping for a substantial portion of their length. The ends of the slots spaced from the belt edges are shaped to a smooth curve. The belt may be single ply or composed of several plies welded together at spaced points. The belt is preferably shaped longitudinally to a curvature of the same order as that of the pulleys on which it is to be used.

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A complete understanding of the invention may be obtained from the following detailed description and explanation which refer to the accompanying drawings illustrating the present preferred embodiment. In the drawings,

Figure 1 is a partial plan view of one form of my improved belt which may be single ply or multiple ply;

Figure 2 is a partial longitudinal section through a two-ply belt of the type shown in Figure 1;

Figure 3 is a partial transverse section through a two-ply belt showing one form of weld joining the plies;

Figure 4 is a partial plan and Figure 5 a partial transverse section showing another type of weld between plies;

Figure 6 is a transverse section of an edge-welded two-ply belt;

Figure 7 is a similar view of a four-ply belt formed by accordion-pleating a single metal band;

Figures 8 and 9 are views similar to Figure 1 showing multiple-width belts;

Figure 10 is a transverse section through the belt of Figure 9;

Figures 11, 12 and 13 are views similar to Figures 1, 8 and 9 showing a belt having a slightly different form of slots; and

Figure 14 is a diagrammatic view illustrating conveying belts forming a chute to guide the end of a length of strip onto a coiler.

Referring now in detail to the drawings, and for the present to Figure 14, the last stand of a continuous hot-rolling mill is indicated at 10. A strip 11 issuing from the mill is delivered into a chute composed of a pair of spaced converging endless belts 12. The belts are trained over driven drums or pulleys 13, idler pulleys 14 and tightener pulleys 15. The belts 12, of course, guide and convey the strip 11 along a path therebetween. A pair of similar guiding belts 16 are trained around pulleys 13 or other pulleys coaxial therewith and idler pulleys 17. The belts 16 constitute a continuance of the guide chute for the strip 11 and deliver the leading end thereof to a coiler of any suitable design and construction (not shown). The coiler may include a belt wrapper similar in character and construction to the belts 12 and 16. This belt construction will now be described in detail.

One form of the belt, illustrated in Figure 1, comprises an endless metal band 18, preferably

of steel, having transverse slots 19 spaced therealong extending inwardly from each edge and terminating short of the opposite edge, forming spaced sections like leaf springs. The band 18 may be formed by welding together the ends of a length of strip of suitable gauge and composition as at 20. The inner ends of the slots 19 are rounded. In the embodiment shown in Figure 1, alternate slots extend inwardly from opposite edges of the strip and adjacent slots overlap each other for the greater portion of their length. Longitudinally, the belt is shaped to a curvature of the same order as that of the pulleys with which it is to be used. This is done before formation of the slots 19.

The belt shown in Figure 1 may be single ply or composed of two or more thicknesses of strip superposed one on the other and secured together as shown in Figure 2. In the case of the multiple ply belt composed, for example, of bands 18 and 18', the welds 20 are staggered longitudinally. The plies are spaced apart as shown in Figure 2 throughout the greater portion of their area. The bands may be conveniently secured together by spot welding them at intervals with a spacer strip 21 therebetween as shown in Figure 3. After welding, the strips 21 are cut through at the slots 19.

Instead of spot welding the bands together, I may employ projection welding as shown in Figures 4 and 5. That is to say, the bands 18 and 18' may be provided with abutting projections 22 on their adjacent faces, high enough to maintain the desired space between the bands after welds have been formed between each pair of abutting projections.

Figure 6 illustrates a further modification in which the plies 18 and 18' are joined by edge welds 23, the space between the bands being occupied by a filler 24 such as sheet asbestos, carbon or other heat-resisting material which will disintegrate after a predetermined period of use. The welds 23 may be arc welds with metal deposition or they may be continuous electric seam welds.

In making a multiple-ply belt such as those described above, it is found preferable to weld the several bands or plies together before forming the slots 19. By forming these slots simultaneously in all the plies, the proper alinement of the slots of the several plies is maintained.

Figure 7 illustrates a further modification in which a belt 25 is made by bending a strip of sufficient width to form accordion pleats, thereby affording superposed plies 26 which are welded together at the edges as indicated at 27. After welding of the edges, the belt is slotted transversely as in the case of the belt of Figure 1 or any of the modifications subsequently described. The thickness of the belt has been exaggerated somewhat in Figure 7 in order to show the principle more clearly.

Figure 8 shows a belt 28 generally similar to the belt 18 except that it is wider and it has a pair of alined slots 29 extending inwardly and terminating short of the center line. In addition, slots 30 are formed between adjacent pairs of slots 29. The slots 30 extend from a point spaced inwardly from one edge to a point spaced inwardly of the other. This arrangement of slots is useful where a belt of greater width than that shown in Figure 1 is desired. The belt 28 may be of single-ply or multiple-ply construction.

Figures 9 and 10 show a further modified form of belt 31 adapted for even greater widths than belt 28. The belt 31 has slots 19 extending inwardly from opposite edges and additional slots 32 in alinement therewith extending from a point adjacent the inner end of the slot 19 to a space extending inwardly from the opposite edge of the belt. The belt 31 may be of single-ply or multiple-ply construction. The illustrated example is of the latter type as shown in Figure 10. The plies 31*a* are separated by spacer strips 33 and are joined by spot welds 34. After welding, the strips are cut through at the slots.

Figure 11 illustrates a further modification, somewhat similar to that of Figure 1. The belt 35 of Figure 11 has elliptical slots 36. The edges of the belt between the adjacent slots are rounded as at 37. If the belt is of multi-ply construction the several plies are separated by spacer discs 38 and joined by spot welds 39.

Figures 12 and 13 show modifications having slots like those of Figure 11 adapted for double and triple width belts respectively, similar to those shown in Figures 8 and 9. The belts in Figures 11 through 13 have the lowest weight for a given value of required strength. The slots are preferably punched before the bands forming the multiple-ply belts are welded together.

The belt of my invention, in any of the forms disclosed, is characterized by numerous advantages which make it particularly adaptable for application as a conveying and guiding belt operating at high speed. In the first place, the belt has great flexibility so it may be subjected to bending at a high frequency without sacrificing minimum longitudinal resilience which is necessary to counteract the substantial centrifugal force involved in traveling about the pulleys at high speed. The belt consists essentially of one or more layers of sections like leaf springs with the ends welded. Each section may thus be subjected to maximum bending deflection with minimum stress in passing over the pulleys.

The multiple-ply construction affords greater belt strength without reducing the flexibility needed for use on small pulleys. The separation of the plies minimizes frictional contact therebetween and the resulting wear. The curvature applied to the belt longitudinally permits good contact with the pulley surface without requiring special preparation to assure smoother running at high speed. The slots extending transversely of the multiple-ply belt minimize or eliminate shearing stress on the longitudinal welds when the belt is subjected to tension. The welds thus serve only to hold the several plies together and prevent excessive flexure of the ends of the spring leaves between slots. The welds also impart the necessary stiffness to the belt edges to sustain the shock resulting from contact of the leading or trailing end of a length of strip with the belt.

Although I have disclosed herein the preferred embodiment of my invention, I intend to cover as well any change or modification therein which may be made without departing from the spirit and scope of the invention.

I claim:

1. A conveying and guiding belt comprising a plurality of superposed endless flat metal bands, each band having transverse slots extending inwardly from each edge thereof and terminating short of the other edge, isolated spacer means between adjacent bands of less area than the latter causing them to stand apart throughout the greater portion of their area and spot welds

spaced longitudinally and transversely of said bands uniting them into a unitary belt.

2. The apparatus defined by claim 1 characterized by said slots being generally elliptical in outline.

3. The apparatus defined by claim 1 characterized by said spacer means being isolated portions of the bands displaced from the general plane thereof.

4. The apparatus defined by claim 1 characterized by said spacer means being strips extending longitudinally of the belt and spaced transversely thereof.

5. The apparatus defined by claim 1 characterized by said spacer means being discs located at said welds.

6. The apparatus defined by claim 1 characterized by the slots in the bands being substantially in registry.

EDWIN T. LORIG.

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