March 10, 1953 G. J. KIRCHNER 2,630,624

CONVEYER WITH DISPLACEABLE BAR-PULLING DOG AND AUTOMATIC CONTROL THEREFOR

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FIG. 1.

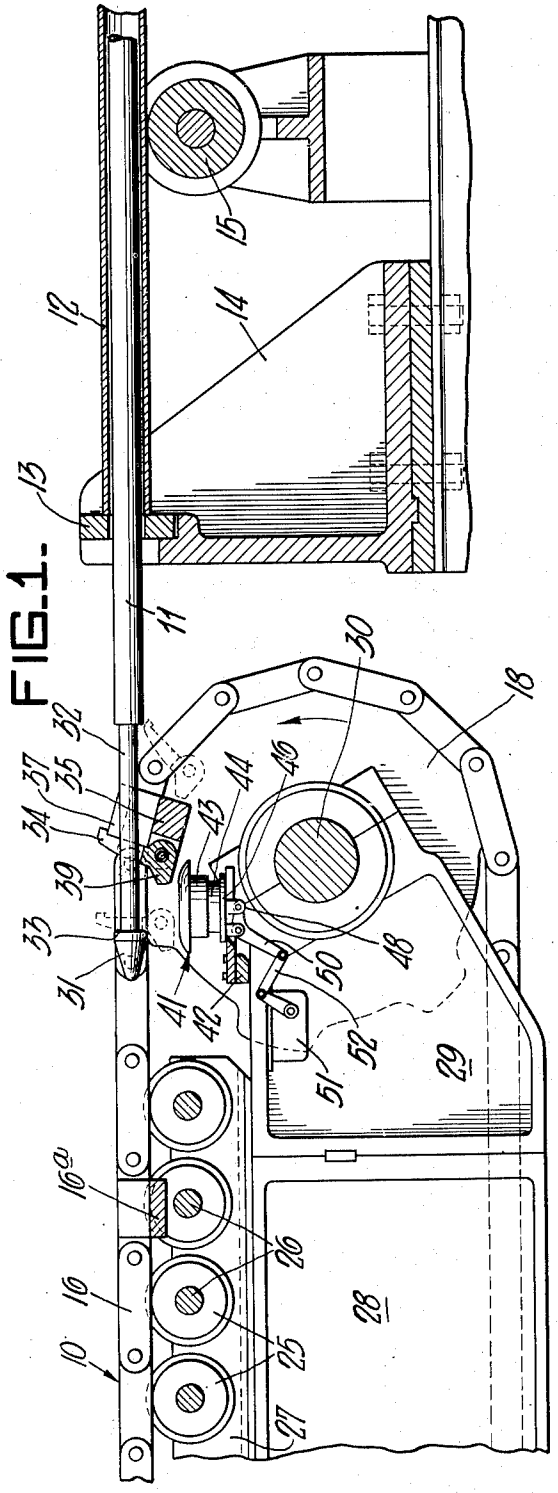
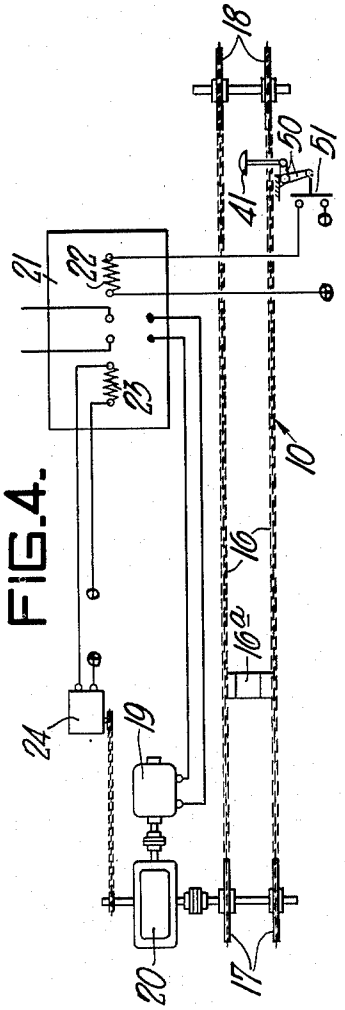


FIG. 4.



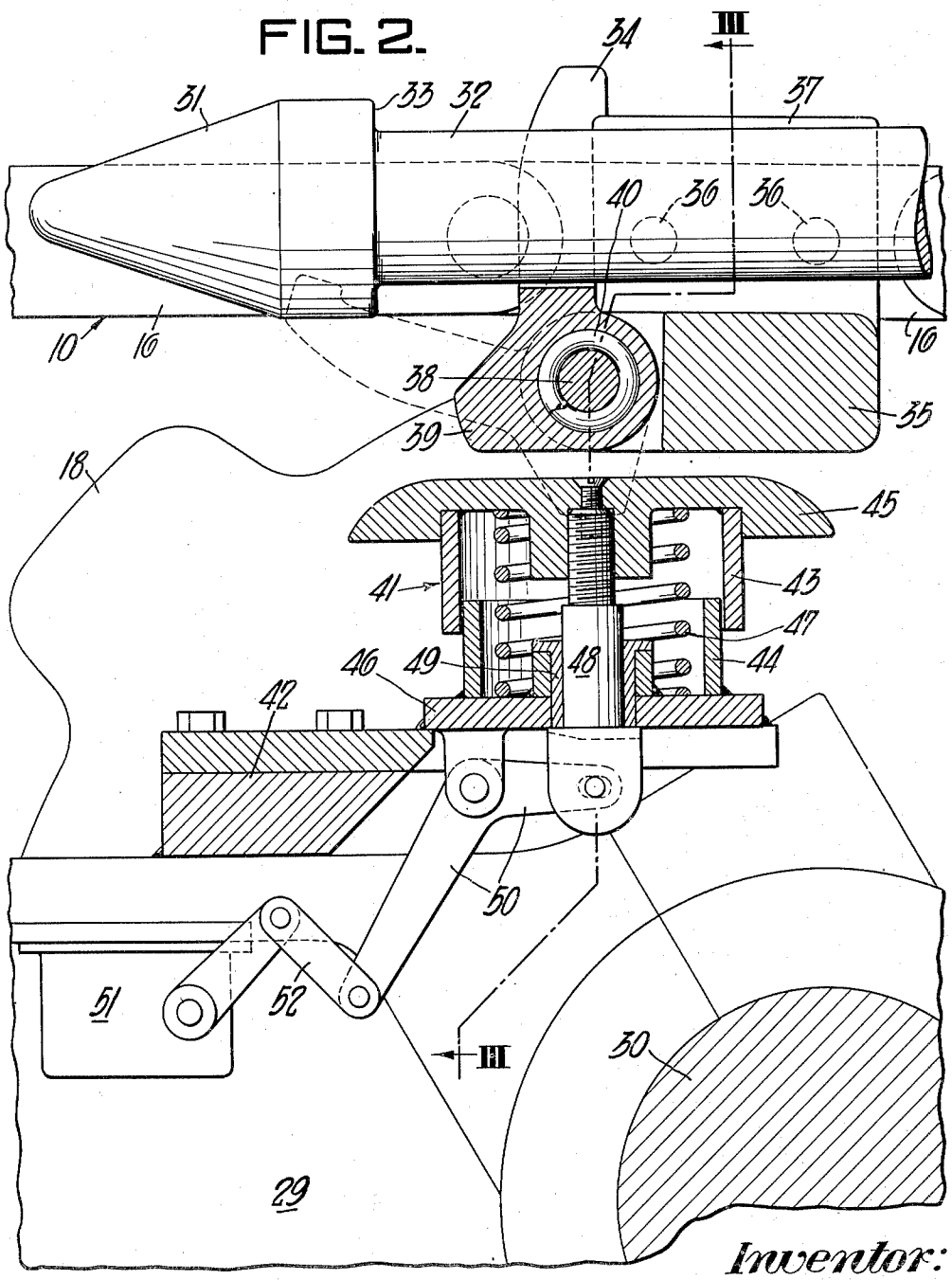
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CONVEYER WITH DISPLACEABLE BAR-PULLING DOG AND AUTOMATIC CONTROL THEREFOR

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FIG. 2.



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CONVEYER WITH DISPLACEABLE BAR-PULLING DOG AND AUTOMATIC CONTROL THEREFOR

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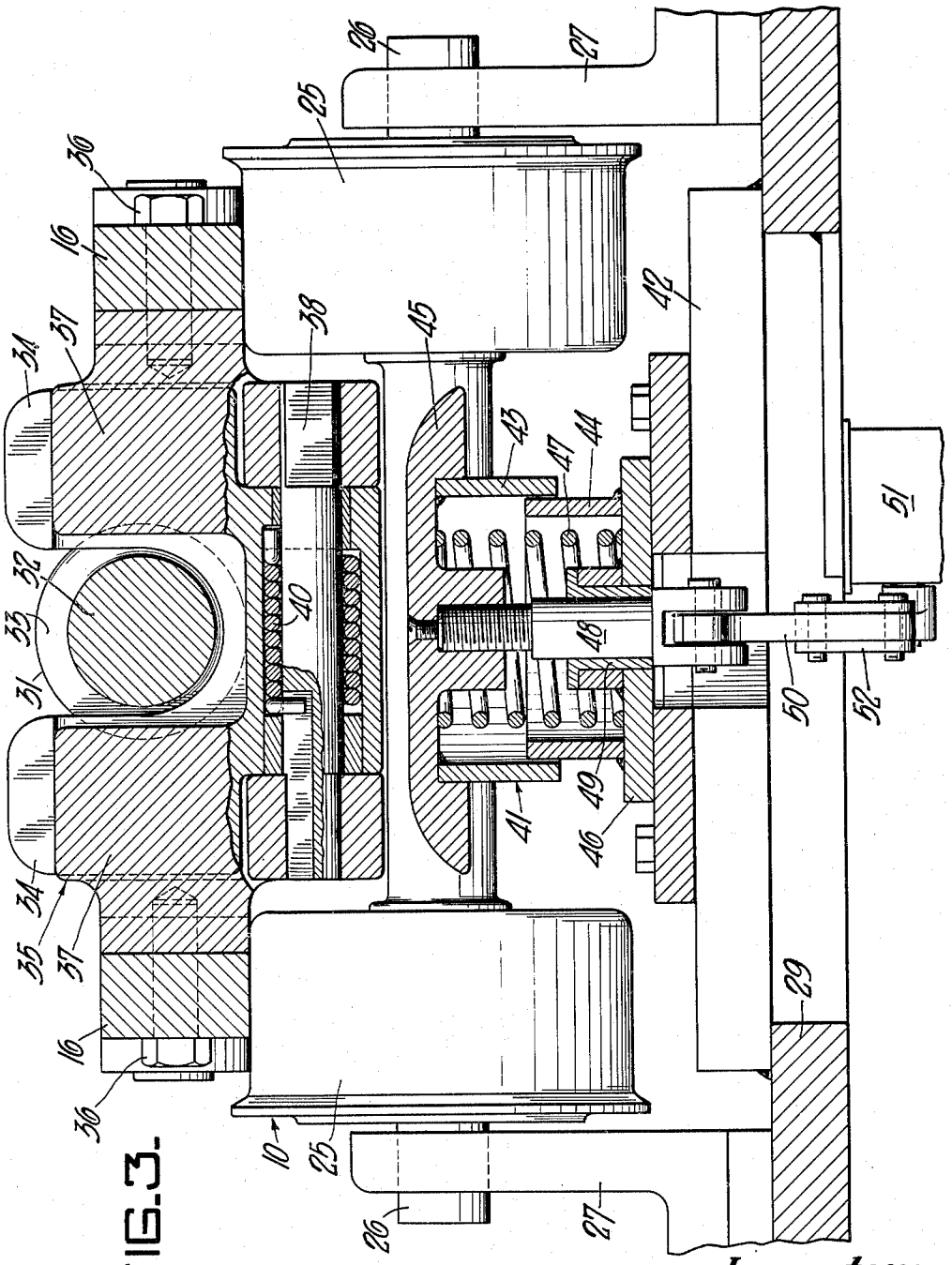


FIG. 3.

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CONVEYER WITH DISPLACEABLE BAR-PULLING DOG AND AUTOMATIC CONTROL THEREFOR

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Application February 15, 1950, Serial No. 144,269

9 Claims. (Cl. 29—208)

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This invention relates generally to the manufacture of seamless tubes and, in particular, to apparatus for stripping a cylindrical shell from a bar in the manufacture of tubes by the method known as "rolling on a bar."

The improved method of making seamless tubes by passing a blank on a mandrel bar through a rolling mill has recently come into use. This method requires the stripping of the rolled shell from the bar after the rolling has been completed. The stripping operation presents quite a problem because of the size and weight of the bar and shell, the tendency of the shell to adhere to the bar and the fact that the shell is at rolling temperature.

I have invented a novel mechanism for stripping the mandrel bar from a rolled shell and automatic control means therefor whereby this operation may be carried out quickly and effectively. In a preferred embodiment, I provide a power-driven chain conveyor having U-shaped traction dogs spaced therealong adapted to engage a pulling head attached to one end of the bar. With this mechanism I pull the bar through a hole in a stationary stripper plate too small to admit the shell, thereby holding the latter as the bar is pulled out. The dog is pivotally mounted on a saddle carried by the conveyor so as to be displaced by the pulling head as the latter is delivered through the stripper plate after which the dog is restored to position for making tractive engagement with the head. I also provide means actuated by the displacement of the dog for automatically starting the conveyor-driving motor. After the bar has been entirely removed from the shell, further control means stop the conveyor with the next dog in position to be displaced by the pulling head on the next bar to be stripped and then tractively to engage it as the chain is again started.

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

Figure 1 is a central longitudinal vertical section through the stripper plate and the adjacent end of the chain conveyor, with parts shown in elevation;

Figure 2 is a portion of Figure 1 to enlarged scale, with additional parts shown in section;

Figure 3 is a transverse section taken on the plane of line III—III of Figure 2; and

Figure 4 is a circuit diagram of the automatic control system showing certain mechanical features schematically.

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Referring in detail to the drawings, a chain conveyor 10 is so disposed as to pull a mandrel bar 11 out of a cylindrical shell 12 which has been rolled thereon, while the latter is held stationary by a stripper plate 13 mounted in a supporting standard 14. As clearly shown in Figure 1, the plate 13 has a hole therein large enough to admit the bar but not large enough to pass the shell. The bar with the shell thereon is advanced toward the stripper plate and the end of the bar inserted therethrough by a roller conveyor, one of the rolls of which is indicated at 15.

The conveyor 10 as shown in outline in Figure 4 includes a pair of spaced, parallel traction chains 16 trained over a pair of driving sprockets 17 and a pair of idler sprockets 18. The two chains are connected by transverse supporting saddles 16a spaced at intervals therealong. These saddles support the bar 11 when it has been entirely stripped from the shell, as will be explained later. Each pair of sprockets is mounted on a common shaft, the shaft of the driving sprockets being driven by a motor 19 through reduction gearing 20. Operation of the motor 19 is under the control of an automatic starting panel 21, the details of which are well known, including a start relay 22 and a stop relay 23. The latter is controlled by a limit switch 24 of known construction operating in timed relation with the travel of the conveyor in a manner to be explained in greater detail later.

Referring now more particularly to Figure 1 to 3, the chains 16 consisting of alternating single-bar links and twin-bar links ride on a plurality of pairs of rollers 25. The rollers are mounted on cross-shafts 26 which are journaled in spaced parallel rails 27. The rails are secured, respectively, to spaced parallel supporting beams 28. Bearing brackets 29 secured to the right-hand ends of these beams support the shaft of the idler sprockets 18 indicated at 30. The length of the conveyor is such as to accommodate the full length of the longest mandrel bars in use.

Each mandrel bar 11 has a pulling head 31 provided with a shank 32 threaded into one end thereof, adapted to receive the tractive force necessary to perform the stripping operation. The forward end of the head tapers to a rounded point. The head has a diameter larger than the shank forming a shoulder 33 at their junction. For cooperation with the pulling head, a bifurcated or U-shaped traction dog 34 is pivoted on a saddle or block 35 secured to single-bar links of the chains by screws 36. There are two saddles 35 having dogs pivoted thereon uniformly spaced along the chains. These saddles

are generally similar to those shown at 16a. As clearly shown in Figures 1 and 2, the dog 34 is shaped to engage the shoulder 33 of the pulling head 31. The forward faces of the sides of the dog are rounded adjacent the top as shown in Figure 2. The saddle 35 has spaced upstanding abutments 37 on each side adapted to be engaged by the rear face of the dog when in its upright position, to sustain the reaction resulting from engagement of the dog with the pulling head.

The dog 34 is pivoted on the saddle 35 by means of a through pin 38 and is thereby tiltable from the position shown in solid lines in Figure 2 to the position shown in dotted lines. The dog has a forwardly projecting lug or toe 39 at the bottom thereof for a purpose which will presently appear. A coil spring 40 surrounding the pin 38 has one end engaging the pin and the other the dog. The pin, furthermore, is secured against rotation in the saddle. The spring is normally under tension sufficient to hold the dog in upright position. Down-tilting of the dog increases the tension in the spring and the latter, therefore, serves to restore the dog to upright position as soon as it is released.

A plunger 41 is mounted on a bracket 42 in a position such that it will be struck by the lug 39 of the dog 34 when the latter is tilted downwardly. The plunger comprises upper and lower telescoping tubular members 43 and 44 having a cap or striker plate 45 and a base 46 secured thereto, respectively. A helical compression spring 47 within the lower tubular member normally supports the upper member in the illustrated position. A stud 48 extends through the base 46, is secured to the striker plate 45 and is slidable in a bushing 49 seated in the base 46. A bell crank 50 pivoted to the bottom of the base 46 is effective on operation of the plunger 41 to actuate an electric switch 51 through a link 52. The switch 51, as shown diagrammatically in Figure 3, controls the energization of the start relay 22 of the panel 21.

The operation of the apparatus described above will now be explained on the assumption that the conveyor 10 is stopped with the saddle 35 in the position shown in Figure 2, that the mandrel bar 11 with the shell 12 thereon has been delivered to the roller conveyor 15 and that the pulling head 31 on the bar is approaching the stripper plate 13. The conveyor 15 is normally driven continuously and immediately advances the pulling head and leading end of the mandrel bar through the hole in the stripper plate. On continued travel of the mandrel bar after the pulling head passes through the stripper plate, the tapered end of the head 31 enters the space between the sides of the dog 34. The dog is then tilted downwardly to the dotted line position by engagement of the tapered surface of the head with the inner surfaces of the sides of the dog. On down-tilting of the dog, lug 39 operates the plunger 41 thus actuating switch 51 which energizes the start relay 22 on panel 21.

The motor 19 starts slowly under control of the automatic starting panel 21 and drives the sprockets 17 in such direction as to move the upper run of the chains 16 from right to left. In the meantime, the mandrel bar has continued its advance until the head 31 passes sufficiently beyond the dog 34 to permit it to be restored to vertical position by spring 40. Forward movement of the bar, of course, is eventually arrested by engagement of the end of the shell thereon with the stripper plate 13. The chains 16 continue to travel at slow speed until the dog 34 engages the shoulder 33 back of head 31, thereby applying tractive force to the bar 11 tending to strip it from the shell 12. The starting panel 21 is preferably arranged to increase the speed of the motor 19 after the initial movement of the bar 11 relative to the shell which, of course, is the moment of maximum load. Continued travel of the chains entirely withdraws the bar from the shell. As the bar is pulled out, it is supported on the saddles 16a when its trailing end passes beyond the stripper plate.

After the bar 11 has been pulled entirely out of the shell 12, the conveyor chain continues its travel until the other saddle 35 with the pivoted dog 34 thereon comes into the position shown in Figure 2. The limit switch 24 is so adjusted that it closes its contact at this time, completing an energizing circuit for the stop relay 23 on panel board 21, shutting down motor 19. The switch 24 may be of any suitable type, e. g., that having a cam driven at a speed proportional to the travel of the conveyor chain and effective to close a contact at predetermined points in the travel. In the meantime, the dog 34 which was operated to withdraw the bar from the shell will have traveled around the driving sprockets 17 and passed out of engagement with the head 31. This is facilitated by the shape of the forward faces of the dog adjacent the top thereof. Bar 11 is thus left on the conveyor 10. On the next cycle of operations, the bar is carried forward by movement of conveyor 10 and delivered to a roller conveyor (not shown) in alignment therewith.

It will be apparent from the foregoing that the invention provides a simple yet effective means for stripping mandrel bars from tube shells rolled thereon. The operation of the apparatus is entirely automatic being initiated by the advancement of a bar into position for stripping. The tilting dog restores itself to position for tractive engagement with the head after being temporarily displaced by the advance of the latter and also serves to initiate the starting of the conveyor-driving motor which continues thereafter until the second dog is in position to be displaced by the next bar preparatory to a succeeding stripping operation. The axis of a bar being pulled is approximately in the horizontal plane through the center lines of the chains. The tractive effort exerted by the dog on the pulling head is therefore applied thereto substantially along the axis of the bar. There is thus no tendency to transmit any bending stress to the bar which might cause binding of the bar in the shell. In addition, any tendency of the head to jump out of the dog is avoided.

I claim:

1. In an apparatus for stripping a mandrel bar from a tube shell thereon, the combination with a chain conveyor and a motor for driving said conveyor, of a dog pivoted on the conveyor adapted to be displaced by engagement of a bar therewith, means tending to restore the dog to normal position for tractive engagement with said bar, a switch controlling the motor and means actuated by tilting movement of the dog for operating said switch.

2. The apparatus defined by claim 1 characterized by said means being a depressible plunger and said dog having a toe engageable with the plunger when the dog is positioned thereabove.

3. The apparatus defined by claim 1 characterized by a limit switch operated in accordance with travel of the conveyor effective to stop said

motor when the dog comes into cooperative relation with said switch-actuating means.

4. In an apparatus for pulling a mandrel bar from a tube shell thereon, the combination with a chain conveyor and a dog pivoted thereon for tilting movement to an out-of-the-way position when struck by a mandrel bar delivered onto the conveyor, means actuated by tilting of the dog effective to start the conveyor, and means constantly tending to restore said dog to normal position, the dog being shaped to make tractive engagement with said bar on return to normal position and forward movement of the conveyor relative to the bar.

5. The apparatus defined by claim 4 characterized by said dog being U-shaped and thereby adapted to embrace said bar on return to normal position after displacement by the bar.

6. The apparatus defined by claim 4 characterized by said conveyor having a saddle on which said dog is pivoted, said saddle having an abutment adapted to sustain the reaction on the dog caused by engagement with said bar.

7. The apparatus defined by claim 6 characterized by said dog being pivoted on a transverse horizontal axis adjacent the bottom of said saddle.

8. The apparatus defined by claim 6 characterized by a pivot pin fixed in said saddle mounting said dog, said restoring means being a helical spring surrounding the pin and secured to the pin and to the dog.

9. The combination with a conveyor including spaced chains, of a saddle extending therebetween having spaced upstanding abutments thereon, a U-shaped traction dog pivoted on said saddle ahead of said abutments for down-tilting movement, and means urging said dog to normal position bearing against said abutments, whereby said dog is adapted to make tractive engagement with a headed bar discharged longitudinally onto the conveyor, after being displaced by the head of the bar and restored to normal position in which the dog embraces the bar back of the head, said saddle having a portion below the level of said chains connecting said abutments, leaving the space between abutments clear to accommodate the bar, whereby the bar is supported substantially in the plane of the chains for the application of traction.

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