

Jan. 17, 1967

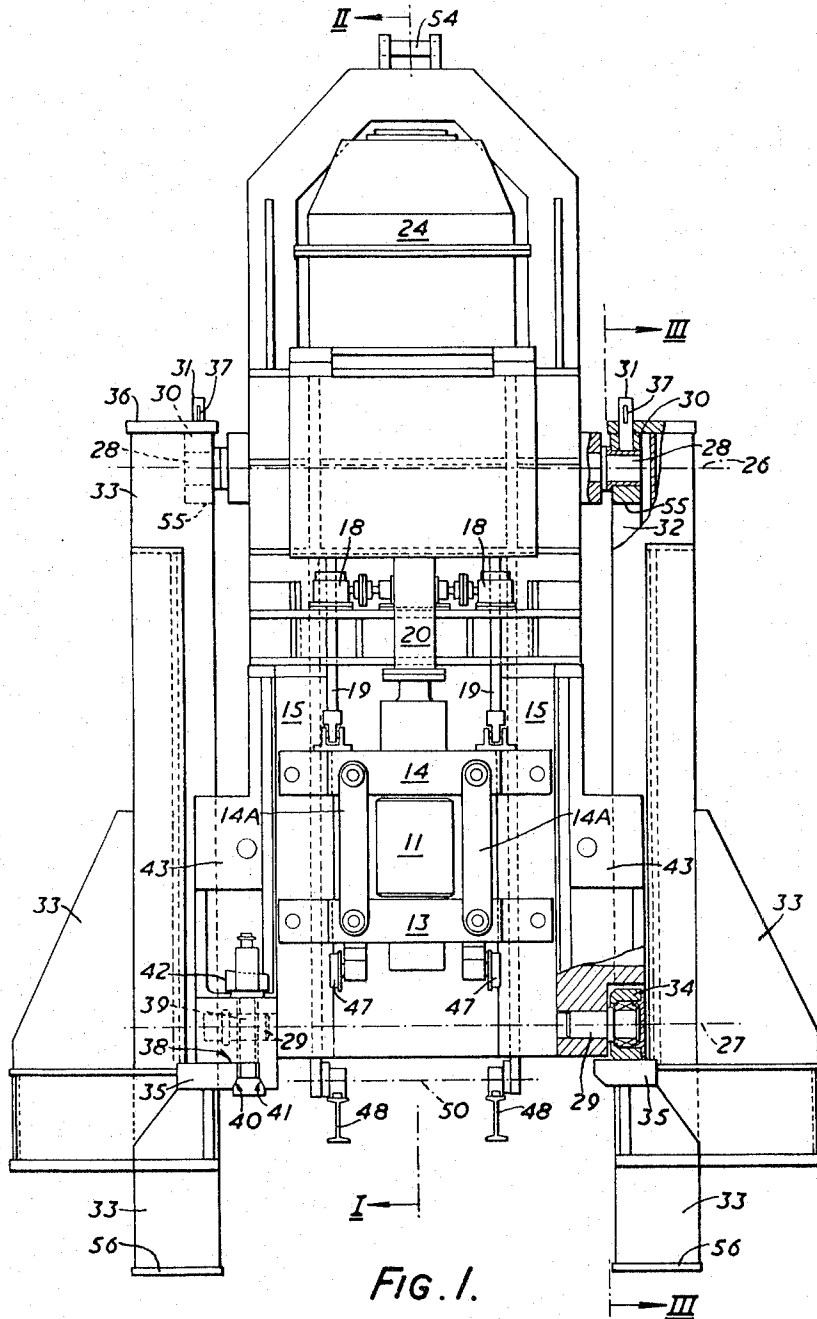
D. STUBBS ET AL

3,298,214

ROLLING MILLS

Filed Oct. 1, 1963

3 Sheets-Sheet 1



INVENTORS
DENNIS STUBBS, COLIN ROY,
H.L.F. BOND & N. VOLLANS
By *Henry C. Weston*
THEIR ATTORNEY

Jan. 17, 1967

D. STUBBS ET AL

3,298,214

ROLLING MILLS

Filed Oct. 1, 1963

3 Sheets-Sheet 2

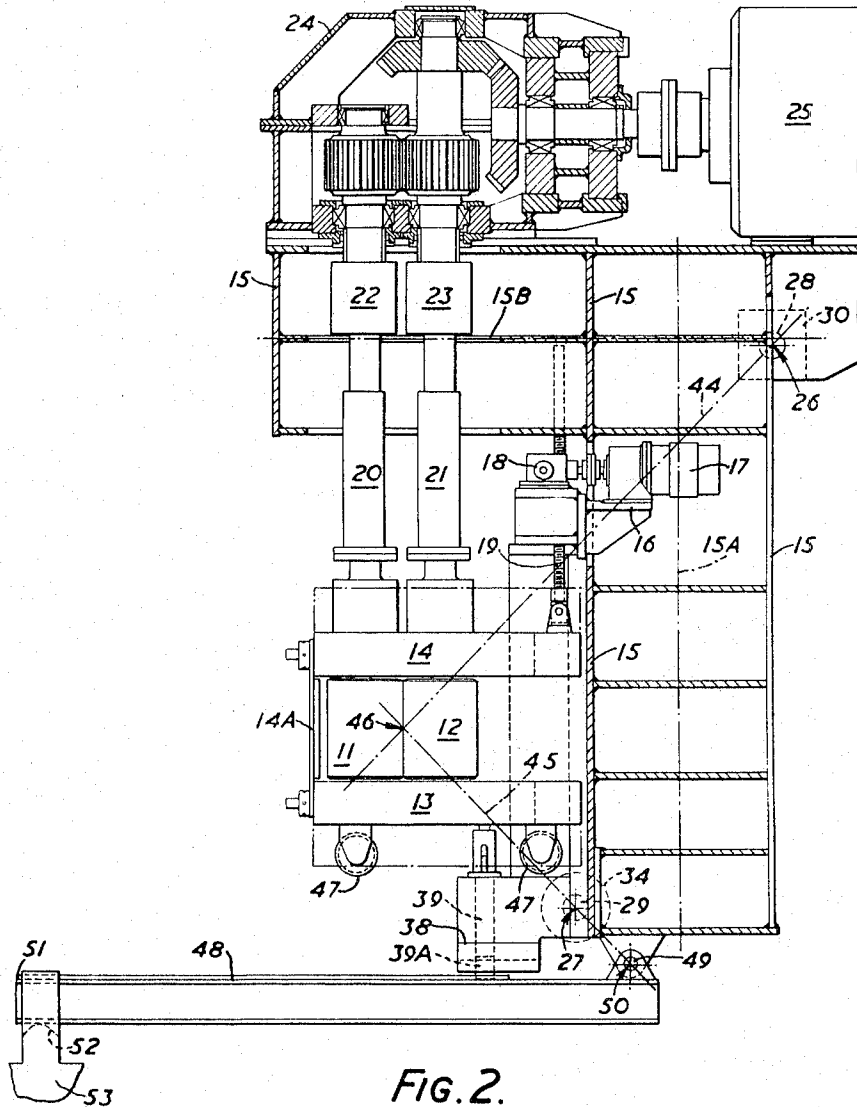


FIG. 2.

INVENTORS
DENNIS STUBBS, COLIN ROY,
H.L. BOND & N. VOLLANS

By

Henry C. Vestin
THEIR ATTORNEY

Jan. 17, 1967

D. STUBBS ET AL

3,298,214

ROLLING MILLS

Filed Oct. 1, 1963

3 Sheets-Sheet 3

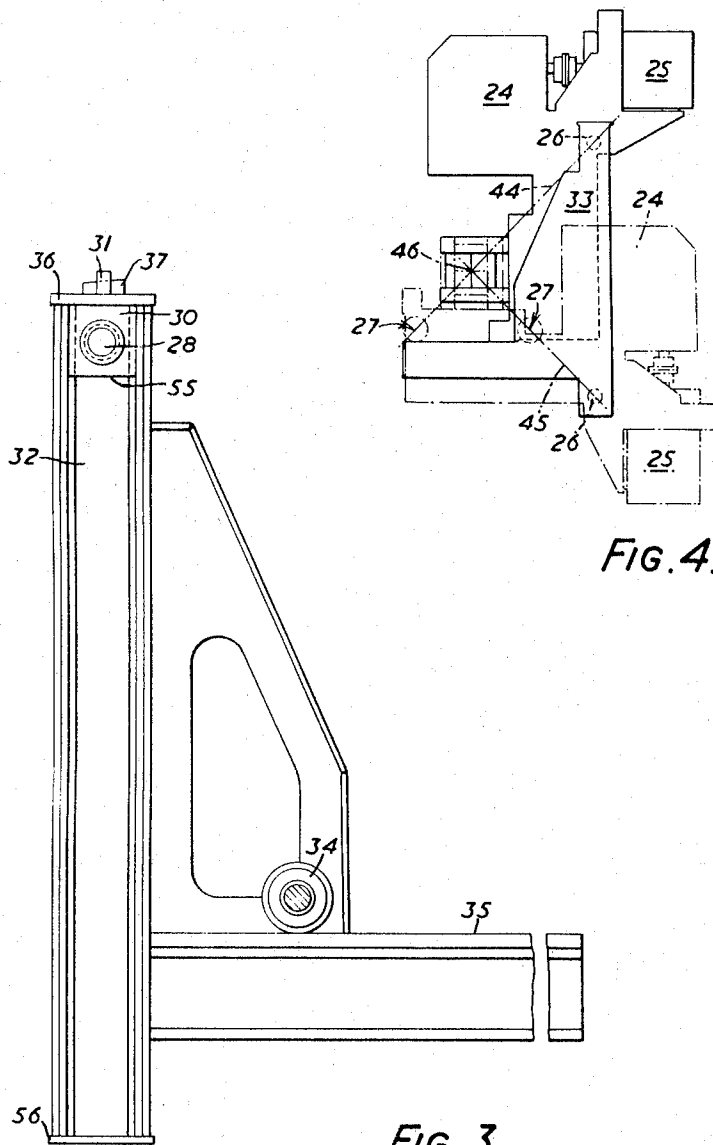


FIG. 4.

FIG. 3.

INVENTORS
DENNIS STUBBS, COLIN ROY,
H.L.F. BOND & N. VOLLANS
By *Henry C. Vestin*
THEIR ATTORNEY

1

3,298,214
ROLLING MILLS

Dennis Stubbs, Sheffield, Colin Roy, Woodhouse, Harry Lawrence Fred Bond, Hathersage, and Neville Vollans, Greasborough, Rotherham, England, assignors to Davy and United Engineering Company Limited, Sheffield, England

Filed Oct. 1, 1963, Ser. No. 338,273
Claims priority, application Great Britain, Jan. 8, 1963, 838/63

8 Claims. (Cl. 72—235)

This invention relates to rolling mills for the rolling down of metals and is particularly concerned with the adaptability of such mills for rolling in more than one plane, and with the accessibility of the rolls and roll adjustment mechanism thereof.

In rolling mills having a succession of mill stands and used for rolling a diverse range of products, it is desirable that the attitude of the axes of the rolls of one or more of the stands should be variable from, for example, the vertical plane to the horizontal plane. Thus, in a rod mill, it is sometimes required that alternate stands of a section of the mill operate with the axes of the rolls in a vertical plane, while the remaining stands of the section, operate with the roll axes in a horizontal plane. At other times it is required that all the stands operate with the roll axes in a horizontal plane.

A "pass line" as that term is used herein, means a line normal to the plane containing the axes of the co-operating work rolls, and passing between the rolls through a point, in the said plane, equidistant from the working surfaces of the rolls. Within the definition, the said point through which the pass line passes may lie at any position along the axial length of the working surfaces of the rolls.

In one aspect the present invention provides a rolling mill in which the structure supporting the rolls is pivotally supported about axes which are movable in planes normal to themselves, whereby the attitude of the axes of the rolls of the mills may be varied.

The structure supporting the rolls is preferably pivotally supported about two parallel axes and the planes of movement of the two axes may be normal to each other.

The pivotal axes of the roll-supporting structure may be so arranged that the plane common to the first pivotal axis and to a pass line of the rolls is normal to the plane common to the second pivotal axis and to the said pass line of the rolls, in which case, when the structure is tilted so that the said planes turn through an angle of 90 degrees, the said pass line of the rolls occupies the same spatial position as it occupied before such adjustment.

The pivotal axes may also be equidistant from a pass line of the rolls, in which case, the said pass line will remain in the same spatial position at all times during such adjustment.

The structure supporting the rolls may also support means for driving the rolls.

In another aspect the present invention provides a rolling mill having a supporting frame consisting of a substantially vertical section from which the housings rotatably supporting the rolls are supported in a cantilever manner, and a substantially horizontal section supporting the driving means for the rolls, from which horizontal section spindles extend from the driving means to the rolls; whereby access to the rolls and roll housings is only impeded on one side by the vertical section of the stand, and to a lesser extent on a second side by the spindles.

In yet another aspect the present invention provides a rolling mill having a supporting frame consisting of two main sections the major axes of which extend in planes substantially normal to each other, one of the said sections supporting the housings in which the rolls are rotatably

2

carried and the other of the said sections supporting the driving mechanism for the rolls.

In a further aspect the present invention provides a rolling mill in which the structure supporting the rolls and the driving means therefor is pivotally supported about axes which are movable in planes normal to themselves, the said structure consisting of two main sections the major axes of which extend in planes substantially normal to each other, one of the said sections supporting the housings in which the rolls are rotatably carried, and the other of the said sections supporting the driving mechanism for the rolls.

The following description relates to the accompanying drawings which show, by way of example, a rolling mill according to the invention.

Of the drawings:

FIGURE 1 is a side view of the rolling mill, parts of which are shown in section;

FIGURE 2 is a section on the line II—II in FIGURE 1;

FIGURE 3 is a view on the line III—III of FIGURE 1; and

FIGURE 4 shows the outline of the mill in both vertical and horizontal positions.

The rolling mill shown includes rolls 11 and 12 rotatably supported in housings 13 and 14, having ties 14A. The housings are slidably supported in a cantilever manner in vertical grooves in a stand 15.

As shown in FIGURE 2, the stand 15 has a vertical section having a major axis 15A, and a horizontal section having a major axis 15B. The stand 15 is provided with a platform 16 carrying a motor 17 which is coupled via worm gear jacks 18 to worm shafts 19 supporting the housings 13 and 14. Operation of the motor 17 causes the housings 13 and 14 to rise or fall, thus providing means for adjusting the rolls relative to a pass line.

The rolls 11 and 12 are coupled via universal spindles 20 and 21 to be driven from shafts 22 and 23. The spindles are slidably engaged with the shafts by means of splines (not shown), thus permitting relative axial movement of the spindles and the shafts. The shafts 22 and 23 are driven from a pinion box 24 which is supported on the stand 15 and which is driven by a motor 25, also supported on the stand 15.

The stand 15 is pivotally supported about two parallel axes indicated by chain lines 26 and 27 in FIGURE 1. The axis of support 26 is provided by trunnions 28, whilst the axis of support 27 is provided by axles 29. The trunnions 28 are provided with bearings 30 which are slidable in vertical channels 32 in frames 33 (one of which is best shown in FIGURE 3) provided at the front and rear of the stand. The axles 29 carry wheels 34 engaging with tracks 35, which are integral with the frames 33.

The frames 33 are arranged so that their channels 32 have their open sides facing each other, and the vertical axes of the channels lie in a common plane which is normal to the plane of the upper surfaces of the tracks 35.

In FIGURE 2 the point indicated at 46 is the point through which the centre pass line of the rolls shown in that figure passes in a direction normal to the plane of the drawing. The plane indicated by the chain dotted line 44 is a plane common to the axis 26 and the centre pass line of the rolls. The plane indicated by the chain dotted line 45 is a plane common to the axis 27 and the centre pass line. The positions of the axes 26 and 27 are chosen so that these planes are normal to each other. With this arrangement, when the stand is tilted so that the planes pass through an angle of 90 degrees, the point 46 occupies the same spatial position as it occupied before such adjustment. This is best illustrated in FIGURE 4, in which the outline of the stand in the vertical position is shown in solid line, and the outline of the stand in the horizontal position is shown in chain line.

The bearings 30 carry vertically extending pins 31, which, in the position shown in FIGURES 1 and 2, pass through holes in portions 36 of the frames 33, and which have eyes in which taper pins 37 are engaged, for the purpose of securing the stand in the position shown.

The stand 33 is provided with pads 38, which, with the stand in the position shown in FIGURES 1 and 2 contact the upper surfaces of the tracks 35, and are secured thereto by means of pins 39, the heads 39A of which have tapered shoulders which engage with corresponding tapered surfaces 40 on the underside of the tracks 35 and with similar surfaces 41 on the stand 15. As indicated by the views shown in FIGURES 1 and 2, the heads 39A of the bolts 39 are rectangular in section in planes normal to the axis of the bolts, so that when the bolts are turned through an angle of 90 degrees from the position shown, the heads will pass without contacting the side faces of the tracks 35, when the stand is tilted. The upper ends of the pins 39 are provided with eyes in which tapered pins 42 engage, again in order to secure the stand in the position shown. The stand 33 is also provided with pads 43 serving the same purpose as the pads 38, when the stand is in the horizontal position. Bolts (not shown) are also provided in the holes in the pads 43, and these bolts are similar to those shown at 39.

The lower housing 13 is provided with wheels 47, which, when the housings 13 and 14 and the roll assemblies they support, are lowered by operation of the motor 17, engage with the rails 48, so that the assembly may be driven out along the rails thus facilitating the roll changing operation. The rails 48 are pivotally secured to the stand 15 by pins 49, having a common axis indicated by the chain dotted line 50, in FIGURE 1. The axis 50 lies in the plane 45 common to the axis 27 and the point 46.

The ends 51 of the rails 48 are slidably and pivotally supported on a surface 52 of a support 53, thus allowing the rails 48 to slide and rock on the surface 52 when the stand is tilted. The axes 26 and 27 are also so arranged in relation to the centre of gravity of the tilting mass that when the stand is in the position shown in FIGURES 1 and 2 of the drawings, a vertical line descending from the centre of gravity, passes between the axis 27 and a vertical line descending from the axis 26. With this arrangement, for tilting the stand from the vertical to the horizontal position, a crane hook may be engaged with lifting pin 54, and the weight of the stand taken until the taper pins 37 can be removed. The taper pins 42 are then tapped loose, the bolts 39 are turned through 90 degrees, and the stand is simply lowered by the crane to the horizontal position. In the horizontal position, the pads 43 contact the upper surfaces of the tracks 35, and lower surfaces 55, of the bearings 30, contact stop plates 56 at the bottom of the grooves 32 in the frames 33. The stand is supported at four spaced points.

The pins 39 in the pads 43 are then turned through 90 degrees, the taper pins 42 are driven home and the stand is then secure for rolling with the axes of the rolls in the horizontal position.

The procedure for tilting the stand from the horizontal to the vertical position is substantially the reverse of that described above.

It will be seen that, in the rolling mill shown in the drawings, the roll housings 13 and 14 are cantilevered from the stand 15. This arrangement greatly facilitates adjustment and maintenance of the roll mechanism when the stand is in either the vertical or horizontal position, since access to the roll mechanism is unimpeded except on the one side of the frame 15 and to a lesser extent on a second side by the universal spindles 20 and 21.

In accordance with the provisions of the patent statutes, we have explained the principle and operation of our invention and have illustrated and described what we consider to represent the best embodiment thereof. However, we desire to have it understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

We claim:

1. A rolling mill comprising a stand, housings, supported by the stand, a pair of rolls having first and second parallel axes and having a pass line therebetween, the rolls being mounted in the housings for rotation about the first and second axes respectively, drive means fixed relative to the stand for rotating the rolls, means for moving the housings relative to the stand and parallel to the first and second axes, the stand being rotatable about a third axis parallel to the pass line of the rolls, displaced from said pass line, and formed by pivots mounted for movement on horizontal tracks in a plane normal to the pass line of the rolls, so that the assembly of stand, housings, drive means and rolls are swingable together through 90 degrees between positions in which the pass line of the rolls occupies the same spacial position.

2. A rolling mill according to claim 1 in which the frame is rotatable about a fourth axis parallel to the pass line of the rolls and formed by pivots slidable in fixed vertical tracks.

3. A rolling mill according to claim 2 in which the third axis and said pass line lie in a plane which is normal to the plane containing the fourth axis and the pass line.

4. A rolling mill according to claim 1 in which the housings are supported by the stand in cantilever manner.

5. A rolling mill according to claim 1 in which vertical grooves are formed in the stand, and the housings are slidably in the vertical grooves.

6. A rolling mill comprising a pair of rolls, housings in which the rolls are rotatably supported, a stand consisting of first and second main sections, having major axes which extend in planes substantially normal to one another, the housing being supported in cantilever manner on the first section, drive means for driving the rolls, means for supporting the drive means on the second section, a frame and means for supporting the stand on the frame for pivotal movement about axes which are movable in planes normal to themselves.

7. A rolling mill according to claim 6 in which the first section extends substantially parallel to the roll axes and the second section extends substantially normal to the roll axes, and the driving means includes spindles extending from the second section to the rolls, the arrangement being such that access to the rolls and roll housings is only impeded on one side by the first section of the stand and on the other side by the spindles.

8. A rolling mill according to claim 7 including means for adjusting the axial position of the rolls and in which the spindles are driven through shafts to which they are slidably engaged by splines to permit axial relative movement between the shafts and the spindles.

References Cited by the Examiner

UNITED STATES PATENTS

749,745	1/1904	Von Philp	72-239
2,049,842	8/1936	Kling	72-238
3,043,170	7/1962	Wales	72-237
3,243,983	4/1966	Norlindh	72-235

CHARLES W. LANHAM, *Primary Examiner.*

G. P. CROSBY, *Assistant Examiner.*