

Sept. 20, 1966

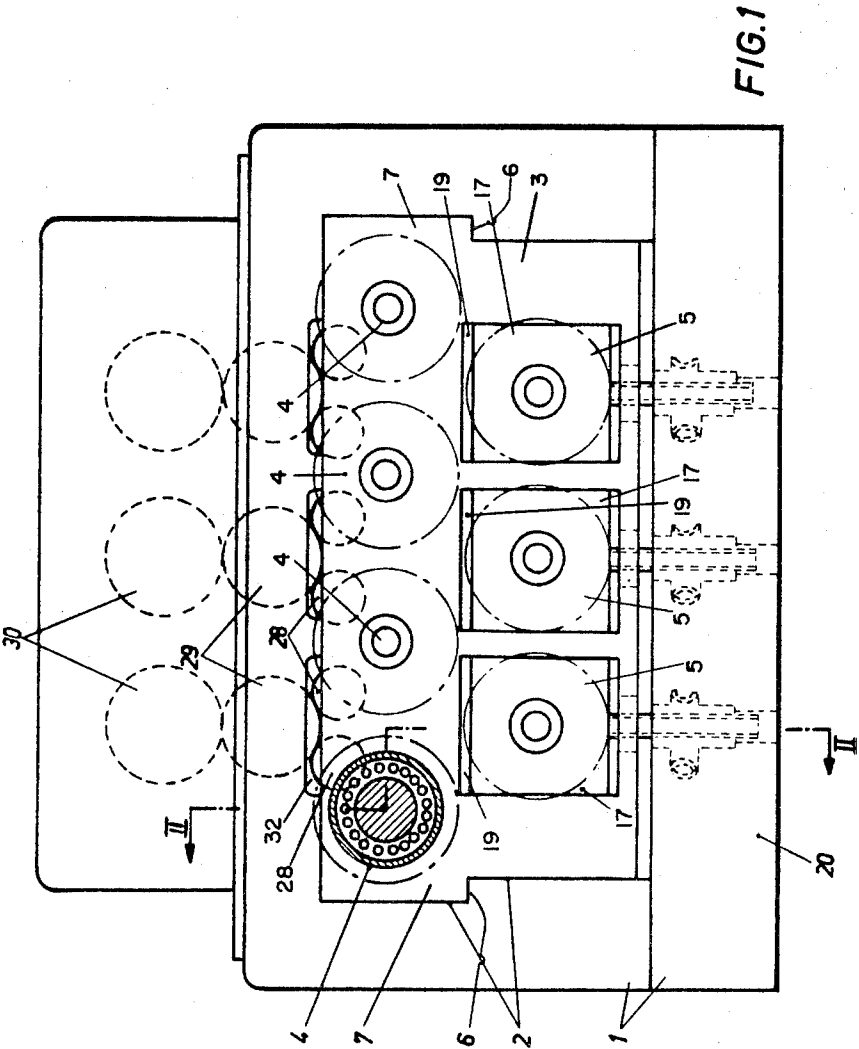
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3,273,369

STRAIGHTENING MACHINE

Filed Sept. 9, 1963

2 Sheets-Sheet 1



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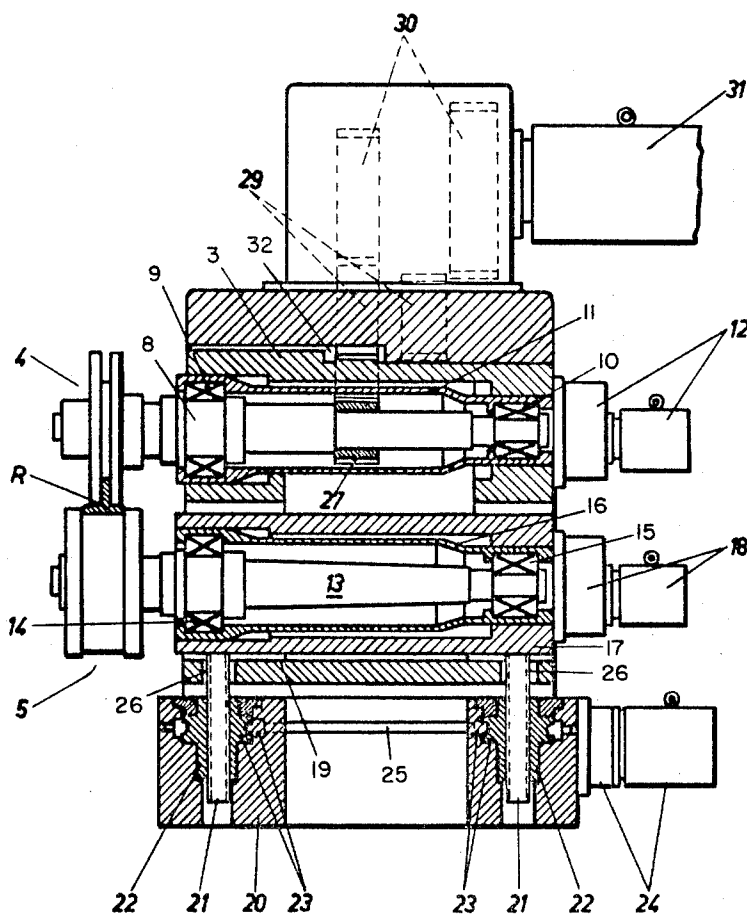


FIG. 2

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STRAIGHTENING MACHINE

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Filed Sept. 9, 1963, Ser. No. 307,604

Claims priority, application Germany, Sept. 13, 1962, S 81,440

7 Claims. (Cl. 72—164)

This invention relates to a straightening machine for the straightening of rails, beams, sheets and similar stock longitudinal in relation to their section, which machine works with the aid of two groups of rollers, whose rolls in the throughpass direction of the straightening stock are positioned staggered in relation to one another and act from opposite sides upon the straightening stock. For that purpose at least the straightening rolls of one roller group are mounted in guide boxes and through displacement means engaging the latter they are individually adjustable against the straightening rolls of the other roller group to produce the straightening pressure.

During the mounting and demounting of rolls of straightening machines, and especially heavy rail and plate straightening machines, there arise considerable difficulties because the rolls inside the machine must be laid open and mounted individually. This takes a considerable amount of time and the thereby conditioned work interruption turns out to be especially disagreeable when the machine is connected to a continuous working process. Namely, either the entire working process must be interrupted or two straightening machines are available that can be alternatively connected to the operating cycle. Attempts have already been made to eliminate these drawbacks by positioning the straightening rolls and the supporting rolls associated with them in a common intermediate frame, that can be lowered from above into the machine frame and fixed therein through the attachment of cross-beams. Irrespective of the fact that also this method of demounting and mounting the straightening rolls, conditioned by the necessity of having to move both the cross-beams and the intermediate frame by means of a special hoist, still brings with it considerable dead times of the straightening machine, it will also be necessary to give a quite sturdy design to the intermediate frame serving to position the sets of rolls. With this type of straightening machines, namely, the intermediate frame has to absorb the full load of the occurring straightening forces and by reason of the required sturdy dimensioning will have a considerable weight. In order to receive the weight of this intermediate frame, the hoist assigned to the straightening machine must be laid out, which again involves a considerable expenditure in time and energy.

The problem on which the invention is based consists of finding a design for a roller leveler which makes it possible to reduce the weight of the intermediate frame demountable from the machine frame and containing the straightening rolls, thereby facilitating the installation and removal of the intermediate frame.

Starting from a roller leveler with which all the straightening rolls of both the top and bottom set are mounted in a removable intermediate frame, the solution of the problem according to the invention is achieved in that of the two groups of rolls positioned in the common intermediate frame, the rolls of one roller group in their working position are provided with a support on the machine body which is independent of the intermediate frame. With this construction the occurring straightening forces are no longer absorbed by the intermediate frame, but instead directed towards the machine body, whereby the function of the intermediate

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frame is merely to hold and guide the straightening rolls, whereby its dimensions can be reduced accordingly. Its weight is thus considerably diminished, thereby facilitating the mounting and demounting.

A further problem to be resolved with the utilization of the aforementioned invention features consists of making possible the mounting and demounting of the intermediate frame on the machine body without the use of a hoist. This solution is achieved by a construction that enables the intermediate frame to move in and out laterally on guides through windows provided in the machine columns. In connection therewith the guides are purposely so arranged in the machine stand that each time during the straightening process they are relieved of the intermediate frame.

Another essential feature of the invention consists of the fact that the displacement means and the drives pertaining thereto for the individual adjustment of the straightening rolls movably guided in the intermediate frame by means of the boxes, are positioned in the machine stand and passing through recesses of the intermediate frame so that they can be placed against the boxes. An especially appropriate development of the straightening machine results in that under load, the one group of rolls through the intermediate frame and the other group of rolls through the roll displacement means engaging the boxes guided in the intermediate frame, are supported against the machine stand, subjecting the latter's cheeks to tensile stresses. It is also of special advantage for the displacement means for the individual adjustment of the straightening rolls guided in the intermediate frame by means of the boxes, to be developed in a way known per se as screw-downs and provide for these screw-downs to be retractable out of the intermediate frame completely into the machine stand.

Finally, according to the invention provision is also made to suspend the displacement drives for the axial alignment of the straightening rolls horizontally on the intermediate frames or boxes within its or their contour lines and to mount the straightening roll drives on the machine stand and to engage or disengage them with the straightening roll shafts positioned in the frame through axial shifting of the intermediate frame in the machine stand.

The drawing represents as an example of application of the invention a roller leveler with overhung straightening rolls, although the object of the invention is also suitable for utilization on roller levelers with straightening rolls mounted on both sides or on sheet levelers.

FIGURE 1 shows the straightening machine in side elevation, and

FIGURE 2 represents the straightening machine according to FIGURE 1 in a section along the plane of line II—II.

As shown in FIGURE 1 the straightening machine consists of a machine housing or stand 1 having a built-in crosswise extending window 2, and of an intermediate frame 3 fitting into this window 2, in which the top straightening rolls 4 and the bottom straightening rolls 5 are positioned. Through the built-in window 2 the machine stand 1 receives a framelike shape, whereby the upper part of the window 2 toward both sides has a wider opening than the bottom part, thereby forming at both ends of the window opening saddlelike bearing areas 6. An intermediate frame 3 serving for the positioning of the straightening rolls 4 and 5 has in its upper part lateral extensions 7 corresponding to the greater opening width of the window 2, by means of whose downwardly directed surfaces it supports itself on the saddlelike bearing areas 6 of the frame 1 and is guided laterally shiftable thereupon.

The top straightening rolls 4, as is distinctly revealed

in FIGURE 2, by means of their shafts 8 through a front bearing 9 and a rear bearing 10, purposely developed as antifriction bearings, are movably mounted in a sleeve 11. Each one of the sleeves 11 is seated non-turnable, but shiftable in the direction of its longitudinal axis directly in the intermediate frame and through a motor drive unit 12 associated with it, suspended on the rear side of the intermediate frame 3, it can be shifted fine-adjustably in the axial direction.

In the same manner as the top straightening rolls 4 the bottom straightening rolls 5, each by means of their shaft 13 and a front bearing 14 and a rear bearing 15, are movably mounted in a sleeve 16. Each one of these sleeves 16 is seated non-turnable, but axially shiftable in a box 17. At the rear end of each box 17 there is suspended a motor drive unit 18 for the precision-adjustable axial displacement of the sleeve 16 and therewith of the straightening roll 5 pertaining thereto, although in a given case it will be appreciated that it may be only necessary to shift one of the two groups of rolls. Similarly to each of the motor drive units 12 being suspended within the contour lines of the intermediate frame 3, each of the motor drive units 18 is arranged within the contour lines of the cross-section of the boxes 17.

Especially does FIGURE 1 of the drawing reveal that the intermediate frame 3 in its bottom part, and in each case indeed lying on a plane of symmetry bisecting the axial spacing of the top straightening rolls 4, contains several rectangular windows 19. Each of the windows 19 has a horizontal dimension corresponding to the width of the boxes 17 and a vertical dimension exceeding the height of the boxes 17. In each of the windows 19 there is seated a box 17, whereby the latter and the straightening roll 5 associated with it is vertically displaceable in relation to the top straightening rolls 4.

As best shown in FIGURE 2 in the base plate 20 of the machine frame 1 there is in front and in the rear beneath each one of the boxes 17 a displacement drive which, for instance, consists of a threaded pressure spindle or screw-down 21 directed vertically and secured against rotation, a screw-nut 22 engaged with the latter and supported in the base plate 20 and a worm drive 23 to actuate the screw-nut 22. Each one of the adjusting devices commonly associated with one box 17 are actuated by a motor drive unit 24 suspended on the machine body 1 through a common worm 25. This causes the two screw-nuts 22 to run synchronously and accordingly to raise or lower synchronously also the two pressure screws 21. The pressure screws 21 can either be withdrawn completely into the base plate 20 of the machine stand 1 or by passing through recesses 26 of the intermediate frame 3 they can be moved upwardly against the boxes 17. Through the pressure screws 21, therefore, the boxes 17 can be moved upwardly and in each adjusted vertical position they can be supported self-locking against the base plate 20 of the machine stand 1. If, on the other hand, the pressure screws 21 are withdrawn completely into the base plate of the machine frame 1, the boxes 17 come to rest on the bottom end surfaces of the window openings 19 on which they are supported.

In the embodiment of the straightening machine represented in the drawing the bottom straightening rolls 5 are not driven. Each of the top straightening rolls 4 receives its drive through its shaft by a pinion 27 keyed thereon, e.g. through another pinion 28, shown only in FIGURE 2, mounted in the intermediate frame, through a spur gear 29 simultaneously engaged with the pinions of two adjacent straightening rolls 4 and, for instance, driven by an electromotor 31 through a sliding gear system 30. Through the pinions 27 and 28 and the spur gears 29 all straightening rolls 4 are maintained in positive drive connection, so that the electromotors 31 acting through the sliding gear mechanisms 30 upon the spur gears 29 effect the common drive of all the straightening rolls 4.

As already mentioned, the pinions 28 engageable with the pinions 27 are likewise positioned in the intermediate frame 3. In connection therewith they have such a position that they extend upwardly out of the intermediate frame 3 and outside thereof they mesh with the common spur gear 29. In the zone of each pinion 28 a groove 32 is worked into the cross-bar of the machine stand extending in the axial direction of the pinion shaft and starting from the front side of the machine stand 1. The purpose of this groove 32 is to prevent the pinion 28 from interfering with the shifting of the intermediate frame 3 in the machine stand 1 after the pressure screws 21 have been withdrawn completely into the base plate 20. Thus during a change in the straightening schedule it becomes possible to quickly remove the hitherto used set of straightening rolls with the aid of the intermediate frame 3 laterally out of the machine stand 1 and move the new set of rolls into the machine stand 1 by means of a similar second intermediate frame. The change of the individual straightening rolls of the removed intermediate frame 3 can then be performed without putting the straightening machine out of action during that time.

During the straightening operation, the straightening stock R, shown in FIGURE 2, passes between and through the top straightening rolls 4 and the bottom straightening rolls 5. In connection therewith the bottom straightening rolls 5 through the pressure screws 21 are so adjusted in relation to the top straightening rolls 4 that the stock R emerges perfectly straight out of the straightening machine. The straightening forces occurring during the leveling operation are conducted by the bottom straightening rolls 5 through the boxes 17 and the pressure screws 21 into the base plate 20 of the machine stand 1, whereas the force component acting upon the top straightening rolls under the compressive load of the upper part of the intermediate frame 3 is conducted into the machine stand 1. Thus there occurs no tensile stress of the intermediate frame, so that the latter can be dimensioned relatively small and thereby have a relatively low weight.

Although the description of the application of the roller leveler according to the invention has been limited to one with suspended straightening rollers, the invention is suitable likewise for roller levelers with straightening rolls mounted on both sides or for sheet levelers, which instead of straightening rollers have so-called straightening rolls. Finally, the invention is not limited to the embodiment shown, it also covers various fundamental deviations. For instance, it is possible to perform the adjustment of the straightening rolls mounted in the boxes 17 by using adjusting devices working with wedges instead of the pressure screws 21. It is also possible to position the pinion 28 in the intermediate frame shifted backwardly and to bring the spur gears 29 in grooves corresponding to the grooves 32 on the intermediate frame into driving connection with the pinions 28. The invention furthermore is not limited to such straightening machines in which the drives are mounted on the machine stand, it also comprises those in which the drive of the straightening rollers or rolls occurs through auxiliary mechanisms, such as pinion housings and universal joint shafts.

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 straightening machine for materials such as, sheets and rails, comprising,
 - a relatively rigid heavy outer housing having a window,
 - a relatively light portable intermediate frame received in the window of said outer housing and engageable

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- with said outer housing on a first side of a pass opening between which the material is fed,
 two groups of straightening rolls received in said intermediate frame and forming said pass opening, said rolls of one group being positioned in a staggered relationship to the rolls of the other group wherein the rolls act upon the opposite sides of the material, guide boxes rotatably receiving the rolls of at least one group of rolls, displaceable toward and away from the rolls of the other group, and
 means carried by said outer housing projectable from a side opposite said first side of said pass opening with respect to said rolls, and engaging said guide boxes for supporting the rolls of said one group independent of said intermediate frame.
2. A straightening machine, according to claim 1, wherein said window of said outer housing receives said frame in a manner that said frame can be moved laterally into and out of the outer housing, and guides in said windows for guiding the lateral movement of said intermediate frame.
3. A straightening machine according to claim 2, including a drive for the rolls of at least one of said groups of rolls carried by said outer housing, means for connecting such roll to said drive in a manner that on lateral movement of intermediate frame said drive can be engaged and disengaged from said rolls.
4. A straightening machine, according to claim 2, in-

cluding means for axially adjusting the rolls of at least one of said groups of rolls,

said means carried by said intermediate frame and arranged to move laterally with said frame.

5. A straightening machine, according to claim 1, including recesses formed in said intermediate frame, said means for supporting the rolls of one group, including displaceable means for each guide box thereof which pass through said recesses to engage said guide boxes, and
 means for operating said displaceable means carried by said outer housing.

6. A straightening machine, according to claim 5, wherein said displaceable means transfers the load developed during straightening by one group of rolls to said outer housing.

7. A straightening machine, according to claim 5, in which said displaceable means comprise screws, so constructed that they can be completely withdrawn out of the recesses of said intermediate frame.

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