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WIRE STRAIGHTENERS

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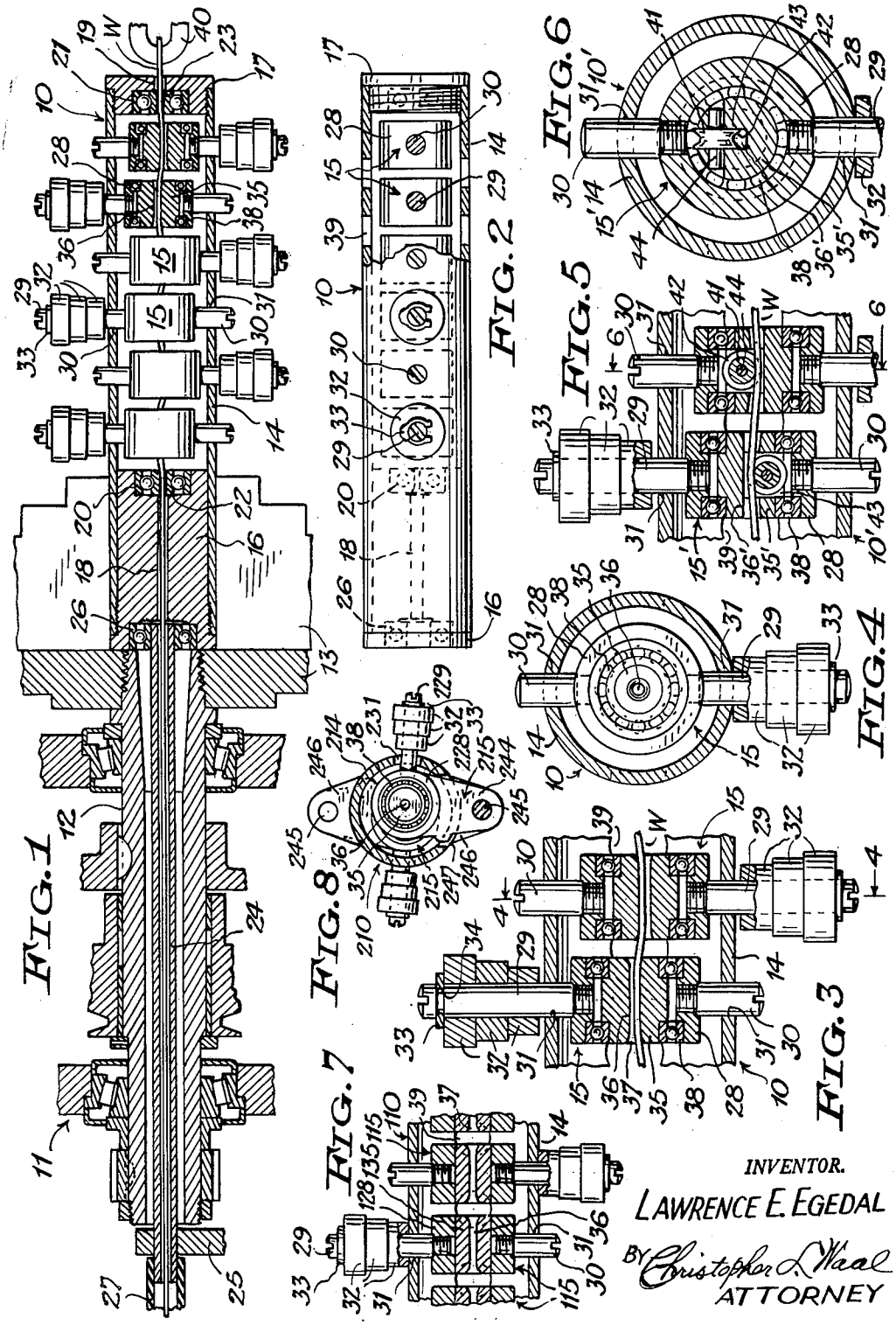


FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 5

FIG. 6

FIG. 7

FIG. 8

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WIRE STRAIGHTENERS

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The present invention relates to wire straighteners.

An object of the invention is to provide an improved wire straightener including centrifugally displaceable wire-flexing means.

Another object is to provide a wire straightener which will minimize wear of the wire-flexing parts, and compensate for any wear that may occur.

Still another object is to provide a wire straightener which will facilitate threading of a wire through the device preparatory to the straightening operation.

A further object is to provide a wire straightener which is of simple, reliable and inexpensive construction and adapted for easy mounting and driving, as on a lathe headstock.

The invention further consists in the several features hereinafter described and claimed.

In the accompanying drawing, illustrating certain embodiments of the invention,

FIG. 1 is a longitudinal sectional elevational view of one form of wire straightener constructed in accordance with the invention and mounted on a lathe headstock, the device being shown in its operating condition;

FIG. 2 is a detail side view of a rotatable straightener arbor or flyer, parts being broken away and parts being shown in section;

FIG. 3 is an enlarged detail longitudinal sectional view of a portion of the device as it appears during operation;

FIG. 4 is a transverse sectional view taken generally on the line 4—4 of FIG. 3, but showing the device at rest;

FIG. 5 is a fragmentary sectional view, similar to FIG. 3, showing a modified form of wire straightener;

FIG. 6 is a transverse sectional view taken generally on the line 6—6 of FIG. 5, but showing the device at rest;

FIG. 7 is a fragmentary sectional view, similar to FIG. 3, showing another modified form of wire straightener, the device being at rest, and

FIG. 8 is a transverse sectional view, similar to FIG. 4, showing a further modified form of wire straightener.

Referring to the form of wire straightening apparatus shown in FIGS. 1 to 4, 10 designates a rotatable wire-straightening arbor or flyer of the invention, and 11 designates a lathe headstock of conventional type including a rotatably mounted hollow spindle 12 equipped with a jaw chuck 13 in which the arbor is coaxially mounted.

The arbor or flyer comprises a rotatable body 14, preferably of tubular shape, carrying a series of pairs of centrifugally displaceable wire-flexing unit 15, hereinafter more fully described, by which a wire W moving longitudinally through the arbor is caused to pass in a tortuous or sinuous path for straightening the wire. The wire-flexing units in each pair are centrifugally urged in opposite directions, and all the units are preferably movable in the same diametrical plane.

Closure members 16 and 17 are screwed or otherwise rigidly fitted in the entrance and exit ends of the tubular arbor body and are provided with respective coaxial wire-receiving bores 18 and 19. The inner ends of the closure members are preferably provided with respective coaxial ball-bearings 20 and 21, the inner race members of which have respective wire-guiding bores 22 and 23. Preferably, a wire-guiding tube 24 extends coaxially in the hollow lathe spindle 12. In some cases, the tube 24 may rotate with the spindle, but it is preferably stationary. The tube is here shown to be carried by an exterior

bracket 25, and the inner end of the tube detachably fits in a ball-bearing 26 coaxially mounted in the arbor closure member 16. In some instances, a flexible extension tube 27, such as a length of rubber hose, is secured to the outer end of the tube 24 to confine the wire against whipping. If desired, the wire may be fed from a reel, not shown.

Each wire-flexing unit 15 comprises a collar or ring member 28 disposed loosely within the tubular arbor body and guided for radial displacement by aligned guide stems 29 and 30 threaded into or otherwise rigidly secured to the diametrically opposite portions of the ring member, the aligned stems slidably passing through radial guide bores 31 in the body. Outside of the arbor body one or more annular weight members 32 are slidably mounted on the guide stem 29 and are detachably secured thereto, as by a snap ring 33 fitting in an annular groove 34 in the outer portion of the stem. The size and weight of the weight members may be varied in accordance with the gauge and physical characteristics of the wire to be straightened. By way of example, each guide stem 29 carried thereon a plurality of weight members of different weights, and these may be interchanged or varied in number to provide different centrifugal forces. Within each ring member or collar 28 is mounted an annular wire-flexing guide member or die member 35, such as of wear-resisting metal, provided with an axial wire-receiving bore or aperture 36 with chamfered or flared ends 37. The die member 35 is here shown to be mounted for relative rotation in the ring member 28, as by a pair of ball-bearings 38. The die member aperture 36 is shown to be of circular cross-section, although other cross-sections may be used. The die members or guide members 35 of adjacent wire-flexing units are spaced a short distance from each other, and the endmost die members are spaced a short distance from the ball-bearings 20 and 21 in the arbor closure members 18 and 19. The several wire-flexing units may all be identical, or the pairs of these units may be so loaded as to be progressively lighter toward the delivery end of the device. The arbor body is provided at opposite sides with a series of inspection openings 39, these openings being spaced 90° from the plane of the wire-flexing units, and each opening being disposed about midway between the radial planes of adjacent units.

In setting up the device for use, the entrance end portion of the straightener arbor is clamped in the lathe chuck 13. The wire W is threaded through the tube 24 in the hollow lathe spindle and centrally through the then stationary arbor body 14, the apertured die members 35 of the slidably mounted wire-flexing units being placed in alignment so as to facilitate the threading of the wire therethrough. The leading end of the wire protrudes through the end closure or cap 17 of the arbor body and is engaged by a suitable pulling gripper or vise 40, which in some instances may be a pair of pliers. A wire that is not too long may be threaded into the device from the delivery end.

In operation, the lathe spindle 12 is set in rotation at a suitable speed to rotate the arbor body 14, whereupon the wire-flexing units 15 are centrifugally displaced to provide a tortuous or sinuous path for the wire W which is simultaneously pulled from the delivery end of the arbor body, effecting a straightening action on the wire. By way of example, an arbor body about two inches in diameter may be rotated at about 1400 r.p.m. for some types of wire. The annular die members or guide members 35 travel in an orbital path but do not rotate except for a possible creeping action, thus reducing wear on these parts and on the wire. The die members and wire are suitably lubricated during the straightening operation. The wire-flexing units in each pair are centrifugally dis-

placed in opposite directions, so that the device is more or less balanced and vibration is minimized. It will be noted that wear in the wire-receiving apertures 36 of the wire-flexing units will not affect the operation of the device since the centrifugal deflection of the wire will be substantially unchanged.

Instead of manually pulling the wire through the device it is possible to provide for automatic wire-pulling and also automatic wire cut-off, as is well understood in this art.

The modified form of straightener arbor 10' shown in FIGS. 5 and 6 is provided with wire-flexing units 15' which are similar to those of FIGS. 3 and 4 except that the ball-bearings 38 in each collar or ring member 28 support a guide member 35' carrying a die-forming roller 41 with a grooved rim portion 42. The guide member 35' has a central wire-receiving aperture 36' communicating with a parallel-sided radial slot 43 in which the roller 41 is disposed, and the roller is mounted on a cross pin 44 the axis of which extends transversely of and spaced from the axis of the guide member. The guide member axis is approximately tangent to the grooved rim portion of the roller.

The operation of the straightening device of FIGS. 5 and 6 is similar to that of FIG. 1 except that the wire W rides in the grooved rollers 41 and is flexed by these rollers in their centrifugally displaced condition to cause the wire to pass in a tortuous or sinuous path as it is pulled through the device.

In the modified form of straightener arbor 110 shown in FIG. 7, wire-flexing units 115 carried by the arbor body 14 are similar to those of FIG. 3 except for centrally apertured bushing-forming die members or guide members 135 of wear-resisting metal which are pressed into or otherwise replaceably fixed in respective collars 128, corresponding to the collars 28 of FIG. 3. In use, the wire-flexing die members 135 may be subject to some wear, but this is of little consequence as the centrifugal deflection of the wire will be effected regardless of such wear. In some instances, the die members 135 may be integral with the collars 128.

The modified form of straightener arbor 210 shown in FIG. 8 comprises a tubular arbor body 214 swingably carrying thereon a series of pairs of centrifugally displaceable wire-flexing units 215. The units 215 in each pair are shown in the form of levers 244 carried on respective pivot pins 245 at opposite sides of the arbor body, the pins being parallel to the axis of the arbor body and being mounted in bracket ears 246 on the arbor body. Each lever projects inwardly from its pivot pin through an opening 247 in the arbor body and is provided with a ring-like inner end portion 228 similar to the collar 28 of FIG. 3, this end portion mounting ball-bearings 38 supporting a wire-flexing die member or bushing 35 with a central aperture 36, as in FIG. 3. A stem 229 projects radially from the lever portion 228 through an opening 231 in the arbor body and detachably supports weight members 32 thereon, the weight members being confined by a snap ring 33 on the outer end of the stem, as in FIG. 3. The laterally adjacent levers 244 in each pair are centrifugally displaceable in opposite directions.

The straightener arbor of FIG. 3 is suitably driven, as in FIG. 1, and the operation of the device is generally similar to that of FIG. 1.

I claim:

1. A wire straightener comprising, a rotatable body adapted to receive along its axial region a longitudinally moving wire to be straightened, a series of axially spaced centrifugally displaceable wire-flexing units aligned in parallel relation in said body, said units including supporting means operatively carried by said body for guiding each adjacent pair of units for free movement in opposite radial directions under the influence of centrifugal force, each unit having a wire-engaging surface adjacent to the rotational axis of said body for laterally displacing the moving wire with respect to said axis, adjacent wire-flexing units being centrifugally displaceable in opposite direction, each wire-flexing unit further having a part projecting laterally from said body, and weight means shiftably mounted on said projecting part to vary the centrifugal force on said unit.

2. A wire straightener comprising, a rotatable body adapted to receive therethrough along its axial region a longitudinally moving wire to be straightened, a series of axially spaced centrifugally displaceable wire-flexing units aligned in parallel relation in said body, each unit having at the axial region of said body a die structure provided with opposite aligned supporting stems freely radially slidable in said body, at least one of said opposed stems of each unit having a part laterally projecting from said body, each die structure having a wire-engaging surface adjacent to the rotational axis of said body for laterally displacing the moving wire with respect to said axis, and weight means carried by the projecting stem part of each unit adjacent stem-supported wire-flexing units being centrifugally slidably displaceable in opposite directions.

3. A wire straightener comprising, a rotatable body adapted to receive therethrough along its axial region a longitudinally moving wire to be straightened, a series of axially spaced centrifugally displaceable wire-flexing units aligned in parallel relation in said body, each unit having at the axial region of said body a die structure provided with opposite aligned supporting stems freely radially slidable in said body, at least one of the opposite stems of each unit being exposed at and projecting from the exterior of said body, each die structure having a wire-engaging surface adjacent to the rotational axis of said body for laterally displacing the moving wire with respect to said axis, adjacent stem-supported wire-flexing units being centrifugally slidably displaceable in opposite directions, and weight means shiftably mounted on the exposed guide stem of each unit.

4. A wire straightener comprising, a rotatable body adapted to receive therethrough along its axial region a longitudinally moving wire to be straightened, a plurality of axially spaced centrifugally displaceable wire-flexing units pivotally carried by said body about axes substantially parallel to the body axis, said units being aligned in said body in parallel relation, each unit having a wire-engaging surface adjacent to the rotational axis of said body for laterally displacing the moving wire with respect to said axis, adjacent pivoted wire-flexing units being centrifugally displaceable in opposite directions, each unit further having a part projecting laterally from said body, and weight means shiftably mounted on said projecting part.

5. A wire straightener comprising a rotatable body adapted to receive therethrough along its axial region a longitudinally moving wire to be straightened, a plurality of axially spaced centrifugally displaceable wire-flexing units aligned in parallel relation in said body and having respective axially spaced wire-engaging portions adjacent to the rotational axis of said body for laterally displacing the moving wire with respect to said axis, each unit including a support movably guided by said body to permit radial centrifugal displacement of said units, each support extending laterally from said body, adjacent spaced wire-engaging portions being centrifugally urged in opposite radial directions, and wire-guiding means for feeding wire axially into the entrance portion of said body including a flexible wire-receiving tube.

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