

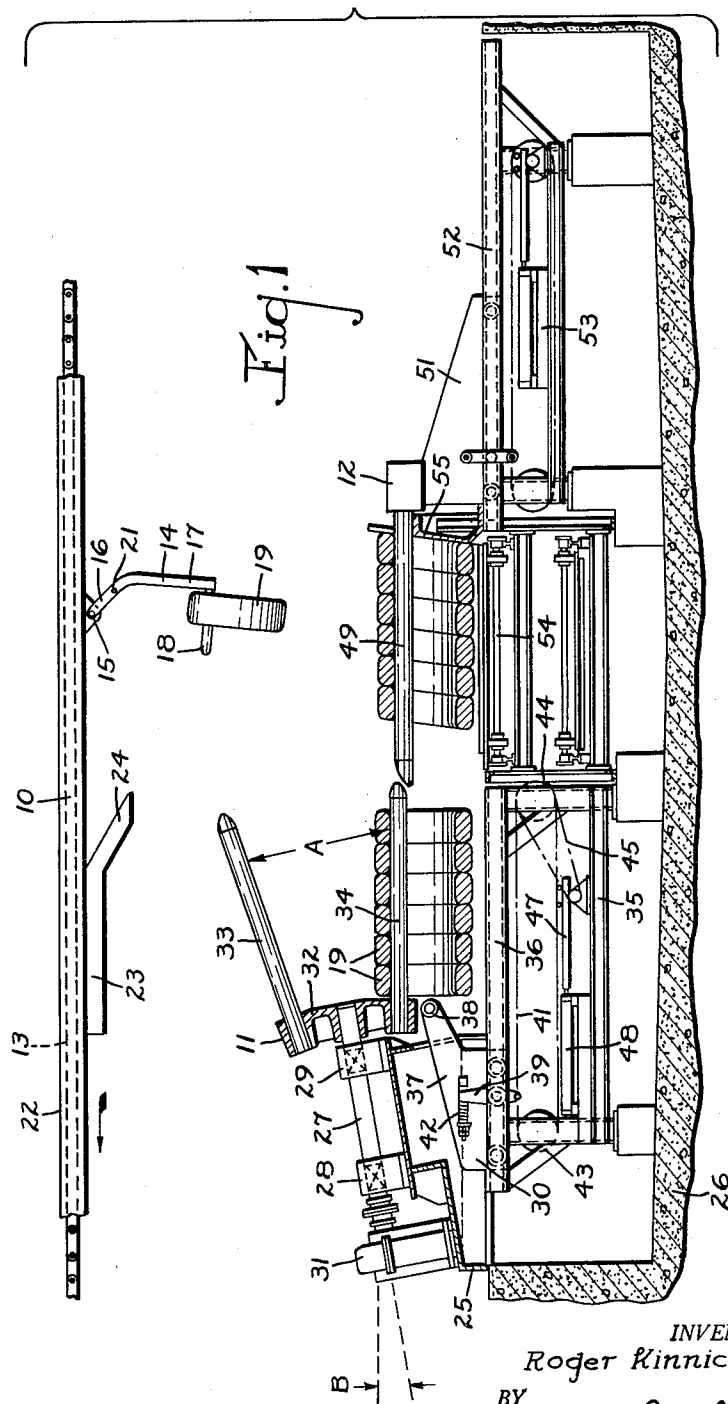
May 8, 1962

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COIL HANDLING APPARATUS

3,033,342

Filed July 13, 1959

3 Sheets-Sheet 1



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Fig. 2

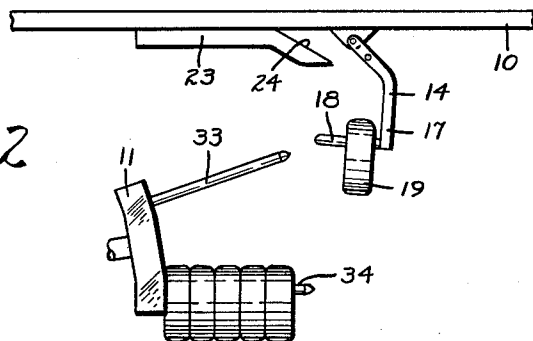


Fig. 3

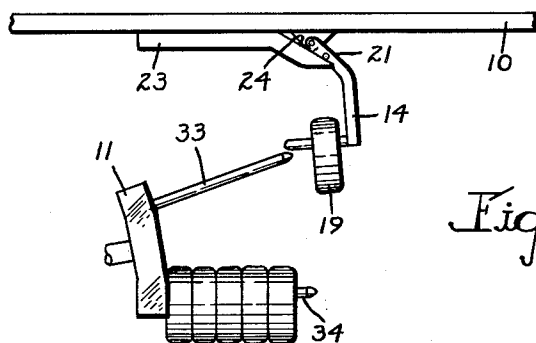
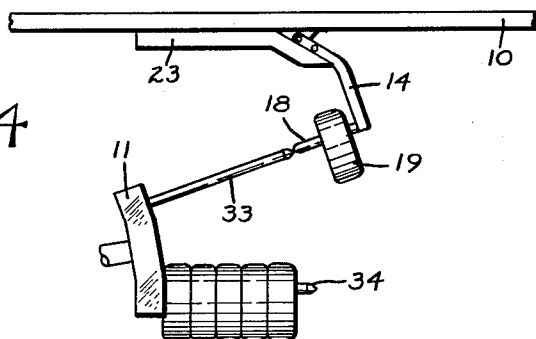


Fig. 4



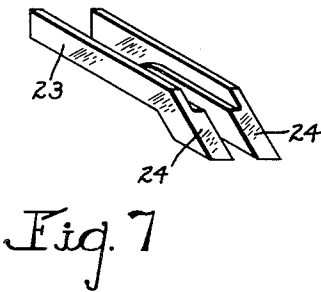
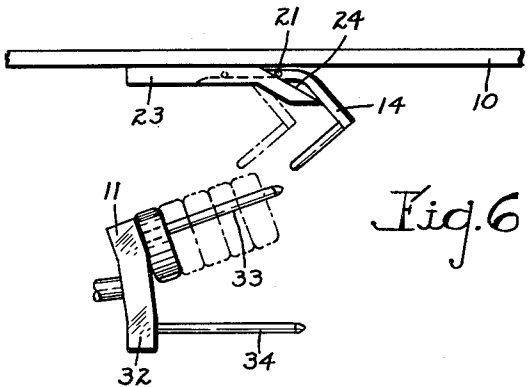
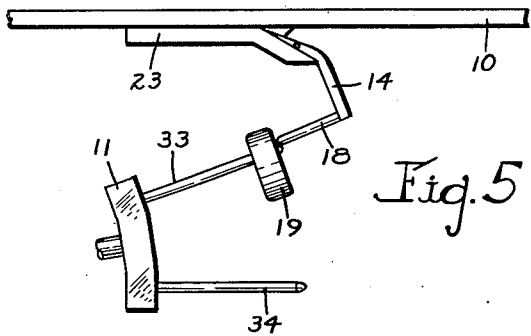
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3,033,342

COIL HANDLING APPARATUS

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Filed July 13, 1959, Ser. No. 826,867

8 Claims. (Cl. 198—25)

This invention relates to coil handling apparatus and more particularly to apparatus arranged to remove coils of rod from a hook-type conveyor.

In a steel mill, the product of a rod mill is usually coiled while still in red hot condition and the coil is removed from the reel to a chain-type conveyor which carries the coil in horizontal position some distance away from the reel while it is being cooled. When the temperature of the coils has been reduced sufficiently, they are transferred to a so-called "hook" conveyor where they are carried individually in hooks in a vertical position. Eventually, the coil reaches a storage station and must be removed from the hook carrier. Originally, the removal was brought about by man-handling the coils, but, more recently, attempts have been made to perform this operation automatically. The apparatus which has been suggested for this purpose, however, has treated the coil too roughly, so that it tends to become unraveled and the individual strands displaced in the coil, making it difficult to handle later on. These and other difficulties experienced with the prior art devices have been obviated in a novel manner by the present invention.

It is, therefore, an outstanding object of the invention to provide a coil handling apparatus having a simple and dependable mechanism for removing rod bundles or the like from the discharge end of a hook carrier without manual labor.

Another object of this invention is the provision of an efficient and reliable apparatus for transferring bundles of rods without disarranging the convolutions thereof.

It is another object of the instant invention to provide a novel turnstile for receiving and assembling a large number of rod coils, which turnstile is simple and rugged in construction.

With these and other objects in view it will be apparent to those skilled in the art the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

The character of the invention, however, may be best understood by reference to certain of its structural forms as illustrated by the accompanying drawings in which:

FIG. 1 is a vertical sectional view of apparatus embodying the principles of the present invention; and

FIGS. 2 through 6 are somewhat schematic views showing the relationship of the parts of the apparatus at different portions of the transfer cycle and FIG. 7 is a view in perspective of the operational cam.

For the purposes of the present specification the expression "longitudinal" shall indicate a direction in the general direction of the movement of coils while the expression "transverse" will indicate a direction at a right angle to the direction of movement of the coils.

Referring now to FIG. 1, wherein are best shown the general features of the invention, a hook carrier 10 is shown in use with a turnstile 11 and a pin-type conveyor 12. The hook carrier 10 consists of a chain 13 from which a hook 14 is hingedly suspended by a pivot pin 15. The hook consists of a forwardly-inclined upper portion 16 joined by a vertical intermediate portion 17 to a generally horizontal lower portion 18 on which is suspended a coil 19 which may be a rod bundle. A cam pin 21 extends transversely of the upper portion 16 closely adjacent to its juncture with the intermediate portion

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17. The chain 13 is enclosed within and supported by a track support 22 from which depends a cam member 23. The cam member is in two parts with one part lying on either side of the path of the hook 14 so that the hook can pass between the two parts of the cam. The cam member is provided with a sloping surface 24 in position to be engaged by the pin 21 on the hook 14. As indicated in the drawing by the arrow, the hook moves from left to right in FIG. 1.

The turnstile 11 is provided with a base 25 which is mounted on the foundation 26 of the mill. A main shaft 27 is mounted in two bearings 28 and 29 mounted on the upper surface of the base 25. The main shaft is inclined to the horizontal at an angle indicated by the reference letter B with its lower end in the direction of movement of the hook 14. At its lower end the main shaft is connected to a reduction drive 31 which in turn is driven by a motor (not shown). At its upper end the main shaft 27 extends beyond the bearing 29 and is provided with a disk-like head 32. Extending from the head 32 in the direction away from the main shaft 27 are two stakes 33 and 34 which are steel bars mounted at their outer ends. The stakes 33 and 34 extend at equal angles on either side of the axis of the main shaft 27 and lie at an angle to one another indicated by the reference letter A. Generally speaking, the angle B is equal to one-half the angle A, but under certain circumstances slight changes in these angles may be necessary. For instance, in a preferred embodiment the angle A would be 22° but the angle B would be about 9°, so that the stake 34 extends downwardly from the horizontal at an angle of about 2°, whereas the stake 33 extends at an angle above the horizontal by an angle of 13°. A series of coils 19 are shown in position on the stake 34. Underlying the turnstile 11 in a pit provided therefor is a pusher mechanism 30. The pusher mechanism 30 consists generally of a supporting frame 35 at the upper portion of which is a track 36 in which is slidably mounted a ram 37. The ram is provided at its forward end with a pusher arm 38 which is broad enough to extend across a coil 19. The track 36 is provided of such an extent that the end 37 can travel along the length of the stake 34. The ram is connected through a pivoted arm 39 to an endless chain 41. As is evident from the drawings, the pivoted arm 39 is pivoted in its center portion to the lower part of ram 37 and is connected through a coil spring 42 at its upper end to another part of the ram. The endless chain 41 extends around sprockets 43 and 44 located at the opposite ends of the supporting frame 35. One of the sprockets 44 is connected by a drive chain 45 to a pinion driven by a rack 47 which constitutes an extension of the piston rod of a hydraulic cylinder 48 which is suitably provided with a source of hydraulic fluid (not shown). Located rearwardly of the pusher mechanism 30 is the pin-type conveyor 12 having a stake 49 extending forwardly and generally horizontally from a base 51. The base 51 is suitably slidably mounted in a track 52 and is propelled therealong by a drive apparatus 53 similar to that described in detail in connection with the pusher mechanism 30. Between the pusher mechanism 30 and the pin-type conveyor 12 is located a transverse conveyor 54 which is of the chain type and is suitably driven by a motor, not shown. An inclined wall 55 extends along the side of the conveyor 54 adjacent the pin-type conveyor 12.

The operation of the invention will now be readily understood in view of the above description. The hook carrier 10 is driven in the direction of the arrow so that the hook passes from right to left in FIG. 1 and, eventually, approaches the stake 33 of the turnstile 11 as well as the cam member 23. Generally speaking, the

coils 19 are individually passed onto the uppermost stake 33 as successive hooks 14 pass by. When the stake is entirely occupied by coils, the turnstile is driven so that the uppermost stake moves down at a lower position and the lowermost stake moves into the upper position. At that time the pusher mechanism 36 is actuated and pushes the group of coils on the lower stake onto the stake 49 of the pin-type conveyor 12. The coils are moved onto the stake 49 until they lean against the inclined wall 55 at which time the conveyor 12 is actuated and the base 51 moves along the track 52 to withdraw the stake 49 from the coils. At that time the transverse conveyor 54 begins operation to move the group of coils transversely away from the plane of the present apparatus to a storage area or the like.

FIGS. 2 through 6 show more or less schematically the manner in which the transfer of a coil takes place from the hook 14 to the turnstile 11. Let us assume that in FIG. 2 the turnstile 11 has just been turned so that a loaded stake 34 has been moved into the lower horizontal position. The hook 14 approaches with its lower portion 18 inclined slightly upwardly so that the coil 19 rests well back against the juncture of the intermediate portion 17 of the hook with the lower portion 18. When the hook 14 has progressed sufficiently so that the end of the hook is closely adjacent to the end of the stake 33, the cam 21 strikes the sloping surface 24 of the cam member 23. Further progress of the hook carrier in the direction of the arrow tilts the hook 14 to a horizontal position, as shown in FIG. 3, and then to a slight downward position as shown in FIG. 4, the tilting of the hook taking place about the end of the lower portion 18 which is closely adjacent the stake 33. At that time the lower portion 18 is close to and acts as an extension of the stake 33. Further motion brings about the situation shown in FIG. 5 where the lower portion 18 of the hook 14 is slightly withdrawn from the coil 19 and the coil has begun to slide down the lower portion 18 and off the end of the hook onto the stake 33. At the end of its rotation because of the pressure of the cam pin 21 on the surface 24 the coil 19 has traveled down the stake 33 and is resting closely adjacent the head 32 of the turnstile. It can be seen that, due to the peculiar relationship of the hook and the stake, sliding of the coil takes place from one to the other without dropping the coil. The friction of the coil on the surfaces of the hook on the stake is sufficient, if the angle of the stake is selected properly, to assure that no undue jarring takes place when the coil contacts the head 32.

It is obvious that minor changes may be made in the form and construction of the invention without departing from the material spirit thereof. It is not, however, desired to confine the invention to the exact form herein shown and described but it is desired to include all such as properly come within the scope claimed.

The invention having been thus described, what is claimed as new and desired to secure by Letters Patent is:

1. Coil handling apparatus comprising a turnstile having at least one stake which is movable from an upwardly-inclined receiving position to a lower horizontal unloading position, a hook-type conveyor overlying the turnstile and having a hook which moves toward the turnstile with the open side of said hook oriented toward the upper end of said stake in a common vertical plane with the stake in said receiving position, the hook being supported from the conveyor and having a generally straight lower section which is normally substantially horizontal, and means for tilting the hook so that it rotates when said straight lower section is adjacent said upper end of said stake, until said straight lower portion is substantially aligned with the stake to define a substantially continuous surfaces for supporting said coil as it slides from said hook to said stake.

2. Coil handling apparatus, comprising a base, a main

shaft rotatably carried by the base and having an inclined axis, a head carried at the high end of the main shaft, two stakes extending from the head in the direction away from the main shaft, the stakes lying on opposite sides of the main shaft and extending outwardly and away from one another at an angle, the angle of the main shaft to the horizontal and the angle between the stakes being selected so that when the stakes lie in a vertical plane the lower stake is substantially horizontal, a hook-type conveyor overlying the main shaft and having a hook which moves toward the shaft in a common vertical plane with a stake in an upper position, the hook being swingably supported from the conveyor and having a generally straight lower section which is normally substantially horizontal, and means for tilting the hook so that it rotates when the end of said straight lower section is adjacent the end of the upper stake, until the straight lower portion of the hook is aligned with the stake to define a substantially continuous surface for supporting a coil as it slides from said hook to said stake.

3. Coil handling apparatus, comprising a base, a main shaft rotatably carried by the base and having an axis inclined to the horizontal, means selectively rotating the main shaft, a disk-like head carried at a high outer end of the main shaft, two stakes extending from the head in the direction away from the main shaft, the stakes lying substantial distances apart on opposite sides of the main shaft and extending outwardly and away from one another at a small angle, the angle of the main shaft to the horizontal being equal to approximately one-half the angle between the stakes so that when the stakes lie in a vertical plane the lower stake is horizontal, a hook-type conveyor overlying the main shaft and having a hook which moves toward the shaft in a common vertical plane with a stake in an upper position, the hook being pivotably supported from the conveyor and having a generally straight lower section which is normally substantially horizontal, and means for tilting the hook so that it rotates when said straight lower section is adjacent the end of the said upper stake, until the straight lower portion of the hook is substantially aligned with the said stake defining a substantially continuous surface for supporting an article as it slides from said hook to said stake.

4. Apparatus according to claim 3 and a horizontal ram movable below and substantially parallel to said lower stake for discharging coils from said lower stake in the same direction said lower stake extends away from said main shaft.

5. Apparatus according to claim 4 and a horizontal conveyor transverse to said overhead conveyor positioned to transport coils discharged from said lower stake.

6. Coil handling apparatus, comprising a base, a main shaft rotatably carried by the base and having an inclined axis, a head carried at the high end of the main shaft, two stakes extending from the head in the direction away from the main shaft, the stakes lying on opposite sides of the main shaft and extending outwardly and away from one another at an angle, the angle of the main shaft to the horizontal and the angle between the stakes being selected so that when the stakes lie in a vertical plane the lower stake is substantially horizontal.

7. Coil handling apparatus, comprising a base, a main shaft rotatably carried by the base and having an axis inclined to the horizontal, means selectively rotating the main shaft, a disk-like head carried in a high outer end of the main shaft, two stakes extending from the head in the direction away from the main shaft, the stakes lying substantial distances apart on opposite sides of the main shaft and extending outwardly and away from one another at a small angle, the angle of the main shaft to the horizontal being equal to approximately one-half the angle between the stakes, so that when the stakes lie in a vertical plane the lower stake is horizontal.

8. Coil handling apparatus, comprising a base, a main

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shaft rotatably carried by the base and having an axis inclined to the horizontal, a stake carried at the high end of the main shaft and extending at an obtuse angle thereto, means for rotating the main shaft, the angle of the main shaft to the horizontal and the angle between the stake and the shaft being selected so that when the shaft is rotated, the stake moves from a first upwardly-inclined position to a second substantially horizontal position.

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