

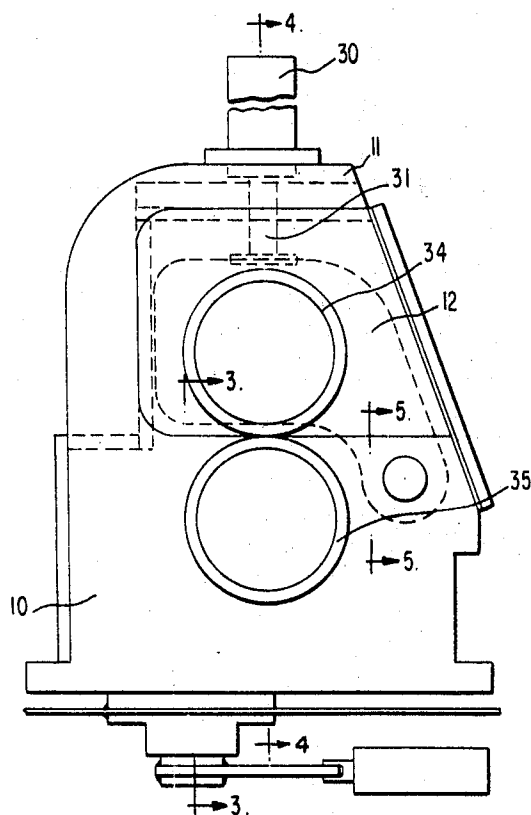
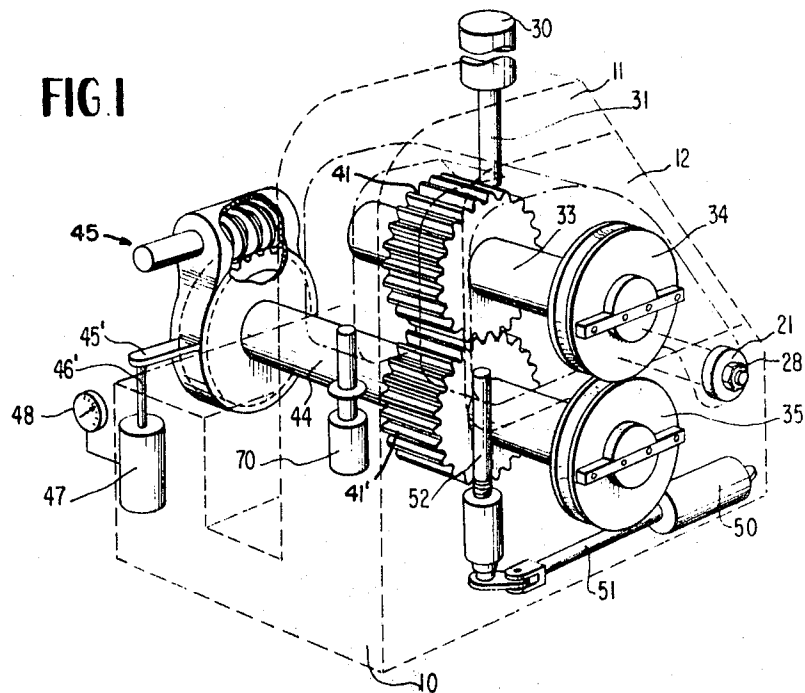
Sept. 23, 1969

L. DIOLOT
ROLLING MILL

3,468,151

Filed Sept. 17, 1965

4 Sheets-Sheet 1



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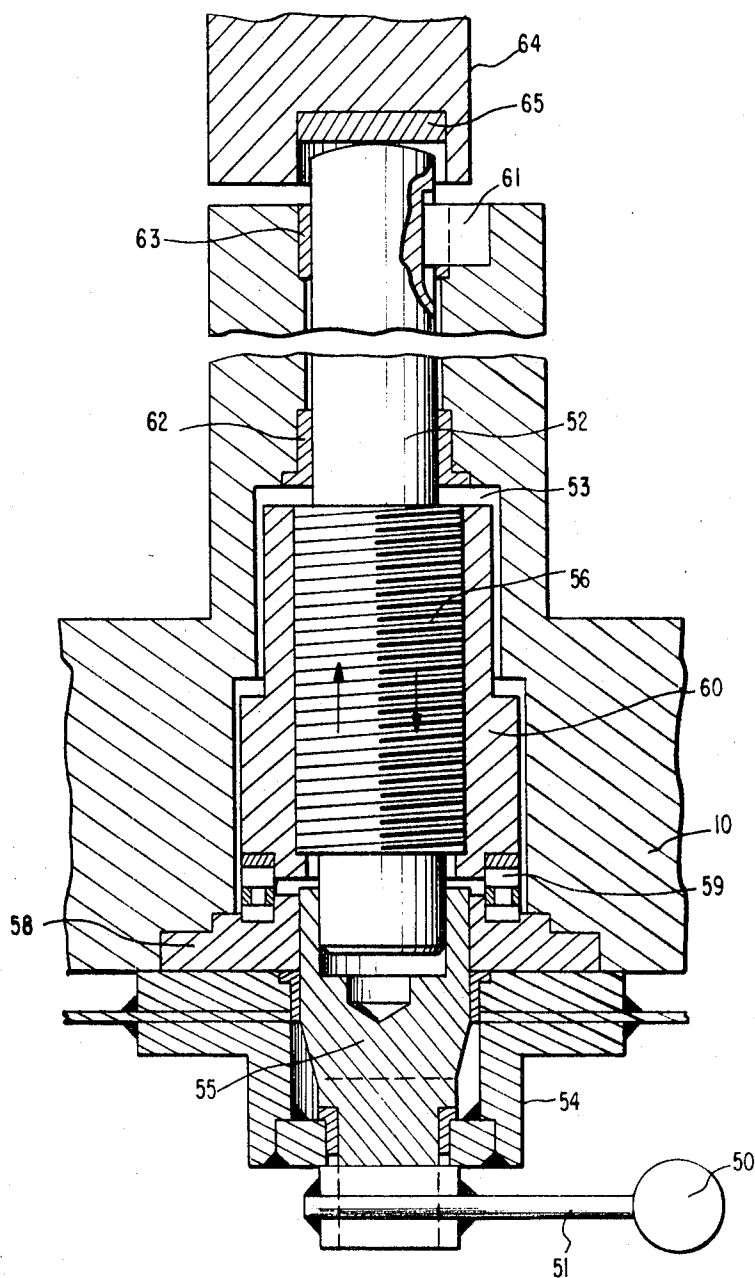
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FIG. 3



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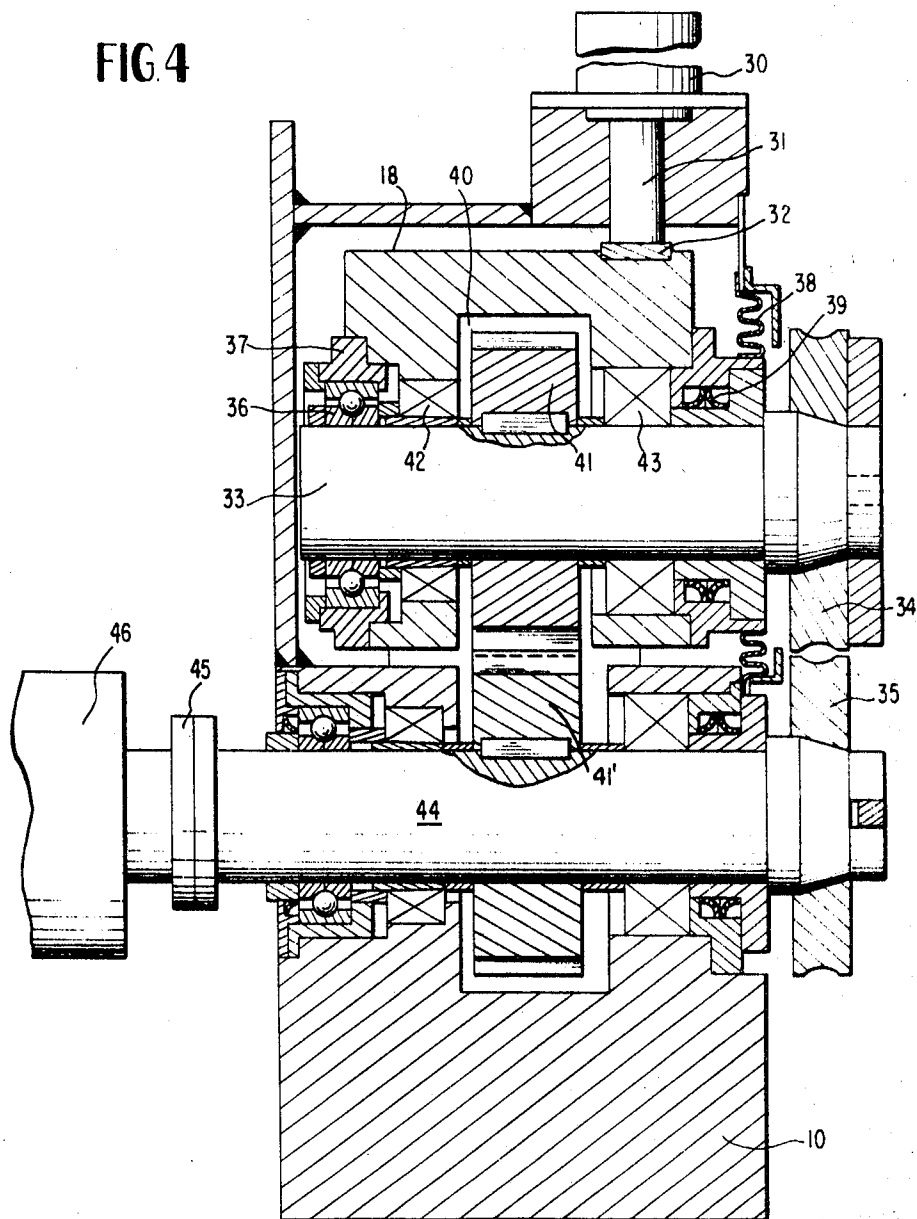
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FIG 4



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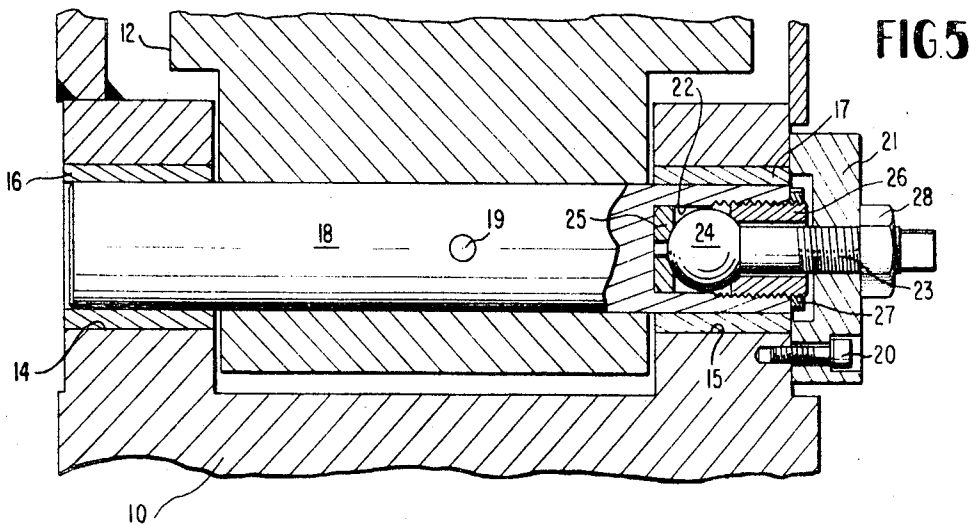


FIG 6

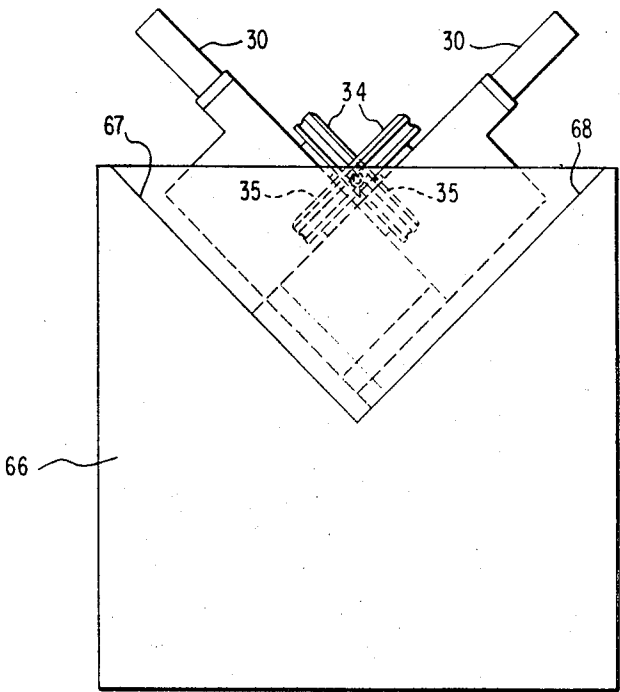
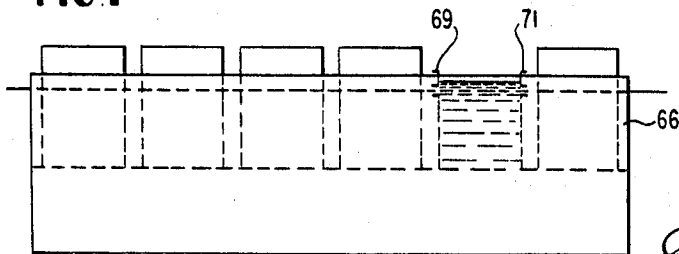


FIG 7



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3,468,151

ROLLING MILL

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Claims priority, application France, Feb. 26, 1965,

7,197

Int. Cl. B21b 13/08, 31/20, 31/32

U.S. Cl. 72—234

9 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates to a rolling mill for continuously reducing running lengths of metallic wire products which pass between spaced rolls. One roll is revoluble in a fixed housing and another is revoluble in a pivotal housing. A plurality of power cylinders are arranged to not only adjust the size of the pass between the rollers, but also to maintain the size of the pass constant during the rolling operation as well as reduce rolling pressure where required.

The present invention relates to an improved rolling mill for continuously reducing the area of indeterminate lengths of longitudinally traveling metallic wire products and, more particularly, to the type of rolling mill wherein the pass between the respective rolling means is controlled by relative movement of the housing members that revolubly support the rolling means.

It is now known that a succession of conventional rolling mill stands may be used to continuously roll small width products, especially wires of certain diameters and in which the several rollers include in their complementally-formed faces grooves called passes. For best results, the roll diameters for the different stands must be carefully selected and maintained in proper proportions. The roll passes, especially for the finishing group of rolls must be skillfully adjusted and accurately turned; the rolls and guides must be carefully set in the housings; and thereafter the draft must be regulated through the mill screws to suit the conditions. The uniform heating of the product being rolled is a matter of importance and under a given pressure a hot bar or rod will elongate more than a colder one. Thus, if the mill is adjusted to roll the colder rod properly, the hotter rod will buckle between passes and cause what is known in the industry as "cobbles." The mill, therefore, must be adjusted to the hottest work piece being rolled, and if the draft on the different passes is regulated to keep this product under slight tension, the same adjustment will produce a pull of considerable force on the colder material. Consequently, this pull is the cause of the longer "finny" ends which are characteristic of material rolled on straight continuous mills, and it also produces a difference in section between the ends and the middle of the material being rolled causing it to exhibit a tendency toward flatness in the middle. This matter is especially important in the case of mills rolling more than one line or strand at a time.

Accordingly, the primary object of the invention is to overcome the previously described disadvantages and to allow the achievement of rolled products having more accurate dimensions.

Another object of the invention is to provide a rolling mill in which the rolling means are carried exteriorly of the housing thereof.

Still another object of the invention is to provide a rolling mill housing comprising a fixed portion and another portion which is movable relative thereto, each of said fixed and movable portions carrying one of the complementary rolling means.

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A further object of the invention is to provide a power-operated means for actuating the movable portion of said housing and therethrough the area of the pass between the respective rolling means.

A still further object of the invention is to provide a series of rolling mills in longitudinal alignment on a supporting member with each mill being rotated at an angle of 45° to the mill adjacent thereto whereby the entire circumference of the product being worked is properly rolled.

These and other objects and advantages will become apparent from the ensuing specification taken in conjunction with the drawing wherein:

FIG. 1 is an isometric view illustrating the essential elements of the new rolling mill;

FIG. 2 is a side elevational view of the rolling mill;

FIG. 3 is a section on line 3—3 of FIG. 2;

FIG. 4 is a section on line 4—4 of the fixed and pivotal housing only of FIG. 2;

FIG. 5 is a section on line 5—5 of FIG. 2;

FIG. 6 shows an end elevational view of a pair of rolling mills which have been longitudinally aligned and disposed at 45° angles relative to each other in a supporting base; and

FIG. 7 is a side elevational view of the trough-shaped supporting base member provided with baffle means adapted to control the height of the cooling medium relative to the outlet pass of the respective mills.

The isometric view of FIG. 1, being more or less schematic, generally shows all of the essential cooperative elements of the new rolling mill in a correlated manner and the operation of which will be best understood from a more careful study of the remainder of the drawings and a perusal of the description material.

Further, in the isometric view of FIG. 1 there is shown at 10 a fixed housing which includes an integral upwardly and outwardly projecting portion 11 that extends out over a housing member 12 that is pivotally supported in the fixed housing by trunnions, either of which may include means adapted to transmit transverse movement to the pivotal housing 12. Such transverse movement of the pivotal housing 12 relative to the fixed housing 10 to provide coincidence of the pass between the rolls is accomplished by the following means.

As best illustrated in FIG. 5 the fixed and pivotal housings are provided with aligned bores 14 and 15 with spaced bushings 16 and 17 being provided in the fixed housing to permit transverse and limited rotary movement of the shaft 18 which is fastened to the pivotal housing by means of the pin 19. To one side of the upstanding wall of the fixed housing there is secured by a series of conventional bolt means 20 an axially apertured and internally threaded cup-shaped element 21.

In the bore 22 provided within the extremity of shaft 18 there is positioned a threaded shaft 23 which includes at its inner extremity an integrated spherical element 24 that is confined between juxtaposed bearing means 25 and 26 and at its free end with a suitably formed portion adapted to receive a wrench.

An internally threaded nut-like member 27 cooperates with the threaded parameter of the cylindrical bearing means 26 and upon rotation thereof pressure is exerted on the rear face of spherical ball 24 when it is desired to adjust the pivotal housing 12 to the fixed housing. Thus, when the shaft 23 is rotated in either direction and the rolls are brought into coincidence, the nut 28 is secured flush against the exterior wall of the cap element 21. The cup-shaped element 21 may include suitable indicating means to assist in aligning the rolls.

Furthermore, in the isometric view is also shown parallel, spacedly arranged shafts, each of which is provided

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with complementally-formed gear wheels which, when either is driven, will transmit motion to the complemental rolling means positioned on the exterior of the housing. Plural power means are also provided, one of which is used to urge the movable housing downwardly to reduce the pass area between the rolls and the oppositely disposed one is used to push the movable housing upwardly away from the fixed housing and adapted, more specifically, to control the pass between said rolls. Another power means mounted adjacent to the torque means and in the fixed housing is provided with an upwardly extending shaft or jack portion which engages the movable housing and is also used to exert a force opposed to the first power means and is relied upon for quick enlarging of the pass between the rolls to prevent jamming or overloading of the mill.

For clarity a more detailed description will now be provided relative to the organization of the machine.

In FIG. 2, which is a side elevational view of the rolling mill, there is shown the complementally formed rolling mill rolls, one of which is positioned for movement on a shaft mounted in the movable housing 12, the other being positioned on a shaft which is carried in the fixed housing. Secured to the outwardly projecting arm 11 is a suitable hydraulic or pneumatic power means 30, the reciprocable depending leg or jack portion 31 of which is adapted to be brought into contact with a hardened steel plate 32 (FIG. 4) which is secured to the upper surface 18 of the movable housing 12.

Also in FIG. 4, it will be noted that the housing 12, which pivots about the spaced trunnions (FIG. 5), includes a shaft 33 to the free end of which is secured a rolling means 34 provided with a channeled perimeter and thereby adapted to cooperate with the adjacent roll 35 carried on the lower shaft 44 to produce a finished product of desired circumference. Since the thrust and roller bearing means for each of the parallel-disposed shafts 33 and 44 which carry the rolling means at the free ends thereof are substantially identical, the assembly for only three will be described.

The inner end of shaft 33 is revolvably supported by the roller bearing 36, the support means 37 for which is secured at its perimeter to a channeled or recessed area within the movable housing 12. At the opposite end of the shaft and within the confines of the sealing means, which is indicated at 38, the shaft is provided with allochiral bearing means 39. Disposed on opposite sides of the opening 40, which is adapted to provide a working area for the gear wheel 41 which is keyed to shaft 33, are thrust bearings 42 and 43, respectively, which are adapted to absorb the radial reactions applies to the bearing means positioned adjacent thereto.

The lower shaft 44 is provided with any suitable coupling means 45 which is associated with the power drive means 46.

At this time, by referring back to the isometric view of FIG. 1, a source of power which drives into the shaft 44 through coupling 45 is better shown and may include a driving reduction gear which is preferably of the floating type, that is, it is entirely supported by the shaft 44 and is simply wedged into rotation by the offstanding dog 45' which rests against the stop 46'. By mounting a power means 47, which includes a pressure gauge 48 in any suitable manner relative to the fixed housing or any other source of support, it is possible through the contact of dog 45' with the stop 46' carried by the jack 47 to determine the reaction force, and consequently the torque developed by the reduction gear, which is necessary to the control of the rolling operation.

Also, in FIG. 1 there is shown another power means 50 through the jack or arm portion 51 of which reciprocating motion is converted to an oscillary motion so as to raise and lower the shaft 52 and therethrough adjust the spacing between the complemental rolls 34 and 35 to regulate the value or thickness of the rolling pass. This

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organization will be best understood from an examination of FIG. 3 in which there is shown at 10 a portion of the fixed housing, the base of which has been provided with an upwardly extending terraced bore 53 which is gradually reduced, as shown. To the base of the fixed housing 10 and in axial alignment with the bore 53 is secured an apertured cup-shaped element 54 within which is positioned a recessed stub socket 55, the downwardly extending extremity of which is suitably secured to the shaft 51. Positioned within the recess of the stub socket 55 and adapted to move vertically relative thereto by means of the threaded portion 56 which cooperates with the revolvably mounted internally threaded nut 60. The annulus 58 which surrounds the upper portion of the stub socket 55 is associated therewith in any manner such as by splining, keying, etc., and adapted to be rotated about a vertical axis upon power being introduced to the cylinder 50. Accordingly, it will be readily appreciated that power can be transmitted from the stub socket through the annulus into the bearing means 59 and therethrough into the nut 60 so as to rotate the same and move the shaft 52 upwardly or downwardly depending upon the direction of movement of the shaft 51. The reciprocable shaft 52 is confined to a vertical reciprocatory path by means of the key 61 which is positioned in the housing 10, as shown. The upper free end of the shaft 52 projects entirely through the reduced area of the bore 53 and is correlated relative thereto by means of the sleeve bushings 62 and 63, respectively. The pivotal housing 12 is provided with a recess 64 complemental to the free end of the shaft 52 and is provided with a hardened steel plate 65 adapted to take the wear therefrom.

In FIG. 6 there is shown a supporting base member 66 which is provided with a trough. The divergent walls that are indicated at 67 and 68, respectively, are positioned at an angle of approximately 45°. By positioning alternate rolling mill machines relative to one another, as shown, along this trough a continuous train of rolls are provided as is clear from an examination of this view.

It is also contemplated in the view shown in FIG. 7 to provide baffle means 69 and 71 which are provided adjacent to their upper extremity with means defining openings of any desirable contour but which will be adequate to confine a bath of fluid, as shown, and through which the rolled product may pass during its reduction travel through the respective continuous train of mills.

OPERATION

Before the rolling operation is undertaken and at which time there is no product positioned between the pair of rollers, the pivotal housing portion 12 is adjusted laterally for coincidence of the roll passes and then is urged in a downward direction upon pressure being introduced to the power means 30, whereupon its shaft 31 will be brought into engagement with the upper portion of said pivotal housing. Of course, the power means shown in FIG. 3 and described in connection therewith is used to adjust the spacing between the complemental rolls by rotating the nut 60 by means of the power source, as described, thus regulating the value or thickness of the rolling pass. Accordingly, although these respective power means are not connected together, the controls therefor being entirely separate, they are coordinated in order to produce the desired product. It is also possible to construct the power means 30 so that it will be double-acting and have its shaft portion 31 fastened in any suitable manner to the pivotal housing 12 so that it will not only urge said housing downwardly but also can be adapted to lift it upwardly when desired, thus making it unnecessary if desired to include in the organization the construction shown in FIG. 3.

When the product to be rolled is initially introduced between the complementally formed rollers, the reaction of support of the shaft 52 on the pivotal housing 12 decreases, but the contact is maintained as long as the reac-

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tion force on the jack 30 is not greater than its rated value and, as will be apparent, must exceed the maximum expected value of the rolling force.

Should it be desired to adjust the clearance between the rollers, power is introduced into the cylinder 50 which thus rotates shaft 51 and therethrough as previously described the nut 60 which translates the rotary motion into reciprocating motion so that shaft 52 may be urged upwardly or downwardly depending upon the clearance value desired.

Should it become necessary during the course of rolling through the continuous train of mills to scrap an indefinite length of wire, pressure is cut off in power means 30 and introduced into power means 70 thereby releasing the product from the grasp of the rollers and permitting it to be removed by lateral displacement relative to the rolls.

The power supply for the respective power cylinders may be correlated through a control system so that if an accidental overloading occurs, the fluid being introduced to power means 30 is immediately cut off and introduced into power means 70 thereby raising the tiltable housing 12 upwardly, thus protecting the rolling mill against overloading and damage.

Although only one embodiment of the invention has been depicted and described, it will be apparent that this embodiment is illustrative in nature and that a number of modifications in the apparatus and variations in its end use may be effected without departing from the spirit or scope of the invention as defined in the appended claims.

That which is claimed is:

1. An improved rolling mill for continuously reducing the area of indeterminate lengths of longitudinally traveling metallic wire-like products comprising, a relatively fixed housing including a first shaft means to support a wire reducing rolling means at one end thereof and exterior of said housing, a pivotal secondary housing supported for movement during working in at least one plane relative to said fixed housing and including second shaft means supporting another wire reducing rolling means for cooperation with said first named rolling means, each of said rolling means being formed with complementary grooved areas to provide a product of predetermined cross section, driving means for at least one of said rolling means, means cooperating with said driven means for driving said other rolling means, and a first power operated means on said fixed housing for controlling the movement of said pivotal secondary housing relative to said fixed housing and therethrough the circumferential area of the pass between the respective rolls.

2. An improved rolling mill as claimed in claim 1, wherein a second power operated means on said fixed housing opposes said first power operated means to

thereby control the area of the pass between said respective rolling means.

3. An improved rolling mill as claimed in claim 2, wherein the second power operated means comprises a nut-like member mounted for rotation in at least one of said housings, an elongated shaft means including a threaded portion adapted to cooperate with said nut-like member for translatory movement of the shaft means, said shaft means including a free end portion engageable with the other of said housings to thereby control the area of the pass between the respective rolling means.

4. An improved rolling mill as claimed in claim 3, wherein said elongated shaft means cooperates with indicating means to facilitate adjustment of the respective rolls.

5. An improved rolling mill as claimed in claim 2, wherein at least one of said housings is provided with a third power operated means, said third power operated means being arranged to overcome the force applied by the second power operated means.

6. An improved rolling mill as claimed in claim 1, wherein the driving means for at least one of said rolling means cooperates with a means mounted on said fixed housing, said last-mentioned means sensing the magnitude of driving torque.

7. An improved rolling mill as claimed in claim 1, wherein a series of said rolling mills are aligned longitudinally on a trough-shaped supporting base member with each alternate mill being rotated at an angle of substantially 45° to that of the mill adjacent thereto.

8. An improved rolling mill as claimed in claim 7, wherein said trough-shaped supporting base member includes baffle means, said baffle means confining a source of lubricant to the surface area of the wire product passing therethrough.

9. An improved rolling mill as claimed in claim 1, wherein means are provided for translational movement of the pivotal secondary housing laterally of the fixed housing to provide for coincidence between the grooved areas of the respective rolling means.

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MILTON S. MEHR, Primary Examiner

U.S. Cl. X.R.

72—240, 245

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,468,151 Dated September 23, 1969

Inventor(s) Lucien Diolot

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In Col. 2, line 7, "mil" should read --mill--; in line 34, "description" should read --descriptive--;

In Col. 3, line 40, "three" should read --one--; in line 51, "applies" should read --applied--;

In Col. 5, line 47, "driven" should read --driving--;

In Col. 6, line 9, --elongated-- should be inserted after "said"; in line 19, "being arranged to overcome" should read --capable of overcoming--

SIGNED AND
SEALED

MAY 5 1970

(SEAL)

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