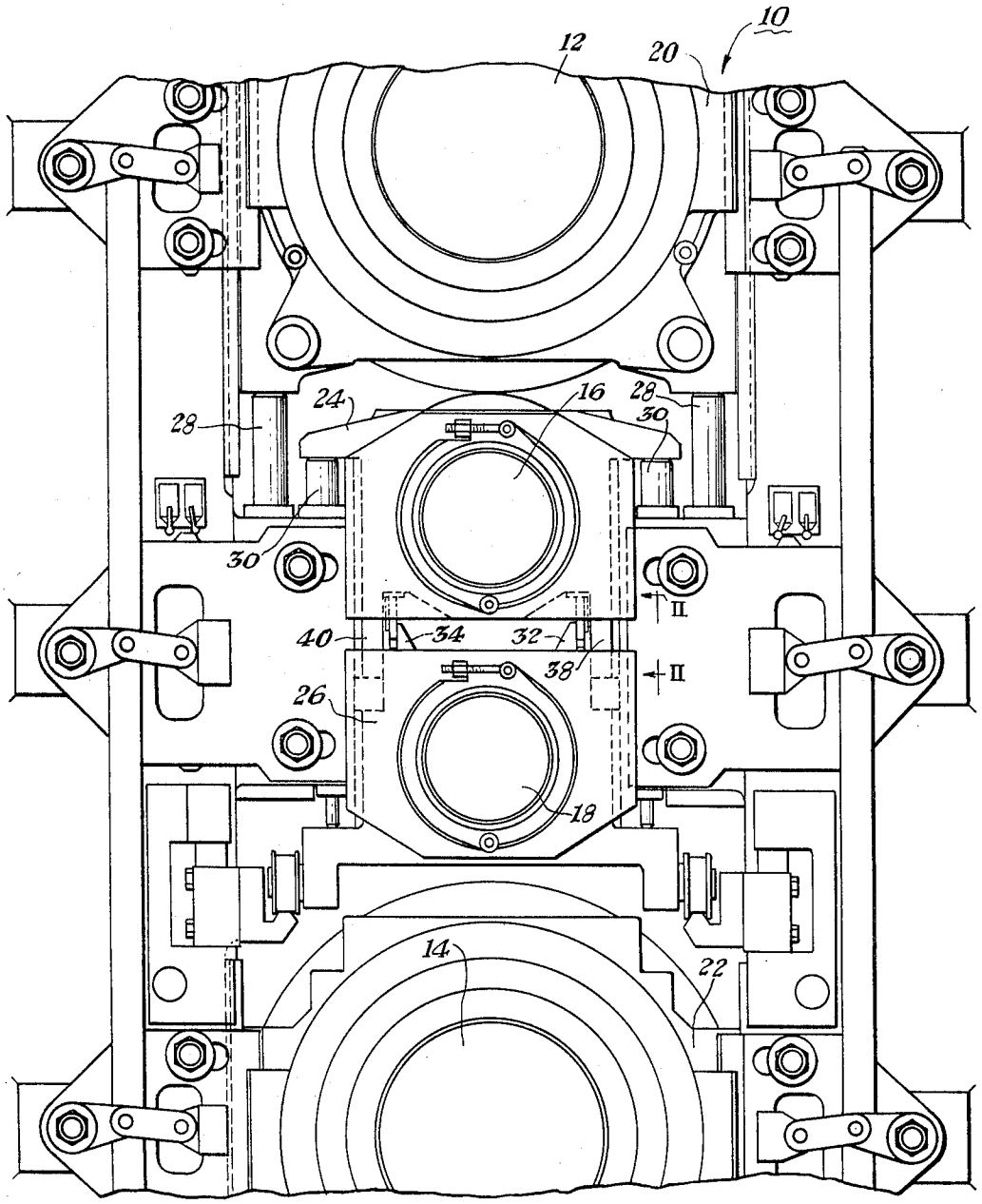
Nov. 4, 1969 A. J. PETROS, JR 3,475,940

FALL-AWAY SPACER BLOCK

Filed July 18, 1967 3 Sheets-Sheet 1

Fig. 1.



INVENTOR
Andrew J. Petros, Jr.
BY
Buell, Blenko & Ziesenheim
HIS ATTORNEYS

Nov. 4, 1969 A. J. PETROS, JR 3,475,940

FALL-AWAY SPACER BLOCK

Filed July 18, 1967 3 Sheets-Sheet 2

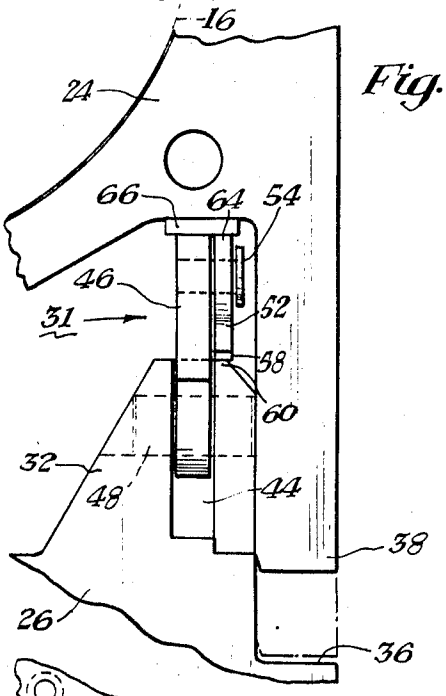
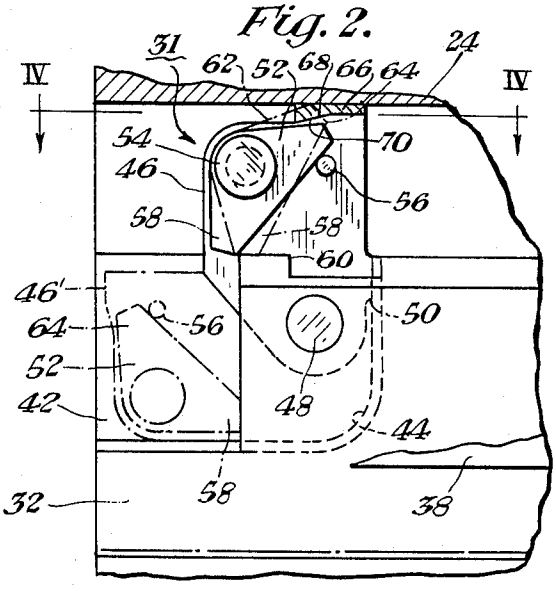


Fig. 3.

Fig. 2.



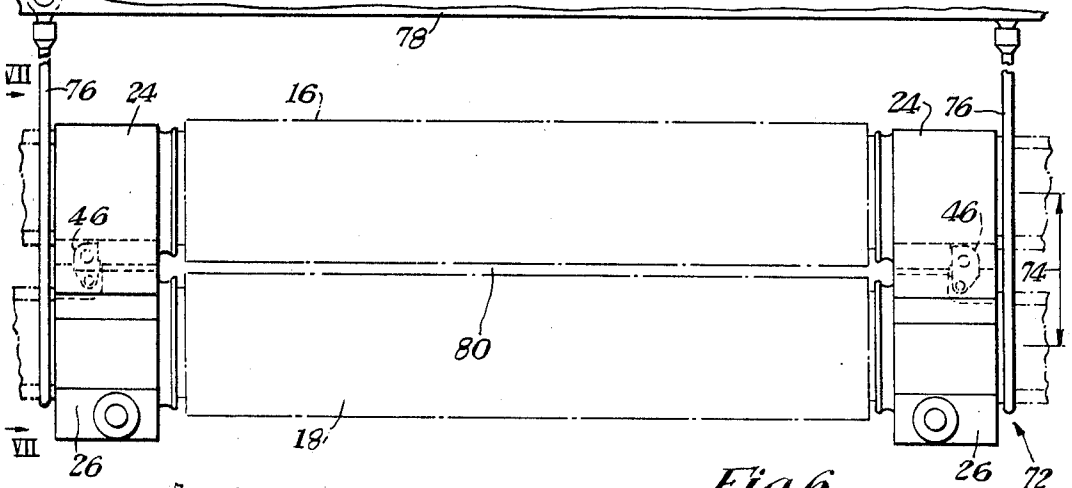


Fig. 6.

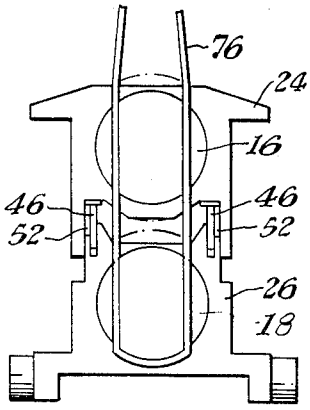


Fig. 7.

INVENTOR
Andrew J. Petros, Jr.
BY
Shell, Hanke & Zieseniss
HIS ATTORNEYS

Nov. 4, 1969 A. J. PETROS, JR 3,475,940

FALL-AWAY SPACER BLOCK

Filed July 18, 1967 3 Sheets-Sheet 3

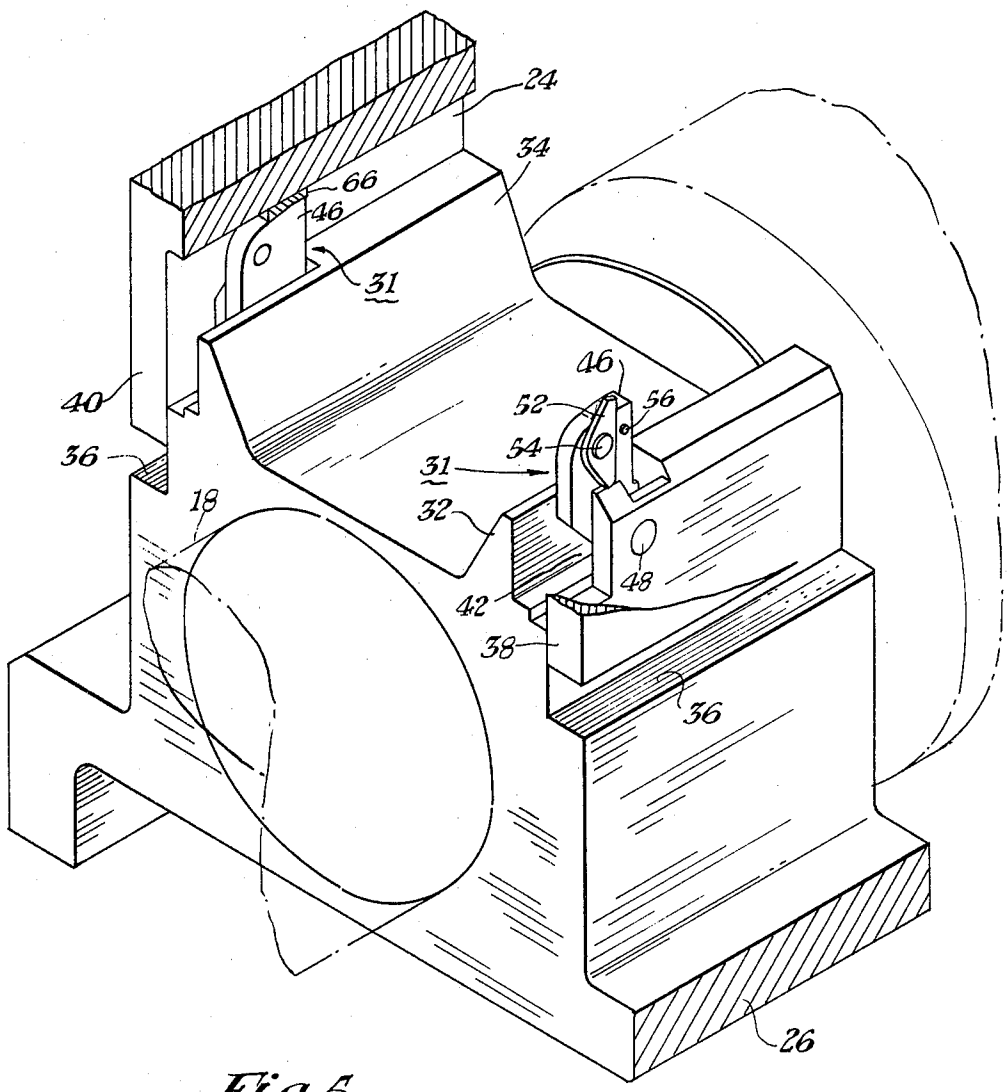


Fig. 5.

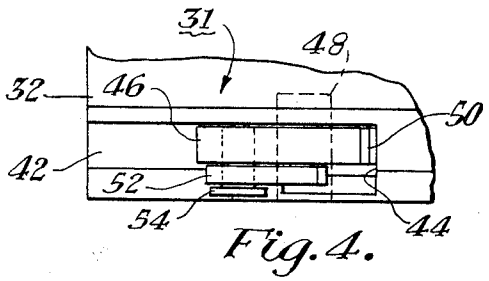


Fig. 4.

INVENTOR
Andrew J. Petros, Jr.
BY
Wolf, Block & Zisman

HIS ATTORNEYS.

United States Patent Office 3,475,940 Patented Nov. 4, 1969

3,475,940

FALL-AWAY SPACER BLOCK

Andrew J. Petros, Jr., Allegheny County, Pa., assignor to Mesta Machine Company, Pittsburgh, Pa., a corporation of Pennsylvania

Filed July 18, 1967, Ser. No. 654,268
Int. Cl. B31b *31/08*
U.S. Cl. 72—239 11 Claims

ABSTRACT OF THE DISCLOSURE

An automatically unlatched and gravity operated spacing mechanism is disclosed having general utility but particularly useful in maintaining the work rolls of a rolling mill stand or the like at a predetermined center-to-center distance. Maintaining such center-to-center distance considerably facilitates inserting or replacing the work rolls and related operations. A pair of pivoted spacing blocks are mounted on each of the bearing chocks for the lower work roll. The blocks are pivoted relative to their centers of gravity so that they will normally drop to an inactive, horizontal position. A gravity operated latch element is mounted on each block for maintaining the block in its vertical or active position. Each latch element has a release tab which projects above the associated block in its upright position. When the upper bearing chocks are lowered to engage the upright spacing blocks the upper bearing chocks first engage the latch element release tabs to unlatch the tabs. Immediately subsequent to such unlatching the upper bearing chocks engage the spacing blocks to prevent their pivoting to their inactive position. Thus, the upper bearing chocks and the upper work roll rotatably supported thereby are spaced by the spacing blocks at a predetermined distance from the lower bearing chocks and the lower work roll respectively. The aforedescribed assembly can then be inserted or withdrawn as a unit relative to the aforementioned rolling mill stand. After the unit is installed, the balance plungers of the mill can be actuated to raise the upper chocks to release the spacing blocks, whereupon the spacing blocks fall to their inactive positions to permit normal operation of the rolling mill stand.

The present invention relates to a self-latch spacing mechanism which can be deactivated when desired by gravitational forces, and more particularly to a spacing mechanism of the character described which is arranged in cooperation with the work roll chocks of a rolling mill stand or the like for spacing the chocks a fixed distance apart to facilitate roll changing.

The spacing mechanism permits differing diameters of work rolls to be inserted in the mill stand without adjusting the positions of the spindle coupling when rolls of different diameters are removed or inserted.

In the past a number of methods and means for changing the aforementioned work rolls have been developed. For example, one roll of a rolling mill was changed at a time using a hollow sleeve and counterweight together with an overhead crane. This practice is much too slow and costly, particularly because of the difficulty of engaging the spindle ends of the rolls with their respective couplings. A more recent method for removing rolls has been a turntable arrangement in which work rolls to be inserted into a stand are placed on one-half of a turntable and the rolls to be removed are pulled onto the other half, the table rotatated and the new rolls inserted. In addition to the disadvantages of having two sets of work rolls close to the mill and blocking vision while otherwise generally obstructing the area around the mill, the use of a turntable does not alleviate the

problem of inserting the roll spindle ends into the spindle couplings. The entire table arrangement had to be removed in order to change the back-up rolls. This is a time-consuming operation and requires heavy handling equipment.

In a co-pending, co-assigned application of Ray A. Wolfendale entitled Roll Changing Means and Method, filed concurrently herewith, means are provided for automatically positioning in a mill stand both the upper and lower spindle couplings, which means eliminates all manual operations and handling of the work rolls when inserting the spindle ends into the spindle couplings. Mr. Wolfendale's apparatus can be automatically adjusted to accommodate the differing diameters of work rolls employed in the rolling mill, and functions satisfactorily for many applications. However, specialized and complicated equipment is required, much of which cannot readily be installed on existing rolling mill stands. Mr. Wolfendale's apparatus however, is useful in prepositioning the aforesaid spindle couplings to accommodate a work roll assembly spaced in accord with my invention as described hereinafter.

On the other hand, my fall-away spacing mechanism can be installed with relative ease on both existing and new rolling mills and the like. Because of the extremely high production rates, my invention finds ready application in rolling mills used in the steel industry where work rolls are changed frequently, although, of course, the invention is not limited thereto.

My invention is a compact, constant center device constructed of a pivoting spacer block assembly affixed to the bottom work roll assembly and falls out of the way into a receiving pocket formed in the bottom work roll chock when not in use. A latching mechanism is attached to the pivoting spacing block to hold the block in the engaged position until the top work roll assembly is juxtaposed to the bottom work roll assembly. The latching mechanism associated with my spacing block assembly is arranged to fall by gravity to its unlatched position, when the pivoting spacing block is not restrained by engagement with the upper work roll assembly.

It will be understood, of course, that my novel spacing block assembly can be employed with conventional roll changing methods or apparatus.

However, my invention is particularly useful with the quick roll changing method described in the copending, co-assigned application of Ray A. Wolfendale et al. entitled Automatic Roll Changing Means and Methods of Roll Changing, Ser. No. 540,245, filed Apr. 5, 1966 and now Patent No. 3,376,724. In this arrangement means are provided for inserting the bottom work roll into the mill stand at some fixed elevation since the bottom work roll is inserted into the stand on delivery rails. A primary advantage of my constant center device is that the spindle couplings can be prepositioned to the same location for every work roll change regardless of the particular diameters of the roll or rolls being removed. Accordingly, the support structures usually provided for the spindle couplings can be considerably simplified. Moreover, after the newly inserted work rolls are dressed and stacked for insertion into the mill stand, they can be stored with my novel spacing mechanism engaged so that the work roll faces are not in contact and the complete work roll assembly consisting of an upper work roll subassembly and a lower work roll subassembly can be inserted as a unit into the mill stand if desired.

My spacing mechanism, moreover, can be used in cooperation with the spindle positioning apparatus described in the concurrently filed R. A. Wolfendale application first-mentioned above. Thus, my spacing mechanism can be employed to establish the center-to-center dis-

tance of the roll chocks and the apparatus of the concurrently filed Wolfendale application, can be employed to preposition the spindle couplings accordingly. My spacing mechanism permits a simultaneous insertion of a pair of work rolls and their chocks into the mill stand at a predetermined center-to-center distance. This distance is invariable as the distance is set by my novel spacing mechanism to accommodate the largest diameter work rolls contemplated for a given rolling mill.

In general, I accomplish these desirable results by providing means for spacing a pair of members movable vertically toward one another, said means comprising a spacing block pivotally mounted on the lower one of said members for movement between a recessed inactive position and an upright active position, said block extending above the said lower member for engagement by said upper member to space said members, said spacing block being so pivoted relative to its center of gravity that said block normally pivots by gravitational force to its inactive position, means for latching said spacing block in its upright position, and means on said latch means and on said upper member for disengaging said latching means upon lowering said upper member into engagement with the upper end of said spacing block, said engagement being disposed relative to said spaced block pivot that said spacing block is retained in its upright position by said engagement, whereby subsequent raising of said upper member permits said spacing block to pivot to its inactive position.

More specifically, in the case of rolling mills and the like, I provide a work roll assembly for a rolling mill stand and the like, said assembly including a lower work roll having a pair of lower bearing chocks operationally engaged therewith, an upper work roll having a pair of upper bearing chocks operationally engaged therewith, each of said lower bearing chocks having a pair of spacing mechanisms spacedly mounted thereon, each of said spacing mechanisms including a pivotally mounted spacing block capable of movement between a recessed inactive position and an upright active position, said block extending above the associated lower chock for engagement by an associated upper chock to space said chocks, said spacing block being so pivoted relative to its center of gravity that said block normally pivots by gravitational force to its inactive position, means for latching said pivot block in its upright position, and means on said latch means and on said associated upper chock for disengaging said latching means upon lowering said upper chocks into engagement with the upper ends of said spacing blocks, said engagement being disposed relative to said spacing block pivots that said spacing blocks are retained in their upright positions by said engagement, whereby said spacing blocks separate said upper and lower bearing chocks so that the finished surfaces of said work rolls are maintained out of engagement with one another, and the rotational axes of said rolls are maintained a constant distance apart irrespective to anticipated changes in roll diameters.

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 certain 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 certain presently preferred methods of practicing the same, wherein:

FIGURE 1 is an elevational view of an exemplary mill stand with which my novel spacing mechanism can be used;

FIGURE 2 is an enlarged partial cross-sectional view of the apparatus shown in FIGURE 1 and taken along reference line II—II thereof;

FIGURE 3 is an end elevational view of the apparatus as shown in FIGURE 2;

FIGURE 4 is a top plan view of the apparatus as shown in FIGURE 2;

FIGURE 5 is an isometric view of a portion of an upper and lower work roll assembly showing my spacing mechanism in operation;

FIGURE 6 is a side elevational view of an upper and lower work roll assembly spaced by my novel latching mechanism, with one arrangement for transporting such assembly being illustrated; and

FIGURE 7 is an end elevational view of the apparatus as shown in FIGURE 6.

Referring now to FIGURE 1 of the drawings, a four-high mill stand **10** includes a pair of back-up rolls **12** and **14** which engage respectively a pair of work rolls **16** and **18**. The back-up and work rolls are respectively and rotationally supported in bearing chocks **20**, **22**, **24** and **26**. The separations between the work rolls **16**, **18** and back-up rolls **12**, **14** are controlled by balance plungers **28** and **30** which respectively engage upper back-up roll chock **20** and upper work roll chock **24**.

The aforedescribed components and other components shown in FIGURE 1 are of conventional construction and need not be further elaborated upon, with the exception of those components shown in detail in FIGURES 2–7.

FIGURES 2 to 4 show in detail my novel, gravity operated spacing mechanism **31** which in this example is associated primarily with the lower work roll chocks **26**. In this arrangement of my invention a pair of such mechanisms **31** are mounted on each lower bearing chock **26** and respectively on upper dyed lugs **32** and **34** as better shown in FIGURE 5. The lower bearing chock conventionally includes an offset **36** adjacent each of the lugs **32** or **34** to accommodate, in interfitting relation, depending lugs **38** and **40** of the related upper bearing chock **24**.

At the outer corners of each lower bearing chock lug **32** or **34** a recess **42** is machined into the lug **32** or **34** and is provided with a re-entrant or mortised recess portion **44**. A spacing block **46** is pivotally mounted in recess **42** by means of pin **48** inserted through aligned apertures in the spacing block **46** and the portions of lug **32** or **34** surrounding the recessed re-entrant portion **44**. The pin **48** is located such that the spacing block **46**, as shown in its solid outline or active vertical position in FIGURE 2, is unstable, with its center of gravity to the left of the center of the pin **48**. Thus, if not otherwise supported the spacing block **46** will fall, while pivoting about pin **48** to its chain outline or inactive horizontal position **46'** (FIGURE 2).

The spacing block is provided with a tab **50** for engagement with the inner extremity of the re-entrant recessed portion **44**. Such engagement determines the upright or active position, as shown in the solid outlines of the spacing block **46** in FIGURE 2.

In order to maintain the spacing block **46** in its upright positions until it can be engaged in the manner described hereinafter by the upper bearing chocks **24**, means are provided for temporarily restraining the block in its active, upright position and subsequently to permit the blocks to fall away to its inactive or horizontal positions **46'**, when no longer needed. One arrangement of such means includes latch mechanism **52** pivotally mounted on the block **46** by means of pivot pin **54** as better shown in FIGURES 3 and 4. When the block is in its horizontal position **46'** the pivoting latch element **52** is restrained to a non-interfering position by pin **56**. On the other hand, when the block **46** is moved to its upright position the latch member is pivoted manually until its lower tab **58** engages an associated catch **60** machined, in this example, on each of the lower bearing

chock lugs 32 or 34 adjacent the re-entrant recessed portion 44.

When the latch member 52 is thus engaged with catch 60, as illustrated by chain outline position 62 thereof, the block 46 no longer can fall by gravity away from its otherwise unstable upright or active position (FIGURE 2). Also, as better shown in FIGURE 2, it will be seen that the latch mechanism 52 is provided with a release tab 64 which projects above the pivoted block 46, in the latched position of latch element 52. When the upper bearing chock is lowered so that its lugs 38 and 40 interfit in recesses 36 of the lower chock 26, a latch release and block restraining plate 66 mounted on the upper bearing chock initially engages the release tab 64 as the upper bearing chock 24 is lowered and permits latch element 52 to pivot to its solid outline position in FIGURE 2 so that its latch lug 58 is no longer engaged with the catch 60. When thus unlatched, the latch element 52 falls to its inactive position, by gravitational forces, where its release tab 64 engages stop pin 56 as shown in FIGURE 2.

At this time the spacing block 46 is prevented from falling because, as the latch member is disengaged from catch 60, the release and restraining plate 66, which is suitably positioned on the underside of the associated upper bearing chock 24 adjacent its lug 38 or 40, also engages the upper edge portion of the block 46. Such engagement prevents the block 46 from pivoting to its inactive, horizontal or stable position. Thus, all of the blocks 46, which in this example are four in number remain, as mentioned above, in their upright positions so as to support the upper two bearing chocks 24 and the work roll 16 supported thereby upon the lower two bearing chocks 26, which in turn support the lower work roll 18. To ensure positive engagement between the release and restraining plates 66 and the top edges of the blocks 46, these components are provided with inclined surfaces 68 and 70 respectively (FIGURE 2) which are angled away from the direction in which the blocks 46 would otherwise tend to pivot.

It will be understood, of course, that the restraining plate 66 is not essential in every application. Thus the spacing block 46 can be provided with a generally horizontal upper edge relative to its upright position so that any weighted engagement by an object supported on the block 46 will prevent pivoting of the spacing block 46.

With my novel spacing mechanisms just described, the upper and lower work rolls 16, 18 and their associated bearing chocks 24, 24 and 26, 26 can be handled as a unit 72, as better shown in FIGURES 6 and 7, in which the center-to-center distance between the work rolls 16, 18 as denoted by dimensional arrow 74, is constant irrespective of the particular work roll diameters. The spacing blocks 46 are in their upright positions and are prevented from pivoting to their stable horizontal position by the weight of the upper work roll 16 and its bearing chocks 24 resting thereon. Accordingly, the upper and lower work roll assembly 72 can be handled as a unit by means of slings 76 and lifting beam 78, with a suitable crane or the like (not shown). The upper and lower work roll assembly 72 can also be handled by utilizing the delivery rails or the roll changing tables as described in the aforementioned co-pending applications of Ray A. Wolfendale and Ray A. Wolfendale et al.

As better shown in FIGURE 6, it will be seen that the spacing blocks 46 associated with the lower bearing chocks 26 are pivoted respectively in opposite directions in order to increase the stability of the work roll assembly 72.

In the operation of my invention the bottom work roll subassembly including work roll 18 and bearing chocks 26 is placed upon a suitable, level surface (not shown). Each pivoting spacing block 46 is lifted manually or by other suitable means to its upright or active position as shown in the solid outlines of FIGURE 2. The latch members 52 of each block 46 is then pivoted to engage its latch tab 58 with the associated lower bearing chock catch 60. This prevents the spacing blocks 46 from falling prematurely by gravitational forces.

After thus latching the spacing blocks 46, the top work roll subassembly, including upper work roll 16 and its bearing chocks 24, is then lowered over the bottom work roll subassembly. The latch members 52 are released as the latch release and block restraining plates 66 of the upper bearing chocks 24 engage release tabs 64 of latch members 52 to pivot the latch member taps 58 out of engagement with catches 60. However, the pivoted spacer blocks 46 cannot fall since they are now restrained by the restraining plates 66 and the weight of the top work roll subassembly.

When upper and lower work roll subassemblies, as in the assembly 72 of FIGURES 6 and 7, are thus stacked, and the newly dressed work rolls 16, 18 are ready for use in the rolling mill, the assembly or assemblies 72 are conveyed to the mill area by means, for example as shown in FIGURES 6 and 7. The upper and lower work roll assembly 74 can be placed on a roll changing buggy or other suitable roll changing means, with the driven end flats aligned. Such alignment is facilitated by the fact that the spacing blocks 46 are of sufficient height in their upright positions to maintain a separation 80 (FIGURES 6 and 7) between the finished work roll surfaces regardless of roll diameter. Such separation 80 also avoids inadvertent damage to the work roll surfaces while handling the work roll assemblies 72.

Thus, the work roll assembly 72 can be inserted into the mill stand and directly into the spindle couplings, which can be pre-set to the center-to-center distance 74 (FIGURE 6) for every roll changing operation irrespective of finished roll diameter. The spindle couplings can be preset by apparatus such as that disclosed in the aforementioned co-pending and co-assigned application of Ray A. Wolfendale, Ser. No. 540,245, now Patent No. 3,376,724, or by other suitable means.

After the work roll assembly 72 has been thus inserted into a mill stand, the pivoted spacer block 46 can be automatically released by separating the newly inserted work rolls by means of the balancing plungers 28 and 30 normally provided in the mill stand. When the upper work roll 16 and its bearing chocks 24 are thus raised, the latch release block restraining plates 66 are then of course disengaged from the upper edges of the spacing blocks 46. With their latch members 52 having been previously disengaged as described above, the blocks 46 immediately fall to their horizontal or inactive positions to permit normal operation of the work rolls 16, 18 in the mill stand.

From the foregoing it will be apparent that novel and efficient forms of fall-away spacer block have been described herein.

While I have shown and described certain presently preferred embodiments of the invention and have illustrated presently 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. Means for spacing a pair of members movable vertically toward one another, said means comprising a spacing block pivotally mounted on the lower one of said members for movement between a recessed inactive position and an upright active position, said block extending above the said lower member for engagement by said upper member to space said members, said spacing block being so pivoted relative to its center of gravity that said block normally pivots by gravitational force to its inactive position, means for latching said spacing block to its upright position, and means on said latch means and on said upper member for disengaging said latching means upon lowering said upper member into engagement with the upper end of said spacing block, said engagement being

disposed relative to said spacing block pivot that said spacing block is retained in its upright position by said engagement, whereby subsequent raising of said upper member permits said spacing block to pivot to its inactive position.

2. The combination according to claim 1 wherein said spacing block is pivoted in a mortised section of a recess cut in said lower member, and said spacing block is provided with a tab to space said block from the inner extremity of said mortised recess section at said upright position.

3. The combination according to claim 1 wherein said latch means includes a latch element pivoted on said spacing block.

4. The combination according to claim 3 wherein said pivoted latch element is engaged in its latched position by a catch mounted on said lower member adjacent said spacing block, said latch member holding said spacing block in its upright position when so engaged, and said latch element is pivoted so that it normally falls by gravity away from said catch when disengaged from said catch.

5. The combination according to claim 4 wherein the falling away of said latch element is delimited by a stop mounted on said spacing block.

6. The combination according to claim 1 wherein said latching means includes a latch release and block restraining plate positioned on said upper member so as initially to release said latch means and then to engage an adjacent surface of said spacing block.

7. The combination according to claim 6 wherein said plate and said block are provided with complementarily shaped surfaces to prevent positively the pivoting of said block to said inactive position.

8. The combination according to claim 1 wherein said members are bearing chocks having interfitting lugs and said spacing block is pivotally mounted on a lug of said lower bearing chock for engagement by said upper bearing chock.

9. The combination according to claim 8 wherein each of said bearing chocks are provided with a pair of lugs disposed to interfit with the lugs of the other bearing chock, and a pair of spacing blocks are pivotally mounted in recesses formed respectively in the lugs of said lower bearing chock.

10. The combination according to claim 9 wherein a pair of latch release and block restraining members are secured to the underside of said upper bearing chocks for engagement respectively with the latched means and upper edges of said spacing blocks.

11. A work roll assembly for a rolling mill stand and the like, said assembly including a lower work roll having a pair of lower bearing chocks operationally engaged therewith, an upper work roll having a pair of upper bearing chocks operationally engaged therewith, each of said lower bearing chocks having a pair of spacing mechanisms spacedly mounted thereon, each of said spacing mechanisms including a pivotally mounted spacing block capable of movement between a recessed inactive position and an upright active position, said block extending above the associated lower chock for engagement by an associated upper chock to space said chocks, said spacing block being so pivoted relative to its center of gravity that said block normally pivots by gravitational force to its inactive position, means for latching said pivot block in its upright postion, and means on said latch means and on said associated upper chock for disengaging said latching means upon lowering said upper chocks into engagement with the upper ends of said spacing blocks, said engagement being disposed relative to said spacing block pivots that said spacing blocks are retained in their upright positions by said engagement, whereby said spacing blocks separate said upper and lower bearing chocks so that the finished surfaces of said work rolls are maintained out of engagement with one another and the rotational axes of said rolls are maintained a constant distance apart irrespective of anticipated changes in roll diameters.

References Cited

UNITED STATES PATENTS

2,901,022	8/1959	Wilkerson	72—705
3,190,099	6/1965	Sieger et al.	72—238
3,208,260	9/1965	Sieger et al.	72—239
3,376,724	4/1968	Wolfendale et al.	72—239

CHARLES W. LANHAM, Primary Examiner

B. J. MUSTAIKIS, Assistant Examiner