Dec. 22, 1964 M. MORGAN ETAL 3,162,070

ROLL ADJUSTING MEANS

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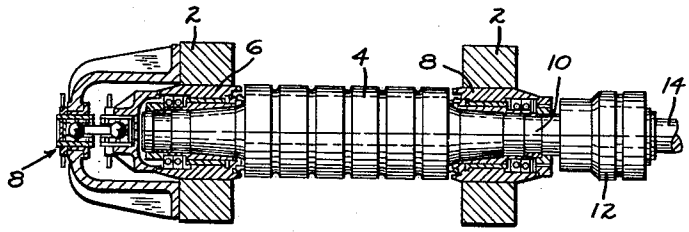

Fig. 1

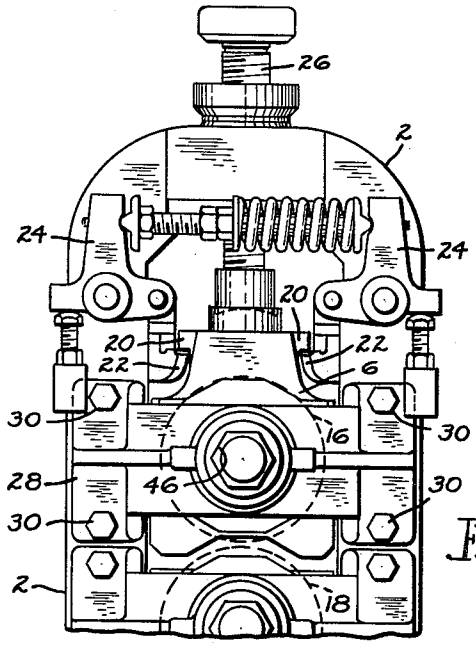

Fig. 2

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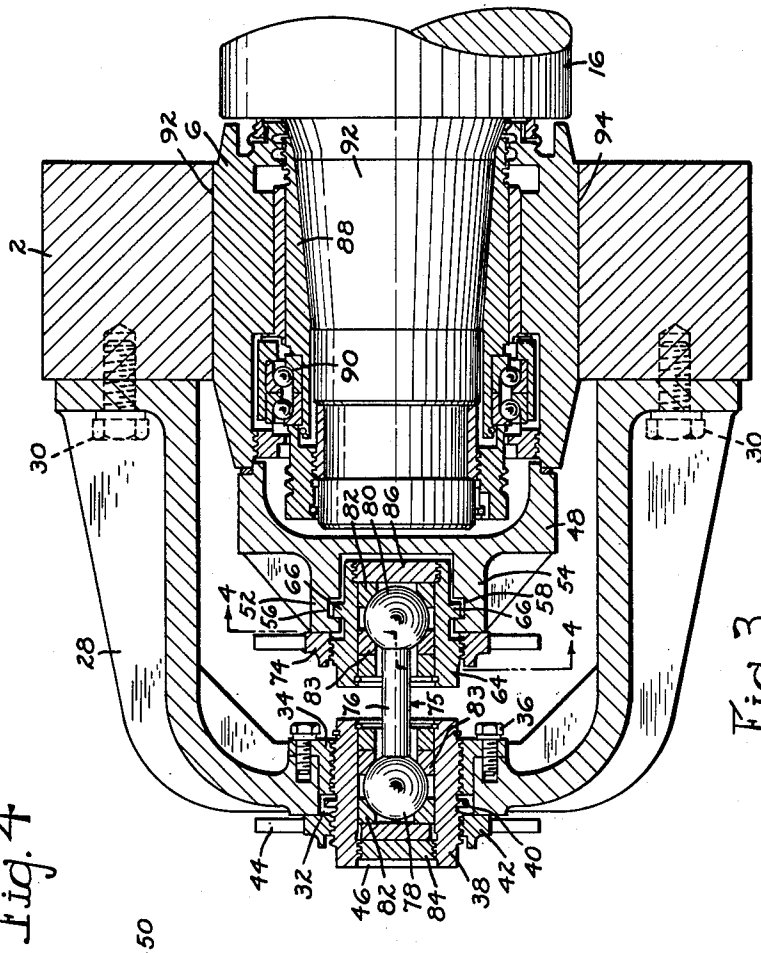

Fig. 3

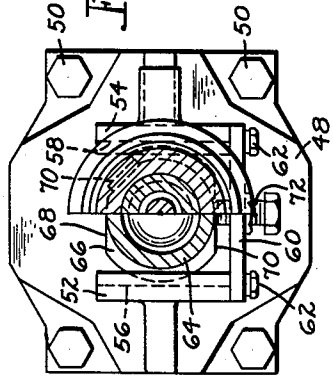

Fig. 4

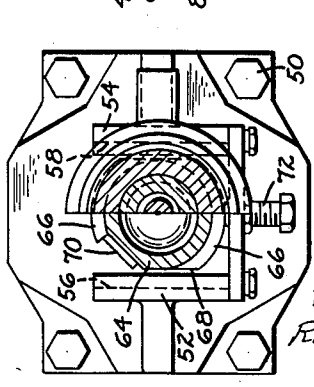

Fig. 5

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ROLL ADJUSTING MEANS

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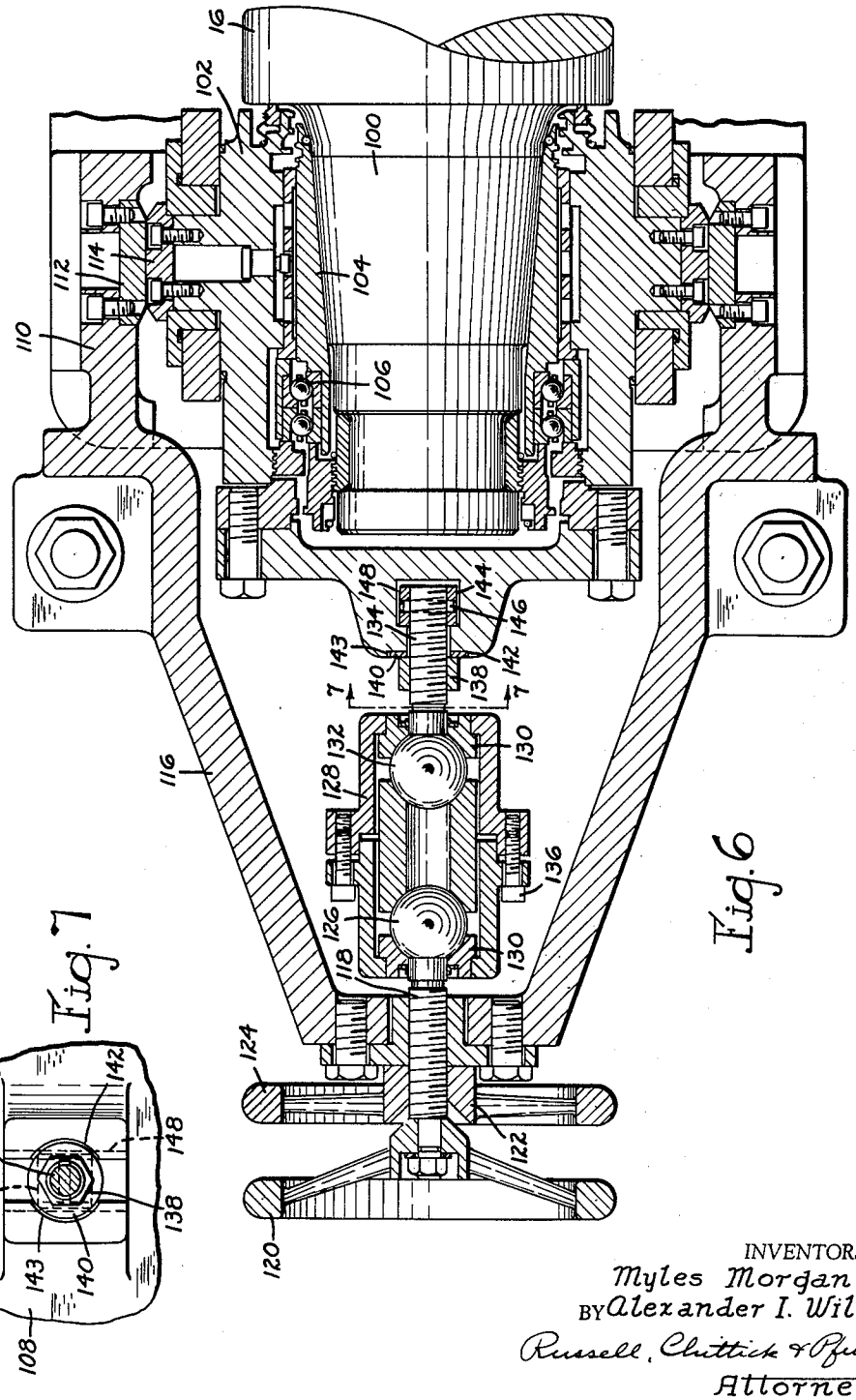

Fig. 6

Fig. 7

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ROLL ADJUSTING MEANS

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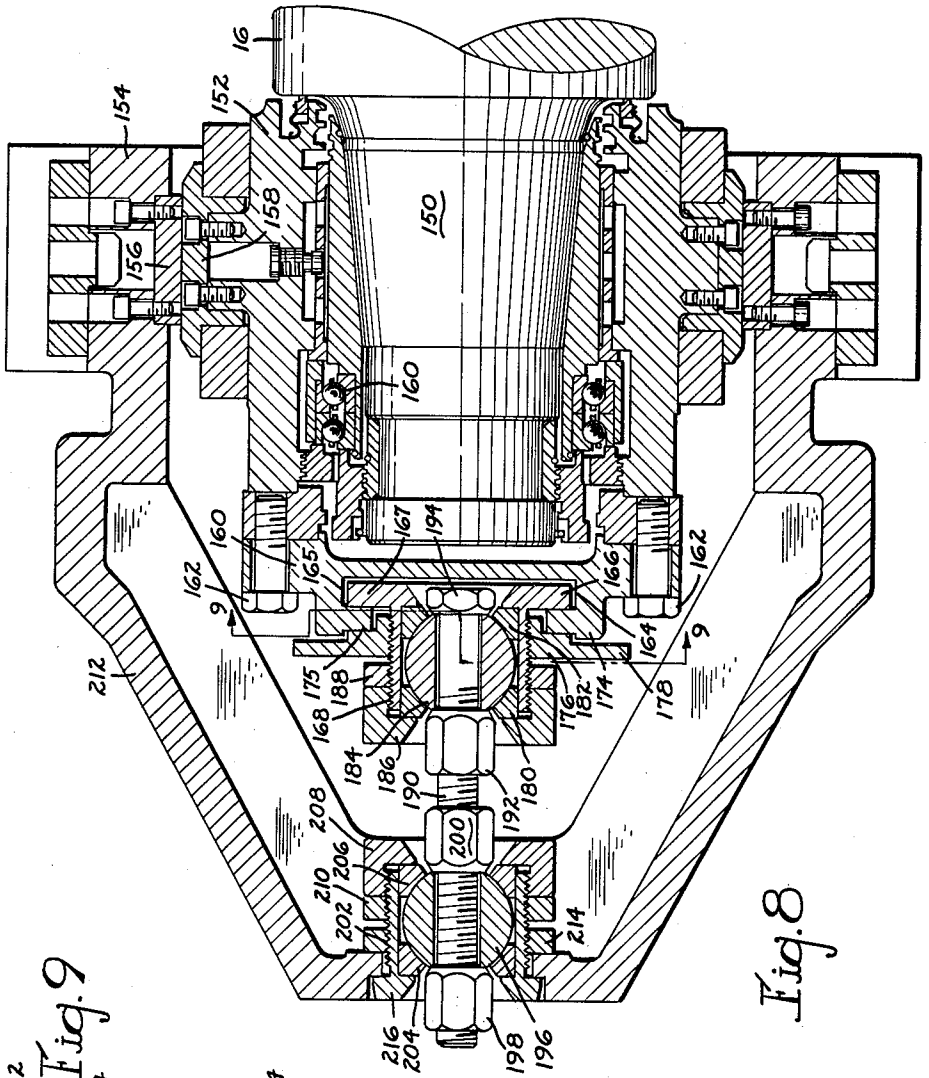

Fig. 8

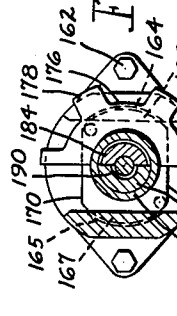

Fig. 9

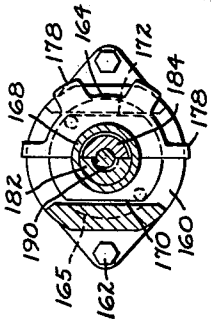

Fig. 10

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3,162,070
ROLL ADJUSTING MEANS

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Filed Aug. 9, 1962, Ser. No. 215,859
8 Claims. (Cl. 80—56)

This invention relates to the metal working industry and is particularly concerned with the provision of new and novel means for effecting axial adjustment of the rolls in a rolling mill.

In the art of rolling metals, in which the material is passed between rolls which reduce the cross-sectional area of the material, it is necessary and conventional to provide means for axially adjusting the rolls with respect to each other. This is essential where the rolls have matching grooves to produce a particular cross-section. The grooves must be aligned with each other if the material leaving the rolls is to have the proper cross-section. One conventional form of longitudinal roll adjustment means has been a pair of parallelogram linkages which act on one of the chocks of the roll. As the chock is axially moved by these linkages, the position of the roll, which is axially fixed with respect to the chock, may be varied. The disadvantage, however, of the parallelogram linkage type of adjustment is that once it is set up tight, the chock becomes anchored with respect to the roll housing. As a result, when the rolls are arched slightly under the separating forces created as the material passes therebetween, the roll necks are correspondingly turned through a slight angle. If the chock and the bearing therein cannot turn with the roll neck, then excessive bearing wear occurs which leads to an undue number of shutdowns for roll changes and bearing replacements.

Accordingly, the present invention contemplates an adjusting mechanism which permits the rolls to be axially adjusted with respect to each other while at the same time permitting vertical adjustment of the rolls as well as slight turning of the chocks in a vertical plane when the rolls are ached slightly as the metal passes therebetween. The ability of the chocks and bearings to shift with the roll necks causes a reduction in bearing wear and minimizes shutdowns.

The adjustment means shown and claimed herein may be applied to existing roll housings, but their most extensive use will be in new installations.

These and other objects of the invention will become more apparent as the description proceeds with the aid of the accompanying drawings in which:

FIG. 1 is a plan view of one roll of a roll stand showing the chocks positioned in the frame with the adjusting mechanism connecting one of the chocks with the frame;

FIG. 2 is an end view of the upper portion of a roll stand showing the general location of the adjusting means;

FIG. 3 is a horizontal section showing one form of the invention, the view being taken through the roll chock bearing and adjusting mechanism:

FIG. 4 is a section taken on the line 4—4 of FIG. 3 showing the means for securing the adjusting mechanism to the chock in locked position;

FIG. 5 is a view similar to FIG. 4 with the adjusting mechanism unlocked from the chock whereby the roll may be removed from the stand;

FIG. 6 is a horizontal sectional view similar to FIG. 3 showing a modified construction;

FIG. 7 is a section taken on the line 7—7 of FIG. 6;

FIG. 8 is a horizontal sectional view similar to FIGS. 3 and 6 showing a still further modification;

FIG. 9 is a vertical sectional view taken on the line 9—9 of FIG. 8 showing the chock locked to the adjusting means; and

FIG. 10 is a view similar to FIG. 9 showing the adjusting means in unlocked position with respect to the chock whereby the roll may be removed from the stand.

Referring first to FIG. 1, a horizontal sectional view through a conventional roll stand is shown to orient the invention with respect to conventional mechanism. The frame of the stand is shown at 2. Mounted therein is a roll 4 carried by the chock and bearing assemblies 6 and 8. Attached to the lefthand end of chock 6 is the adjusting mechanism generally referred to at 8 which will be more particularly described in connection with the other figures that are on a larger scale. The right roll neck 10 of roll 4 is connected in conventional manner at 12 with drive shaft 14. When the roll is to be removed from the frame, the adjusting mechanism 8 is disconnected from chock 6, drive spindle 14 is disconnected from roll neck 10, and the roll is withdrawn through frame 2 in conventional manner.

Before turning to detailed description of the invention, the general location of the adjusting mechanism with respect to the rolls may be further seen in FIG. 2. Here the upper roll is indicated at 16 and the lower roll at 18. The chock 6 has conventional flanges 20 under which are the chock supporting jaws 22 which are adjustable vertically in conventional manner by the bell cranks 24 acting in cooperation with the usual screwdowns 26. By these means, the upper roll 16 may be set at a determined distance above lower roll 18. The axial adjustment mechanism which is the subject matter of this application is applicable to both the upper and lower rolls 16 and 18. As the mechanism is the same for both rolls, description in relation to one roll will suffice.

The adjusting mechanism found in FIG. 2 is shown in larger scale in horizontal section in FIG. 3. There is a U-shaped bracket 28 bolted to the end of frame 2 by four bolts 30. In a circular opening 32 through the end of bracket 28 is a short internally threaded sleeve 34 bolted in place by bolts 36. Into sleeve 34 is screwed a tubular bearing member 38 which has a circular flange 40 designed to limit its entry into sleeve 34. A lock nut 42, having wings 44, is threaded onto member 38 to lock the latter in any desired axial position with respect to bracket 28. An hexagonal interior opening 46 is provided at the end of member 38 whereby a cooperating tool may be inserted to rotate member 38 to move it axially the extent required in making the roll adjustment.

On the end of chock 6 is a cover plate 48 held by bolts 50 (see FIGS. 4 and 5). Cover plate 48 has two vertical flanges 52 and 54 oppositely grooved at 56 and 58. The bottom of flanges 52 and 54 are joined by a crossbar 60 secured by bolts 62. Residing between the two flanges 52 and 54 is a second tubular bearing member 64 having a discontinuous circular flange 66. As can be seen in FIG. 4, flange 66 is cut away at 68 and 70. When member 64 is in the position shown in FIG. 4, the flanges 66 are located in the vertical grooves 56 and 58, preventing member 64 from being removed in an axial direction from cover plate 48. When member 64 is rotated 90 degrees to the position shown in FIG. 5, the flange 66 is then clear of grooves 56 and 58 so the member 64 may be withdrawn from cover plate 48. To limit the rotation of member 64 in either direction to 90 degrees, a stop 70 is applied to the side of the sleeve at a position where it will engage first one and then the other of the walls of grooves 56 and 58.

A set screw and lock nut assembly 72 is provided in crossbar 60 to secure member 64 against rotation and to support it at correct level when in the position shown in FIG. 4.

Member 64 is further secured to the cover plate 48 through the use of lock nut 74 threaded on the member as shown in FIG. 3. The lock nut, when set up tightly, pulls the flanges 66 against the adjacent walls of the grooves, thereby making member 64 substantially an integral part of cover plate 48.

The two bearing members 38 and 64 are connected by a dumbbell-like link 75 which comprises a shank 76 having spherical heads 78 and 80. Circular bearing elements 82 and 83 form sockets in both members. These elements are held tightly against the spherical portions 78 and 80 under adequate pressure by the threaded discs 84 and 86 which are screwed into the sleeves with sufficient force to produce a no-clearance situation. The material of which the bearing elements 82 and 83 are made is of such character that the spherical heads 78 and 80 may swivel therein as up and down relative movement of members 38 and 64 may occur. That is to say, if the chock 6 is moved up or down or rotated slightly in a vertical plane, such motion may be readily accommodated by the movement of the dumbbell connection in the supporting members.

It is believed clear that by means of the construction just described and shown in FIGS. 3, 4 and 5 the chock 6 may be readily adjusted axially in the following manner: Lock nut 42 is released. A tool is then applied to the hexagonal opening 46 and member 38 is rotated in one direction or the other. If it is unscrewed with respect to bracket 28, the chock 6, pulled by link 75, will be moved to the left, as viewed in FIG. 3; if it is screwed inwardly, chock 6, pushed by link 75, will be moved to the right. As chock 6 is moved so is roll 16 because the chock is axially fixed with respect to sleeve 88 by conventional thrust bearings 90 interposed between chock 6 and sleeve 88. Sleeve 88, in known manner, is fixed on the roll neck 92.

It should be pointed out that chock 6 where it engages frame 2 at surfaces 92 and 94 is free to move vertically with respect to the frame and to turn in a vertical plane. The engagement is in the nature of a smooth sliding fit which prevents any movement of the chock in the direction of the pass line while permitting movement up and down and axially of the roll.

A modified form of the invention is shown in FIGS. 6 and 7. The same basic principles found in FIGS. 3, 4 and 5 are present here, the differences residing in the manner in which adjustment is accomplished and in the means whereby the axial adjusting means may be freed from the cover on the end of the chock.

In FIG. 6, the roll 16 has its roll neck 100 supported by chock 102 in the usual manner. This includes a sleeve 104 fixed on the roll neck that is in bearing engagement with the interior of the chock. Endwise movement of the chock with respect to the sleeve and roll is prevented by a thrust bearing 106. A cover plate 108 closes the end of the chock. The chock 102 engages frame 110 through suitable engaging pads 112 and 114, which pads make smooth sliding engagement with each other to permit the chock to move up or down and axially while preventing movement of the chock in the direction of the pass line.

Frame 110 includes U-shaped extension 116 on which the adjusting mechanism is mounted. This includes adjusting screw 118 rotated by hand wheel 120. Lock nut 122, rotated by hand wheel 124, serves to lock adjusting screw 118 in any selected position. On the right end of adjusting screw 118 is spherical element 126 which is suitably secured within a two-part cylindrical casing 128. The casing includes circular bearing elements 130 forming sockets which also support at the other end of the casing a spherical element 132 similar to 126 that is mounted on the end of a threaded member 134. By setting up properly on bolts 136, spherical elements 126 and 132 are supported with respect to each other in their respective sockets in a no-clearance manner. Member 134 may turn within limits with respect to screw 118 and any axial movement of screw 118 is transmitted exactly to member 134.

Mounted on member 134 is nut 138 having affixed to its inner face a washer 140 which resides in opposed shallow recesses 142 and 143. On the extremity of member 134 is nut 144 pinned thereto by pin 146. Nut 144 is located in vertical slot 148, as can be seen in FIG. 7. When nut 138 is screwed tightly against cover 108 with washer 140 in recesses 142 and 143, screw threaded member 134 will be locked in position with respect to cover 108.

From the foregoing description it can be seen that, upon loosening lock nut 122, hand wheel 120 may be rotated to shift adjusting screw 118 axially, and this will cause corresponding axial movement of chock 102 and associated roll 16. When it is desired to remove the roll, nut 138 is backed off sufficiently so that screw 134 may be raised or dropped enough to free it from slot 148. The roll may then be removed from the housing in the usual manner.

It will be appreciated that the construction just described in FIGS. 6 and 7 provides an adjustable connection between the frame and the roll chock which acts in the same manner as that described in FIGS. 3, 4 and 5 in that the chock 102, after axial adjustment, may move up and down in accord with any vertical adjustment made to the roll and is also free to turn in a vertical plane as the roll neck may be deflected when arching of the roll occurs during the rolling operation.

A third form of the invention is shown in FIGS. 8, 9 and 10. This construction is not unlike that shown in FIGS. 3, 4 and 5, but axial adjustment of the roll chock and roll is achieved by somewhat different mechanism. Here roll 16 has its roll neck 150 mounted in chock 152 which resides in frame 154 in the usual manner. The frame and chock pads 156 and 158 engages each other to permit the chock to move in all directions except in the direction of the pass line. The usual thrust bearings 160 connect the chock to roll neck 150 so that any axial movement imparted to the chock will result in corresponding movement of roll 16. The chock has a cover plate 160 secured thereto by bolts 162. Cover plate 160 has two oppositely disposed curved grooves 164 and 165 behind walls 174 and 175. In the grooves are positioned flanges 166 and 167 on the end of a sleeve 168. The flanges are cut away on opposite sides as at 170 and 172 (see FIGS. 9 and 10). When sleeve 168 is in the position shown in FIG. 9, flanges 166 and 167 are behind walls 174 and 175. When sleeve 168 is rotated 90 degrees to the position shown in FIG. 10, the cut-away sides 170 and 172 are narrow enough to be withdrawn between walls 174 and 175.

When sleeve 168 is in the position shown in FIG. 9, it may be locked against rotation by lock nut 176 which has wings 178 to facilitate its rotation. Two circular bearings 180 and 182 forming a socket are positioned in the sleeve 168 to engage and hold a spherical member 184. The bearings may be forced into tight position with member 184 by the flanged cap 186 which may be locked in position by lock nut 188.

Spherical member 184 is mounted on a threaded shaft 190, being held in axial position thereon by nuts 192 and 194. On the other end of shaft 190 is a similar arrangement comprising a like spherical element 196 secured in position on the shaft by nuts 198 and 200. Spherical member 196 is mounted in sleeve 202 in the socket formed by circular bearings 204 and 206. These bearings are secured in position in the sleeve by a flanged cap 208 which may be secured against loosening by lock nut 210. Sleeve 202 is positioned in a circular opening in a U-shaped extension 212 of housing 154. Nut 214, acting in cooperation with circular flange 216, holds sleeve 202 firmly in position on the frame 212.

When it is desired to make axial adjustment of roll 16 in the form shown in FIG. 8, this may be accomplished by backing off on nut 198 and tightening nut 200 to the

extent required, or vice versa. When roll **16** is to be removed from the roll housing, it may readily be disconnected from the adjustment mechanism by loosening lock nut **176** on sleeve **168** and then rotating the sleeve from the position in FIG. 9 to that shown in FIG. 10. When in this position, the chock **152** and associated cover plate **160** may be moved axially to the right to separate from sleeve **168**.

As in the previous examples, the spherical members **184** and **196** in their respective sockets are in a no-clearance relationship so that any adjustment of shaft **190** with respect to spherical element **196** will produce a corresponding axial movement of chock **152** and roll **16**. At the same time the connection is of such character that the chock **152** may be moved up or down within limits without disturbing the axial adjustment and likewise as the roll **16** may be arched to deflect the roll neck **150** the chock may shift correspondingly as permitted by the rotation of spherical members **184** and **196** in their sockets.

All of the several forms of the invention as heretofore described may be broadly considered as universal joints inasmuch as they allow free movement in all directions within certain limits.

It is our intention to cover all modifications and changes of the examples of the invention herein chosen for purposes of disclosure which do not constitute departures from the spirit and scope of the invention.

We claim:

1. Means for effecting longitudinal adjustment of a roll in a roll stand and for holding the roll in fixed longitudinal position once the adjustment has been attained and without restricting the vertical movement of the roll within limits and without restraining movement of the chock as it is moved by the roll neck in accord with roll deflection or misalignment, said means comprising a chock fixed axially with respect to the roll, a member fixed with respect to the roll stand and spaced in an axial direction from the chock, a no-clearance flexible connection between said chock and member, said connection comprising a first element rigidly connected to said member, a second element rigidly connected to said chock, and a third element pivotally connected to both said first and second elements whereby said chock is fixed axially but can move up or down within limits with respect to said member or turn in a vertical plane within limits without restraint by said second and third elements.

2. Means as set forth in claim 1, said first and second elements including bearing sockets and said third element having enlarged cooperating end portions adapted to reside in said sockets in rotatable relation.

3. Means as set forth in claim 1, said first and second elements including enlarged end portions, said third element including two spaced sockets in which said end portions reside in rotatable relation.

4. Means as set forth in claim 1, said first and second elements each including a bearing socket for receiving a spherical element, said third element being generally of dumbbell configuration with spherical ends which reside in the said bearing sockets.

5. Means as set forth in claim 1, said first and second elements each having opposed extensions with spherical ends, said third element having spaced bearing sockets in which said spherical ends are positioned.

6. Means for making axial adjustment of a roll in a roll stand, said means comprising a chock fixed axially on a roll neck, a frame portion located beyond said chock, a first member on said frame portion movable in the direction of the axis of the roll, a second member connected to said chock, and a no-clearance universal joint connecting said members whereby said roll may be axially adjusted by movement of said first member without restricting within limits the up or down or vertical plane turning movement of said chock.

7. Adjusting means connecting a chock with a roll stand, said means comprising a first socket affixed to said chock, a second socket affixed to said stand, a dumbbell-shaped member having one end in said first socket and the other end in said second socket, and means for moving said second socket with respect to said stand in the direction of the axis of said chock.

8. Adjusting means connecting a chock with a roll stand, said means comprising a first member secured to said chock in axial alignment therewith, a second member secured to said stand in substantial alignment with said first member and the axis of said chock, means connecting said first and second members in free turning, no-clearance relation, and means for adjusting said second member with respect to said stand in the direction of said first member, thereby to shift said chock axially to the same extent.

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