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(54) **Rolling mill roll assembly**

(57) A rolling mill roll assembly comprises a support shaft having a tapered section leading from an abutment to an end section. A ring-shaped roll with inboard and outboard flanks and a cylindrical bore is axially mounted on the shaft with its inboard flank seated against the shaft abutment and with its cylindrical bore surrounding the tapered shaft section. A tapered sleeve is inserted between the tapered section of the shaft and the cylindrical bore of the roll, and a load ring is rotatably fixed with respect to and axially shiftable on the end section of the shaft. A resilient spacer is interposed between the load ring and the sleeve to yieldably maintain a gap be-

tween the load ring and the outboard flank of the roll. A roll retainer mounted on the end section of the shaft acts in an abutting relationship with the load ring and via the resilient spacer to close the gap and axially wedge the tapered portion of the sleeve between the tapered section of the shaft and the cylindrical bore of the roll. Bolt members threaded in through bores in the roll retainer are torqued to urge the load ring against the outboard flank of the roll, which in turn urges the outboard flank of the roll against the shaft abutment.

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The invention relates generally to rolling mills, and is concerned in particular with an improved roll assembly of the so called "overhung" type, in which ring-shaped roll discs with cylindrical bores are centered on tapered shaft sections by means of tapered sleeves tightly wedged therebetween.

2. Description of the Prior Art

[0002] In a known roll assembly of the above-mentioned type, as described in U.S. patent No. 5,934,131 (Shen), the tapered sleeve is urged into its operative wedged position by a rigid circular retainer. The retainer is rotatably fixed to the shaft, and is advanced against the sleeve by torquing a nut threaded onto the end of the shaft. Screws carried by the retainer are then tightened against on outboard flank of the roll to urge an inboard flank of the roll against a shaft shoulder. When thus tightened, the screws provide the primary means of transmitting torque from the roll shaft to the roll.

[0003] There are several drawbacks to this arrangement. First, the tapered sleeve may not be fully wedged into its operative position prior to tightening of the retainer screws against the outboard roll flank. Thus, the roll will not be properly centered on the roll shaft. Secondly, the outboard roll flank can be damaged by the torque transmitting retainer screws.

[0004] The objective of the present invention is to provide an improved roll assembly which overcomes these drawbacks.

[0005] This problem is solved by the rolling mill comprising the features of claim 1.

[0006] Preferred embodiments are comprised in the subclaims. Preferably, said load ring is splined to the end section of said shaft.

[0007] According to another preferred embodiment said resilient means comprises a disc spring interposed between an end of said sleeve and an adjacent surface of said load ring.

[0008] Preferably, said roll retainer is threaded onto the end section of said shaft.

[0009] Further, the roll assembly may comprise thrust buttons interposed between said bolt members and said load ring.

SUMMARY OF THE INVENTION

[0010] A roll assembly in accordance with the present invention includes a support shaft with a tapered section leading from an abutment to an end section, and a ring shaped roll with inboard and outboard flanks and a cylindrical bore. The roll is axially mounted on the shaft

with its inboard flank seated against the shaft abutment and with its cylindrical bore surrounding the tapered shaft sections. A tapered sleeve is inserted between the tapered shaft section and the cylindrical roll bore. A load ring is rotatably fixed with respect to and axially shiftable on the shaft end section on the outboard side of the roll.

[0011] A resilient element is interposed between the sleeve and the load ring to yieldably maintain an initial gap between the load ring and the outboard flank of the roll, and a roll retainer is mounted on the shaft end section outboard of the load ring. The roll retainer acts in an abutting relationship with the load ring and via the resilient element to gradually and at least partially close the gap between the roll and load ring while gradually and precisely urging the sleeve into its wedged position. Screw members threaded through the roll retainer are then torqued to urge the load ring against the outboard flank of the roll, which in turn urges the inboard flank of the roll against the shaft abutment.

[0012] These and other features, advantages and objectives will now be described in greater detail with reference to the accompanying drawings, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

Figure 1 is a vertical sectional view taken through a rolling mill roll assembly in accordance with the present invention;

Figures 2A-2C are sectional views depicting successive stages in the installation of the roll assembly shown in Figure 1;

Figure 3 is a perspective view of the resilient element interposed between the tapered sleeve and the load ring; and

Figures 4 and 5 are horizontal sectional views taken respectively along lines 4-4 and 5-5 of Figure 1.

DESCRIPTION OF PREFERRED EMBODIMENT

[0014] With reference initially to Figures 1 and 3-5, a roll assembly in accordance with the present invention is generally depicted at 10. The roll assembly comprises a support shaft 12 having a tapered section 14 leading from an abutment 16 provided by a pair of flingers 18a, 18b to an end section 20. The shaft end section 20 is externally splined as at 22 and threaded as at 24. A ring shaped roll 26 has inboard and outboard flanks 28, 30, external grooves 32, and a cylindrical bore 34. The roll 26 is axially mounted on the shaft 12, with its inboard flank 28 seated against the abutment 16, and with its cylindrical bore 34 surrounding the tapered shaft section 14.

[0015] A tapered sleeve 36 is inserted between the tapered shaft section 14 and the cylindrical bore 34 of the roll 26. The outboard end of the sleeve is internally splined as at 38 for mechanical interengagement with

the external splines 22 of the shaft end section 20.

[0016] A load ring 40 is received on and is axially shiftable with respect to the shaft end section 20. The load ring is rotatably fixed to the shaft by means of internal splines 42 coacting in mechanical interengagement with the external shaft splines 22. A disc spring 44 is captured in an internal recess of the load ring by means of a spring retainer 46 held in place by a snap ring 48.

[0017] A roll retainer 50 is threaded onto the end section 20 of the roll shaft. Jack bolts 52 are threaded in through bores containing thrust buttons 54.

[0018] The roll assembly is installed in stages as depicted by the following drawings:

Figure 2A

[0019] The roll 26 is mounted on the shaft end section 20 with its inboard flank 28 in contact with the abutment 16, and with its cylindrical bore 34 surrounding the tapered shaft section 14. The tapered sleeve 36 is inserted without a radial interference fit between the roll bore 34 and the shaft section 14.

Figure 2B

[0020] The load ring 40 is mounted on the shaft end section 20, with its internal splines 44 interengaged with the external splines 22. The disc spring 44 coacts via the spring retainer 46 with the outboard end of the sleeve 36 to yieldably maintain a gap 56 between the load ring and the outboard flank 30 of the roll.

Figure 2C

[0021] The roll retainer 50 is threaded onto the shaft end section 20 and torqued to compress the disc spring 44 to an extent sufficient to partially close the gap 56, with the resulting resilient force being sufficient to create an interference fit between the tapered sleeve 36 and the roll bore 34 and tapered shaft section 14. At this juncture, therefore, the roll is precisely centered on the shaft.

Figure 2D

[0022] The jack bolts 52 are torqued to urge the load ring 40 against the outboard flank 30 of the roll 26, which in turn results in the inboard roll flank 28 being urged against the abutment 16.

[0023] In light of the foregoing, it will now be understood that prior to torquing the jack bolts 52, the tapered sleeve 36 is firmly seated with an interference fit between the cylindrical roll bore and the tapered shaft section. This insures that the roll is precisely centered on and aligned axially with the roll shaft. Torquing the jack bolts then completes the installation by axially clamping the roll between the shaft abutment and the load ring, the latter being in annular area contact with the outboard roll flank. This reliably transmits torque from the roll shaft

to the roll without resulting roll damage.

Claims

1. A rolling mill roll assembly comprising:

a support shaft having a tapered section leading from an abutment to an end section;
a ring-shaped roll having inboard and outboard flanks and a cylindrical bore, said roll being axially mounted on said shaft with its inboard flank seated against said abutment and with its cylindrical bore surrounding said tapered shaft section;
a tapered sleeve inserted between the tapered section of said shaft and the cylindrical bore of said roll;
a load ring rotatably fixed with respect to and axially shiftable on the end section of said shaft; resilient means interposed between said load ring and said sleeve for yieldably maintaining a gap between said load ring and the outboard flank of said roll;
a roll retainer mounted on the end section of said shaft, said roll retainer acting in an abutting relationship with said load ring and via said resilient means to close said gap and axially wedge the tapered portion of said sleeve between the tapered section of said shaft and the cylindrical bore of said roll; and
bolt members threaded in through bores in said roll retainer, whereupon torquing of said bolt members urges said load ring against the outboard flank of said roll, which in turn urges the outboard flank of said roll against said abutment.

2. The roll assembly of claim 1 wherein said load ring is splined to the end section of said shaft.

3. The roll assembly of claim 1 or 2, wherein said resilient means comprises a disc spring interposed between an end of said sleeve and an adjacent surface of said load ring.

4. The roll assembly of claim 1, 2 or 3, wherein said roll retainer is threaded onto the end section of said shaft.

5. The roll assembly of claim 1, 2, 3 or 4 further comprising thrust buttons interposed between said bolt members and said load ring.

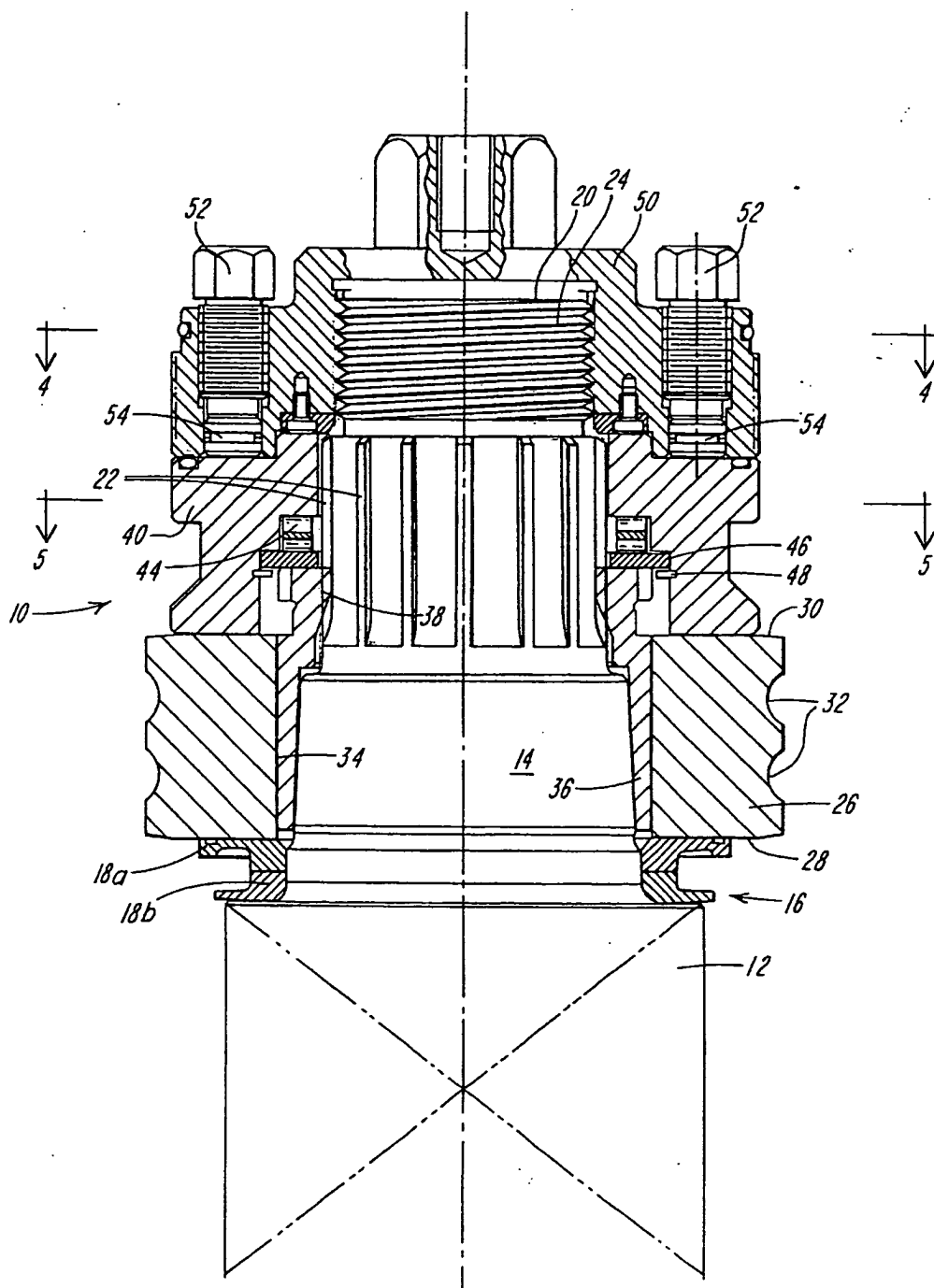


FIG. 1

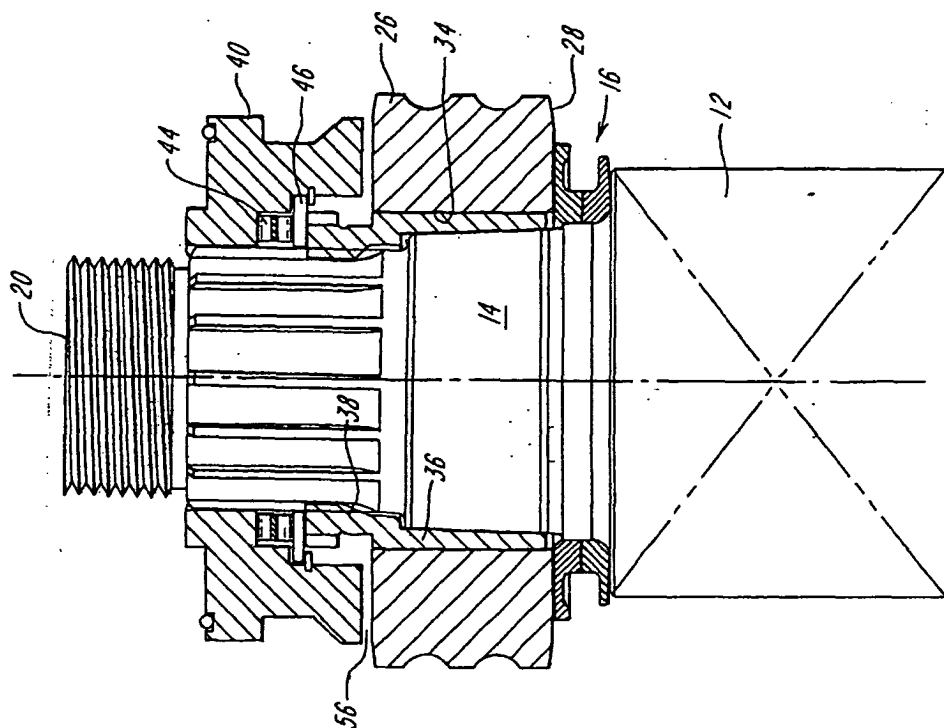


FIG. 2B

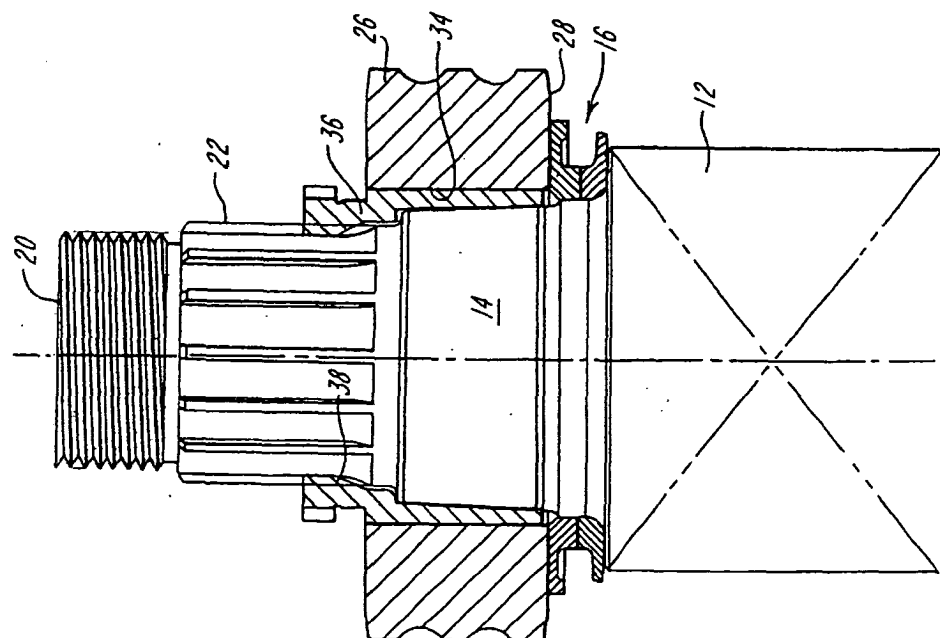
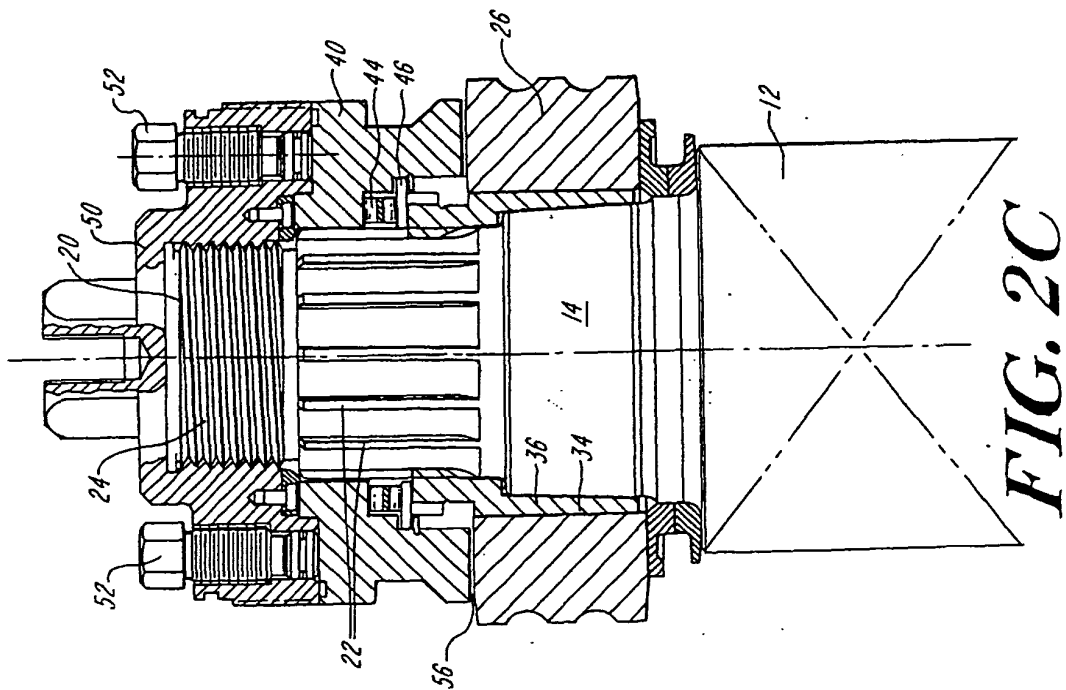
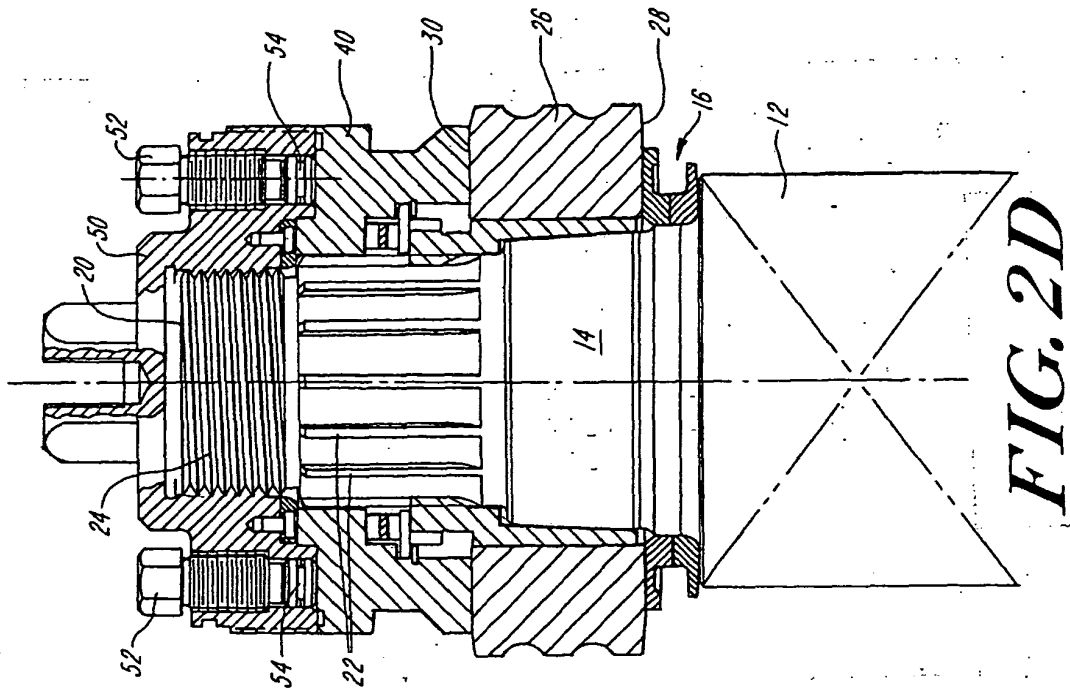


FIG. 2A



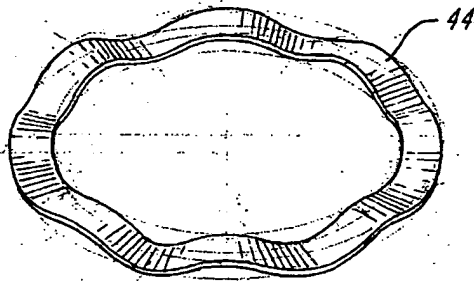


FIG. 3

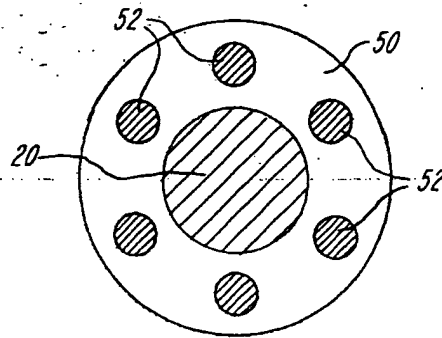


FIG. 4

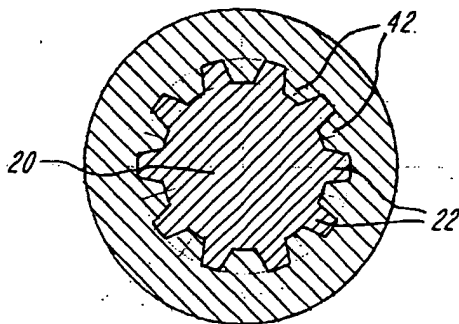


FIG. 5