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WIRE STRAIGHTENER OR SHAPER

Filed Nov. 4, 1944

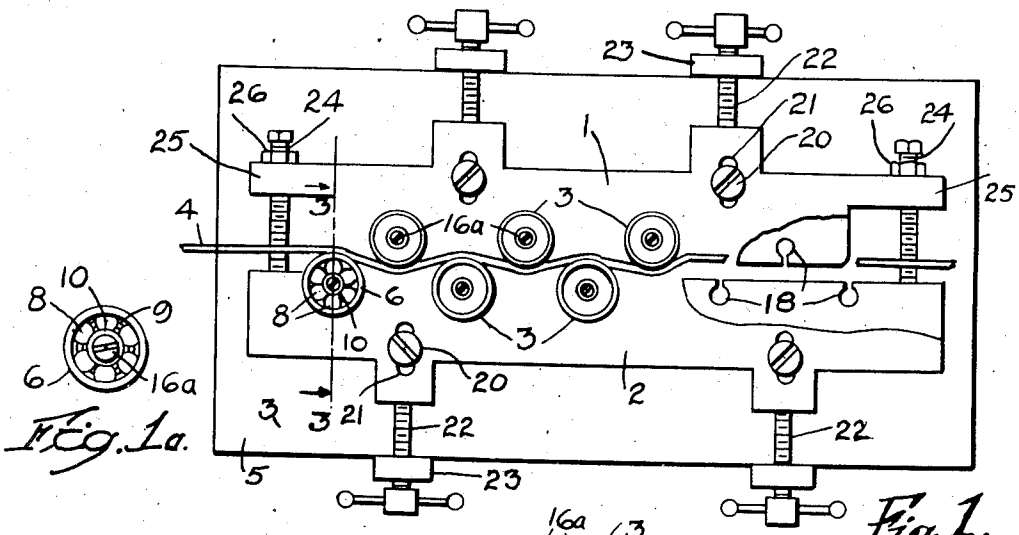


Fig. 1.

Fig. 1a.

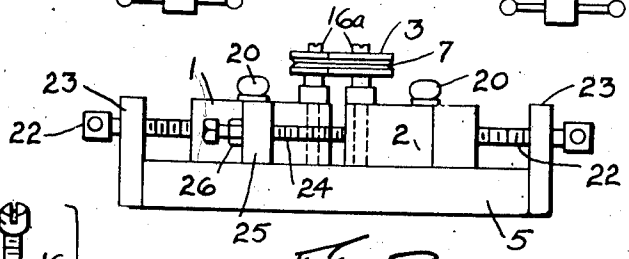


Fig. 2.

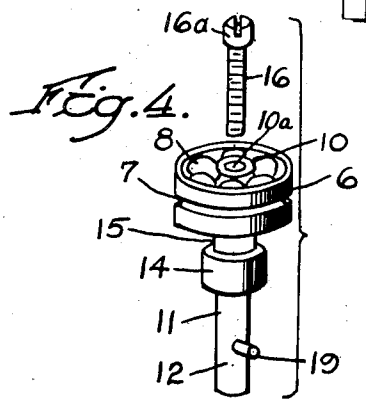


Fig. 4.

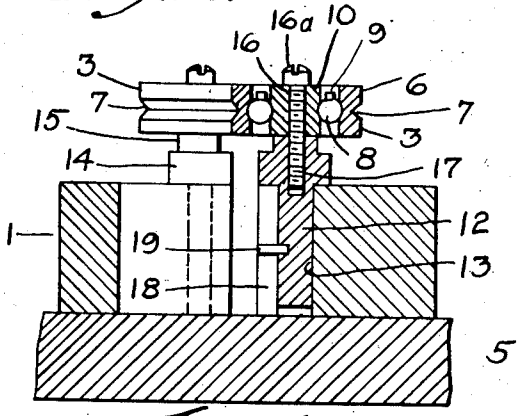


Fig. 3.

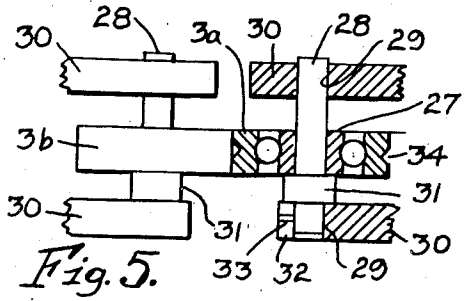


Fig. 5.

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WIRE STRAIGHTENER OR SHAPER

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Application November 4, 1944, Serial No. 561,953

2 Claims. (Cl. 140—148)

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The present invention relates to wire working machinery of the type in which wire or other stock is straightened, or otherwise shaped, by passage between cooperating rolls. In a wire straightener, for example, the wire or other stock is drawn between two rows of staggered rolls so arranged that the wire is subjected to a multiple flexing operation by being bent first in one direction and then in another as it contacts with the successive rolls.

In wire working machinery of the above indicated type, it is important that the rolls should always be capable of turning freely, otherwise the wire will have a sliding instead of a rolling contact therewith, a condition which is undesirable. Heretofore, it has been proposed to mount the spindles for the rolls in ball bearings located above and below the roll pass in order to insure that each roll is freely rotatable, such an arrangement being shown, for example, in Johnson patent No. 2,307,133, issued January 5, 1943, for a Wire straightener.

The object of the present invention is to provide a wire straightener or shaper of the above indicated type, in which each individual roll constitutes the outer race of a ball bearing, with the inner race of the bearing being so mounted that it is positively held against turning; consequently, free rotation of the roll surface is always insured as the wire passes through the straightener in contact with the roll. A further object of the invention is to provide an improved unit mounting for the roll and bearing assembly which will permit each roll to adjust itself at right angles to the direction of movement of the wire being straightened, so that all the rolls of both rows are capable of axial self-alinement with respect to the wire, to obtain a maximum straightening effect without offering too much resistance to passage of the stock being straightened. The above and other advantageous features of the invention will hereinafter more fully appear from the following description with reference to the accompanying drawing, in which:

Fig. 1 is a top plan view of a wire straightener embodying the present invention, with portions being broken away to better show the construction.

Fig. 1*a* is an enlarged plan view of an individual roll and bearing.

Fig. 2 is an end view of the device shown in Fig. 1.

Fig. 3 is a sectional view along the line 3—3 of Fig. 1, on an enlarged scale, looking in the direction of the arrows.

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Fig. 4 is a perspective view of a roll and bearing assembly removed from its supporting block.

Fig. 5 is a fragmentary sectional view illustrating a modified form of roll mounting.

Referring first to Figs. 1 and 2 of the drawings, the invention is shown for purposes of illustration as being embodied in a wire straightener of the same general character disclosed in the aforementioned Johnson patent, wherein blocks 1 and 2 each carries a row of straightening rolls 3, with the rolls of one row being staggered with respect to the rolls of the other row, and with the rows of rolls 3 having a slightly overlapping relation. As the wire 4 or other stock to be straightened is drawn between the two rows of rolls 3, it is subjected to a flexing action, as is usual in wire straighteners of this type. The roll-carrying blocks 1 and 2 are adjustably mounted on a bed 5, as later described, so that the blocks may be adjusted toward and away from each other to vary the degree of flexing, and the present invention contemplates an improved mounting of the rolls 3, so that each roll will always be freely rotatable and thus have a rolling contact with the wire 4.

As best shown in Figs. 3 and 4, each roll 3 is an integral part of a ball bearing assembly, in which the outer race 6 provides a peripheral groove 7 for receiving the wire 4 which is to be straightened. A series of balls 8 is confined by a suitable cage 9 between the outer ball race 6 and an inner ball race 10, and the invention contemplates the mounting of the bearing assembly so that the outer race 6 will always be free to rotate, while the inner race 10 is held stationary.

To this end, each combined roll and ball bearing assembly is mounted on a spindle 11 providing a shank 12 slidably received in an opening 13 provided in a block 1 or 2. The shank 12 is formed with an enlarged head 14 normally resting on the top of the associated block 1 or 2, and this head 14 provides a reduced shoulder 15 having a diameter substantially the same as the outside diameter of an inner ball race 10.

The ball bearing assembly constituting each roll 3 is adapted to be mounted on a spindle 11 by means of a stud 16 extending freely through the opening 10*a* in the center of the inner ball race 10, see Fig. 4, and in threaded engagement with an opening 17 extending axially of the spindle 11. Therefore, when the stud 16 is screwed down into the spindle 11, its head 16*a* will engage the inner ball race 10 and serve to clamp the race firmly against the shoulder 15 to thereby hold the race against turning. Since

the shoulder 15 serves to space the remainder of the roll assembly away from the spindle head 14, the outer race 6 is always capable of free rotation on the ball 8; consequently the wire 4 will engage the groove 7 of the roll 3 only in rolling contact.

As previously pointed out, a further object of the invention is to insure that each roll 3 is capable of movement at right angles to the general line of movement of the wire being straightened, and obviously the sliding fit of the shank 12 of each spindle 11 in the corresponding block opening 13 will permit of such movement by the associated roll 3. However, in order to prevent turning of an entire roll and spindle assembly within a block opening 13, which would nullify the action of the ball bearing, each spindle 11 provides means for locking it against turning with respect to its supporting block 1 or 2.

As best shown in Fig. 3, and in the broken away portion of Fig. 1, each spindle opening 13 provides a slot 18 extending through the wall of the opening and of sufficient width to freely receive a pin 19 projecting laterally from the shank 12 of a spindle. The pin 19 is inserted in a slot 18 when positioning a roll and spindle assembly, such as is shown in Fig. 4, and with spindle head 14 resting on the top of the associated block, the pin 19 will be positioned substantially midway of the slot.

Therefore, when the two rows of rolls 3 are assembled as shown in Fig. 2, all the roll grooves 7 will lie in substantially the same plane. However, as the wire 4 is drawn between the two rows of rolls as shown in Fig. 1, the rolls 3 in addition to their free rotation on the bearing balls will also be free to shift at right angles to the line of movement of the wire, in order to compensate for any surface irregularities of the wire with respect to the common plane of the grooves 7. Such self-alinement of the rolls along their respective axes of rotation results in the straightening action being performed on the wire without appreciable jamming, and the resulting application of a pulling force such as might tend to break the wire during its passage through the straightener.

As previously pointed out, the roll-carrying blocks 1 and 2 are adjustably mounted on the bed 5, so that the blocks may be moved with respect to each other to vary the degree of flexing imparted to the wire 4. As shown in Figs. 1 and 2, the block 1 is retained in position on the bed 5 by means of clamping screws 20 that pass through slots 21 in the block, with the block being adjustable on the bed at right angles to the wire 4 by means of adjusting screws 22 which are threaded through lugs 23 provided by the bed 5. The screws 22 are adapted to bear on the outside of the block 1, and the adjusting screws 22, together with the clamping screws 20, provide conveniently operated means for setting and clamping the block 1 in any desired adjusted position with respect to the line of movement of the wire 4.

The other roll-carrying block 2 provides means for adjusting and clamping the same similar to the means described above with reference to the block 1, with the adjusting and clamping screws being indicated by the same reference characters 22 and 20. The block 1 is also shown as being provided with a positioning screw 24 at each end, which is threaded into an extension 25 of the block and engages the inner face of the block 2. These screws 24 serve to limit the adjusting movement of the blocks toward each other,

each positioning screw 24 providing a lock nut 26 to assist in retaining the block in its adjusted position.

With the block adjusting arrangement described above, it is obvious that the blocks 1 and 2 may be adjusted bodily with respect to each other, so as to closely determine the degree of overlap between the two rows of rolls 3 with respect to the line of movement of the wire or other stock being subjected to a straightening action by passage between the rolls 3. By such adjustment, the degree of flexing which the wire receives is accurately controlled, and the previously described individual mounting of the several rolls 3, as units, is in no way disturbed by adjustment between the blocks 1 and 2. That is to say, each roll unit, comprising the ball bearing assembly and the spindle, is adapted to support each roll surface for free rotation about the spindle axis. Furthermore, each roll is self-aligning with respect to the plane of the roll pass, so that the wire receiving grooves 7 are capable of adjustment with respect to each other, in order to accommodate the rolls to surface irregularities of the wire in any adjusted relation between the blocks 1 and 2.

From the foregoing, it is apparent that by the present invention there is provided an improved construction for wire straighteners of the staggered roll type, characterized by the fact that each individual roll is always freely rotatable about its bearing axis, while at the same time is capable of self-alinement along this axis, so as to accommodate the roll to surface irregularities of the stock. The net result is the procurement of a maximum straightening effect, without excessive strains on the rolls and without jamming of the stock between the rolls.

Referring now to Fig. 5, there is shown a modified construction wherein the roll spindle is supported above and below the roll, so as to more evenly distribute the load placed on the spindle as a result of the wire straightening or shaping operation performed on the wire. In this modified construction, the inner race 27 is rigidly mounted on the spindle 28 by means of a tight force fit. The ends of the spindle 28 are slidably received in openings 29 provided in a pair of spaced supporting arms 30, with the normal position of the rolls 3a between the arms 30 being determined by a collar 31 bearing on the lower arm.

The opening 29 in the lower arm 30 which receives the lower end of the spindle 28 provides a vertical slot 32 for receiving a pin 33 projecting from the side of the spindle. The function of the pin 33 is the same as that of the pin 19 in the previously described construction, namely to prevent turning of the spindle about its axis, while permitting self-alinement of the roll 3a along this axis.

As previously pointed out, the roll mounting of the present invention, while particularly adapted for use in connection with wire straighteners, is also applicable to other types of wire working machinery wherein freely rotatable rolls are employed to perform a shaping action on the wire or other stock. For example, the roll 3a shown in Fig. 5 is adapted to cooperate with the smooth periphery of a second roll 3b mounted in the same manner, so that wire or other stock entering the pass between the rolls 3a and 3b will have its cross section altered to conform to the shape of the groove 34 provided in the periphery of the first roll 3a. Obviously, with the rolls 3a and 3b thus functioning as shaping rolls, the support of the roll spindles 28 above and below the roll pass by the

arms 38 will serve to better distribute the load on the spindles than would be the case with the roll spindles supported in a single block, as described with reference to Fig. 3.

I claim:

1. A wire straightener comprising, a base providing a pair of opposed series of bores, the bores of one series being spaced in staggered relation with the bores of the other series, a spindle mounted within each of said bores so as to be capable of free axial movement therein, means for holding each spindle against rotation within its associated bore, and a plurality of roll assemblies between oppositely spaced pairs of which a wire is drawn, each of said roll assemblies being mounted upon a respective one of said spindles, with each such assembly including an inner race secured rigidly upon a spindle, anti-friction elements carried on said inner race, an outer race rotatably mounted upon said anti-friction elements, and a peripheral groove formed about said outer race for receiving and guiding the wire, each of said spindles being adapted to be shifted axially within its bore in response to thrusts set up by said wire upon the sides of said groove.

2. A wire straightener comprising, a pair of blocks, each of said blocks providing a series of bores therein and being disposed relative to the other block so that the bores of one series are spaced in staggered relation with the bores of the other series, means for adjusting said blocks back and forth relative to each other, a spindle mounted within each of said bores so as to be capable of free axial movement therein, means including a mating pin and slot construction for holding each spindle against rotation within its associated bore, and a plurality of roll assemblies between oppositely spaced pairs of which a wire is drawn, each of said roll assemblies being mounted upon a respective one of said spindles, with each such assembly including an inner race secured rigidly upon a spindle, anti-friction elements carried on said inner race, an outer race rotatably mounted upon said anti-friction elements, and a peripheral groove formed about said outer race for receiving and guiding the wire, each of said spindles being adapted to be shifted axially within its bore in response to thrusts set up by said wire upon the sides of said groove.

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