United States Patent [19]

Bjorkman

[11] **3,918,287**

[45] **Nov. 11, 1975**

[54] **ROLLING STAND PRESTRESSING SYSTEM**

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[22] Filed: **July 18, 1974**

[21] Appl. No.: **489,702**

[30] **Foreign Application Priority Data**

July 20, 1973 Sweden 101511

[52] **U.S. Cl.** ..... **72/246;** 72/248; 74/424.8 A

[51] **Int. Cl.**[2] **B21B 31/24**

[58] **Field of Search** ..... 74/424.8 A, 441; 72/248, 72/237, 246

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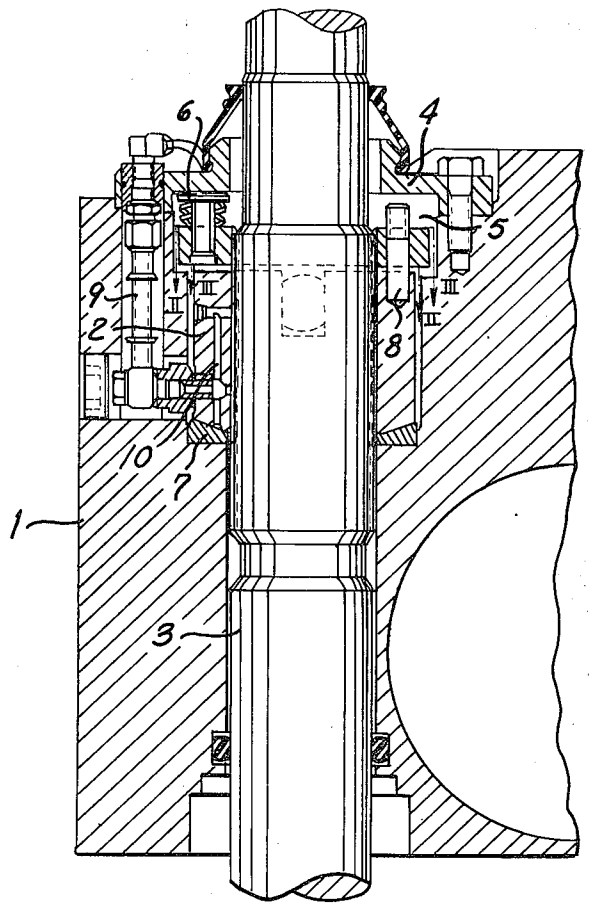
Primary Examiner—Milton S. Mehr

[57] **ABSTRACT**

A rolling stand for hot or cold rolling of bar steel or wire rod stock, including a pair of chocks for rotatably supporting a pair of rolls and means for effecting movement of one of the chocks toward and away from the other chock to effect the relative positions of the rolls. Apparatus is provided for applying a prestressing force to one chock in a direction tending to urge the chocks apart, the apparatus including at least one spring whose force remains substantially constant independent of the position of the chock.

9 Claims, 5 Drawing Figures



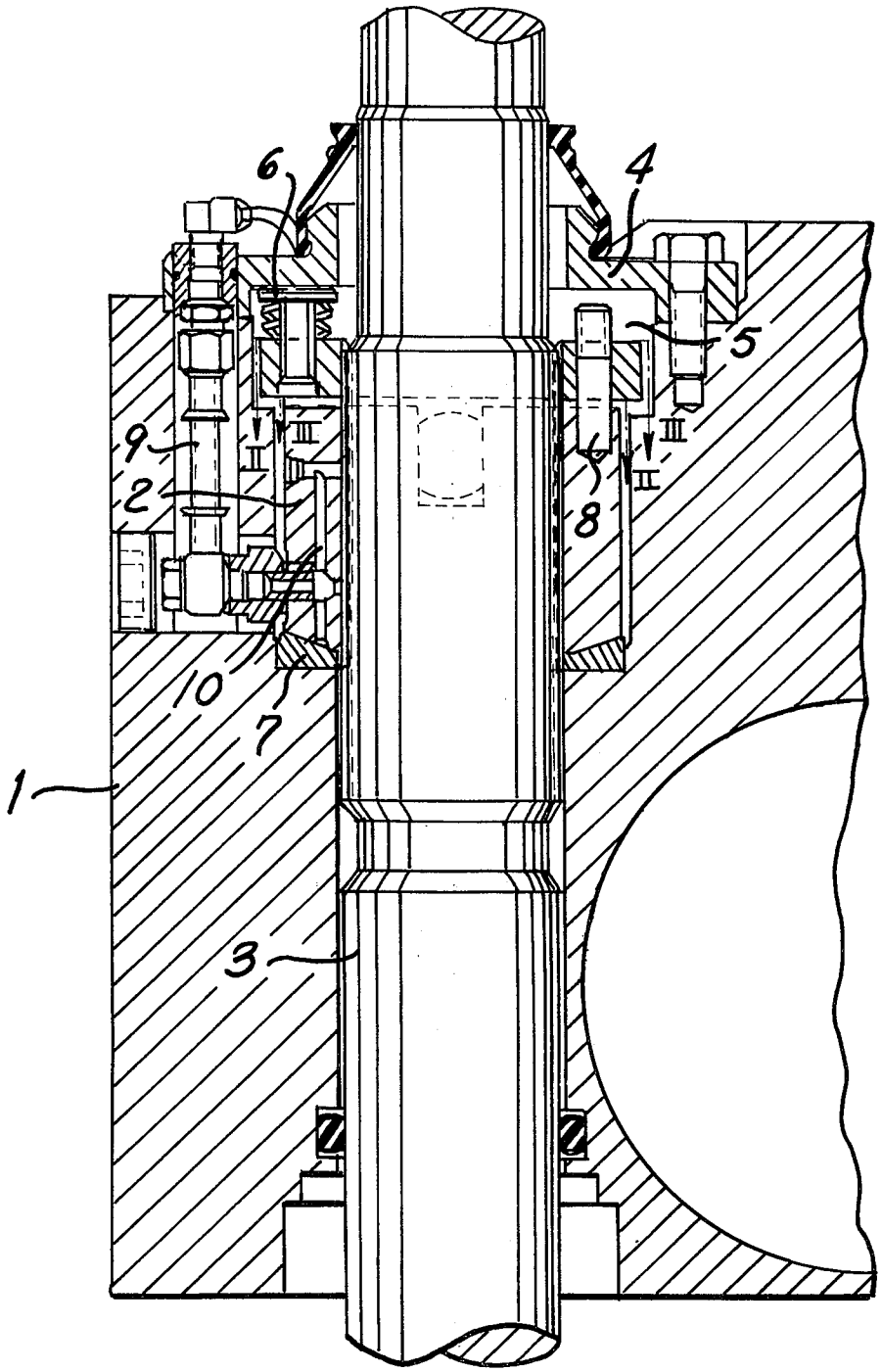


FIG. 1

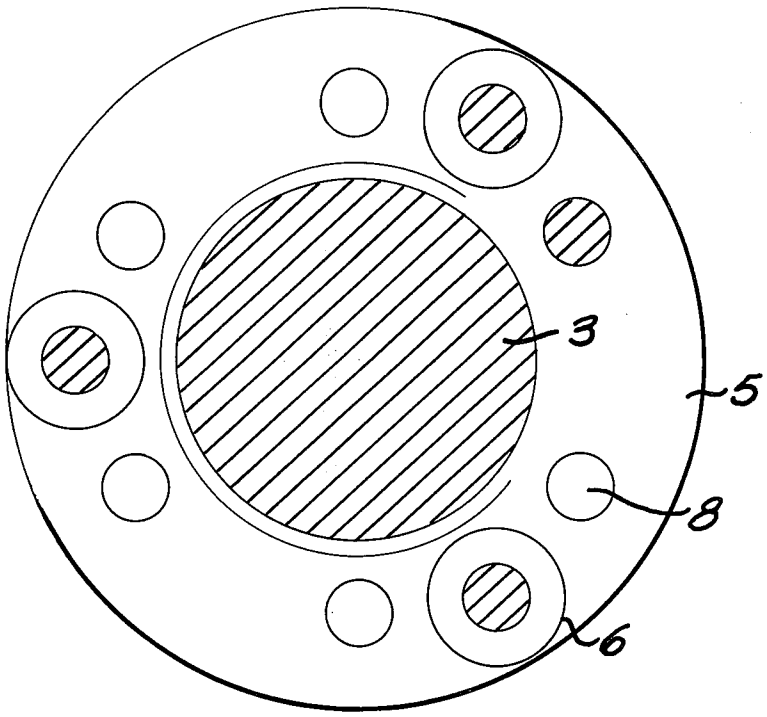


FIG. 2

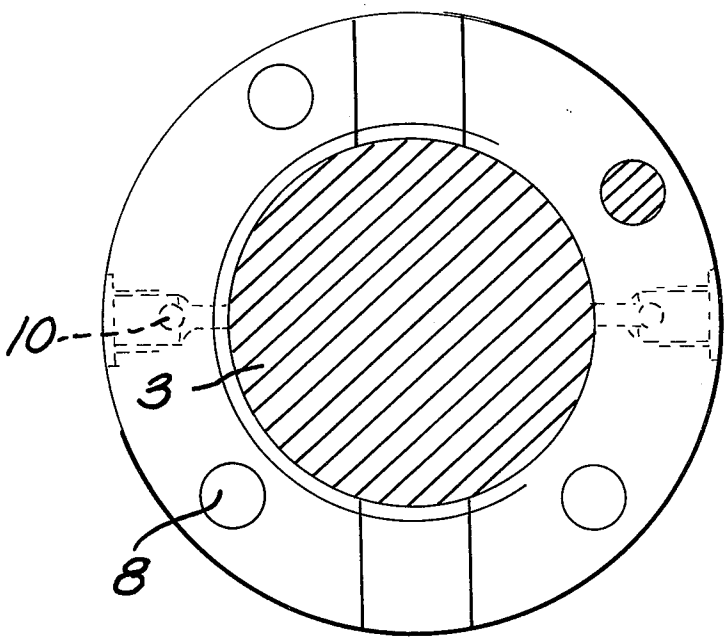


FIG. 3

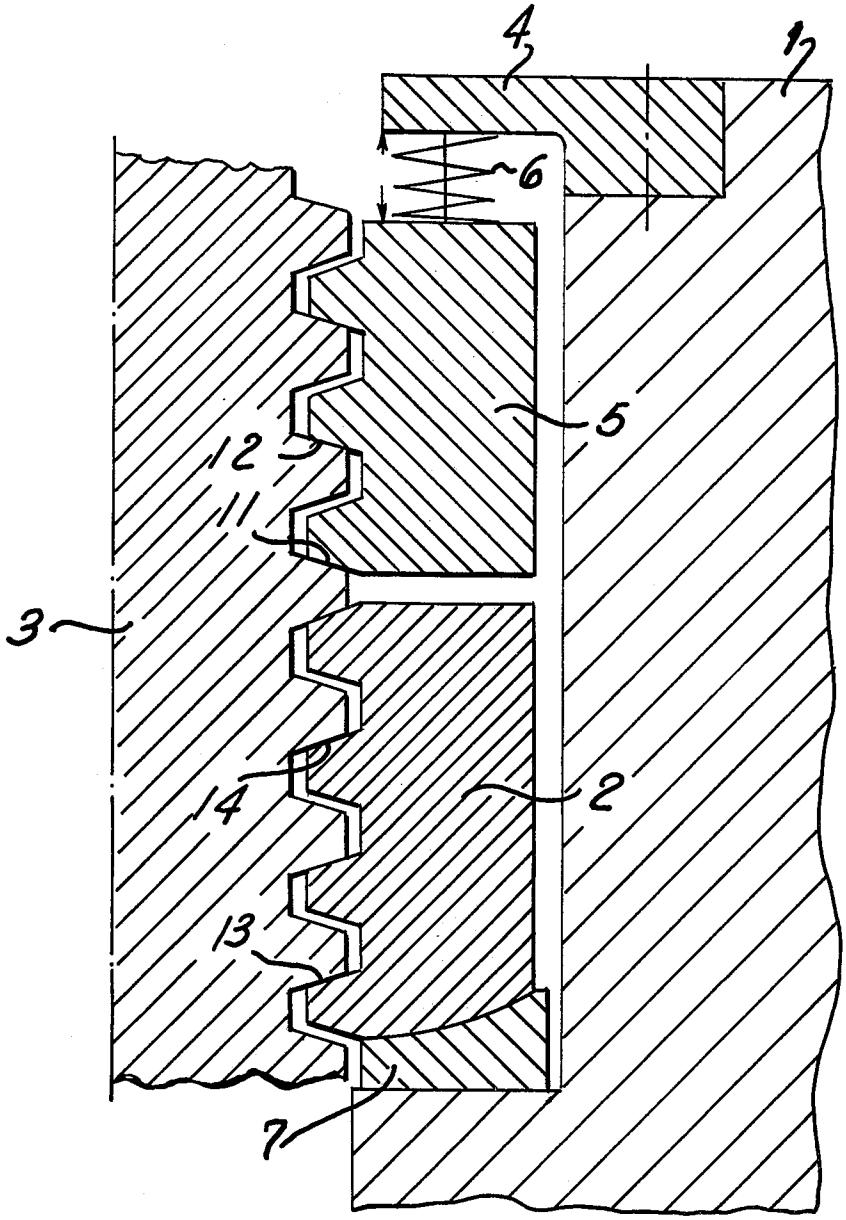


FIG. 4

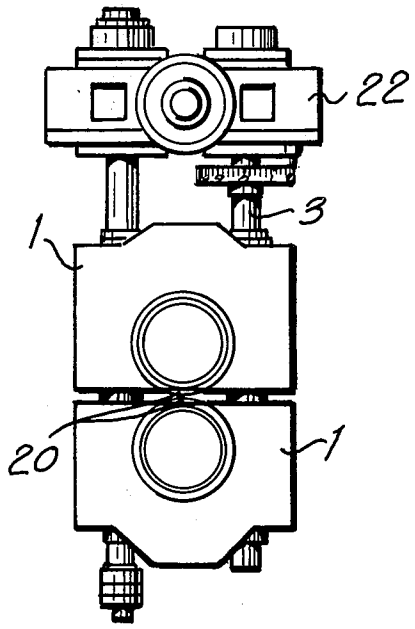


FIG. 5

ROLLING STAND PRESTRESSING SYSTEM

BACKGROUND OF THE INVENTION

The present invention relates to rolling stands for hot or cold rolling of bar steel or wire rod stock. Rolling stands generally include one or more pairs or rotatably mounted rolls, between which bar or wire stock is introduced. The ends of each of such rolls are usually supported in a chock or other similar type of housing member.

Also, some adjusting mechanism has been included in roll stands for moving the chocks when roll diameters are changed or the gap between the rolls must be varied. Such adjusting mechanisms generally include a threaded rod and nut arrangement where rotation of either the rod or the nut will cause movement of one of the chocks. Such adjusting mechanisms have introduced a problem into the roll stand structures which problem centers around movement of the rolls away from each other when the material is introduced between the rolls. Such movement results because of backlash in the system and has resulted in damage and wear of the structures and also greatly affects the accuracy of the rolling. In order to solve the above problem, it has been conventional to provide rolling stands with a prestressing mechanism for loading one of the chocks away from the other and thereby take up any backlash in the system, thus eliminating the possibility of movement of one chock away from the other.

In one known construction, a threaded rod is rotated relative to a nut carried by a chock and upon such rotation the chock is moved along the nut to set a desired roll gap. In such system there is a problem due to the fact that the thread flanks or flanges of the threaded rod and the nut, while generally made to precise specifications, often have some clearances therebetween. These clearances tend to cause hammering of the threads as the stock tends to urge the rolls apart. Accordingly, a prestressing mechanism has been used to apply a prestressing force to the chock urging it away from the other chock, as a means for eliminating that hammering.

One type of prestressing mechanism used employs springs acting between the upper chock and an adjacent lower chock and urging them apart. In such an arrangement the spring forces vary as the distance between the chocks varies. Thus, the spring forces tend to vary with changes in the roll diameters, as well as with changes in gap adjustment. Also, since the springs are external to the chocks the spring mechanism may be damaged by cobles which may form during a stock rolling process.

Another known prestressing mechanism employs hydraulic actuated members which urge the chock apart. While such hydraulic systems have been found effective, they have a great disadvantage in that they are complex and tend to be fairly dirty due to fluid leakage.

SUMMARY OF THE PRESENT INVENTION

The present invention is directed to a roll stand arrangement where the rolls are mounted in chocks which are adjustable relative to each other in order to provide for roll gap adjustment, as well as adjustment for purposes of changing roll diameter. In addition, the present invention includes a prestressing mechanism which eliminates the problems noted above with regard to present known prestressing arrangements.

In accordance with the present invention, springs are utilized eliminating the aforementioned problems with regard to hydraulic-actuated prestressing systems. However, the spring construction of the present invention is not subject to the problems of known spring prestressing construction, noted above, since the force which is applied by the spring construction to a chock does not vary with the position of the chock, but rather is consistent at all positions of the chock. In addition, the construction is internal of the chock and the problem of damage caused by cobles is substantially minimized.

More specifically, in accordance with the present invention, a pair of threaded nuts are carried by a chock and each of which engages the threads of a rod. A spring means acts between one of the nuts and the chock. The force urges the chock and the other nut away from the other chock. Any backlash in the system between the other nut and the threaded rod is taken up by the spring action. The nuts are located within the chock housing as is the spring means and thus are protected from cobles.

In view of the fact that the spring means is carried on the chock, upon relative rotation of the threaded rod and the pair of threaded nuts which effects movement of the chock and the threaded nuts, the spring means likewise is moved with the chock. As a result, the spring force which is applied by the spring to the chock does not vary, even though the chock has been moved. Accordingly, the force applied by the springs to the chock is completely independent of chock position.

DESCRIPTION OF THE DRAWINGS

Further advantages and features of the present invention will be apparent to those skilled in the art to which it relates from the following detailed description of a preferred embodiment thereof made with respect to the accompanying drawings in which:

FIG. **1** is a sectional view of a chock embodying the present invention;

FIG. **2** is a sectional view taken substantially along the line II—II of FIG. **1**;

FIG. **3** is a sectional view taken substantially along the line III—III of FIG. **1**;

FIG. **4** is a sectional view illustrating the principal features of the present invention; and

FIG. **5** is a schematic side view of a two-high roll stand.

DETAILED DESCRIPTION OF AN EMBODIMENT OF THE PRESENT INVENTION

The present invention, as noted above, provides an improved mechanism for prestressing a roll stand. The present invention is applicable to a variety of roll stand constructions which are known in the art, and as representative will be described as applied to a two-high roll stand. Two-high roll stands are well known in the art and comprise two pairs of roller bearing chocks or housings. In a two-high rolling stand such as that shown in FIG. **5**, the rolls **20** are rotatably supported by chocks in such a manner that both roll axes lie in a substantially vertical plane. The foregoing overall construction of a two-high rolling stand is very common in the art and therefore need not be more fully described herein. For the purposes of explanation, it will be assumed hereinafter that the chock represented in FIGS. **1** through **4** supports the upper roll of the two-high roll

stand which is represented in FIG. 5. A pair of cylindrical rods 3 extend through the chock 1. Each rod 3 is constructed similarly and similar mechanisms are associated with each rod 3. Accordingly, only one of the rods 3 and the mechanism associated with it will be described in detail.

Referring to FIGS. 1 through 4, rod 3 includes threads which engage the threads of a nut 2. The nut 2 is constrained against rotational movement and its lower surface engages spherical washer 7 which, in turn, in supported by the chock 1. The nut 2 is connected to the chock so that rotational movement of the rod 3 is translated into vertical movement of the chock 1 when adjustment of the chock is desired, as for adjusting roll gap or changing rolls to change roll diameter. The rotational movement which effects this adjustment is applied to rod 3 by means of conventional drive means 22, which is known and will not be described.

A second nut 5 is also threadedly engaged with rod 3 and is located above the nut 2. The nuts 5 and 2 are separate nuts but both are carried by the chock 1. The nuts 5 and 2 are interconnected by pins 8 so as to rotate together. However, the nut 2 is slidable axially relative to the pin 8. As noted above, the nuts 2 and 5 are restrained from rotation relative to the chock 1 and this is accomplished by means of a suitable key arrangement for keying the nuts to the chock and which is designated 5a. From the above, it should be clear that upon rotation of the rod 3, the nuts 2 and 5 will move axially along the rod 3 and will force the chock 1 to likewise move axially along the rod 3. Such adjusting movement of the chock 1 is provided in order to adjust the gap between the rolls 20 of the rolling stand of for purposes of adjusting the position of the chock for positioning replacement rolls of different diameters in the chock.

In accordance with the present invention, there is provided a prestressing mechanism for prestressing the upper chock 1 away from the lower chock 2 and for taking backlash out of the adjusting system which includes the rod 3 and the threaded nuts which cooperate therewith. In accordance with the present invention, the prestressing mechanism comprises a plurality of springs 6 which are arranged in equal circumferential spaces around the rod 3. Each set of springs 6 comprises a plurality of Belleville washers which encircle a rod 6a which are carried by the upper nut 5. The Belleville washers act between the upper surface of the nut 5 and a cover member 4 which is suitably secured to the chock 1. The cover member 4 basically closes a chamber in which the nuts 2 and 5 and the prestressing mechanisms are located. In addition, a boot 4a extends between the cover 4 and the rod 3 to prevent dust or dirt from fouling the adjusting and prestressing mechanisms. As a result, it should be clear that the prestressing mechanism is completely located within the chock 1 and the possibility of a coble contacting and damaging the prestressing mechanism is substantially eliminated.

It should be clear from the above, how the prestressing mechanism operates. In essence, the springs 6 urge the chock 1 upwardly, as viewed in the drawings, and the chock 1 in turn urges the nut 2 upwardly so that the upper surfaces or flanks 13 of the threads on the nut 2 engage the lower surfaces or flanks 14 of the threads on the rod 3. As a result, movement of the chock 1 upwardly during the rolling operation is substantially eliminated. It should be clear also, however, that the nut 5 is biased downwardly so that the lower flank surface 12 of the threads on the nut 5 engage the upper flank surface 11 of the threads on the rod 3. The rod 3 is fixed against axial movement. Also, the number of threads on the nut 2 which contact and are prestressed against the threads on the rod 3 is selected so as to provide a sufficient surface area to resist any upward movement or damaging movement to the mating threads of either the nut 2 or the rod 3.

It should further be clear from the above that upon adjustment of the chock 1 for purposes of change or roll diameter or change of roll gap, the springs 6 are likewise moved with adjustment of the chock 1. Since the springs 6 are likewise moved, there is no significant change in the distance between the nut 5 and the member 4 carried by the chock 1, and therefore the force which the springs apply to the chock 1 remains substantially constant on all adjusted positions of the chock 1. This eliminates the problem of the prior art which utilizes springs, since previously adjustment of the chock 1 would cause a corresponding adjustment of the spring force applied by the prestressing mechanism to the chock. In the present embodiment, the spring force remains substantially constant for all adjustment positions of the chock. Further, it should be clear that the mechanism includes a lubricating system for lubricating the prestressing and adjusting mechanisms. The lubricating system basically includes a means 9 of conducting lubricant to a passage 10 in the nut 2 and a lubricant is flowed through the passage in a conventional manner for purposes of lubricating the mehcanisms within the chamber of the chock.

Having described the invention, what is claimed is:

1. A rolling stand comprising a pair of chocks for rotatably supporting a pair of rolls, means for effecting movement of one of said chocks toward and away from the other of said chocks in order to effect the relative position of said chocks and the rolls carried thereby, prestressing means for applying a prestressing force to one of said chocks urging said one chock away from the other chock, said prestressing means comprising spring means urging one of said chocks away from the other of said chocks, and said spring means including at least one mechanical spring for applying a force to said one of said chocks which is substantially constant and independent of the position of said one of said chocks.

2. A rolling stand as set forth in claim 1, wherein said spring comprises a compression spring.

3. A rolling stand as set forth in claim 1 wherein said means for moving said chock toward or away from the other chock includes a threaded rod, a pair of threaded nuts each in threaded engagement with the threads of said rod, said spring means acting between one of said nuts and said one chock and urging said nuts toward each other.

4. A rolling stand as set forth in claim 3, wherein one end of said spring is connected to said nut and the other end of said spring is connected to said chock.

5. A rolling stand as set forth in claim 4, wherein said spring is a compression spring.

6. A rolling stand as set forth in claim 3, wherein the threads of said nuts and of said rod each include upper and lower flanks, the upper flanks of a first threaded nut being in contact with the lower flanks of said rod, the lower flanks of a second threaded nut being in contact with the upper flanks of said rod, said spring

means acting between the one chock and said second threaded nut and being effective to urge said lower flanks of said second threaded nut against said upper flanks of said rod and to urge said upper flanks of said first nut into contact with the lower flanks of said rod whereby the weight of said one chock is transmitted to said rod through said second nut and any rollseparating force due to the material being rolled is transmitted to said rod through said first nut.

7. A rolling stand as defined in claim **1** wherein said means for effecting movement of said one of said chocks toward and away from the other includes at least one rotatable rod member for effecting adjustment of one of said chocks relative to the other and further including means for transmitting any roll-separating force due to the material being rolled to said rod independent of said spring means.

8. A rolling stand comprising a pair of chocks for rotatably supporting a pair of rolls, means cooperating with one of said chocks to effect movement of said one chock toward and away from the other chock, said means including a threaded rod, a pair of threaded nuts in threaded engagement with the threads of said rod, prestressing means comprising spring means urging said one chock away from said other chock and urging said nuts toward each other, said spring means including at least one mechanical spring acting between one of said nuts and a portion of said one chock.

9. A rolling stand as set forth in claim **8,** wherein said chock includes a pair of surfaces, said threaded nuts being located between said surfaces, said spring acting between said one of said nuts and one of said surfaces, said other nut having a portion thereof in engagement with the other surface.

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