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(54) A spindle for pilgrim-process rolling mill.

(57) On a pilgrim-process rolling mill (1), a mandrel (10) is held locked against radial movement within a cradle-shaped seat (12) formed in a spindle (8) by a head (19) having a lug (20) and being guided for movement in the spindle into and out of an operative position where the lug (20) overlies the tang (9) of the mandrel (10); no specific machining of the mandrel tang being necessary to have it locked in the cradle seat, such a spindle can directly accept mandrels from existing pilgrim-process rolling mills.

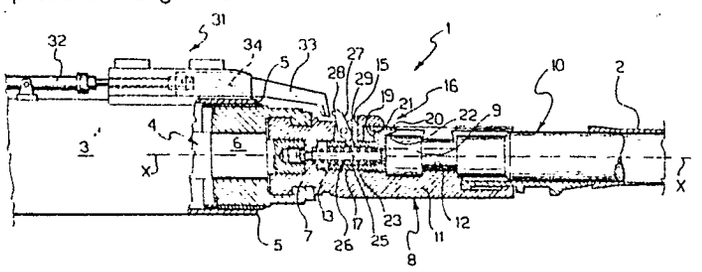

FIG.1

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This invention relates to a spindle for pilgrim-process rolling mills, being of a type which includes a body formed with a substantially cradle-shaped seat extending along an axis of said body and adapted to receive the tang of a mandrel, and locking means mounted on said body and effective to lock the tang radially in the cradle-shaped seat.

For a pilgrim-process rolling mill to operate properly, it is necessary, as is known, to prevent the mandrel from becoming uncoupled from the spindle, which uncoupling may occur when the spindle presents the cradle-shaped seat -- which has a substantially U-shaped cross-section and accommodates the mandrel tang -- turned downwards.

Several devices have been conventionally arranged on the spindle to fill that need which have a detent adapted to engage in notches or recesses formed in the mandrel tang and hold the mandrel in the cradle seat.

Conventional spindles equipped with such devices have, however, the disadvantage that they involve machining the mandrel tang ends purposely to form said notches and recesses therein.

A further shortcoming of prior spindles is that quite often, if the mandrel does not fit properly in the cradle seat the detent will fail to correctly engage its respective notch or recess in the tang, and the mandrel-to-spindle coupling is therefore insecure and unreliable.

It is an object of this invention to provide a spindle as indicated which has such construction and performance characteristics as to overcome the drawbacks with which the prior art is beset.

This object is achieved according to the invention by a spindle of the type specified above being characterized in that said locking means comprises a head formed with a lug and mounted in said body for guided movement into and out of an operative position where said lug is extended over the cradle-shaped seat to overlie said tang.

The features and advantages of a spindle according to this invention will be apparent from the following detailed description of a preferred embodiment thereof, to be taken by way of illustration and not of limitation in conjunction with the accompanying drawings.

In the drawings:

Figure 1 is a fragmentary, part-sectional side view showing schematically a pilgrim-process rolling mill incorporating a spindle according to the invention; and

Figure 2 is an enlarged scale, perspective view showing schematically the spindle of Figure 1.

With reference to the drawing views, the numeral 1 generally designates a pilgrim-process rolling mill, only partially shown, designed for hot rolling a seamless pipe 2.

The rolling mill 1 comprises a hydropneumatic box 3, known per se, which has a piston 4 movable in the direction of a horizontal rolling axis X-X along guides 5, and driven for rotation about its own axis by a drive means, not shown.

The piston 4 has a piston rod 6 to which a tang 7 of a spindle 8 is coupled axially. The spindle 8 is intended to hold the tang 9, substantially cylindrical in shape, of a mandrel 10 over which the pipe 2 being rolled fits.

The spindle 8 comprises an elongate body 11 formed integrally with the tang 7 and having a longitudinal axis coincident with the rolling axis X-X.

Formed in the body 11 is a substantially cradle-shaped seat 12 which extends in the direction of the axis X-X and opens to the body 11 outside. The cradle seat 12 is adapted to receive the tang 9 of the mandrel 10, whose axis coincides with the axis X-X, with the tang 9 properly fitted in the cradle seat 12.

The numeral 13 designates a cylindrical recess formed in the body 11 and extending in the direction of the axis X-X; the recess 13 opens, at one end 14, into the cradle seat 12. In addition, an aperture 15 formed in the body 11 perpendicularly to the recess 13 puts the recess in communication with the body 11 outside.

Mounted on the body 11 of the spindle 8 is a locking means, generally indicated at 16, which is effective to lock the tang 9 radially within the cradle seat 12.

The locking means 16 comprises a slider 17, substantially tubular in shape, which fits into the recess 13 and is slidable therealong.

At one end of the slider 17 confronting the cradle seat 12, there is arranged a head 19 provided laterally with a lug 20 projecting beyond the head 19 in a parallel direction to the axis X-X.

The slider 17, head 19, and lug 20 are advantageously a unitary construction.

Further, the head 19 and lug 20 jointly constitute a body having a substantially L-shaped longitudinal cross-section and fitting in a seat 21 formed in the body 11 between the recess 13 and the cradle seat 12 and opening into both of them.

It matters to observe herein that the longitudinal axis, coinciding with the axis X-X, of the slider 17, and the axis of the head 19-lug 20 assembly, lie parallel ad a predetermined distance "d" apart (see Figure 2); due to this offsetting, to be obtained by a two-center machining operation, the slider 17 and head 19 are prevented from rotating in the recess 13 and seat 21, respectively.

In accordance with this invention, as the slider 17 is driven along the recess 13, the head 19 would be moved in a guided fashion in the seat 21 on the body 11 of the spindle 8, along the axis X-X

into and out of an operating position where the lug 20 is extended partway over the cradle seat 12 and overlies the tang 9 of the mandrel 10.

Indicated at 23 is a coil spring housed within the slider 17 and stretched between the head 19 and a bottom 24 of the recess 13, which bottom lies opposite the open end 14 of the recess 13.

A spring guide tension rod 25 mounted between the bottom 24 and the head 19. The spring 23 and said spring guide tension rod 25 jointly constitute a sprung means 26 constantly biasing the head 19 with the lug 20 toward said operating position.

A toggle lever, indicated at 27, is pivoted on the body 11 of the spindle 8 at the aperture 15. A first end 28 of the lever 27 protrudes out of the body 11, whereas an opposite second end 29 engages into a hollow 30 formed in the slider 17.

The reference numeral 31 denotes a pusher means arranged to act on the slider 17 via the lever 27 and operative to move the head 19 away from the operative position against the bias force of the sprung means 26.

Said pusher means 31 comprises a hydraulic cylinder 32 lying parallel to the axis X-X and mounted on the box 3, and an arm 33 associated with the cylinder 32 and guided for movement along camming guides 34 toward and away from the first end 28 of the lever 27.

To mount the mandrel 10 to the spindle 8, as previously set with its cradle seat 12 upwards, the pusher means 31 is operated to push the arm 33 against the lever 27.

By moving the lever 27, the slider 17 and head 19 with the lug 20 will be caused to retract from the operative position to an inoperative or home position out of the way in the seat 21, thus clearing the way for the tang 9 of the mandrel 10 to enter the cradle seat 12.

Once the tang 9 is set in the cradle seat 12, the pusher means 31 is deactivated, and the sprung means 26 will push the slider 17, head 19, and lug 20 back into the operative position.

In that position, the lug 20 overlies the end of the tang 9 and holds it within the cradle seat 12 with a wall 22 thereof facing the cradle seat 12 and advantageously set at an angle to the axis X-X.

It should be noted that, by virtue of said sloping wall 22, the lug 20 is enabled to overlie and hold the tang 9 of the mandrel 10 radially even if the latter is not a perfect fit into the cradle seat 12.

Thus, on a spindle for pilgrim-process rolling mills according to this invention, the mandrel can be held securely in its cradle seat in the radial direction without requiring additional machining of the mandrel tang to form any special hollows or notches therein, inasmuch as the locking means of this invention will overlie the tang in the cradle seat.

As a result, the spindle of this invention can accept mandrels from existing pilgrim-process rolling mills without any adaptation work.

Claims

1. A spindle for pilgrim-process rolling mills, being of type which includes a body (11) formed with a substantially cradle-shaped seat (12) extending along an axis (X-X) of said body (11) and adapted to receive the tang (9) of a mandrel (10), and locking means (16) mounted on said body (11) and effective to lock the tang (9) radially in the cradle-shaped seat (12), characterized in that said locking means (16) comprises a head (19) formed with a lug (20) and mounted on said body (11) for guided movement into and out of an operative position where said lug (20) is extended over the cradle-shaped seat (12) to overlie said tang.

2. A spindle according to Claim 1, characterized in that said head (19) is fast with a slider (17) fitting slidably within a recess (13) formed in the body (11) and extending in the direction of said axis (X-X).

3. A spindle according to Claim 2, characterized in that it comprises a sprung means (26) mounted in said recess (13) and acting on said slider (17) to constantly bias said head (19) toward its operative position.

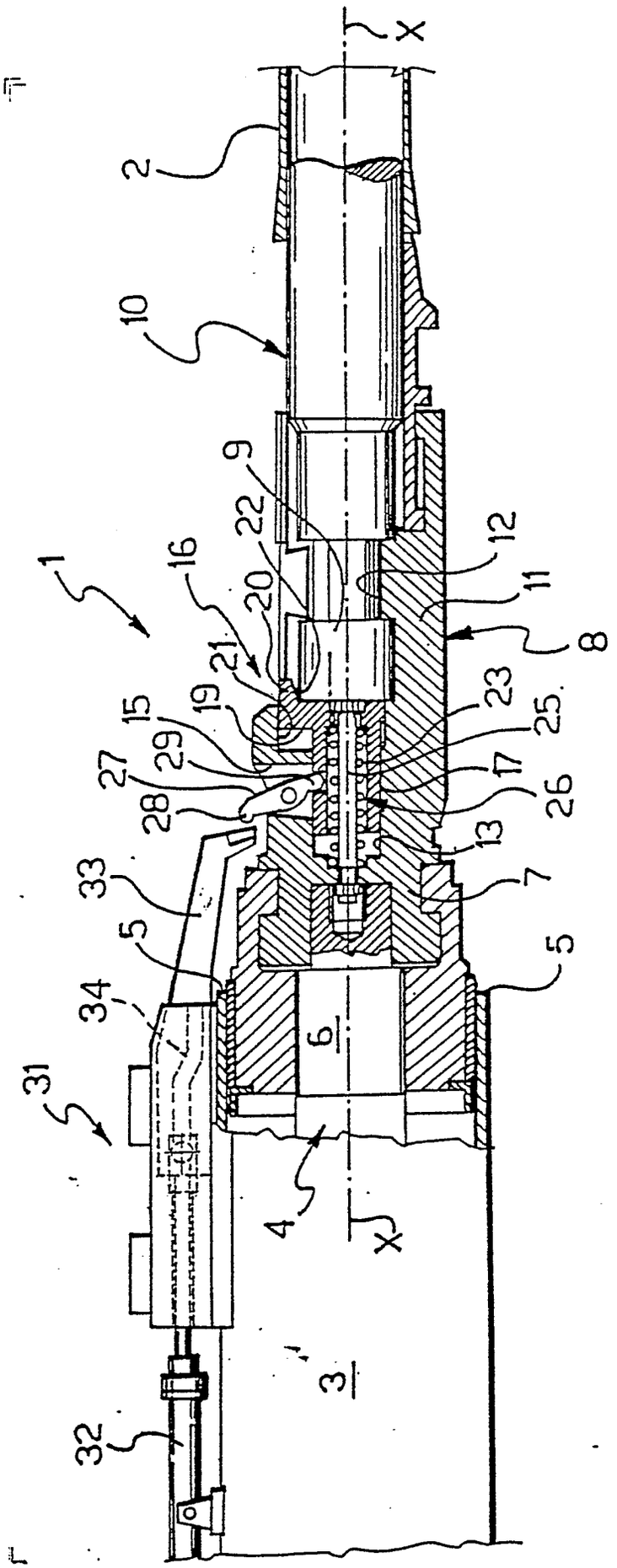
4. A spindle according to Claim 3, characterized in that it comprises a pusher means (31) acting on the slider (17) to move said head (19) out of its operative position against the bias of said sprung means (26).

5. A spindle according to Claim 4, characterized in that said pusher means (31) is arranged to act on one end (28) of a lever (27) pivoted on said body (11) and having its opposite end (29) engaged inside a hollow (30) formed in the slider (17).

6. A spindle according to Claim 2, characterized in that a portion (22) of said lug (20) facing the cradle-shaped seat (12) is set at an angle to said axis (X-X).

7. A spindle according to Claim 2, characterized in that the slider (17), head (19), and said lug (20) are a unitary construction.

8. A spindle according to Claim 2, characterized in that said head (19) and said slider (17) have respective axes lying parallel to each other in mutually spaced-apart relationship.


X
2
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9
22
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X
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32

FIG.1

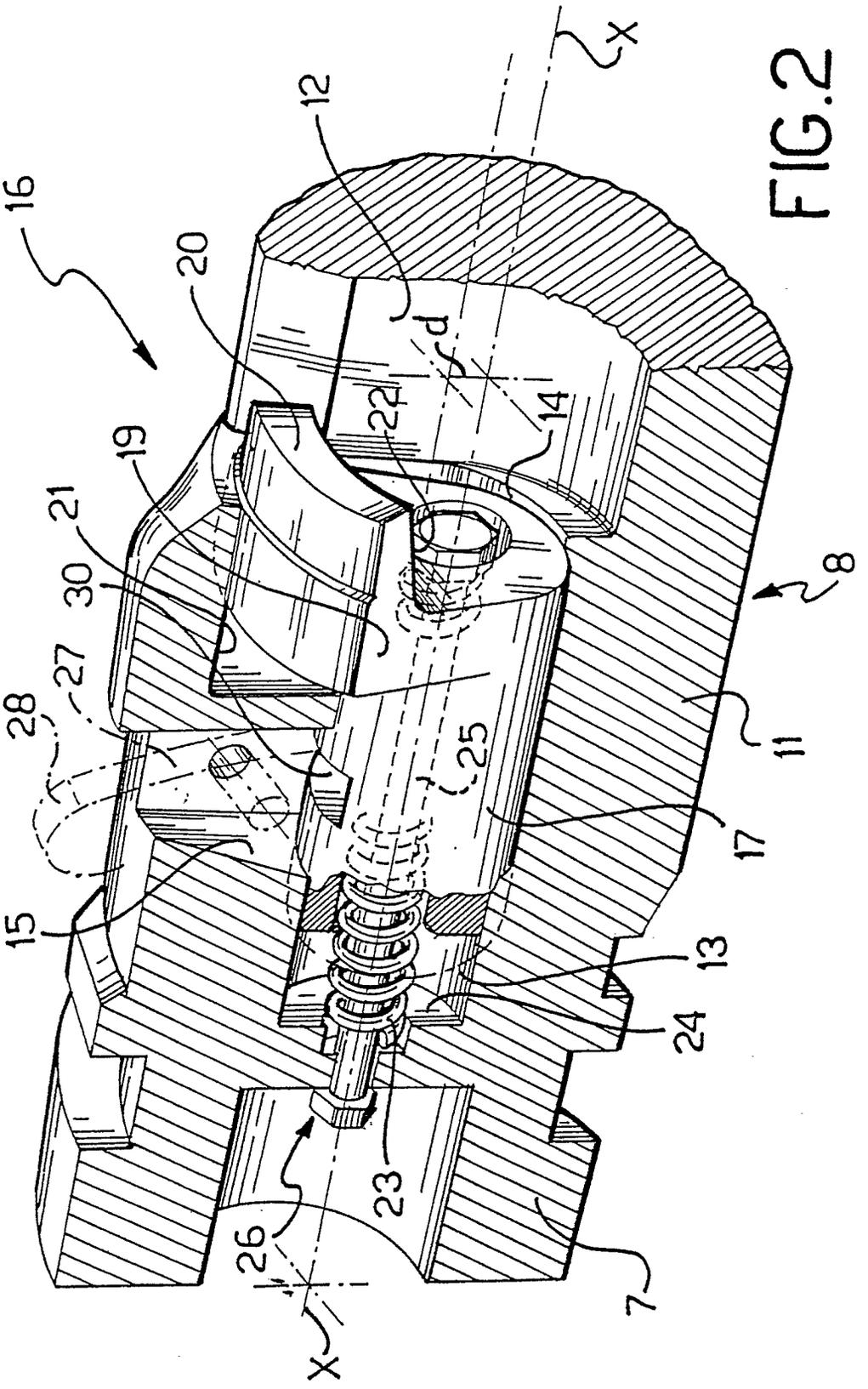

FIG.2