United States Patent

Hinterholzl

[15] **3,650,139**

[45] **Mar. 21, 1972**

[54] ROLLING STAND, PARTICULARLY FOR THE SHAPING OF A CAST BAR IMMEDIATELY UPON LEAVING A CONTINUOUS CASTING PLANT

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[22] Filed: **July 24, 1969**

[21] Appl. No.: **844,337**

[30] **Foreign Application Priority Data**

Apr. 23, 1969 Austria ..... A 3911/69

[52] **U.S. Cl.** **72/249**

[51] **Int. Cl.** **B21b 31/08,** B21b 35/00

[58] **Field of Search** 72/238, 239, 249

[56] **References Cited**

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[57] **ABSTRACT**

A rolling stand, particularly intended for shaping a cast bar immediately upon leaving a continuous casting plant, is described, comprising two horizontal roll supports having their ends connected by a fixed crossmember on one side and a releasable cap on the other side to form a cage wherein a pair of vertical rolls mounted in inserts is arranged to be horizontally displaceable for adjustment of the roll gap. According to the invention the entire rolling stand including the rolls is detachably mounted on a base frame to be vertically removable therefrom, said base frame containing two transmission gears releasably connected for rotation with the roll shafts and enclosed in suspended casings which are moveable together with said rolls; the drive is located below floor and comprises driving spur wheels which are larger than the meshing drive-off spur wheels of the transmission gears by at least half the adjustment range of the rolls to maintain a stress-transmitting engagement of the gearing irrespective of any shifts occuring on roll gap adjustment.

2 Claims, 3 Drawing Figures

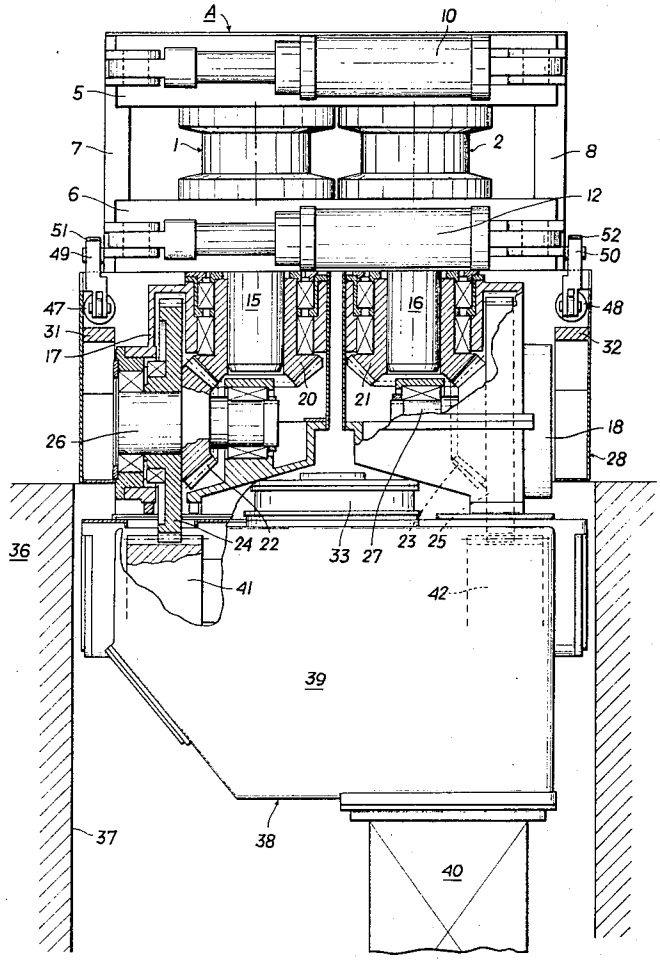

FIG. 1

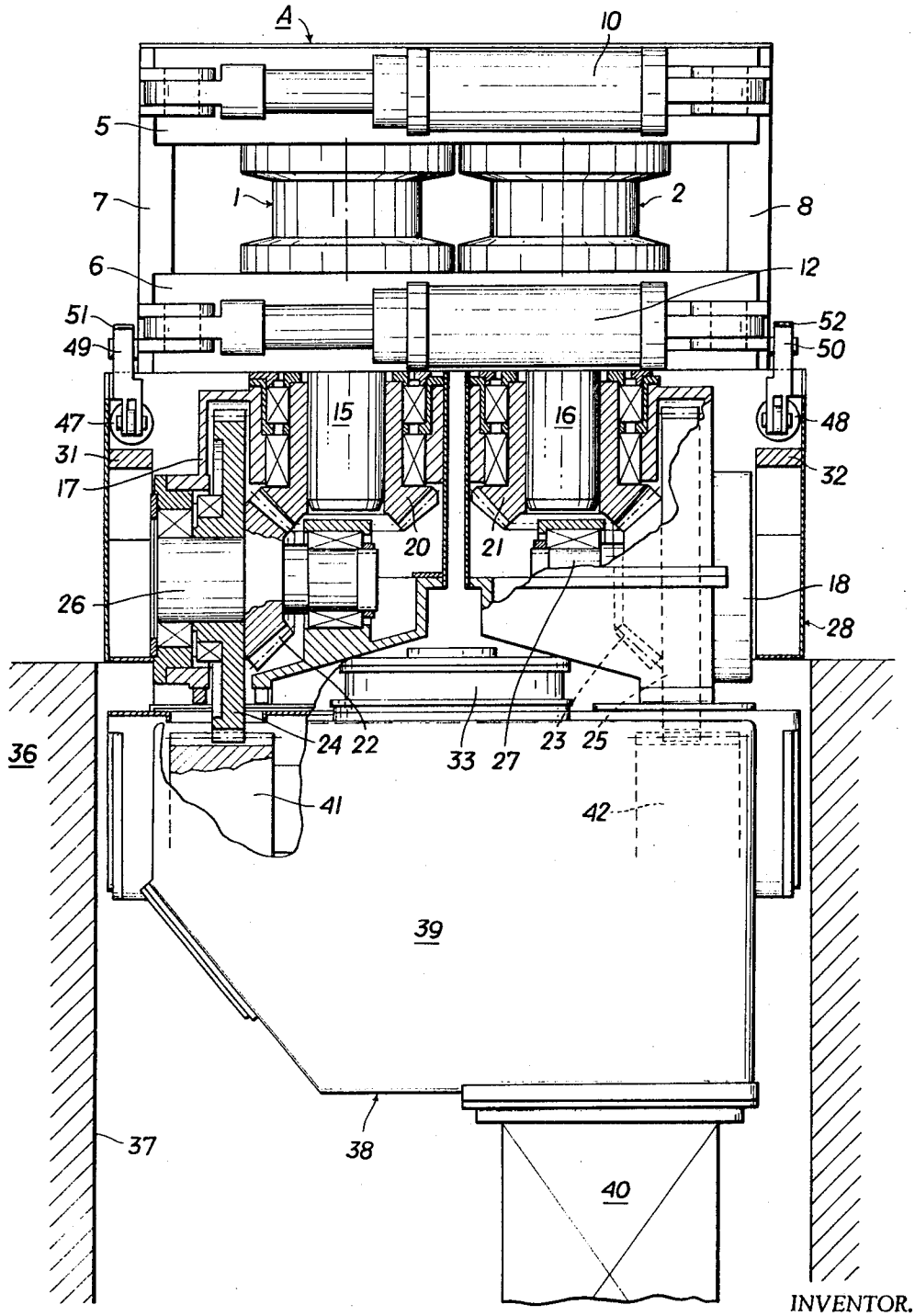

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FIG. 2

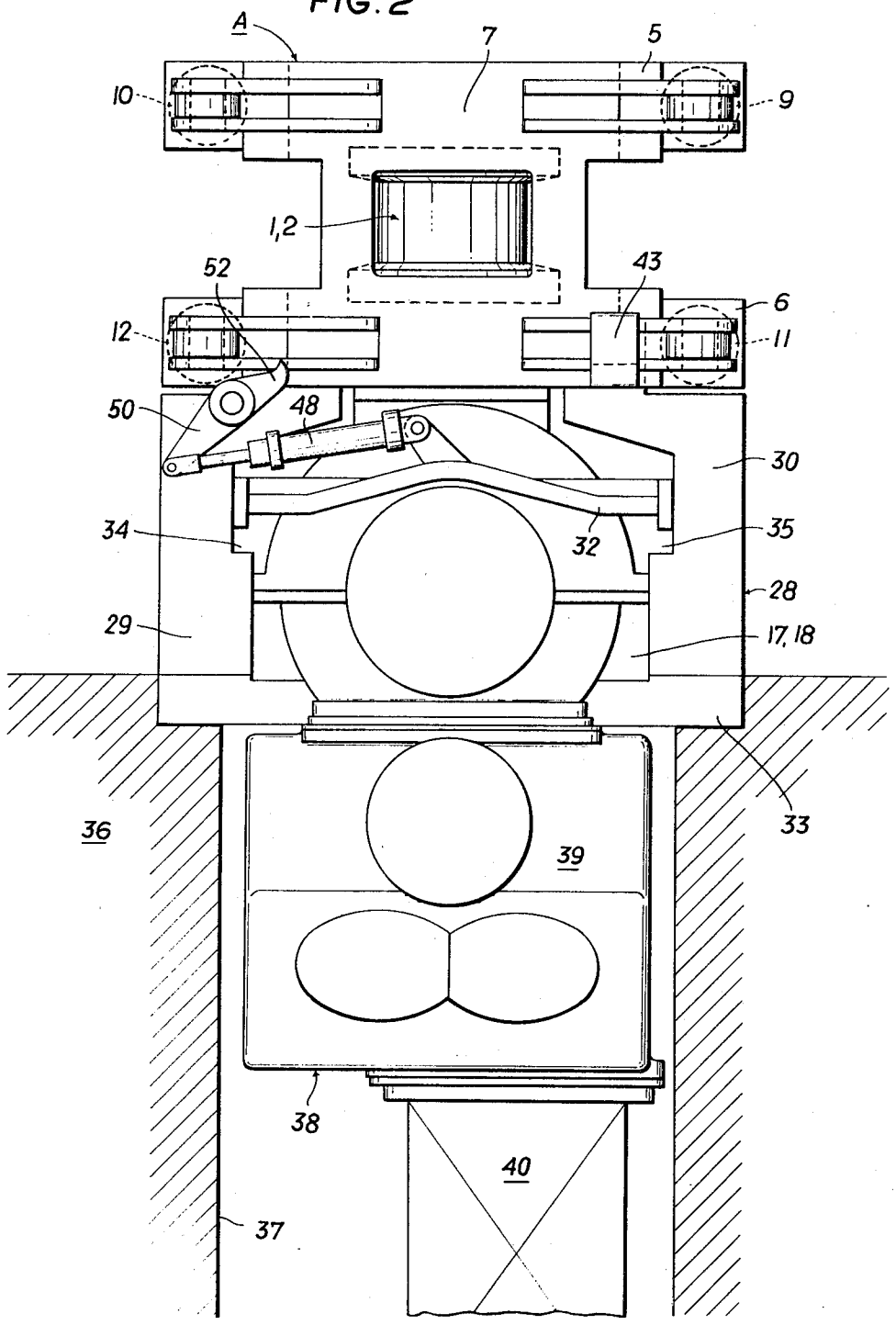

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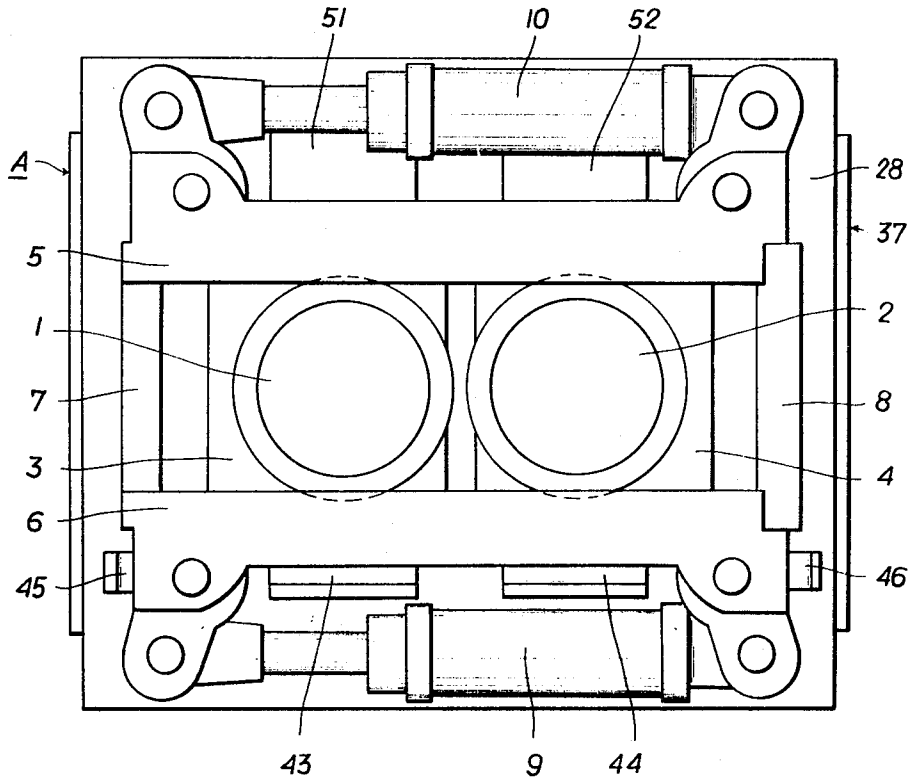
FIG. 3



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ROLLING STAND, PARTICULARLY FOR THE SHAPING OF A CAST BAR IMMEDIATELY UPON LEAVING A CONTINUOUS CASTING PLANT

The present invention relates to a rolling stand, particularly for the shaping of a cast bar immediately upon leaving a continuous casting plant, with two roll supports in which a vertical pair of rolls with its inserts is arranged to be horizontally displaceable, the roll supports having a rigid cross-connection on one side and a detachable cap connection on the opposite side.

The problem with continuous casting plants and in particular with multi-bar continuous casting plants is a space-saving arrangement of the rolling stands used for further shaping of the castings subsequent to the casting process. The aim is to achieve the closest possible side-by-side arrangement of the rolling stands so that the tundish located above the continuous casting molds may be small and any loss in temperature of the liquid steel kept at a minimum. The individual rolling stands have also to be placed in the closest possible tandem arrangement. Due to the low casting speed the feed speed of the casting in the rolling stands is much smaller than with conventional rolling trains, resulting in an undesirably high loss in temperature in the casting to be shaped in case of considerable distances between the individual rolling stands. The compact structure of the rolling stands makes roll changing rather difficult and time-consuming. As rolling stands following continuous casting plants cannot work independently from the casting and melting operations, any roll changing or exchange of rolling stands, respectively, must be carried out as quickly as possible in cases of a change of the rolling program or repairs so that the metallurgical operations will remain unaffected.

According to the invention this problem is solved by detachably mounting the entire rolling stand inclusive of the rolls on a base frame so that it is vertically removable therefrom, two gears enclosed in a gear casing being suspended side-by-side within the base frame and the roll shafts engaging with said gears.

Suitably each gear casing is detachable connected with a roll shaft, the gear casings being horizontally displaceable together with the rolls to allow the adjustment of the roll gap.

The roll shafts are preferably designed as spline shafts or as two-edge pieces and the bevel gears detachably arranged thereupon have adequately shaped bores.

The drive of the rolling stand according to the invention is located below floor in a base pit. The drive is preferably suspended from the base frame, the driving gear being connected with the gears located inside the gear casings by spur wheels which are wider than the drive-off spur wheels inside the gear casings by at least half the adjustment stroke of the rolls, so that their displacement does not result in the disengagement of the spur wheels.

In order that the invention may be more fully understood it will be described by way of example with reference to the accompanying drawings.

FIG. 1 is a front view of a rolling stand with a sectional view of the suspended driving gears,

FIG. 2 is a side view, and

FIG. 3 a plan view of the rolling stand.

Rolls **1, 2** are mounted in inserts **3, 4** being horizontally guided in U-shaped roll supports **5, 6**. At one side the roll supports **5, 6** are rigidly connected by a cross connection **7** and on the opposite side by a detachable cap connection **8** to form a cage-like unit. Numerals **9, 10, 11, 12** designate hydraulically operated cylinders for the adjustment of the rolls **1, 2**.

The roll shafts **15, 16** designed either as spline shafts or two-edge pieces can be connected with the bevel gears **20, 21** located in the gear casings **17, 18** and having adequate bores.

The gear casings **17, 18** are suspended in a base frame **28** and therein horizontally displaceable along the guides **34, 35**. The base frame **28** consists of the two longitudinal supports **29, 30** held together by two detachable cross-connections **31, 32** and a fixed cross-connection **33**. The base frame **28** is secured and fixed to the base **36** by centering bolts and anchor screws. The rolling stand A is fixed to the base frame **28** by several centering devices **43, 44, 45, 46** and secured by hydraulically operated clamping devices **47, 48, 49, 50, 51, 52** fixed to the base frame **28** or its cross-connections **31, 32**, respectively, and acting from below on the roll support **6**, said connection being quickly and easily detachable. In detail the clamping devices consist of the hydraulically operated cylinders **47, 48**, the levers **49, 50**, and the clamps **51, 52**.

The gears arranged displaceably in the base frame **28** consist of the bevel gears **20, 21**, which can be connected with the roll shafts **15, 16** and are in engagement with the bevel gears **22, 23**. The bevel gears **22, 23** together with the spur wheels **24, 25** are each fixed to a common shaft **26** and **27**. The spur wheels **24, 25** are in engagement with the spur wheels **41, 42** of the drive **38**, the spur wheels **41, 42** being wider by at least half the adjustment stroke of the rolls **1, 2**. The drive **38** with the driving gear **39** and the motor **40** is located in a base pit **37** or—as shown in FIGS. **1** and **2**—suspended from the cross-connection **33** of the base frame **28**.

The torques required for shaping the casting are transmitted by the drive **38** via the spur wheels **41, 42** to the spur wheels **24, 25**, which due to the greater width of the spur wheels **41, 42** cannot become disengaged. From the spur wheels **24, 25** the torques are transmitted to the bevel gears **22, 20** and **23, 21**, respectively, and to the rolls **1** and **2**, respectively.

The removal of the rolling stand A is effected upon opening the clamping devices **47, 48, 49, 50, 51, 52** by vertical lifting, e.g., by means of a crane. The roll shafts **15, 16** are accordingly disengaged from the bevel gears **20, 21**. The hydraulically operated cylinders **9, 10, 11, 12**, and the lubricating spots of the rolling stand A are coupled to their pertinent connecting lines by means of rapid-action connections, not shown. Said connections have to be released before removal.

Other assembly activities on the rolling stands, such as roll changing, adjusting the roll gap, the axial adjustment of the rolls and the like, as well as repair and maintenance tasks are done outside the steel mill at roll workshops, a fully assembled and adjusted rolling stand being meanwhile installed in the rolling train. The provision of an exchange rolling stand allows short-term unproblematic roll changing with minimum stoppages.

What I claim is:

1. A rolling mill assembly for shaping rolling stock including continuously cast bars comprising,

a base frame,

two horizontally displaceable gear casings suspended side-by-side in the base frame,

two transmission gears, one of the transmission gears enclosed in each of the gear casings,

a drive in communication with the base frame and adapted to drive the transmission gears,

a rolling stand detachably mounted on the base frame,

a pair of horizontally displaceable vertical rolls mounted in the rolling stand,

a pair of shafts, one of the shafts rigidly connected to each of the rolls and projecting downwardly therefrom, and

the shafts in releasable rigid engagement with the transmission gears, a horizontal displacement of the rolls providing a similar and corresponding displacement of the gear casings.

2. A rolling mill assembly for shaping rolling stock including continuously cast bars comprising,

a base frame,

two horizontally displaceable gear casings suspended side-by-side in the base frame,

two transmission gears, one of the transmission gears enclosed in each of the gear casings, and each transmission gear having a drive-off spur wheel,

a drive in communication with the base frame and having a driving gear with a pair of driving spur wheels,

a rolling stand detachably mounted on the base frame,

a pair of horizontally displaceable vertical rolls mounted in the rolling stand,

a pair of shafts, one of the shafts rigidly connected to each of the rolls and projecting downwardly therefrom, the shafts in releasable rigid engagement with the transmission gears, a horizontal displacement of the rolls providing a similar and corresponding displacement of the gear casings, and

the driving spur wheels being wider than the drive-off spur wheels by at least one-half of the maximum horizontal displacement range of the rolls.

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