ROLL CHANGING DEVICE

Joseph Hlafcsak, Pittsburgh, Pa., assignor to Mesta Machine Company, Pittsburgh, Pa., a corporation of Pennsylvania
Filed Nov. 1, 1968, Ser. No. 772,722
Int. Cl. B21b 31/08

U.S. Cl. 72—239

9 Claims

The present invention relates to roll changing means for a roll straightener or the like, and more particularly to means of the character described for changing the rolls of a straightener or other similar device simultaneously.

Structural mill straighteners are employed throughout the steel and related industries for straightening various structural shapes or sections such as beams and angles. Some devices employ usually a large number of rolls, with seven or more such rolls being common. In practice, the rolls of the straightener must be changed to accommodate each shape or size of product to be leveled. Frequent roll changes are, therefore, required.

At the present time, each of the rolls is individually and successively changed by means of a crane, a troublesome and time-consuming operation. The new or replacement rolls must be handled in a similar, one-at-a-time fashion, which aggravates the situation. As the rolls are subject to severe wearing forces, roll changes for maintenance purposes common are, in addition to the aforementioned productional changes.

It would be difficult indeed to overstate the difficulties and hazards involved in making these roll changes in accordance with present practices. The heaviest rolls presently used in straightener devices weight as much as 3,500 pounds and more. The dangers inherent in moving articles of this size and weight, particularly with overhead cranes, are immediately apparent. In addition to the considerable personnel hazard and the possibility of roll damage by careless handling, the down time and loss of production entailed in conventional roll-changing operations is far from negligible.

I overcome these disadvantages of the prior art by providing a roll-changing device capable of removing and replacing straightener rolls in simultaneous operations respectively. My roll-changing device supports the replacement rolls thereon in a predetermined array and receives the rolls from the straightener in a similar array. Thus, the changing device can be moved to a first position at which the rolls of the straightener are engaged and removed simultaneously. The roll-changing device is withdrawn from the straightener to remove the rolls from their individual shafts. Subsequently, the changing device is again advanced, but in a different attitude, to the straightener to slip new rolls stored on the changing device onto the vacated shafts of the leveler. With arrangement, the leveler rolls can be changed in a matter of minutes. The hours of downtime of previous practices are avoided, together with the attendant personnel hazard, equipment damage, and losses in production.

Moreover, the changing device, besides its operation in the simultaneous removal and replacement of the rolls, can be used for conveniently transferring groups of new and used rolls between a suitable storage area and the location of actual use.

I accomplish these desirable results by providing a roll-changing device for use in withdrawing and replacing the rolls of a roll straightener and the like, said device comprising a support housing, means for releasely clamping a plurality of said rolls in a predetermined array on one side of said housing, means for releasely clamping a plurality of said rolls in an identical array on another side of said housing, and means for presenting said housing sides successively to said straightener so that the rolls on the straightener can be simultaneously clamped and withdrawn therefrom and so that replacement rolls supported on said device can be simultaneously positioned on said straightener.

I also desirably provide a similar changing device wherein said housing is pivotally mounted upon a carriage therefore, and means are provided for moving said carriage toward and away from said straightener and for revolving said housing with respect to said carriage.

I also desirably provide a similar changing device wherein said carriage is mounted on rail means disposed to align the array of rolls supported on said roll changing device with the array of rolls on said straightener. I also desirably provide a similar changing device wherein said clamping means include a pair of clamping bars aligned with a row of said rolls, for movement toward and away from said row, said clamping bars being slidably mounted on said housing.

During the foregoing discussion, various objects, features and advantages of the invention have been set forth. These and other objects, features and advantages of the invention together with structural details thereof will be elaborated upon during the forthcoming description of presently preferred embodiments of the invention and presently preferred methods of practicing the same.

In the accompanying drawings I have shown certain presently preferred embodiments of the invention and have illustrated presently preferred methods of practicing the same wherein:

FIG. 1 is a top plan view of one arrangement of a roll changing device of my invention shown in conjunction with a conventional roll straightener;
FIG. 2 is an end elevational view, partially sectioned, of the roll changing device and straightener as shown in FIG. 1;
FIG. 2A is an enlarged left end elevational view of the changer and a portion of the straightener as shown in FIG. 2;
FIG. 3 is an enlarged rear elevational view of the roll changing device (and straightener) as shown in the preceding figures;
FIG. 4 is a partial right end elevational view of the roll changing device as shown in FIG. 3 and taken along reference line IV—IV thereof;
FIG. 5 is a vertically sectioned view of the changing device as shown in FIG. 3 and taken along reference line V—V thereof; and
FIG. 6 is a partially sectioned view of the changing device of FIG. 3 and taken generally along reference line VI—VI thereof.

Referring now more particularly to the drawings, the roll changing device 10 of my invention is arranged in this example with a seven roll straightener 12. It will be
apparent as this description proceeds that the straightener 12 is of conventional construction and need not be described in detail. Briefly, the straightener 12 includes a housing 14 in which are rotatably mounted a plurality of drive shafts 16. On the cantilevered ends of the shafts 16 are mounted an equal number of straightener rolls 18. In the illustration, seven each of the shafts 16 and rolls 18 are employed although a different number obviously can be used.

The protruding or cantilevered ends (not shown) of the shafts 16 can be tapered in accord with conventional practice so that the rolls 18 can be wedged thereon where they are retained by suitable keys (not shown). The straightener shafts 16 are rotated through spindle couplings 24 which in turn are coupled to drive unit 26 powered by main drive motor 28.

Mounted on rails 30 for controlled movement to and from the straightener 12 is a roll changing device 32. The device 32 is so mounted by virtue of its carriage structure 34 having a pair of wheel supported axles 36 engaging the rails 30. A turntable 36, rotatably mounted upon the carriage 34, includes a supporting housing 38, which is revolved with the turntable 36.

A unique arrangement of clamping bars are slidably mounted on the front and rear or other opposed sides, of the housing 38 for releasably engaging the straightener rolls 18 and replacement rolls 40. FIG. 3 of the drawings shows a typical array of seven straightener rolls which are usually arranged in two horizontal rows. Accordingly, I provide a pair of clamping bars for each row of rolls on each side of the housing 38. Thus, for engagement with the straightener rolls 18, I utilize clamping bars 42, 44 and 46, 48 on a given housing side and for the replacement rolls 40, I use clamping bars 42-48 on the other side of the housing 38. The lower clamping bars 42, 44, 46, 48 are engaged below the lower row of straightener rolls 18 and of replacement rolls 40 respectively. Similarly, the upper clamping bars 42, 44, 46, 48 can engage the upper rows of the straightener and replacement rolls.

As better shown in FIG. 6, each of the clamping bars 42-48 is notched at appropriate locations 53 in order to engage a protruding hub section 50 of the rolls 18 or 40 when the respective parts of clamping bars 42-48 are moved sufficiently apart to insert the hub sections 50 therebetween. Each of the hub sections 50 can be furnished with a flange 51 or the like to prevent slippage when inserted into the associated clamping bar notches 53.

Each pair of clamping bars 42, 44 and 46, 48 are thus moved inward and away from one another to clamp the roll hub sections 50 therebetween. For this purpose, each pair of clamping bars are slidably mounted in channel members 52 secured in pairs to the ends of the housing 38. The intermediate clamping bars 44, 46 project respectively through slots 58 therefrom in each side 60 or 63 of the channel members 52 to permit connection of their protruding ends 54 to piston and cylinder arrangements 56 respectively. Desirably, cylinders 56 are pivotally mounted on the outward sides 60 of housing end channels 52. The remaining, shorter clamping bars 42, 48 are raised and elevated in slots 61 by similar piston and cylinder arrangements 62, which are pivoted upon the inward sides 63 of the housing end supports 60 as better shown in FIG. 3. At least the lower pistons and cylinders 56, 62 are double acting since the associated clamping bars 42 and 48 are raised against gravitational forces.

A suitable drive motor 64 is mounted on carriage 34 for rotating the turntable 36 through suitable transmission linkage denoted generally by reference character 66.

In operation, the carriage 34 is moved along rails 30 by suitable means (not shown) to the position of the roll changing device 10 denoted by the solid outlines in FIGS. 1 and 2 of the drawings. Clamping the front two pairs of clamping bars 42, 44 and 46, 48 are actuated to clamp the two rows of straightener rolls therebetween. Thereupon the roll changing device 10 is retracted along rails 30 to its chain outline position 68 in FIG. 1 carrying with it the simultaneously withdrawn straightener rolls 18. In this position, turntable drive 64-66 is actuated to turn the turntable 36 and support housing 38 through a one-half revolution as denoted by chain outline circle 70.

The roll changing device 18 is then returned to its solid outline position (FIGS. 1 and 2) and the replacement rolls 40 on the rear or opposite housing side are inserted upon the cantilevered straightener shafts 20, wherupon the clamping bars 42-48 on the adjacent side of the housing 38 are released. The replacement rolls 40 are then secured to the straightener shafts 16 by replacement of the keys 22 (FIG. 3).

The rails 30 are suitably aligned horizontally and vertically relative to the straightener 12, and the clamping bars 42-48 are supported on the housing 38 at suitable elevations such that the replacement rolls 40, when the housing 38 is revolved, are always presented in a predetermined and aligned array relative to the protruding ends 20 of the straightener shafts 16. The sides of the housing 38 as successively presented to the straightener 12, desirably are identical, i.e., the predetermined array of straightener rolls 18 or replacement rolls 40 secured to one side of the housing 38 is identical to the array of removed rolls 18' on the other side of the housing.

When the rear housing face clamping bars 42-48 are actuated to their clamped positions by the associated cylinders 58 and 62, the replacement rolls 40 are aligned with the respective axes of the straightener rolls 18 and straightener shafts 16. The notches 53 of the clamping bars 42-48 and stops 72 described below are spaced to maintain this relationship. Thus, when the housing 38 is revolved as stated above, the replacement rolls 40 are precisely aligned with the protruding shaft ends 20 so that the rolls 40 can be slipped simultaneously therefrom.

It will be understood, of course, that clamping bars having a different notch spacing can be substituted to adapt the changing device 32 to levelers having a different horizontal spacing between adjacent rolls 18. Likewise, a pair of stops 72 are adjustably secured to each side of each end support 60 of the housing 38 to adjust the alignment of the replacement rolls 40 to a given elevation of the straightener rolls 18 relative to the rails 30. Suitable means (not shown) are provided for adjusting the elevations of the several stops 72. Thus, the replacement rolls 40 can be vertically aligned with various arrays of straightener rolls 18 within the structural limitations of a particular roll changer 32. The stop members 72 provide alignment in one direction, e.g., in the vertical direction, of the rolls 18, 40 respectively which are securable to the front and back sides of the housing 38, while the noted clamping bars 42-48 provide alignment in a transverse direction, e.g., in the horizontal direction.

From the foregoing it will be apparent that novel and efficient forms of roll changing device for roll straighteners and the like have been disclosed herein. While I have shown and described certain presently preferred embodiments of the invention and have illustrated certain particularly preferred methods of practicing the same, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims.

I claim:
1. A roll changing device for use in withdrawing and replacing the rolls of multiple roll utilizing apparatus, said device comprising a support housing, means for releasably clamping a plurality of said rolls in a predetermined array on one side of said housing, means for releasably clamping a like number of said rolls in an identical array on another side of said housing, means for presenting said housing sides successively to said apparatus so that the rolls on the apparatus can be simultaneously clamped and withdrawn therefrom and so that replacement rolls supported on said device can be simul-
taneously positioned on said apparatus, said clamping means including a pair of clamping bars aligned with a row of said rolls, said clamping bars being slidable mounted on said housing for movement toward and away from said row.

2. The combination according to claim 1 wherein adjustable stop means are mounted on said housing and generally between each of said pairs of clamping bars to align in at least one direction the rolls clamped between a pair of said bars on one side of said housing with rolls clamped between a pair of said bars on the other side of said housing.

3. The combination according to claim 2 wherein at least one of each pair of said clamping bars is notched to space said rolls therealong, said notched bars being identically notched to align in a transverse direction rolls engaged on one side of said housing respectively with rolls on the other side of said housing.

4. The combination according to claim 1 wherein said housing is elongated and includes a pair of support members at the ends of the housing respectively, each of said clamping bars being slidable mounted adjacent its ends on said supports respectively, some of said clamping bars extending outwardly of each of said supports, and clamping bar actuators forming part of said clamping means mounted on the outward surfaces of said supports and engaging said protruding bar portions, and additional actuators mounted on the inward surfaces of said supports and engaging the remainder of said clamping bars.

5. A roll changing device for use in withdrawing and replacing the rolls of multiple roll utilizing apparatus, said device comprising a support housing, means for releasably clamping a plurality of said rolls in a predetermined array on said housing, said clamping means including a clamping mechanism shaped to conform to said array of rolls and movable on said housing to positions of simultaneous engagement and disengagement with said array of rolls, and means for presenting said housing to said apparatus in a position of alignment of said clamping mechanism with a similar array of rolls on said apparatus so that the rolls of said apparatus can be simultaneously withdrawn therefrom and positioned thereon by said device.

6. The combination according to claim 5 wherein said clamping mechanism includes a pair of clamping bars aligned with a row of said rolls, said clamping bars being slidable mounted on said housing for movement toward and away from said row.

7. The combination according to claim 6 wherein adjustable stop means are mounted on said housing and generally between said clamping bars to align in at least one direction the rolls clamped between said bars with roll supporting means on said apparatus.

8. The combination according to claim 7 wherein at least one of said clamping bars is notched to space said rolls therealong, relative to the rolls of said apparatus.

9. The combination according to claim 6 wherein said housing is elongated and includes a pair of support members at the ends of the housing respectively, each of said clamping bars being slidable mounted adjacent its ends on said supports respectively, at least one of the clamping bars having its ends protruding outwardly of said supports respectively, actuators forming part of said clamping means are mounted on the outward surfaces of said supports in engagement with the protruding bar portions, and additional actuators are mounted on the inward surfaces of said supports in engagement with the remainder of said clamping bars.

References Cited

UNITED STATES PATENTS

2,829,697 4/1958 Rockhoff et al. -------- 72—239X
3,208,260 9/1965 Sieger et al. -------- 72—239
3,323,345 6/1967 Lyle et al. -------- 72—239

MILTON S. MEHR, Primary Examiner

U.S. Cl. X.R.

72—160