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This invention relates to a method of manufacturing track shoes. In the manufacture of tractors and the like, the tractor is often provided with an endless chain to which a plurality of track shoes are attached. The tractor is propelled in a forward or rearward direction by driving the chain so that the tip of each track shoe bites into the earth.

These track shoes are usually about one foot in width and can be initially formed from a length of rolled strip stock. In transverse section, the length of track shoe provides a generally horizontal center base portion, with one edge raised and the other edge portion depressed to conform more nearly with the tractor chain contour. A vertical projection extends outwardly from the base at approximately 90° therefrom and is adapted to engage and bite into the earth.

Numerous problems have arisen in the forming of such track shoes from rolled strip stock, such as by flame cutting. In the assembly of the track shoes and chain, it has been found necessary to provide a plurality of grooves or notches in the raised edge of the track shoe so that the next adjacent chain link may be lowered into place. These grooves must be of sufficient depth to easily accommodate the link. In addition, as the chain makes the turn on its support, each link must be able to rise over the notches.

Secondly, when the strip has been cut into successive individual shoes, difficulty has been encountered due to the extreme depth of metal created by the vertical projection. In flame cutting across the strip, the projection has required a substantial slowdown of the cutting torch, and a resulting loss of operating time.

The method of the present invention solves the aforesaid problems and provides a highly advantageous procedure for forming track shoes of the type mentioned.

In carrying out the invention, rolled strip stock is cut by a plurality of cutters with one cutter notching the edge of the strip and another cutter simultaneously notching the vertical rib on the strip at the same time. A third cutter severs a previously notched piece from the main strip stock.

The notching of the vertical rib is at the location for severing of the strip and by pre-notching in this manner the time for severing is reduced and production is thereby increased.

The notching of the edge of the strip is obtained by specially controlling the cutter according to a pattern starting in each instance with the edge whereby tolerances in strip dimensions do not effect the notching; nor do they produce ineffective pre-heating of the strip.

The accompanying drawings illustrate the best mode presently contemplated by the inventor for carrying out the method of the invention.

In the drawings:
FIGURE 1 is a fragmentary side elevation of a portion of a tractor chain with track shoes attached thereto;
FIG. 2 is a perspective schematic view of an apparatus capable of carrying out the method of the invention;
FIG. 3 is a side elevation of the carriage drive for the U groove cutting heads;
FIG. 4 is a view taken on line 4—4 of FIG. 3, showing the cam;

FIG. 5 is a rear elevation of the V-groove cutting apparatus; and
FIG. 6 is a side elevation of the cutoff head control mechanism.

As shown in the drawings, the method of the invention is applied to the formation of a plurality of track shoes 1 which are adapted to be secured, as by bolts 2, to individual chain links 3 of a tractor chain or the like. Each track shoe 1 is provided with a lowered edge portion 4 which overlaps the raised edge portion 5 of the next adjacent shoe.

In order to assemble links 3 together and to provide for curving of links 5, a pair of generally U-shaped grooves or notches 6 are formed in the raised edge 5 of each shoe so that, upon assembly, the adjacent link may be lowered therethrough. The depth of each groove 6 must be sufficient to accommodate the end of the adjacent link as it passes therethrough.

An earth-engaging projection 7 extends vertically in the form of a ridge from the central base portion of each track shoe 1.

The shoes are initially formed in a length of rolled strip stock 8, which is fed in measured lengths through a flame cutting apparatus 9 on a conveyor 10 driven by a motor 11, the latter being controlled by a switch 12.

Apparatus 9 comprises, generally, a base 13, a pair of spaced vertical extending flame cutting heads 14 which are horizontally translatable in all directions; a horizontally extending flame cutting head 15 which is translatable in a vertical direction; and a vertical flame cutting head 16 which is translatable only in a transverse horizontal direction for cutoff purposes.

Heads 14, 15, and 16 are supplied through conduits with any suitable flame cutting gas from any suitable source in a manner well known in the art.

In order to provide the proper depth and shape for grooves 6, heads 14 must be carefully positioned and controlled in their cutting movement. For this purpose, the base 13 is provided with an inclined portion having suitable inclined transverse rods 18 for mounting a slide 19. Slide 19 is movable on rods 18 by an air cylinder 20 mounted on base 13 and having a piston rod 21 secured to the slide. Movement of rod 21 may be controlled by a valve 22 connected to any suitable source of compressed air.

Slide 19 carries a downwardly extending finder bar 23 which is adapted to engage the strip edge 5, for purposes to be described.

A first carriage 24 is mounted for longitudinal movement on slide 19 by a plurality of wheels 25 which ride on guide rails 26 on the inclined portion of the base. Similarly, a second carriage 27 is mounted for transverse movement on carriage 24 by a plurality of wheels 28 which ride on guide rails 29 on the lower carriage. Upper carriage 27 is secured against movement, due to the incline of base 13 by a counterweight 30 and associated pulley 31 on the lower carriage 24.

Flame cutting heads 14 are secured to carriage 27 for movement therewith and are longitudinally spaced apart the desired distance for the width between the two grooves 6.

In order to form the U-shape of grooves 6, a contour driving mechanism is provided. For this purpose, a cam member 32 is secured to the upper surface of slide 19, with the cam being made of iron or some other magnetically permeable material. An aluminum guide rail 33 surrounds cam 32 in a manner to create a guide track 34 which receives a magnetic roller 35 which acts as a follower.

Roller 35 is rotatably driven by a motor 36 mounted on upper carriage 27 and will be magnetically attracted to cam 32 and follow around the edge thereof when the
motor is operating. A suitable switch 37 may be utilized for controlling motor 36. Since the edge of cam 32 corresponds to the desired contour of grooves 6, carriages 24 and 27 will be propelled to move cutting heads 14 across the strip 8 in the desired directions to cut the grooves.

Finder bar 23 is shown as disposed midway between the two heads 14 and provides two important functions in carrying out the method of the invention. First of all, it assists in initially positioning heads 14 so that grooves 6 will be cut to the proper depth. Secondly, it assures an initial position of the heads for proper pre-heating of the edge 5 of the strip stock.

For this purpose, cutter heads 14 are adjusted so that the center point 38 of each cutter nozzle opening lies within or closely adjacent a longitudinal plane which contains the forward edge 39 of finder bar 23. This is accomplished by a suitable manual adjustment mechanism 40 which permits shifting bar 23 in a transverse direction and relative to cam 32.

When valve 22 is operated, slide 19 shifts forwardly until edge 39 of finder bar 23 engages the raised edge 5 of strip stock 8. The nozzles of each head 14 are then positioned adjacent edge 5, with the central axes of the nozzles just intersecting the edge.

When heads 14 are set to provide a warmup flame, only the edge of the stock will be heated. If heads 14 were positioned to far over the stock for warmup, the initial edge cut of the nozzles would be imperfect, as well as the cut in the portion where the improper warmup occurred. If heads 14 were positioned too far outwardly from the stock edge for warmup, the metal in advance of the subsequent cutting flame would never preheat in the proper manner, and the cut would not start.

Once the proper preheat of the edge has occurred, additional cutting gas is supplied to heads 14, motor 36 is energized and heads 14 will be driven by cam 22 so that their flames will cut the desired grooves 6. No matter how the width of stock 8 may vary, grooves 6 will always be of the same depth, i.e., sufficient for passage of chains 3, since the initial starting point is always at the edge, due to utilization of finder bar 23.

Where it is desirable to produce a beveled edge on grooves 6, the nozzles of heads 14 should be adjustable to an inclined position of desired magnitude, as shown.

At the same time grooving is carried out, the machine contemplates elimination of the cutting difficulty created by the vertical extent of longitudinal projection or ridge 7. For this purpose, a rotatable plate 41 having a large radial guide slot 42 therein is suitably secured to base 13, the plate being adapted to have the rear end portion of horizontal head 15 pass therethrough for movement in a bracket 43.

Bracket 43 is suitably connected to a reversing screw 44 which is drivenly rotated by a motor 45 mounted on plate 41. Energization of the motor by a suitable switch 46 will, due to the nature of screw 44, cause head 15 to move in slot 42 and toward the center of plate 41 and immediately back toward the periphery thereof.

The axis of plate 41 is in the same horizontal plane as the root of projection 7. Thus, movement of head 15 will cause the flame to cut through the projection from its outer edge to its root. Therefore, when cutting procedures are performed at the base of the projection cut, can thus be accomplished at a single speed.

It is highly desirable to make the projection cut in the form of a V-groove 47, so that the projection is beveled in the complex shoe. For this purpose, plate 41 is adapted to rotate on its axis between two positions, the rotation being accomplished by a piston rod 48 secured adjacent the periphery of the plate and connected within a cylinder 49 mounted on base 13.

A lower and upper limit switch 50 and 51, respectively, may be provided adjacent the ends of guide slot 43. As bracket 43 reaches either end of its stroke, it will engage one of the limit switches, which, in turn, will energize a solenoid valve 52 connected to move piston 48. In each position of plate 41, slot 42 is disposed at a slight angle from the vertical, corresponding to one opposite edge of V-groove 50.

Plate 45 is secured with slot 42 in each of its two offset center positions by a suitable spring-pressed plunger 53 which engages one of a pair of detents 54 in the edge of the plate.

Simultaneously with the cutting of grooves 6 and 47, vertical head 16 performs the cutting off operation for the next preceding completed track shoe 55.

As shown, head 16 is mounted on a carrier bar 56 which is disposed for lateral movement between rollers 57 secured to base 13. Forward movement of the cut-off head is provided by a transverse feed screw 58 which passes through a brace 59 extending longitudinally from bar 56. Screw 58 is mounted on base 13 and is driven by a motor 60 actuated by a switch 61.

A feed nut 62 is secured within brace 59 for driving engagement with screw 58, and is releasable by actuation of a solenoid valve 63 which operates to move a piston rod 64 connected at one end within a cylinder 65 and connected at the other end to nut 62.

When nut 62 is engaged, screw 58 will drive head 16 across stock 8 to sever the line of projection 7. When the cut-off is complete, nut 62 may be disengaged and carrier bar 56 may be swiftly returned to its retracted position. For this purpose, a suitable piston rod 66 is connected to the rearward end of bar 56, and operates within a cylinder 67 fixed to base 13 and controlled by a suitable valve 68.

The method of the invention also contemplates an initial warmup of the edge of stock 8 by head 16. To properly position head 16 at the edge, regardless of stock width variations, a cut-off finder bar 69 is secured to the forward end of a rod 70 which is movable laterally from base 13. The rearward end of rod 70 is connected through a brace 71 to a piston rod 72 secured for movement in a cylinder 73 mounted on the base. The piston 72 may be suitably actuated by a valve 74 to move finder bar 69 into engagement with the rearward edge of stock 8 adjacent the cut-off head.

To provide the necessary positional relationship between the center of the head nozzle, the forward edge of bar 69 and the stock edge, as with heads 14 and bar 23, a limit switch 75 is mounted stop brace 71, and is adapted to be engaged by an adjustable trip member 76 extending rearwardly from brace 59. Trip 76 will engage switch 75 as brace 59 moves forward on feed screw 58, which will actuate valve 63 to release nut 62 and stop further movement of head 16 forwardly. By properly adjusting trip 76, the nozzle for head 16 will be positioned over the edge of the stock for preheat in a manner similar to heads 14.

The method of the invention, as exemplified by the described apparatus, may include the following operations: (a) cutting grooves 6, (b) cutting groove 47, and (c) cutting off of the previously completed track shoe 55 on a line intersecting the base of the previously formed V-groove. After each group of cutting operations, the strip stock is moved on conveyor 10 a measured distance so that the end portion overhangs the end of the machine, and so that groove 47 is disposed directly beneath cut-off head 16. To assure that latter stock 8 travels only the desired distance, a limit switch 77 may be suitably placed in the path of stock 8 for engagement by the end thereof, with switch 77 connected to conveyor motor 11 to shut the latter off.

All cutting operations take approximately the same time, due to the pre-cutting of projection 7. There is no need for slowing down of the cut-off head at the projection, so that the full track shoe forming operation takes only a minimum of time.

While one apparatus has been shown for performance of the method, it is to be understood that the method may be performed on other machines, and also by hand, with-
out departing from the spirit of the invention. If desired, the various drives may be manually controlled or connected by a control mechanism to provide selective automatic performance of the method. That is: switches 12, 37, 40, 51, 54, 61, 75 and 77, as well as valves 22, 52, 63, 68 and 74 may be interconnected by a suitable control circuit, not shown.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. A method of manufacturing a plurality of track shoes in succession from a longitudinally extending length of rolled strip stock having a base portion and a longitudinally extending projection extending at approximately 90° from the central portion of the base, comprising the steps of: conveying a first portion of the stock to a desired position, flame cutting at least one generally U-shaped groove in one longitudinal edge of the base portion, simultaneously flame cutting a V-shaped groove in the projection inwardly along the stock from said U-shaped groove, causing the stock so that a second stock portion is in position for cutting with said first stock portion still attached thereto, and then flame cutting transversely of the stock to sever said first stock portion from said second stock portion at a generally constant speed and along a line passing through the base of said V-shaped groove while simultaneously flame cutting similar U-shaped and V-shaped grooves in said second stock portion.

2. A method of manufacturing a plurality of chain track shoes in succession from a longitudinally extending length of roller strip stock having a base portion and a longitudinally extending projection extending at approximately 90° from the central portion of the base, comprising the steps of: conveying a first portion of the stock to a desired position, preheating a portion of one longitudinal edge of the base, flame cutting a plurality of spaced generally U-shaped grooves of the same depth in the preheated portion of said edge, simultaneously flame cutting a V-shaped groove in the projection inwardly along the stock from said U-shaped grooves, conveying the stock so that a second stock portion is in position for cutting with said first stock portion still attached thereto, and then flame cutting transversely of the stock to sever said first stock portion from said second stock portion at a generally constant speed and along a line passing through the base of said V-shaped groove, simultaneously flame cutting a V-shaped groove in the projection inwardly along the stock from said U-shaped grooves, conveying the stock so that a second stock portion is in position for cutting with said first stock portion still attached thereto, and then flame cutting transversely of the stock to sever said first stock portion from said second stock portion at a generally constant speed and along a line passing through the base of said V-shaped groove.

References Cited in this patent

UNITED STATES PATENTS

1,698,173 Royer ........................ Jan. 8, 1929
1,705,802 Best .......................... Mar. 19, 1929
1,932,545 Gotthall ....................... Mar. 27, 1934
2,039,012 Lindberg ...................... Apr. 28, 1936
2,511,591 Keller ........................ June 13, 1950
Disclaimer


Hereby enters this disclaimer to claim 5 of said patent.
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