April 28, 1936. I. LINDBERG 2,039,012

METHOD OF PROVIDING TRACK SHOES

Filed March 7, 1931 2 Sheets-Sheet 1

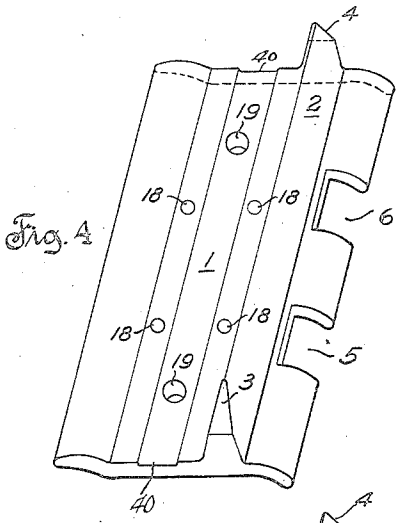


Fig. 4

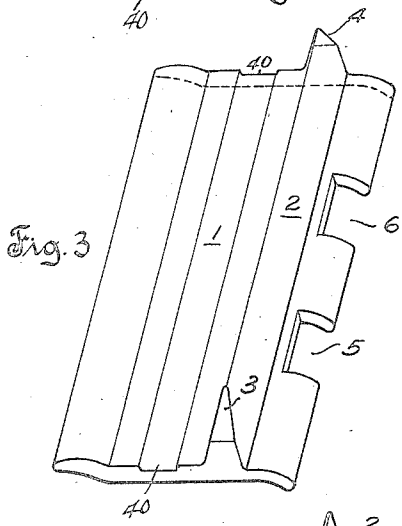


Fig. 3

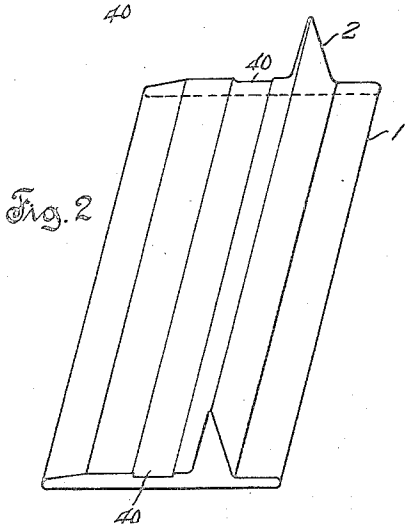


Fig. 2

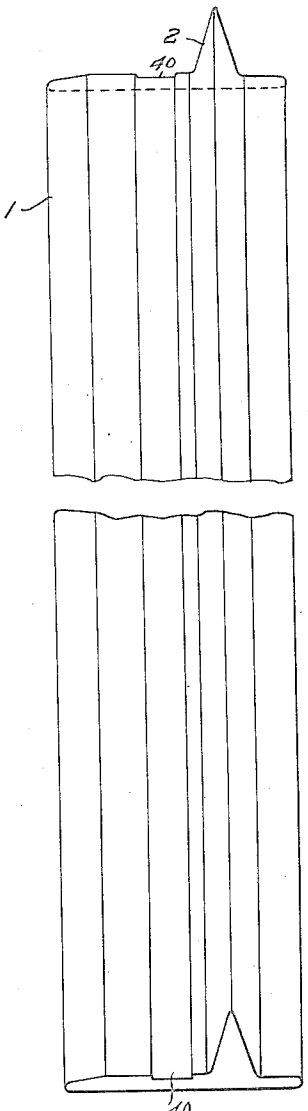


Fig. 1

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METHOD OF PROVIDING TRACK SHOES

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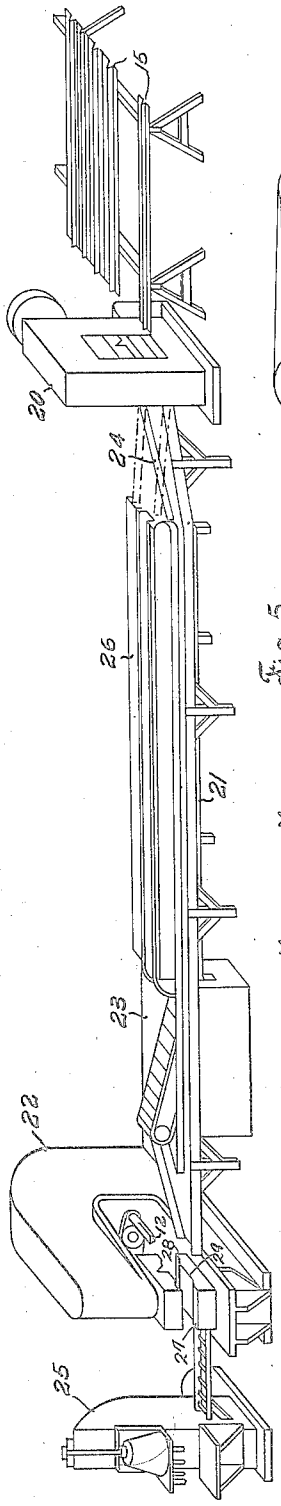


Fig. 5

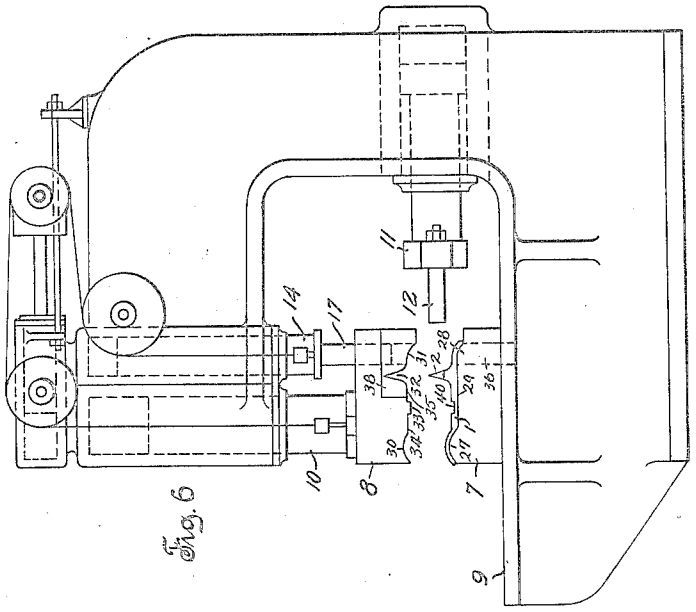


Fig. 6

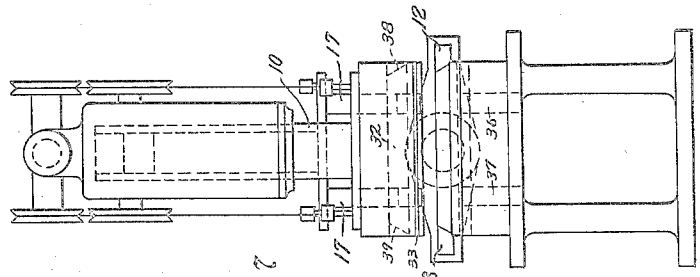


Fig. 7

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UNITED STATES PATENT OFFICE

2,039,012

METHOD OF PROVIDING TRACK SHOES

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Application March 7, 1931, Serial No. 520,841

9 Claims. (Cl. 29—148.3)

This invention relates generally to a method of providing track shoes for vehicles of the self-laying track type such as crawler tractors or the like. In particular the invention relates to an improved method of providing track shoes of the grouser type, which consist essentially of a tread plate having a rib extending from one surface thereof and disposed transversely to the direction in which the vehicle is supposed to travel. For reasons of satisfactory operation of the vehicle it is desirable that in the assembled track belt the tread plates overlap each other, and the latter must therefore be shaped with a certain amount of accuracy in order to insure proper fit of their overlapping portions. A well known method of providing overlapping track shoes consists in rolling a metal bar into a strip having portions adapted to lap suitable portions on a similar strip, and then severing said strip to form a plurality of plates which are subjected to subsequent cutting operations in order to produce a finished track shoe. Such subsequent cutting operations will be necessary for instance to get the proper angle of cut at each end of a plate, or if it is desired to bevel only the ends of the transversely extending rib of the track shoe and not the plate itself, or if it is desired to provide one of the overlapping portions in the usual manner with two notches to prevent packing of soil between the cooperating portions of the tread plates. In actual practice, however, a considerable disadvantage has heretofore been connected with this well known method of providing track shoes, for it has been found that the track shoes after they have been cut from the rolled stock and prepared for assembly, for instance, by beveling and notching, do not have the accurate shape which they should have in order to insure proper fit with cooperating parts especially with the overlapping portion of an adjacent track shoe in the assembled track belt. Such inaccuracy may be due to distortions in the rolled stock which may have been twisted or bent during or after the rolling operation, or the distortions may have occurred, and they ordinarily do occur, when the track shoes are severed from the rolled stock and when they are beveled and notched as mentioned above.

It is an object of the invention to provide a track shoe of the character described which is free from undesired distortions and which is accurately shaped to insure proper fit with cooperating parts especially with the overlapping portion of an adjacent track shoe in the assembled track belt.

It is another object of the invention to form track shoes for track-laying vehicles in such a manner that the mentioned cutting operations may be performed without any liability of distorting the track shoe after it has received its final shape which insures proper fit with the cooperating parts.

Another object of the invention is to minimize the number of handling operations to which the working material has to be subjected in order to form a plurality of track shoes from a strip of stock material.

Still another object of the invention is to cut a strip of stock material into a maximum number of grouser type track shoes having beveled side surfaces at both ends of the grouser portion, and thus minimizing waste of stock material in forming said beveled side surfaces.

These and other objects and advantages of the invention will be apparent from the following description. A clear conception of a series of steps taken to carry out the invention in a preferred manner may be had by referring to the drawings accompanying and forming a part of this specification, in which like reference characters designate the same or similar parts in the several views.

Fig. 1 is a perspective view showing a strip of stock material of sufficient length to form a plurality of track shoes.

Fig. 2 is a perspective view showing a track shoe blank.

Fig. 3 is a perspective view of a track shoe formed from the blank shown in Fig. 2.

Fig. 4 is a perspective view of a track shoe ready for assembly.

Fig. 5 is a diagram showing machinery and apparatus used to form the track shoe shown in Fig. 4.

Fig. 6 is a side elevation of a machine which may be used to give the track shoe blank shown in Fig. 2 the shape shown in Fig. 3.

Fig. 7 is a front elevation of the machine shown in Fig. 6.

The strip of stock material shown in Fig. 1 is the product of a rolling process and comprises a tread portion 1 and a rib or grouser portion 2. The whole strip is of sufficient length to form a plurality of track shoes and it is severed transversely to the rib portion 2 and preferably at right angles to the plane of the tread portion 1 to produce a plurality of track shoe blanks as shown in Fig. 2. Each of these blanks is then dieformed through the application of pressure to the tread plate portion 1 thereof (Fig. 2) at its edges which extend longitudinally of the grouser

portion 2, and between said edges, so as to produce the shape shown in Fig. 3, which insures proper fit of the finished track shoe with its associated chain link and proper fit of the overlapping tread plate portions of adjacent track shoes in the assembled track belt. By the die-forming operation the ends of the blanks, corresponding to the marginal portions of the strip of stock material are deformed so as to permit the track shoes to be brought in overlapping relation with each other, and the proper and necessary accuracy of the track shoe as a whole is obtained. The corners of the grouser portion are then sheared off as shown at 3 and 4 in Figs. 3 and 4, and notches 5 and 6 providing mud clearances are punched out of the portion of the tread plate adjacent to the grouser portion 2. The machine shown in Figs. 6 and 7 is designed to perform these operations without the necessity of handling the track shoe blank after it has been placed into the machine in a suitable position. How this is accomplished will be apparent from an inspection of the figures. The track shoe blank, after being placed into the machine, is first deformed in a set of dies 7 and 8, the lower die 7 being mounted stationarily on the machine frame 9 and the upper die 8 being fastened to the lower end of a hydraulically operated plunger 10. The lower die 7 has an upper surface corresponding to the lower surface of the die-formed blank shown in Fig. 3, that is, the lower die has a raised portion 27 with a curved upper surface, a plane portion 29 and a curved shoulder 28. The raised portion 27 has a uniform profile throughout the width of the die, as may be seen from the showing of the press at 22 in Fig. 5, and the plane portion 29 likewise extends clear across the die as may also be seen from Fig. 5. The curved shoulder 28 extends across the entire width of the die but is interrupted by vertical slots 36 and 37 (Fig. 7) into which punching tools 17 enter, as will be described later. The upper die 8 has a lower surface corresponding to the upper surface of the die-formed blank shown in Fig. 3, that is, the upper die has a recessed portion 30 with an inwardly curved surface, a plane portion 34, a rectangular projection 33, a plane surface 35, a V-shaped recess 32, and a downwardly curved portion 31. The recessed portion 30, the plane surface portions 34 and 35, the rectangular projection 33, and the V-shaped recess 32 extend clear across the entire width of the upper die, as may be seen from Fig. 7, and it should be noted that the side portions of the die, near the lateral ends of the V-shaped slot are recessed as shown at 38 and 39 in Fig. 7. The recesses form inclined side surfaces on the upper die, along which cutting tools 12 and 13 are advanced as will be described later. The downwardly curved portion 31, like the recess 30, extends across the full width of the upper die but is interrupted by two vertical slots through which cutting tools 17 are advanced, as will be described later. The rectangular projection 33 is shaped to conform with a channel shaped recess 40 in the tread plate portion of the track shoe, and the V-shaped recess 32 is so dimensioned that it seats on the grouser portion 2 of the track shoe when the rectangular projection 33 is seated in the channel shaped recess 40. A downward movement of the plunger 10 brings the die 8 in contact with the track shoe blank and under the action of the fluid pressure exerted upon the plunger 10 the blank will be die-formed between the upper surface of the lower die and the lower surface of the upper die. It will be seen that the marginal portion of the blank, adjacent to the grouser portion 2, will be curved downwardly between the shoulder 28 of the lower die and the curved portion 31 of the upper die, and that the other marginal portion of the blank will be curved upwardly between the raised portion 27 of the lower die and the inwardly curved recess 30 of the upper die. It will also be seen that while the upper die is being forced down and the marginal portions of the blank are being curved, the grouser portion of the blank projects into the V-shape recess 32 of the upper die and that the rectangular projection 33 of the upper die enters into the channel shaped recess 40 of the blank. By the time the marginal portions have assumed their curved shape between the upper and the lower die and the full pressure is active upon the plunger 10, the V-shaped recess is seated on the grouser portion, the rectangular projection 33 is seated in the channel shaped recess 40, and the plane surface portions 34 and 35 are seated on the blank. As a result, the lower surface of the blank between the curved marginal portions is firmly seated on the plane surface portion of the lower die. In other words, the marginal portions are not only curved but they are also placed accurately at predetermined levels relative to the plane surface at the lower side of the intermediate portion of the blank. This is important in order to insure proper fit of the overlapping portions of adjacent track shoes in the assembled track belt. Moreover, if the blank, before the die-forming operation, should be somewhat distorted, for instance as a result of the preceding cutting operation in the shear 20 or due to other causes, as during rolling, handling and cooling of the strip of stock material from which they are cut, such distortions will, of course, be straightened out during the die-forming operation. While the upper die is being held under pressure on the track shoe blank a hydraulically operated cutting ram 11 is advanced in horizontal direction to shear off the corners of the grouser portion 2, the cutting ram having two cutting tools 12 and 13 which cooperate with suitable cutting edges on the upper die 8. As the track shoe is securely held between the dies 7 and 8 it will be seen that this shearing operation cannot cause any distortions of the track shoe, which might lead to difficulties in mounting rail members thereon or in assembling the track belt. In addition to the vertical plunger 10 an auxiliary vertical plunger 14 is provided for punching out the notches 5 and 6 of the track shoe, these notches being clearly shown in Figs. 3 and 4 and serving as mud clearances in the finished track shoe. The plunger 14 carries at its lower end two punching tools 17 which are slidable in suitable passages through the upper die 8. Thus, when the upper die is lowered the punching tools may first remain stationary and they will not be brought into action before pressure has been applied to the plunger 10 and the track shoe blank is firmly held between the dies 7 and 8. In this operation, like in the shearing operation performed at the grouser portion, all liability of distorting the track shoe will therefore be avoided. After the track shoe has received the form shown in Fig. 3 it is taken out of the machine and a number of holes 18 and 19 are drilled into the tread plate, the holes 18 serving to receive fastening bolts for rail members and the holes 19 being provided for fasten-

ing grouser protecting shoes or similar attachments.

The diagram of Fig. 5 shows a suitable arrangement of the various machines and apparatus used in producing the finished track shoe shown in Fig. 4. Strips of stock material 15 are piled up in front of a shear 20 adapted to cut each strip into a plurality of track shoe blanks. A conveyor 21 lined up with the shear 20 serves to carry the track shoe blanks either directly to the cutting press 22 or through a heating furnace 26 to a quenching tank 23 in which the track shoe blanks may be subjected to a hardening process in order to obtain greater wear resistance. A switch 24 at the right hand end of the conveyor 21 may be adjusted to direct the track shoe blanks either directly to the cutting press or into the furnace. From the lefthand end of the conveyor 21 or from the quenching tank 23 the track shoe blanks are delivered into the cutting press 22 and subjected therein to the operations which have been described hereinbefore. A multiple spindle drilling machine 25 is used to drill holes 18 and 19 into the tread plate of the track shoe.

It will be seen that in cutting the strips of stock material in the described manner a maximum number of track shoe blanks may be obtained from a given length of stock material as the length of the track shoe blanks is exactly the same as that of the finished track shoes. According to a method of forming track shoes which has been practiced for some time prior to this invention strips of stock material having a longitudinal rib and portions adapted to lap suitable portions on a similar strip, were cut at an inclination to the plane of said strip in order to provide beveled ends of the grouser portions, and in this method it was necessary to cut the track shoe blanks about one inch longer than the length of the finished track shoes. For each track shoe, therefore, one inch of stock material was wasted in this earlier method, while with the method according to the present invention no such waste of stock material is incurred.

It is evident that the invention can be followed by any suitable specific steps and with any suitable kinds of track shoes. Instead of rolling a metal bar into a strip having the shape shown in Fig. 1 it is possible, for instance, to roll two separate sections, one corresponding substantially to the tread portion 1 and another one corresponding substantially to the grouser portion 2. These strips are then cut to lengths corresponding to that required for the individual shoes, whereupon the tread and grouser plates obtained in this manner are assembled in pairs, preferably by welding, in order to form track shoe blanks similar to the one shown in Fig. 2. The method of rolling the tread and grouser portions of track shoes separately, however, is not broadly claimed herein. This method and a track shoe formed in accordance therewith have been disclosed in a separate application by R. W. Gotshall, Serial No. 520,994, filed March 7, 1931.

It should be understood that it is not intended to limit the invention to the details of procedure which have been disclosed hereinbefore, for various modifications within the scope of the claims may occur to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:

1. A method of providing track shoes for track belts of the type in which track shoes are secured to chain links, and tread plates of adjacent track shoes overlap each other, comprising providing a strip of stock material having opposite longitudinal edges and a longitudinal rib therebetween, the length of said strip being sufficient to form a plurality of track shoes, severing said strip transversely of said rib to form a plurality of track shoe blanks each having a tread plate and a grouser portion projecting from said tread plate, die-forming each blank through the application of pressure to said tread plate between the edges thereof corresponding to said opposite longitudinal edges of said strip, so as to insure proper fit of the finished track shoes and their associated chain links and of the overlapping tread plate portions of adjacent track shoes in the assembled track belt, and shearing off at least one corner of said grouser portion of each blank while the latter is being held under pressure applied for said die-forming operation.

2. A method of providing track shoes for track belts of the type in which track shoes are secured to chain links, and tread plates of adjacent track shoes overlap each other, comprising providing a strip of stock material having a longitudinal surface and a longitudinal rib projecting therefrom, the length of said strip being sufficient to form a plurality of track shoes, severing said strip transversely of said rib and at right angles to the plane of said longitudinal surface to form a plurality of track shoe blanks each having a tread plate and a grouser portion projecting from said tread plate, die-forming each of said severed blanks through the application of pressure to said tread plate between the edges thereof corresponding to the longitudinal edges of said strip surface, so as to insure proper fit of the finished track shoes and their associated chain links and of the overlapping tread plate portions of adjacent track shoes in the assembled track belt, cutting portions from the tread plate of each blank, and shearing off corners of said grouser portion of each blank, said cutting and shearing operations being performed while the respective blank is being held under pressure applied for said die-forming operation.

3. A method of providing track shoes for track belts of the type in which track shoes are secured to chain links and tread plates of adjacent track shoes overlap each other, comprising providing a strip of stock material having opposite longitudinal edges and a longitudinal rib therebetween, the length of said strip being sufficient to form a plurality of track shoes, severing said strip transversely of said rib to form a plurality of track shoe blanks each having a tread plate and a grouser portion projecting from said tread plate, die-forming each blank, after severing from said strip, through the application of pressure to said tread plate between the edges thereof corresponding to said opposite longitudinal edges of said strip, so as to insure proper fit of the finished track shoes and their associated chain links and of the overlapping tread plate portions of adjacent track shoes in the assembled track belt, shearing off at least one corner of said grouser portion of each blank and removing portions from said tread plate of each blank, said shearing and removing operations being performed while the blank is being held under pressure applied for said die-forming operation.

4. A method of providing track shoes for track belts of the type in which track shoes are secured to chain links, and tread plates of adjacent track shoes overlap each other, comprising providing a

strip of stock material having opposite longitudinal edges and a longitudinal rib therebetween, the length of said strip being sufficient to form a plurality of track shoes, severing said strip transversely of said rib to form a plurality of track shoe blanks each having a tread plate and a grouser portion projecting from said tread plate, die-forming each blank through the application of pressure to said tread plate between the edges thereof corresponding to said longitudinal edges of said strip, so as to provide an accurately shaped surface insuring proper fit of the finished track shoe with its associated chain link, and through the application of pressure to said tread plate at least at one of said edges thereof so as to provide an accurately shaped curved portion on the finished track shoe adapted to cooperate in overlapping relation with an adjacent track shoe in the assembled track belt, and shearing off at least one corner of said grouser portion of each blank while the latter is being held under pressure applied for said die-forming operation.

5. A method of providing track shoes for track belts of the type in which track shoes are secured to chain links, and tread plates of adjacent track shoes overlap each other, comprising providing a strip of stock material having opposite longitudinal edges and a longitudinal rib therebetween, the length of said strip being sufficient to form a plurality of track shoes, severing said strip transversely of said rib to form a plurality of track shoe blanks each having a tread plate and a grouser portion projecting from said tread plate, die-forming each blank through the application of pressure to said tread plate between the edges thereof corresponding to said longitudinal edges of said strip so as to provide an accurately shaped plane surface insuring proper fit of the finished track shoe with its associated chain link, and through the application of pressure to said tread plate at both of said edges thereof so as to provide on the finished track shoe accurately shaped marginal portions adapted to cooperate in overlapping relation with adjacent track shoes in the assembled track belt, one marginal portion extending upwardly and the other downwardly with respect to said plane surface, and shearing off at least one corner of said grouser portion of each blank while the latter is being held under pressure applied for said die-forming operation.

6. A method of providing track shoes for track belts of the type in which track shoes are secured to chain links, and tread plates of adjacent track shoes overlap each other, comprising providing a strip of stock material having opposite longitudinal edges and a longitudinal rib therebetween, the length of said strip being sufficient to form a plurality of track shoes, and forming track shoes from said strip in a manner including the following steps: die-forming a portion of said strip having a length longitudinally of said edges thereof equal to the width of the finished track shoe, through the application of pressure to said strip portion at its longitudinal edges and between the latter, and thereby producing a shape of said strip portion insuring proper fit of the finished track shoe and its associated chain link and of the overlapping tread plate portions of adjacent track shoes in the assembled track belt, and cutting the portion of said rib associated with said strip portion while the later is being held under pressure applied for said die-forming operation, said cutting operation providing a beveled corner at least at one end of said rib portion in the finished track shoe.

7. A method as set forth in claim 6, including the additional operation of removing portions from the part of said strip portion corresponding to the tread plate of the finished track shoe while said part is being held under pressure applied for said die-forming operation.

8. A method of providing track shoes for track belts of the type in which track shoes are secured to chain links, and tread plates of adjacent track shoes overlap each other, comprising providing a strip of stock material having opposite longitudinal edges and a rib therebetween, the length of said strip being sufficient to form a plurality of track shoes, severing said strip transversely of said rib to form a plurality of track shoe blanks each having a tread plate and a grouser portion projecting from said tread plate, die-forming each blank through the application of pressure to said tread plate and thereby deforming the longitudinal edges of the blank in opposite directions in order to provide overlapping tread plate portions, and shearing off at least one corner of said grouser portion of each blank while the latter is being held under pressure applied for said die-forming operation.

9. A method as set forth in claim 8, including the additional operation of removing portions from the tread plate of the blank while the latter is being held under pressure applied for said die-forming operation.

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