United States Patent

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[54] **ROLLING MILLS**
10 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **72/237,** 72/244
[51] **Int. Cl.** **B21b 31/00**
[50] **Field of Search** 72/237, 244, 248

[56] **References Cited**

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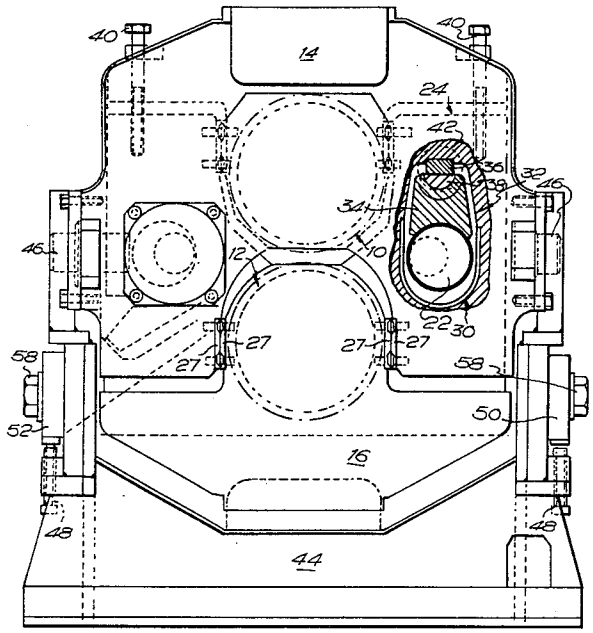
ABSTRACT: A rolling mill has adjacent roll chocks connected together by a pair of pins extending parallel to the axes of the rolls.



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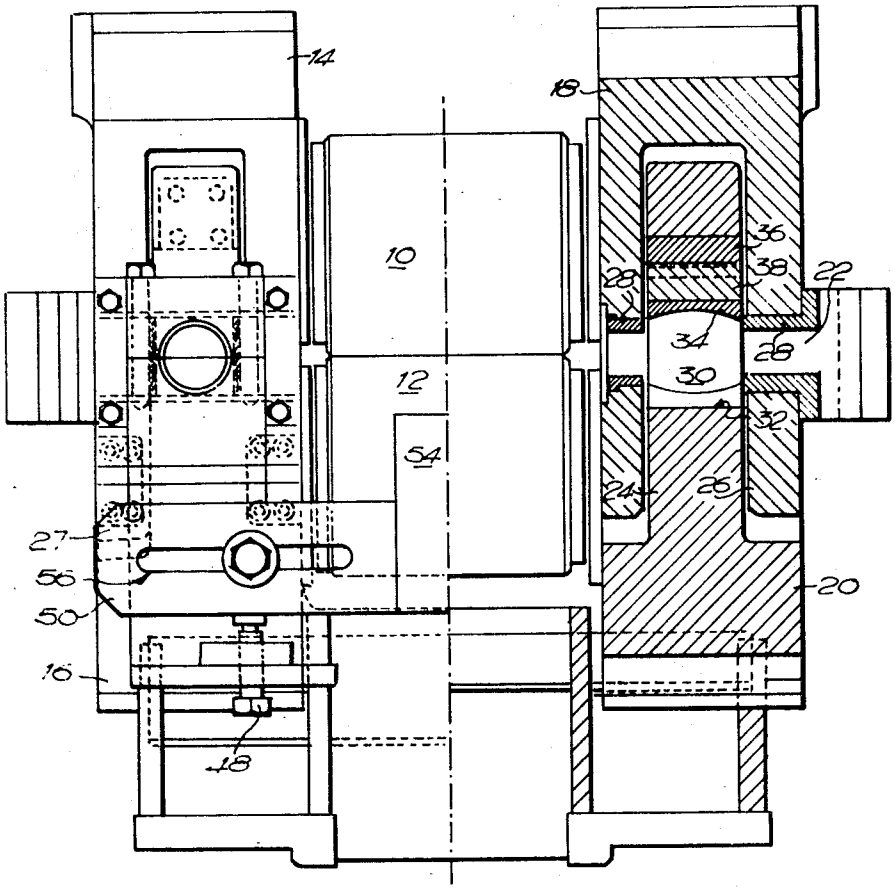

FIG. 1

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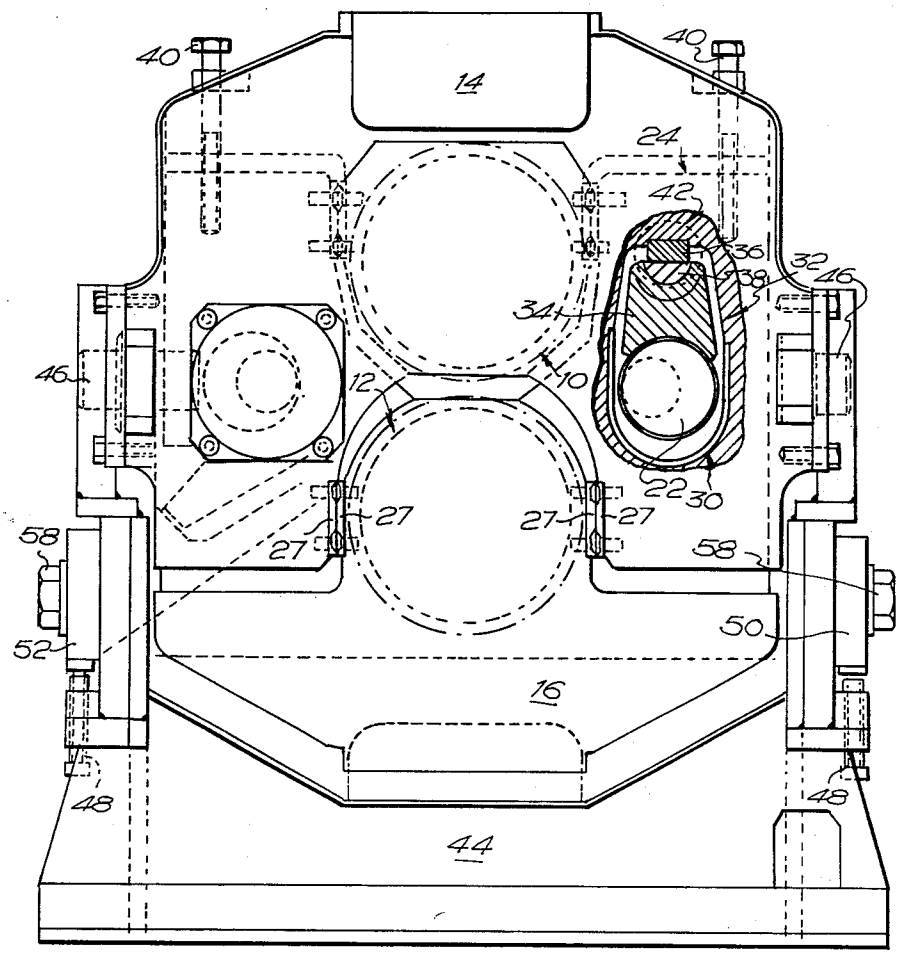

FIG. 2

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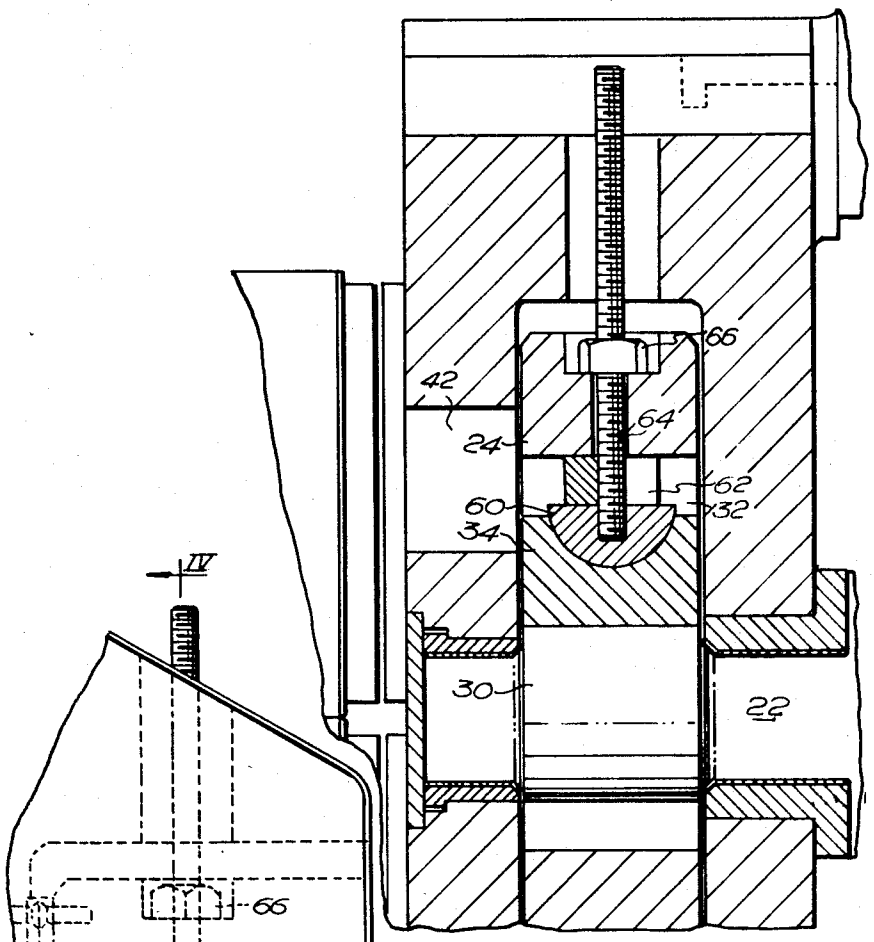

FIG.4

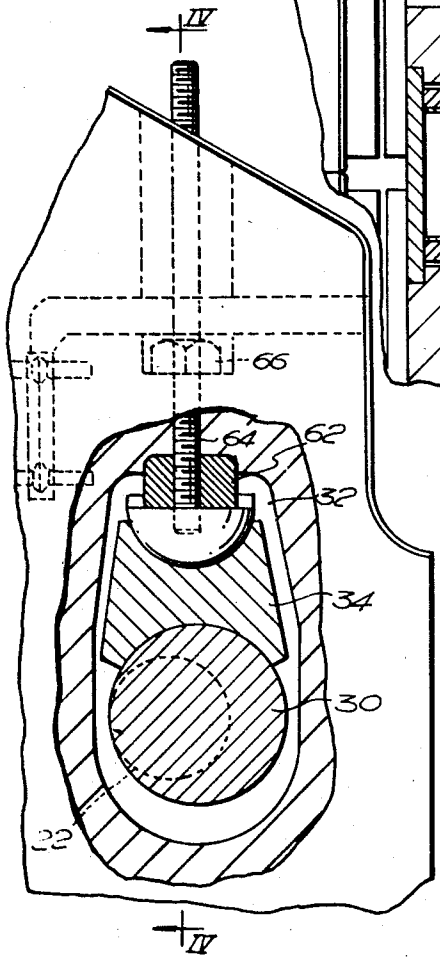

FIG.3

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ROLLING MILLS

The invention relates to rolling mills and has for its object to provide an improvement therein.

According to the invention, a rolling mill has at least two cooperating rolls carried between respective roll chocks, each roll chock for one roll being connected to an adjacent roll chock for an adjacent roll by a pair of pins extending parallel to the axes of the rolls. Preferably, the pins by which the adjacent roll chocks are connected together are disposed on the pass line between the rolls, one on the input side and one on the output side of a plane in which the axes of the rolls are disposed. Preferably, also, the pins by which adjacent roll chocks are connected together are provided with eccentric portions so that rotation of said pins can effect adjustment of the rolls towards or away from each other. To allow for lateral movement of the eccentric portions of the pins which occurs when adjustments of the rolls towards or away from each other are effected, thrust blocks preferably act against said eccentric portions, being so mounted as to be capable of orientating themselves easily to adjustments of said pins. The eccentric portions are preferably slightly barrelled to allow relative movements between adjacent roll chocks, in the plane of the rolls, when under load. Alternatively, the thrust blocks which act against said eccentric portions may react against the two upper roll chocks or the two lower roll chocks as the case may be through part-spherical seating pieces. Said thrust blocks preferably react against the upper roll chocks or the two lower roll chocks through respective spacer members, and said spacer members are preferably capable of being replaced by spacer members of different thickness to vary the size of the roll gap by a substantial amount, that is to say by an amount greater than can be achieved by rotating the pins connecting the adjacent roll chocks. Of each pair of roll chocks, one is preferably provided with a pair of lugs disposed centrally of its width whilst the other is provided with a pair of complementary apertures for the reception of said lugs. The pairs of roll chocks are preferably suspended in a frame and are preferably vertically adjustable in said frame as respective units by screw means. Each pair of roll chocks is preferably trunnion mounted in the frame on an axis perpendicular to the plane containing the axes of the rolls.

In order that the invention may be fully understood and readily carried into effect, a preferred embodiment thereof and a modification will now be described, by way of example only, with reference to the accompanying drawings of which:

FIG. 1 is a part-sectional front elevation of a rolling mill embodying the invention;

FIG. 2 is a part-sectional end view thereof;

FIG. 3 is a part-sectional detail view showing a modification; and

FIG. 4 is a sectional view on the line IV–IV in FIG. 3.

Referring now to the drawings, a rolling mill has a pair of cooperating rolls **10** and **12** carried between respective roll chocks **14, 16** and **18, 20**.

Each roll chock for one roll is connected to the adjacent roll chock for the other roll by a pair of pins **22** extending parallel to the axes of the rolls and disposed on the pass line between said rolls, one on the input side and one on the output side of a plane in which the axes of the rolls are disposed. The pins **22** extend through lugs which are formed integrally with the roll chocks, each lower chock being provided with a pair of lugs **24** disposed centrally of its width and each upper chock being provided with a pair of complementary apertures to form pairs of lugs **26** between which the lugs **24** are received. Wearing plates **27** are provided on the inner edges of the lugs **26** and on complementary surfaces of the lower roll chocks to take up any slack in the direction of movement of material through the mill.

The pins **22** are rotatably mounted in respective pairs of bushes **28** which are inserted in the lugs **26**. Eccentric and slightly barrelled portions **30** of said pins are located within the widths of the lugs **24** through which said pins extend and are disposed within elongated apertures **32** in said lugs.

It will be seen that the lower roll chocks are suspended from the eccentric portions **30** of the pins **22**, and the weight of said lower chocks together with the weight of the lower roll and the force tending to separate the rolls under load is transmitted to said eccentric portions through thrust blocks **34** which overlie said portions and seat accurately on their barrelled surfaces. Spacer members **36** are disposed between the thrust blocks and the upper extremities of the apertures, and said spacer members overlie respective inserts **38** of half round cross section each of which seats in a semicircular pocket in the crown of its associated thrust block.

The arrangement is such that rotation of the pins **22** effects adjustment of the rolls towards or away from each other and the slightly barrelled form of the eccentric portions of the pins allows relatively movements between adjacent roll chocks in the plan of the rolls when under load. The thrust blocks are capable of orientating themselves easily to allow for lateral movement of the eccentrics when the pins are rotated.

Spacer members (not shown) are provided for replacing the spacer members **36** when it is desired to vary the size of the roll gap by a substantial amount, that is to say by an amount greater than can be achieved by rotating the pins **22** and the spacer members can be inserted into or withdrawn from their operative positions through respective apertures **42** when the pins have been relieved by the weight of the lower roll chocks. For this reason, a pair of relatively long bolts **40** extend through each upper roll chock and engage threaded holes in the respective lower roll chocks. During normal operation, the bolts **40** extend freely above the upper roll chocks as shown in the drawings, but when it is desired to replace the spacer members **36**, said bolts are tightened down so that they take the weight of the lower roll and the lower roll chocks. The spacer members **36** can then be withdrawn through apertures **42** in the outer lugs of the upper chocks.

The pairs of roll chocks and the rolls mounted between them are suspended in a frame **44** on pairs of trunnions **46** which project from the upper roll chocks on axes perpendicular to the plane containing the axes of the rolls. Means are provided for effecting vertical adjustments of the pairs of roll chocks as respective units in said frame, said means being constituted by a pair of screws **48** spaced apart at each end of the frame and abutting against the undersides of respective bars **50** and **52** which extend across the front and rear of the mill and which support the trunnions. Guide apparatus generally indicated **54** is mounted on the bars **50** and **52**. Each of these bars is slotted at each end as at **56** so that lateral adjustments of the guide apparatus can be effected after slacking nuts **58**.

Referring now to FIGS. **3** and **4**, in a modification of the arrangement just described the pins **22** are formed with plain cylindrical eccentric portions **30** for ease of manufacture. Relative movement between adjacent roll chocks in the plane of the rolls is allowed for by virtue of the fact that in this case the thrust blocks **34** which act against the eccentric portions react against the upper surfaces of the apertures **32** through respective part-spherical seating pieces **60**. The part-spherical seating pieces abut against respective spacer members **62** which in this case are slotted so that they can be inserted into position around respective screwed rods **64**. The latter engage tapped holes in the part-spherical seating pieces and extend upwards through the spacer members and through clearance holes in the lugs **24** and through relatively large diameter holes in the upper chocks. Nuts **66** which engage said rods abut against seating surfaces formed at the upper ends of the lugs of the bottom chocks and can be reached by means of a box spanner, through the holes in the upper chocks, when it is desired to slacken them off to fit spacer members of different thickness. The arrangement is otherwise the same as the described with reference to FIGS. **1** and **2**.

Various other modifications may be made without departing from the scope of the invention. For example, the invention could quite well be applied to a 3-high mill, roll chocks for the middle roll being provided with oppositely extending pairs of lugs and the pins **22** being duplicated, but in this case of course the sets of chocks could not be trunnion mounted.

The adjustment means for rotating the pins **22** are not illustrated but may take various forms, and it will be understood that said adjustment means are preferably such that the pairs of pins are rotated in unison, although means may be provided for making an initial adjustment of individual pins or for making individual adjustments to compensate for wear.

What I claim and desire to secure by Letters Patent is:

1. A rolling mill comprising at least two cooperating rolls disposed so as to define a pass line and so that each has an axis parallel to an axis of the other in a common plane; a pair of roll chocks for each roll carrying the roll therebetween; a pair of pins extending parallel to the axes of the rolls and spaced from the common plane containing the axes of said rolls for connecting adjacent roll chocks together, each of said pins having an eccentric portion such that rotation thereof effects adjustment of the rolls towards or away from each other; self-orienting thrust blocks mounted to act against said eccentric portions of said pins and to react against the respective chocks of one of said pair of roll chocks; and spacer members cooperating with said thrust blocks and said roll chocks and by way of which said thrust blocks react against the respective cocks of said one of said pair of roll chocks.

2. A rolling mill as claimed in claim **1**, wherein the pins of each pair of pins are disposed on the pass line between the rolls, one on each side of the common plane containing the axes of the rolls.

3. A rolling mill as claimed in claim **1**, wherein the spacer members are interchangeable with spacer members of different thickness to vary the size of the roll gap, whereby the roll gap can be varied by an amount greater than can be achieved by rotating the pins connecting the adjacent roll chocks.

4. A rolling mill as claimed in claim **1**, wherein the eccentric portions are slightly barrelled to allow relative movements between adjacent roll chocks in the plane of the rolls when under load.

5. A rolling mill as claimed in claim **1**, additionally comprising part-spherical seating pieces by way of which the respective thrust blocks can react against the respective roll chocks whereby relative movement between adjacent roll chocks when under load is allowed for in the plane of the rolls.

6. A rolling mill as claimed in claim **1**, additionally comprising a lug on each chock of one pair of roll chocks disposed centrally of its width, and a complementary aperture on each adjoining chock of the other pair of roll chocks for the reception of said lugs.

7. A rolling mill as claimed in claim **1**, additionally comprising a frame, the pairs of roll chocks being suspended in the frame.

8. A rolling mill as claimed in claim **7**, additionally comprising screw means by which the pairs of roll chocks are vertically adjustable as respective units in said frame.

9. A rolling mill as claimed in claim **7**, additionally comprising trunnion mounting means by which each pair of roll chocks is mounted in the frame on an axis perpendicular to the plane containing the axes of the rolls.

10. A rolling mill comprising: as least two cooperating rolls disposed so as to define a pass line and so that each has an axis parallel to an axis of the other in a common plane; a pair of roll chocks for each roll carrying the roll therebetween; a pair of pins extending parallel to the axes of the rolls and connecting adjacent roll chocks together and having eccentric portions for adjustment of the rolls; thrust blocks mounted to act against said eccentric portions of the pins and react against the respective chocks of one of said pair of roll chocks and so as to be capable of orienting themselves upon adjustment of said pins to allow for lateral movement of the eccentric portions; and spacer members by way of which said thrust blocks react against the respective roll chocks, said spacer members being interchangeable with spacer members of different thickness to vary the size of the roll gap, whereby the roll gap can be varied by an amount greater than can be achieved by rotating the pins connecting the adjacent roll chocks.