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Abarotin et al.

[11] **3,781,663**

[45] **Dec. 25, 1973**

[54] **APPARATUS FOR ADJUSTABLY MOUNTING A TESTER TRANSDUCER RING AROUND THE PASS LINE OF A TUBULAR PRODUCT PROCESSING MILL**

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[52] **U.S. Cl.** **324/37**
[51] **Int. Cl.** **G01r 33/12**
[58] **Field of Search** 324/37, 40

[56] **References Cited**

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3,534,258	10/1970	Forster	324/37
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OTHER PUBLICATIONS

Godshall et al.; Eddy Current Inspection of Pipe at 2150 DIG. 1 American Soc. of Mech. Eng. Publ. 66–PET–36; Received in Pat. off. August 4, 1970.

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[57] **ABSTRACT**

Apparatus includes a frame adapted to be affixed to the side of a tube rolling mill housing for supporting a vertically adjustable slide member having a horizontally adjustable support plate slidably mounted on its upper end. The support plate has a cylindrical guide mounted thereon which surrounds the pass line of the mill. The exit end of the guide is rigidly connected and aligned with the entry end of the tester transducer so that the two are moved together when either the slide member or the support member is moved. In use, to properly position the tester transducer, a screw shaft is passed through the guide and transducer and a first frusto conical plug is threaded along the shaft to a position adjacent the exit end of the transducer and second and third frusto conical plugs are threaded one on each end of the shaft between the forming rolls of the pairs adjacent opposite ends of the guide-transducer combination. The slide member and the support plate are then manipulated alternately until the center frusto conical plug fits in the exit end of the transducer and the other two plugs fit properly between the forming rolls of each pair. At this time the transducer will be properly positioned surrounding the centerline of the pass line of the mill. Then the slide member and support plate are fixed in position and the screw shaft and plugs are removed so that the mill can be operated.

6 Claims, 3 Drawing Figures

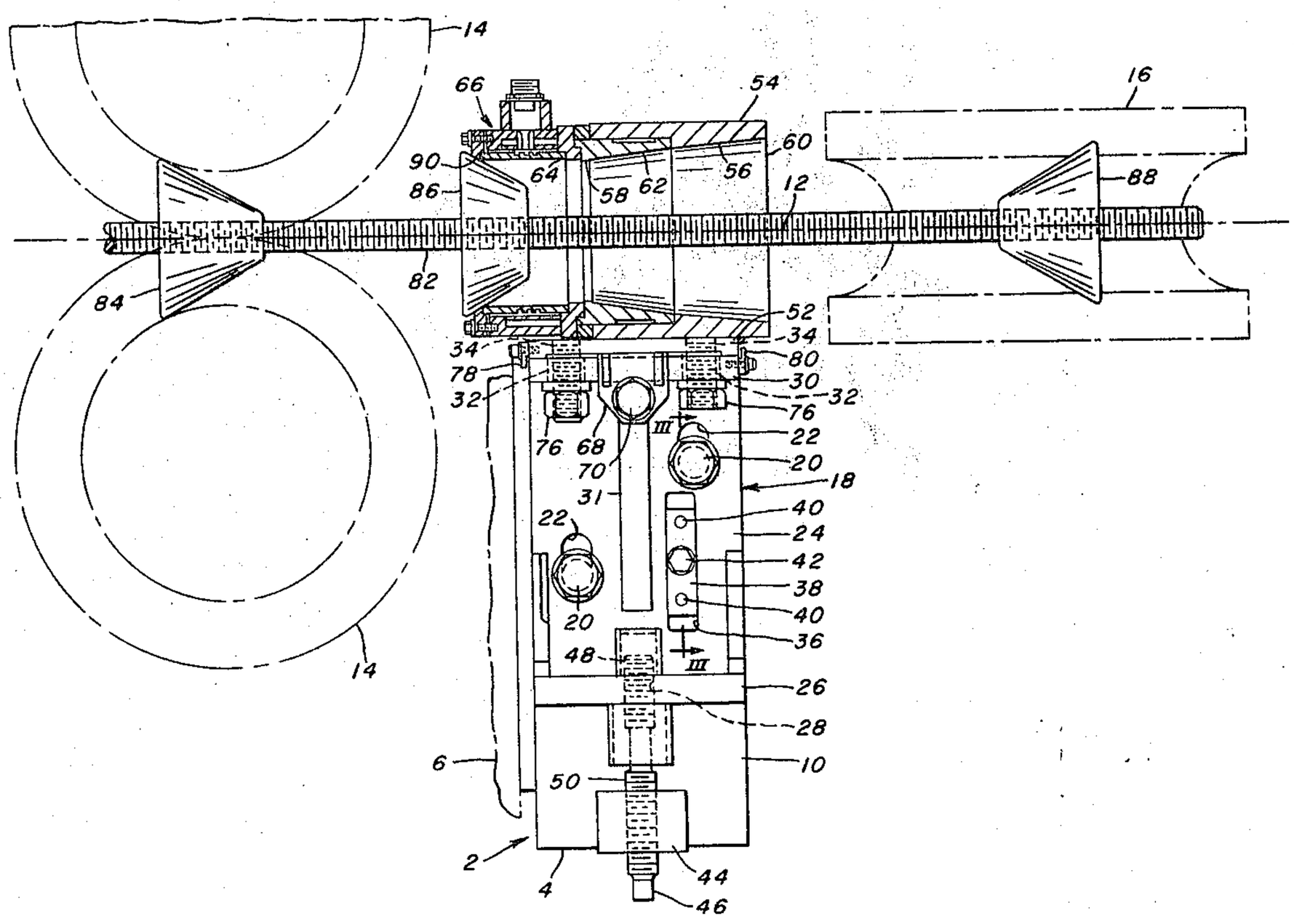
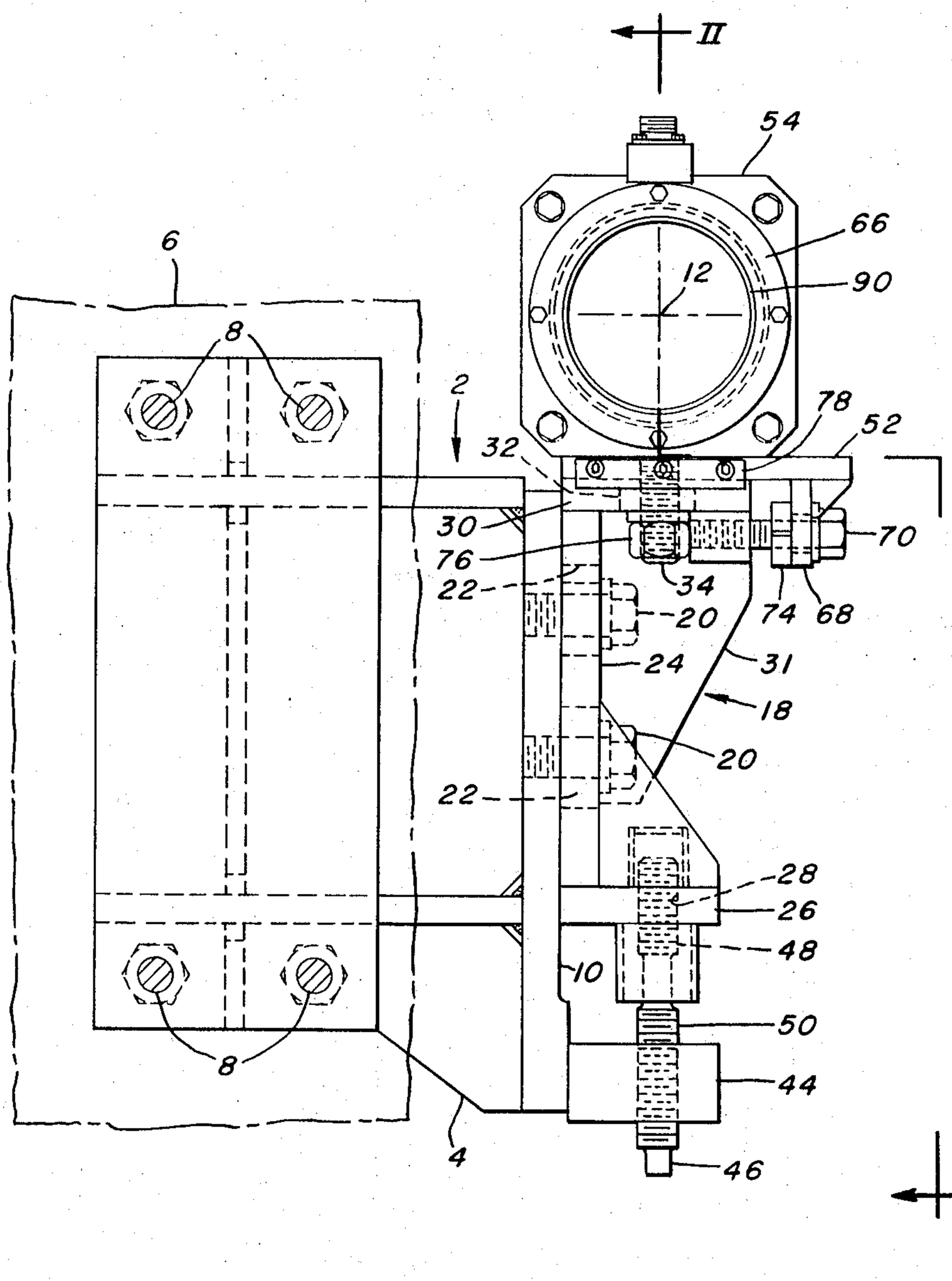


FIG. 1.


II
54
66
90
12
6
8
2
78
52
32
30
76
70
22
34
20
74
68
24
31
18
20
22
28
26
48
10
50
44
8
4
46
II

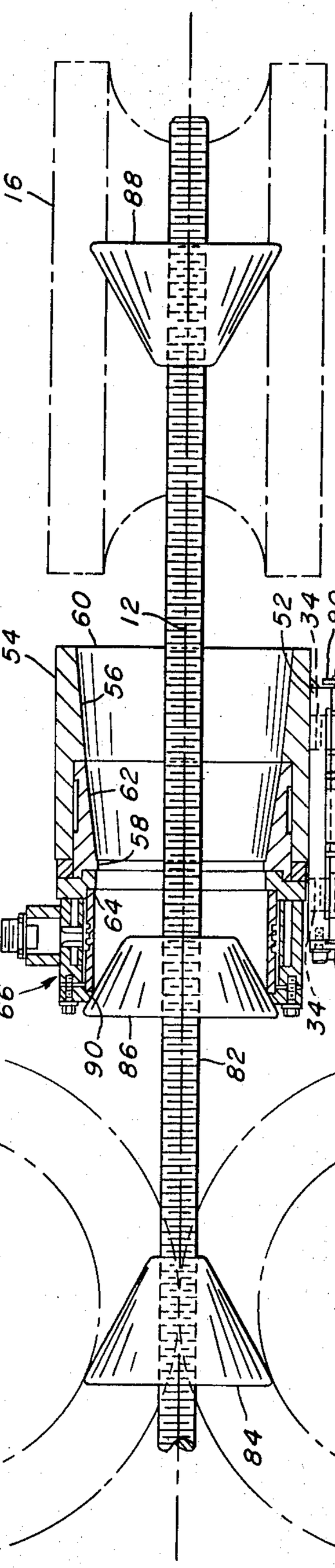

16
88
12
60
54
56
62
58
64
66
14
90
86
82
84
52
34
80
30
76
22
20
40
24
42
38
36
26
28
10
18
32
31
68
70
48
50
44
46
4
2
6

FIG. 2.

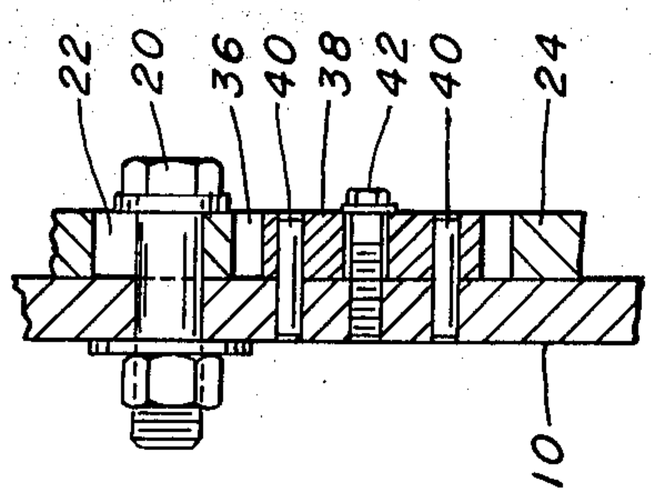

22
20
36
40
38
42
40
24
10

FIG. 3.

APPARATUS FOR ADJUSTABLY MOUNTING A TESTER TRANSDUCER RING AROUND THE PASS LINE OF A TUBULAR PRODUCT PROCESSING MILL

The present invention relates generally to mounting fixtures and more particularly to apparatus especially suitable for adjustably mounting a tester transducer ring around the pass line of a tubular product processing mill.

Since defects in pipes being produced on continuous-weld pipes cannot be visually detected even when pipe is being processed at relatively low line speeds, an eddy-current transducer ring is used for inspecting the pipe during processing. One example of this type of pipe inspection device is shown and described in U. S. Pat. No. 3,694,735 dated Sept. 26, 1972. In using this type of pipe inspecting device, during processing the welded pipe is passed through the eddy-current inductor-coil transducer and a variation in signal across the coil provides information as to whether the weld is of desirable quality.

For reliable operation the transducer must be concentrically mounted with respect to the pass line of the mill, and a small spacing between the transducer coil and the outer periphery of the pipe is necessary.

Prior to our invention when transducers were used to inspect welded pipe, the transducer mountings were not capable of being accurately centered with respect to the pass line of the mill. When the transducer coils were not centered properly, they not only functioned inaccurately in providing information as to the quality of the welded pipe but were also susceptible to frequently occurring damage by defective pipe even to the extent of being torn from its mounting. Full utilization of this type of welded pipe inspection, therefore, was not possible.

It is, accordingly, the primary object of our invention to provide an adjustable transducer mounting that assures proper centering of the transducer around the mill pass line.

It is a further object of our invention to provide a transducer mounting which, without change, will accommodate a wide variety of pipe sizes.

It is a more specialized object of our invention to provide an improved apparatus for properly adjustably mounting a coil transducer around the pass line of a tubular product processing mill which includes a slide member mounted by means of a frame on the side of the mill housing, means for vertically adjusting the slide member, a horizontally movable support member carried by the upper portion of the slide member, means for horizontally moving the support member transversely of the pass line of the mill, an upstanding cylindrical guide on the support member surrounding the pass line of the mill between two pairs of rolls of the mill, the exit end of the guide member being connected with the entry end of a coil transducer for imparting adjustable vertical and horizontal to the transducer, a screw shaft adapted to be disposed through the guide and transducer coil along the pass lines extending between adjacent pairs of rolls of the mill, three frusto conical plugs threaded on the shaft in spaced relation, the outer plugs being adapted to fit between the rolls of each pair and the center plug fitting into the exit end of the transducer coil is properly positioned by alternately manipulating the slide member and the support member.

These and other objects will become more apparent after referring to the following specification and drawing, in which:

FIG. 1 is an elevational side view showing the mounting of our invention supporting a coil-induction transducer;

FIG. 2 is an elevational view partly in section taken substantially along the line II—II of FIG. 1; and

FIG. 3 is a partial vertical sectional view taken substantially along the line III—III of FIG. 2.

Referring more particularly to the drawing, reference character 2 designates generally the mounting of the invention which includes a frame 4, which may be in the form of a weldment affixed to the housing 6 of a pipe processing mill by means of bolts 8. Frame 4 is formed with a vertical side wall 10 which is parallel with and perpendicular to the normal planes passing through the center of the pass line 12 of the mill, as best shown in FIG. 1. As best shown in FIG. 2, the rolling mill includes a pair of vertical forming rolls 14 and a pair of horizontal forming rolls 16 in spaced tandem relationship. The mounting 2 of the invention is disposed between the pairs of rolls 14 and 16.

A vertical adjusting bracket 18 is bolted to the vertical side wall 10 of the frame 4 by means of bolts 20 which pass through elliptical elongated, vertically directed holes 22 and are threaded into the side wall 10 of the frame 4. The bracket 18 includes a vertically disposed slide plate 24, through which the holes 22 are formed, disposed in slidable relation adjacent to the vertical side wall 10 of frame 4 and a projecting plate 26 rigidly affixed to and extending normal to the lower portion of slide plate 24. Projecting plate 26 is provided withn internally threaded transversely directed hole 28 intermediate its ends for a purpose which will become obvious hereinafter. A ledge plate 30 is rigidly affixed to and extends normal to the upper portion of the slide plate 24. Ledge plate 30 is provided with a spaced pair of elongated slots 32 for receiving threaded studs 34, the function of which will be more fully explained hereinafter. A gusset plate 31 extends between plates 30 and 24.

A vertically elongated slot 36 slidably accommodates a smaller dimensioned guide bar 38 which is retained by two dowel pins 40 which are pressed into the vertical side wall 10 of frame 4. A mounting bolt 42 passes through guide bar 38 and is threaded into an internally threaded hole in the side wall 10 of frame 4.

A lug 44 having an internally threaded, vertically directed hole intermediate the ends thereof is rigidly connected with and extends normal to the bottom portion of the wall 10 of frame 4 substantially parallel with projecting plate 26. As best shown in FIG. 1, the internally threaded holes in lug 44 and projecting plate 26 are aligned for receiving an adjustment rod 46. Two spaced portions 48 and 50 of the periphery of rod 46 are threaded of opposite hand and threadingly engage the holes in lug 44 and projecting plate 26. A portion of the rod 46 projects below the lug 44 and is shaped to receive a wrench (not shown) for turning the rod 46 to move bracket 18 vertically, as will be more fully explained hereinafter.

A support plate 52 is mounted for slidable movement on ledge plate 30 transversely of the pass line 12 of the mill. The inner ends of threaded studs 34 are secured

in the support plate **52** which is welded or is otherwise rigidly attached to the bottom of a cylindrical guide **54** which, in turn, is upstanding on the support plate **52.** The guide **54** is formed with an internal bore **56** which tapers outwardly from its exit end **58** to its entry end **60.** The exit end portion of guide **54** circumferentially surrounds and is rigidly connected with a short length of tubing **62** which, in turn, is rigidly connected with the entry end **64** of a coil transducer **66.**

A lug plate **68** depends from support plate **52** and has a hole therethrough for accommodating a bolt **70** which extends into threaded engagement with a lug **72** which depends from the ledge plate **30.** Rotation of the bolt **70** causes horizontal movement of the support plate **52** on the ledge plate **30** to move guide **54** and transducer coil **66.** A lock nut **74** may be provided on the bolt **70** between the lug plate **68** and the lug **72.**

Securing nuts **76** are threaded on the outer ends of studs **34** to lock the support plate **52** in adjusted position relative to ledge plate **30.**

A retaining plate **78** is bolted along the left side of support plate **52,** as viewed in FIG. **2,** and overlaps the corresponding edge of ledge plate **30.** Another retaining plate **80** is bolted along the right side of ledge plate **30** and extends upwardly to overlap the corresponding edge of support plate **52.** Plates **78** and **80** retain plates **52** and **30** in proper juxtaposed position and act as guides when support plate **52** is moved horizontally relative to ledge plate **30.** Although retaining plates **78** and **80** have been shown as being bolted to plates **52** and **30,** respectively, they may be both affixed to either support plate **52** or ledge plate **30** and positioned to overlap the other plate.

A screw shaft **82** having frusto conical plugs **84, 86,** and **88** threaded thereon in spaced relation to each other extends along the pass line **12** of the mill between the pairs of forming rolls **16** and **18.** When the plug **84** is engaged between the vertical rolls **14** and plug **88** is engaged between the rolls **16** and plug **86** is engaged in the exit end **90** of transducer coil **66,** the transducer coil is in properly centered position relative to the centerline of the pass line **12** of the mill.

In operation, the screw shaft **82** is placed into position extending between pairs of rolls **14** and **16** and passing through the guide **54** and transducer **66,** and plug **86** is threaded on the screw shaft. The plugs **84** and **88** are then threaded along opposite ends of the screw shaft until the tapered surfaces of the plugs **84** and **88** are in contact with the forming rolls **14** and **16,** respectively. Once the end plugs **84** and **88** are firmly in place, plug **86** is threaded along shaft **82** until plug **86** is in contact with the inner periphery of the exit end **90** of the transducer **66.** If the tapered surfaces of plug **86** and the inner periphery of the exit end **90** of the transducer are not in circumferential contact, the mounting must be centered. In order to center the mounting in the vertical direction, bolts **20** must be loosened. The vertical adjustment rod **46** is turned to change the vertical position of the mounting.

To adjust the mounting of the invention in the horizontal direction, nuts **76** on studs **34** must be loosened, and then the horizontal adjustment bolt **70** is rotated until plug **86** and the inner periphery of the exit end **90** of transducer **66** are in contact. The use of vertical and horizontal adjustment is continued alternately until a complete circumferential contact is achieved between the tapered surface of the plug **86** and the inner periphery of the exit end **90** of the transducer **66.** After this has been done, all the securing bolts are tightened and the screw shaft **82** and plugs **84, 86** and are removed. The transducer is then in position to function properly to evaluate the quality of welded pipe passing therethrough.

While we have shown but one embodiment of our invention, other adaptations and modifications may be made without departing from the scope of the following claims.

We claim:

1. Apparatus for adjustably mounting a tester transducer ring having an entry end and an exit end disposed around the pass line of a tubular product processing mill including a mill housing having a plurality of pairs of forming rolls spaced in tandem therein, and a pass line extending between said pairs of rolls, said apparatus comprising a vertically disposed elongated frame affixed to one side of said mill housing below said pass line between two pairs of said forming rolls, one vertical side of said frame being parallel and perpendicular to continuations of the normal planes passing through the center of said pass line, a slide plate mounted for adjustable vertical movement along said one vertical side of said frame, means for adjustably moving said slide plate along said one vertical side, means for detachably connecting said slide plate with said frame, a ledge plate rigidly affixed to and extending normal to the upper portion of said slide plate, a support plate mounted for adjustable horizontal movement on said ledge plate, means for slidably retaining said support plate on said ledge plate, means connected with said ledge plate and said support plate for adjustably moving said support plate relative to said ledge plate below and transversely of the longitudinal horizontal plane containing said pass line, an upstanding guide having an entry end and an exit end rigidly mounted on said support plate surrounding said pass line, said guide being rigidly connected at its exit end with the entry end of said tester ring for common vertical and horizontal movement therewith whereby said tester is adjustably moved vertically relative to said pass line when said slide plate is moved vertically and adjustably moved transversely horizontally relative to said pass line when said support plate is moved horizontally, an externally threaded adjustment screw shaft extending longitudinally between said two pairs of forming rolls and through said guide and tester substantially along said pass line, a substantially frusto conical plug threaded on said screw shaft adjacent each end thereof, another substantially frusto conical plug threaded on said screw shaft intermediate the ends thereof, said first-mentioned plugs adjacent the ends of said screw shaft being adapted to fit one each between the rolls of each pair of rolls and said another plug being adapted to fit into the exit end of said tester ring when said adjustment screw extends along the centerline of said pass line between said pairs of forming rolls, said guide and tester ring being selectively vertically and horizontally adjustable to achieve fitting of said plugs adjacent the end of said shaft between said rolls of each pair and said another plug into the exit end of said tester ring.

2. Apparatus as defined by claim **1** in which said means for adjustably moving said slide plate includes said slide plate having at least one vertically directed substantially elliptical opening therethrough, and a screw passing through said opening and being threaded

into said one vertical side of said frame, a projecting plate having an internally threaded hole therethrough extending normal and rigidly affixed to the bottom portion of said slide plate, a lug rigidly affixed to and extending normal to said one vertical side of said frame spaced below and substantially parallel with said projecting plate, said lug having an internally threaded hole therethrough aligned with the internally threaded hole in said projecting plate, an adjustment stud having a pair of externally threaded circumferential threaded portions extending along its length, said threaded portions being of opposite hand, one of said threaded portions being threadingly engaged in the internally threaded hole through said projecting plate and the other threaded portion being threadingly engaged in the internally threaded hole through said lug, a portion of said adjustment rod projecting below said lug whereby said rod can be grasped and turned.

3. Apparatus as defined by claim **2** in which said slide plate has a vertically elongated slot therein, and a guide bar slidably fitted in said slot and rigidly fastened to said one vertical side of said frame, said guide bar having a length less than that of said elongated slot.

4. Apparatus as defined by claim **1** in which said means for slidably retaining said support plate on said ledge plate includes a stop plate rigidly affixed on the sides of one of said support plate and said ledge plate extending below and transversely of the longitudinal

horizontal plane containing said pass line, said stop plates overhanging the sides of the other one of said support plate and said ledge plate which extend below and transversely of the longitudinally horizontal plane containing said pass line, said ledge plate has at least a pair of spaced elongated slots therethrough extending substantially parallel with said sides of said ledge plate, a threaded stud passes through each of said slots, one end of each of said stud being rigidly attached to said support plate and its other end projecting below said ledge plate and a nut threaded on the projecting end of each of said studs.

5. Appparatus as defined by claim **1** in which said means connected with said ledge plate and said support plate for adjustably moving said support plate relative to said ledge plate includes a lug plate having a hole threthrough rigidly attached to and from the underside of said support plate extending normal thereto spaced from said ledge plate, a lug having an internally threaded hole therethrough aligned with the hole in said lug plate attached to and depending from said ledge plate, a bolt passes through said lug plate and is threaded into the hole in said lug depending from the ledge plate.

6. Apparatus as defined by claim **5** in which a lock nut is threaded on said stud between said lug and said lug plate.

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