Jan. 26, 1971 K. ILLERT 3,557,595

UNIVERSAL ROLLING MILL

Filed March 12, 1968

FIG. 2

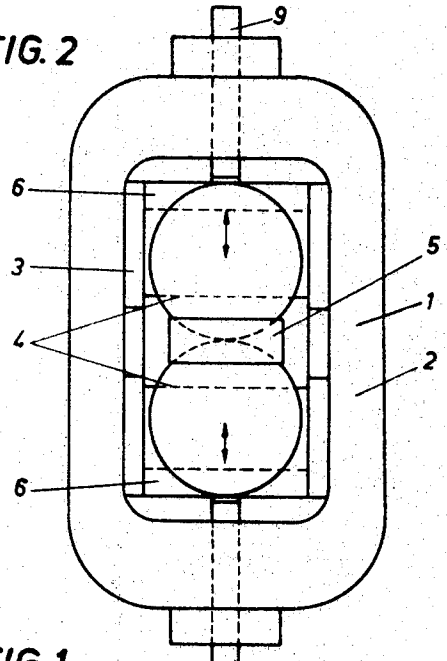


FIG. 4

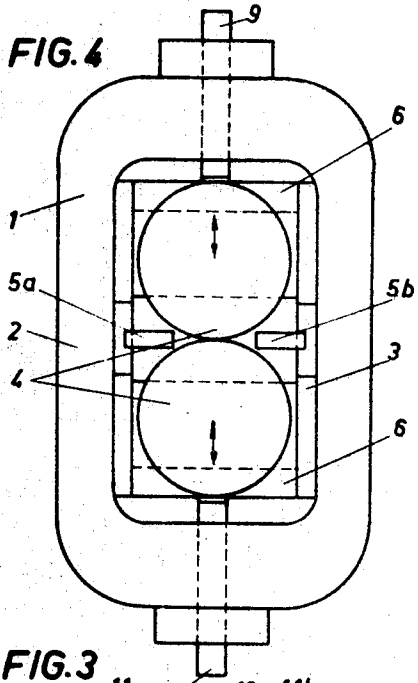


FIG. 1

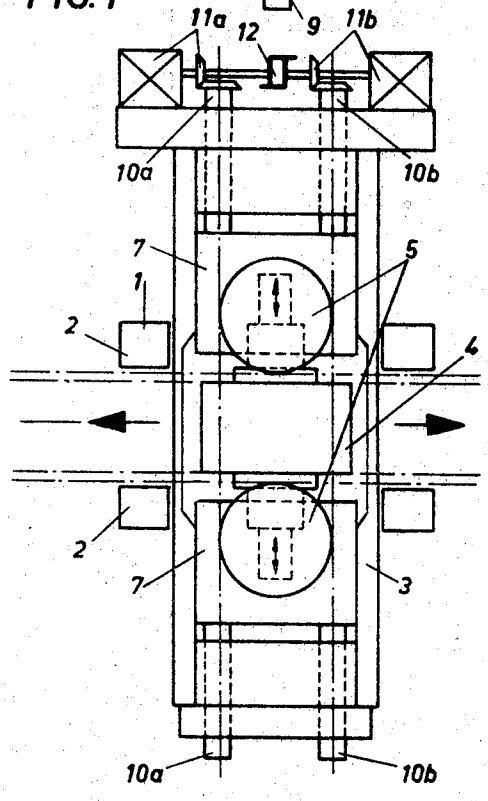
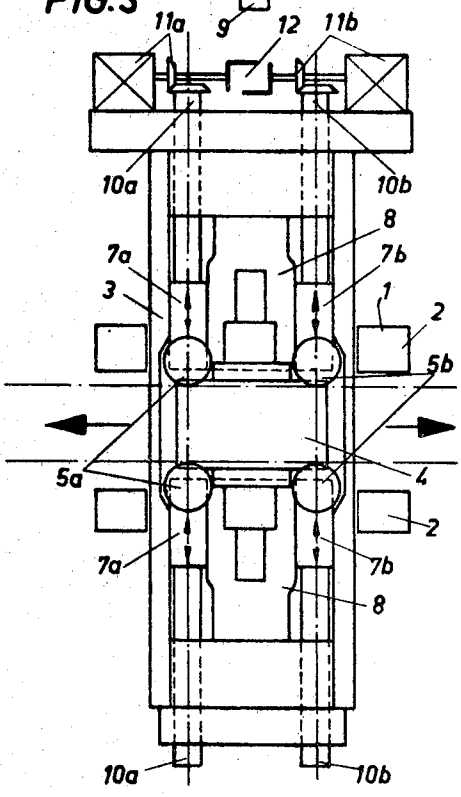


FIG. 3



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UNIVERSAL ROLLING MILL

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Int. Cl. B21b *31/08*
U.S. Cl. 72—237 5 Claims

ABSTRACT OF THE DISCLOSURE

The universal rolling mill disclosed is designed for alternative employment for rolling either beams or plate. The rolling mill comprises housings for supporting a frame that, in turn, receives a pair of horizontal rolls with their chocks. The frame, when rolling beams, supports a pair of vertical rolls and their chocks located in a co-planar relationship with the horizontal rolls. When rolling plate, the frame supports the chocks of two pairs of vertical rolls located within the region of the circumference of the horizontal rolls. The frame is also provided with two pairs of screws for independently adjusting each pair of vertical rolls when rolling plate or by means of a clutch synchronously adjusting the vertical rolls when rolling beams. The housings are each provided with screws for adjusting the horizontal rolls.

BACKGROUND OF THE INVENTION

Universal mills commonly known in the art are employed for rolling beams with parallel flanges. In addition to two horizontal rolls, such mills are provided with two vertical rolls, the rolling plane of the one pair of rolls being coincidental with that of the other pair of rolls. As a rule the horizontal rolls do work on the web of a beam and its flanges are formed by the vertical rolls against the end faces of the horizontal roll bodies. Since the end faces of the horizontal roll bodies act as a support for the flanges being worked by the vertical rolls, the vertical rolls must be arranged in the mill stand in the same vertical plane as the horizontal rolls.

Pairs of horizontal and vertical rolls are also used for rolling flat products. In this case the vertical rolls, commonly referred to as the edging rolls, are employed to work the edges on either side of the flat product passing through the horizontal rolls. To obtain products of suitable quality, the width of this flat product must be less than the body length of the horizontal rolls and, furthermore, the body length of the vertical rolls, to have the desired edging effect, must be greater than the thickness of the rolled product. As a result, such edging rolls, unlike the vertical rolls in universal beam mills, cannot be arranged in the same vertical plane as the horizontal rolls. Consequently, the pairs of vertical rolls are supported in special edging mill stands arranged immediately in front of and at the back of the horizontal roll stand. These edging mill stands are in their best location when arranged so close to the horizontal mill stand such that the vertical rolls are located where the usual rolled product guides would be positioned. It is then practically impossible to adapt guides for rolled products entering and leaving the roll pass.

The installation of special edging stands in front and at the back of the horizontal stand for rolling flat products not only entails considerable cost, but also presents the additional disadvantage that the vertical edging rolls are located a comparatively long distance from the vertical plane containing the horizontal rolls. This gives rise to technical problems, such as in the event the leading end of the product is either tapered or bent. Trains of

such roll stands are, moreover, uneconomical to operate because, in most instances, they cannot be permanently employed to capacity.

SUMMARY OF THE INVENTION

The object of the invention is to eliminate the aforedescribed disadvantages of rolling mills employed for rolling flat steel products. The aim is thus to design a rolling mill for reducing flat steel products so that the vertical edging rolls do not have to be mounted in separate mill stands in front and at the back of the horizontal rolls, and that the rolling planes of the vertical edging rolls continue to be close to the rolling plane of the horizontal rolls. A further object is to enable the rolling mill to be utilized to capacity, even should there be no orders for rolling flat products.

According to the present invention there is provided a universal mill stand in which the horizontal and vertical rolls, with their chocks, are mounted in a common guide frame or "cassette" and by means thereof can be laterally traversed into and out of the roll housing. The universal mill stand is provided with screw-down screws for adjusting the vertical rolls supported in the guide frame. By this construction, it is a feature of this invention that the guide frame, or "cassette," permits either a pair of vertical rolls to be mounted in the vertical rolling plane containing the horizontal rolls, or two pairs of vertical rolls to be mounted in a desired relationship relative to said plane. The guide frame is preferably provided with two pairs of screw-down screws, each pair being located in the rolling plane of the two vertical rolls. The screw-down screws are coupled together for joint operation when employing only one pair of vertical rolls and are operated individually when employing two pairs of vertical rolls. A universal mill as taught by the present invention offers, on the one hand, the advantage of a compact inexpensive construction and, on the other hand, the possibility for use to roll beams, joists, rails or special sections in addition to flat steel products.

The present invention also provides that the rolling planes of the two pairs of vertical rolls be arranged in the region of the circumference of the horizontal rolls. As a result, the bite of the edging rolls will be effective close to the opening of the two horizontal rolls. This will insure utmost efficiency of the edging rolls without giving rise to guiding problems when reducing flat products.

According to the invention, the chocks for both pairs of vertical rolls can be carried either directly on the side walls of the guide frame or on the end faces of liners located in parallel therewith in the guide frame. The possibility is thus provided to employ the same guide frame, or "cassette," for mounting a set of rolls for reducing flat products or a set of rolls for shaping beams, joists, rails or special sections.

Another feature of the invention is that a separate adjusting motor is provided for each of the two pairs of screw-down screws and that said motors can be individually or jointly operated by selective operation of a clutch. This arrangement also provides a comparatively simple means for changing the mode of operation of the roll stand for rolling either flat products or beams.

As each universal rolling mill stand is usually provided with several exchangeable guide frames, those guide frames not in use can be set up in readiness for a change in schedule. The down-times when changing from one product to another will be only as long as it takes to exchange the guide frames. The periods the rolling mill remains idle are thus minimized.

BRIEF DESCRIPTION OF THE DRAWING

These objects, as well as other features and advantages of the present invention, will be more fully understood

when the following description is read in conjunction with the accompanying drawing, of which

FIG. 1 illustrates a plan view of a universal rolling mill stand set up for rolling beams,

FIG. 2 is an elevational view of the mill stand illustrated in FIG. 1,

FIG. 3 illustrates a plan view of a universal rolling mill stand set up for rolling flat products, and

FIG. 4 is an end view of the mill stand illustrated in FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Before describing the universal rolling mill for beams illustrated in FIGS. 1 and 2, which is convertible into the universal rolling mill for flat products illustrated in FIGS. 3 and 4, and vice versa, it is pointed out that similar components making up these rolling mills have the same reference numerals applied thereto.

The universal mill stands illustrated in FIGS. 1 to 4 of the drawing consist mainly of the roll housings **2** and the guide frame **3**, also referred to as the cassette, which can be laterally advanced into and withdrawn from the roll housings. The frame **3** is designed to accommodate either the horizontal roll set **4** together with the set of vertical rolls **5** as shown in FIGS. 1 and 2 or the set of horizontal rolls **4** together with sets of vertical rolls **5***a* and **5***b* as shown in FIGS. 3 and 4.

In the case of the mill stand **1** equipped for rolling beams as shown in FIGS. 1 and 2, the two horizontal rolls **4** are received in chocks **6** carried direct between the two walls of the guide frame **3**, as clearly shown in FIG. 2. The vertical rolls **5** are adjustably mounted in chocks **7** and likewise retained between the side walls of the guide frame **3**.

From FIGS. 1 and 2 of the drawing it will be seen that when mill stand **1** is set up for rolling beams the axes of rotation of the rolls of both sets **4** and **5** are on one and the same vertical plane. This is necessary when rolling beams, indicated by dot-and-dash lines in FIG. 1, so that with the aid of the pair of vertical rolls **5** the beam flanges can be worked over their full width against the end faces of the bodies of the pair of horizontal rolls **4**.

With reference now to the mill stand **1** equipped for rolling flat steel products and as shown in FIGS. 3 and 4, the pair of horizontal rolls **4** are received in the chocks **6** mounted directly between the side walls of the guide frame **3**. Chocks **7***a* and **7***b* are employed for mounting the two pairs of vertical rolls **5***a* and **5***b*. On the one hand, these chocks are retained by the side walls of the guide frame **3** and, on the other hand, they are carried in special liners **8** inserted in the guide frame **3**.

As shown in FIGS. 3 and 4, the rolling planes of the two pairs of vertical rolls **5***a* and **5***b* are laterally displaced in relation to the rolling plane of the pair of horizontal rolls **4** so that the pairs of vertical rolls **5***a* and **5***b* are located immediately in front and at the back of the vertical plane axes of rotation of the pair of horizontal rolls **4**. By this construction, the vertical rolls can be readily adjusted to achieve the desired edging effect between the bodies of the horizontal rolls **4** on a flat product. This is shown by dot-and-dash lines in FIG. 3.

According to the invention, the set of horizontal rolls **4** in the universal mill stand are adjusted in the usual manner by screw-down screws **9** mounted in the roll housings **2**, as illustrated in FIGS. 2 and 4. By contrast, screw-down screws **10***a* and **10***b* are mounted direct in the guide frame **3** and employed for adjusting the pair of vertical rolls **5** or pairs of vertical rolls **5***a* and **5***b*.

For the purpose of adjusting the vertical rolls the invention provides for two pairs of screw-down screws **10***a* and **10***b* in the guide frame **3**, the center lines of both pairs of screws **10***a* and **10***b* being so located that when two sets of vertical rolls **5***a* and **5***b* are installed in the guide frame **3** the screws are located in the rolling plane of both said sets of vertical rolls **5***a* and **5***b*.

The two pairs of screw-down screws **10***a* and **10***b* are individually driven and the respective drives **11***a* and **11***b* can be operated by means of a clutch **12** jointly, as shown in FIG. 1, or separately, as shown in FIG. 3. The two drives are coupled by the clutch only when one pair of vertical rolls **5** is installed in the guide frame **3**, as shown in FIGS. 1 and 2. This arrangement insures that the two pairs of screw-down screws **10***a* and **10***b* will be operated synchronously to thereby attain uniform distribution of the screw-down pressure on the chocks **7**.

The coupled connection between the two drives **11***a* and **11***b* must be disengaged by means of the clutch **12** when rolling flat steel products when the two pairs of vertical rolls **5***a* and **5***b* are to be independently adjusted to ensure effective use of the vertical rolls **5***a* and **5***b* on the sides of the flat product.

It is the particular feature and advantage of the present invention to provide a universal mill stand equipped for rolling either beams, joists, rails and special sections or for reducing flat steel products, which mill stand can be set up at comparatively small cost and can be quickly and simply reset for changes in the rolling schedule. Consequently, the invention not only enables considerable savings to be made in capital outlay but permits maximum utilization of productive capacity.

In accordance with the provisions of the patent statutes, I have explained the principle and operation of my invention and have illustrated and described what I consider to represent the best embodiment thereof. However, I 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.

I claim:

1. A universal rolling mill alternatively employing two different roll arrangements for processing different products, comprising:

a pair of housings;

a frame adapted to be supported by said housings in a manner that said frame is traversable into and out of said housings for the purpose of changing one of said roll arrangements arranged in said mill for the other roll arrangement awaiting insertion into said mill;

a pair of horizontal roll assemblies received in said frame and whose axes fall within a common vertical plane;

said frame receiving alternative sets of vertical rolls to form with a pair of horizontal rolls said two different roll arrangements;

said alternative sets of vertical rolls comprising a first roll set made up of a pair of vertical roll assemblies carried by said frame and whose axes fall within said vertical plane, and a second roll set made up of two pairs of vertical roll assemblies carried by said frame and whose axes of each pair fall on each side of said vertical plane;

a pair of screws supported by said frame for adjusting each vertical roll of one of said alternative sets of vertical rolls; and

drive means for jointly positioning said pair of adjusting screws for adjusting one of the alternative sets of vertical rolls carried at that particular time by said frame.

2. A universal rolling mill according to claim **1** wherein separate pairs of horizontal roll assemblies are employed with said alternative sets of vertical roll assemblies, and wherein one of the horizontal-vertical roll assemblies is employed to produce a structural shaped product and the other horizontal-vertical roll assembly is employed to produce a flat shaped product.

3. A universal rolling mill according to claim **1** wherein the axes of each pair of vertical roll assemblies of said second roll set are contained within the circumferential limits of said horizontal rolls.

4. A universal rolling mill according to claim 1 further comprising:

vertical surfaces formed on said frame;

said pair of vertical roll assemblies of said first set including roll chocks engaging said vertical surfaces;

said two pairs of vertical roll assemblies of said second set including roll chocks engaging said vertical surfaces; and

a liner member received in said frame between and engageable with a chock of each pair making up said second set of roll assemblies.

5. A universal rolling mill according to claim 1 wherein said drive means includes separate motors for each of said pairs of screws; and

selectively actuatable coupling means for interconnecting the separate motors of said pairs of screws to effect a joint positioning and a separate positioning of said screws.

References Cited

UNITED STATES PATENTS

3,319,449 5/1967 Hill ..... 72—237

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U.S. Cl. X.R.

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