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(54) **ROLLING MILL LAYING HEAD**

(57) The invention discloses a tubular nose (36) adapted to project axially in cantilever fashion from the rotatable quill of a rolling mill laying head, said quill carrying a product guide having an entry end aligned with a rotational axis of the quill, and having an intermediate curved portion leading from said entry end to a delivery end communicating with a guide trough (50) providing a helical extension of said product guide, said nose (36) having an auger plate (42) configured and arranged to provide continuous support for said guide trough (50) and for the intermediate curved portion and delivery end of said product guide, said nose (36) further having a mounting flange (40) and a central body (38), wherein the auger plate (42) extends continuously from the mounting flange (40) to a distal end of the central body (38), wherein said auger plate (42) is fabricated as an integral component of said nose (36).

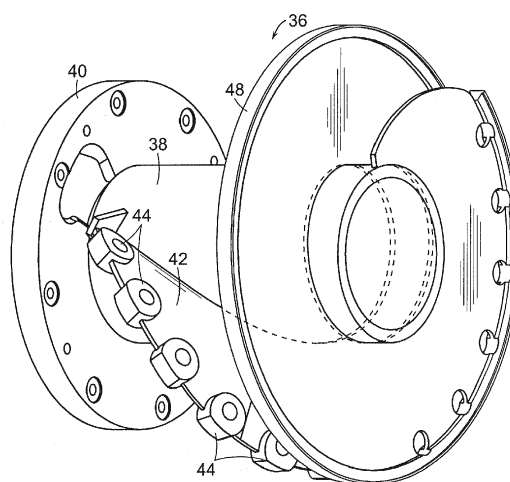


FIG. 5

Description

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims benefit, under 35 U.S.C. § 119(e), of U.S. Provisional Application Serial No. 61/707,510 filed on September 28, 2012, and U.S. Utility Application Serial No. 13/614,145 filed September 13, 2012, the contents and substance of which are herein incorporated by reference.

BACKGROUND

1. Field

[0002] Aspects of the present invention relate to high speed rod rolling mills, and more particularly to improvements to the laying heads employed in such mills to form the hot rolled product into a helical series of rings.

2. Description of Related Art

[0003] With reference to Fig. 1, a conventional laying head 10 includes a housing containing a rotatably driven hollow quill 12. The quill is subdivided into a tubular body 12a journaled for rotation between axially spaced bearings 14, 16, and a nose 18 detachably secured by means of a mounting flange 20 to the tubular body 12a. The nose projects axially and forwardly in cantilever fashion from the tubular body.

[0004] The quill 12 carries a product guide, typically in the form of a three dimensionally curved laying pipe 22. The laying pipe has an entry end 22a aligned with the rotational axis "X" of the quill 12, and a curved intermediate section 12b leading to a delivery end 12c spaced radially from axis X.

[0005] Hot rolled steel rod is directed into the entry end 22a of the laying pipe 22 along axis X, and exits from the delivery end 22c as a helical formation of rings (not shown). Upon exiting from the delivery end 22c of the laying pipe 22, the rings are additionally confined and moved forward by a helical guide trough 24 surrounded by a cylindrical shroud 26. The guide trough 24 is configured and dimensioned to coact with the shroud 26 in providing an axially and radially confined helical extension of the guide path defined by the laying pipe 22.

[0006] Although this extended confinement has proven to be highly beneficial in resisting distortion and kinking of the tail ends of products as they exit from the laying head 10, the manner of supporting the guide trough 24, as well as its design, have given rise to difficulties that have been found to compromise high speed operation of the laying head.

[0007] For example, the curved intermediate portion 22b of the laying pipe 22 is supported on the nose 18 by radially projecting struts 28, whereas the guide trough 24 is carried on a separate disc-shaped trough support 30 detachably mounted on the end of the cantilevered nose

18.

[0008] With further reference to Figs. 2 and 3, the disc-shaped trough support 30 may be seen as including a hub 32 at the center of a helical plate 34 on the outer rim of which are attached channel-shaped trough segments typically indicated at 24'.

[0009] The helical plate 34 is typically welded to the hub 32, with the resulting structure of the trough support 30 being robust and consequently heavy in order to withstand the stresses resulting from high speed operation of the laying head. Moreover, difficulties are encountered in accurately aligning the trough support 30 with the rotational axis X of the laying head, with even slight misalignments causing disruptive vibrations at high speeds.

[0010] An additional drawback relates to the conventional trough segments 24', which typically comprise unitary expensive investment castings. The traditional casting materials have been found to lack adequate resistance to wear occasioned by factional contact with the hot rolled product. Attempts at dealing with this problem have included increasing the thicknesses of the trough segment side walls, but the resulting increased weight has been found to further contribute to instability of the laying head.

[0011] WO 03/051553 A1 shows a laying head for forming an axially moving hot rolled product into a helical series of rings, said laying head comprising a quill rotatable about an axis, said quill having a tubular body journaled for rotation between axially spaced bearings, and having a nose projecting axially and forwardly from said body; a product guide carried by said quill, said product guide having an entry and aligned with said axis and arranged to receive said product; a guide trough providing a helical extension of said product guide.

SUMMARY

[0012] Broadly stated, aspects of the present invention include supporting both the product guide, which may comprise a laying pipe, and the guide trough, on a continuous helical support formed as an integral component of the nose projecting axially and forwardly from the tubular body of the quill.

[0013] In accordance with other aspects of the present invention, the guide trough segments are subdivided into a continuous bottom comprising the outer rim of the helical support, with the side walls being segmented, detachably secured to the trough bottom, and readily replaceable when worn.

[0014] These and other objects, features and advantages of the present invention will become more apparent upon reading the following detailed description in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

Fig. 1 is a side view, with portions in section, of a conventional laying head;

Fig. 2 is a perspective front view of the nose and guide trough assembly of the conventional laying head shown in Fig. 1;

Fig. 3 is a partially exploded perspective view of the conventional guide trough assembly shown in Figs. 1 and 2;

Fig. 4 is a rear perspective view of the nose of a laying head quill in accordance with an exemplary embodiment of the present invention, with the laying pipe and guide trough carried on a continuous helical support comprising an integral component of the nose;

Fig. 5 is a front perspective of the nose depicted in Fig. 4;

Fig. 6 is a view showing one side of the nose depicted in Fig. 5;

Fig. 7 is a view showing the opposite side of the nose depicted in Fig. 5;

Fig. 8 is a sectional view on an enlarged scale taken along line 8-8 of Fig. 4 and showing details of trough segments in accordance with an exemplary embodiment of the present invention; and

Figs. 9A and 9B are respectively perspective and side views of a guide trough side wall segment in accordance with an exemplary embodiment of the present invention.

DETAILED DESCRIPTION

[0016] In accordance with the present invention, the conventional assembly of the nose 18 and separate disc-shaped trough support 30 depicted in Fig. 1 is replaced by a unitary nose 36, an exemplary embodiment of which is depicted in Fig. 4. The unitary nose 36 has a central tubular body 38 provided at one end with a mounting flange 40 adapted to be connected to the tubular body 12a of the conventional laying head quill 12 shown in Figs. 1-3. A helical support, which may comprise a continuous auger plate 42 configured as an unwinding spiral scroll, is permanently joined to the central body 38.

[0017] As can best be seen by additional reference to Figs. 5-7, the auger plate 42 extends continuously from the mounting flange 40 to the distal end of the central body 38. A segment of the plate 42 carries brackets 44 on its rim. As can best be seen in Fig. 4, the brackets 44 coact with clamps 46 to secure the laying pipe 22 in its operative position. The remaining rim of the auger plate 42 is defined by a continuous collar serving as the bottom 48 of a channel-shaped guide trough 50.

[0018] By supporting both the laying pipe 22 and the guide trough 50 on a continuous auger plate 52 formed as an integral component of the cantilevered nose 36, stress concentrations are significantly reduced. This in turn makes it possible to reduce the weight of the nose 36, with the result that the center of gravity of the laying head's rotating assembly is advantageously shifted rear-

wardly and closer to the bearings 14, 16. Overall rigidity and resistance to vibration is thus beneficially enhanced.

[0019] With reference to Figs. 8, 9A and 9B, the sides 52 of the guide trough 50 are segmented and detachable secured to the bottom 48 by conventional fasteners which may comprise bolts 54 and nuts 56. An exemplary embodiment of a trough side wall segment 52 is depicted in Figs. 9A and 9B.

[0020] When individual side wall segments 52 experience accelerated wear, they may be readily replaced without replacing others that experience lesser wear.

[0021] Preferably, the side wall segments 52 are identical. The side wall segments may be cast or fabricated from light weight wear resistant materials, illustrative examples including aluminum, aluminum alloys, carbon fibers, thermoplastics, etc. Additionally, or alternatively, the interior surfaces 52' of the side wall segments 52 may comprise or be coated with a wear resistant material, for example, a nano metal.

[0022] The foregoing description and drawings are merely illustrative of the principles of the present invention and are not to be construed in a limiting sense. Various changes and modifications will become apparent to those of ordinary skill in the art. All such changes and modifications are seen to fall within the scope of the invention as defined by the appended claims.

Claims

1. A tubular nose (36) adapted to project axially in cantilever fashion from the rotatable quill of a rolling mill laying head, said quill carrying a product guide having an entry end aligned with a rotational axis of the quill, and having an intermediate curved portion leading from said entry end to a delivery end communicating with a guide trough (50) providing a helical extension of said product guide, said nose (36) having an auger plate (42) configured and arranged to provide continuous support for said guide trough (50) and for the intermediate curved portion and delivery end of said product guide, said nose (36) further having a mounting flange (40) and a central body (38), wherein the auger plate (42) extends continuously from the mounting flange (40) to a distal end of the central body (38), wherein said auger plate (42) is fabricated as an integral component of said nose (36).
2. Tubular nose according to claim 1 wherein an outer rim of said auger plate (42) comprises a bottom (48) of said guide trough (50).
3. Tubular nose according to claim 1 or 2 wherein said continuous auger plate (42) is configured as an unwinding spiral scroll permanently joined to the central body (38).

4. Tubular nose according to claim 1 wherein the tubular nose (36) has one end thereof configured and arranged to be detachably secured to said quill.
5. Tubular nose according to claim 1 wherein the intermediate curved portion and delivery end of said product guide are secured by brackets on a rim of said auger plate (42).

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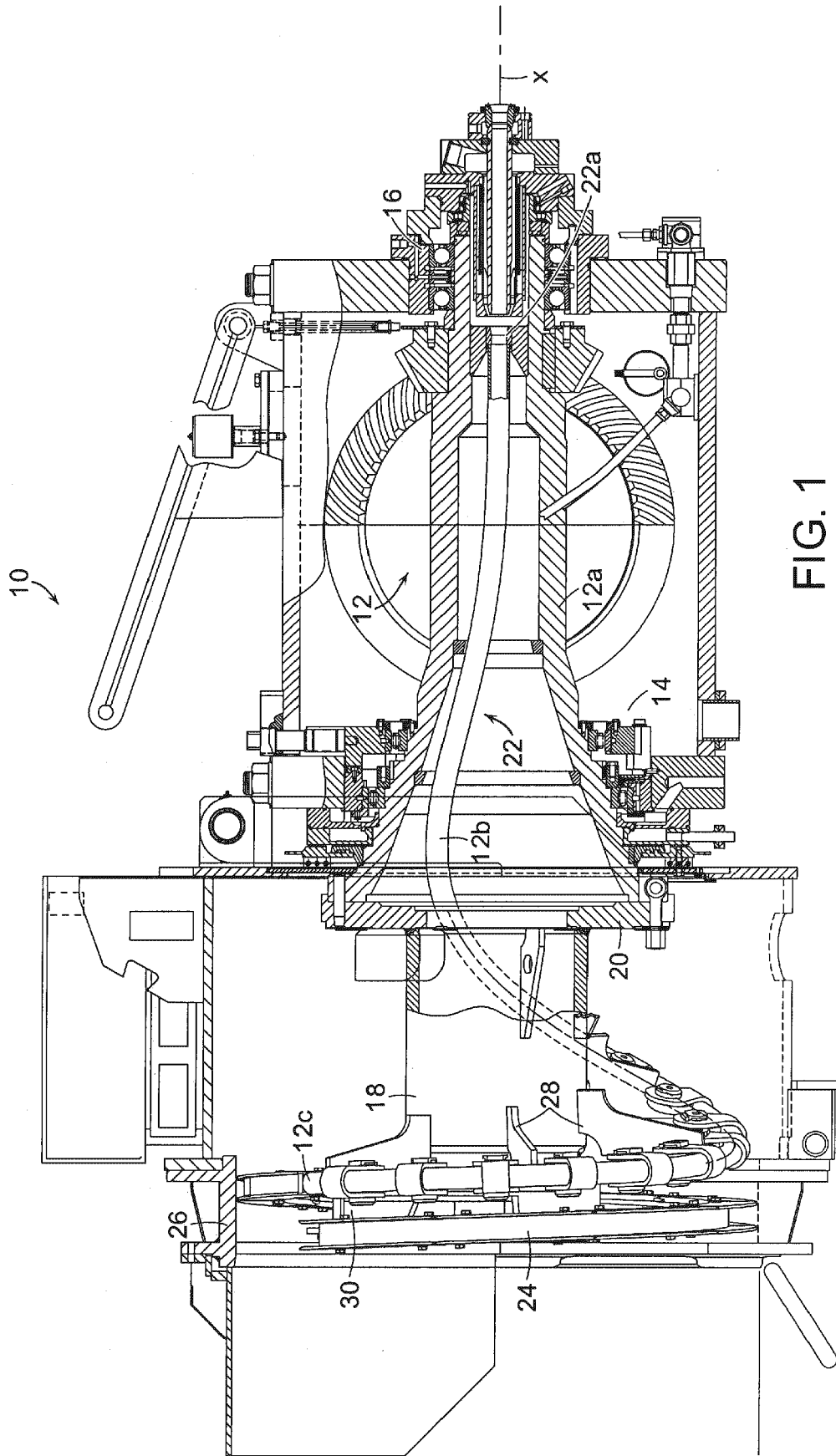
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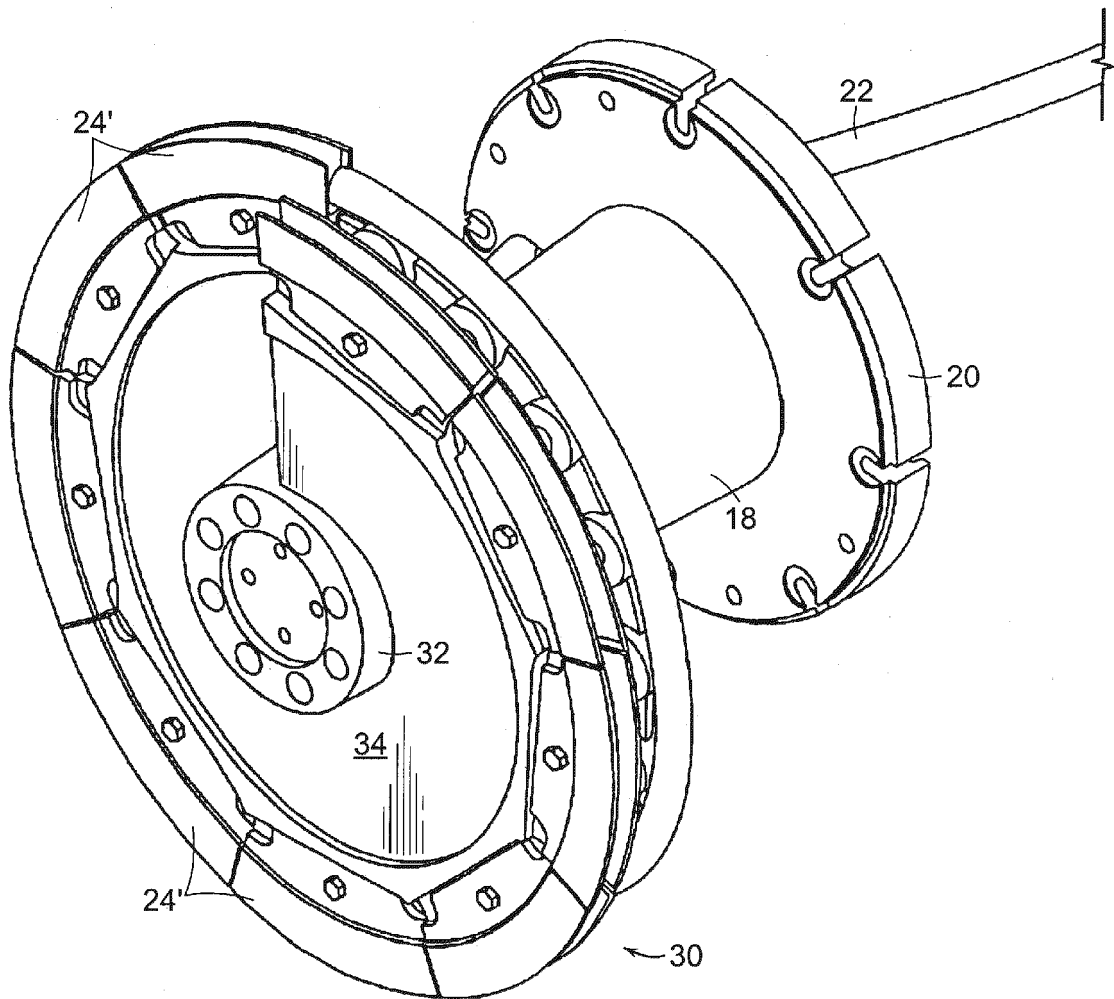


FIG. 2
PRIOR ART

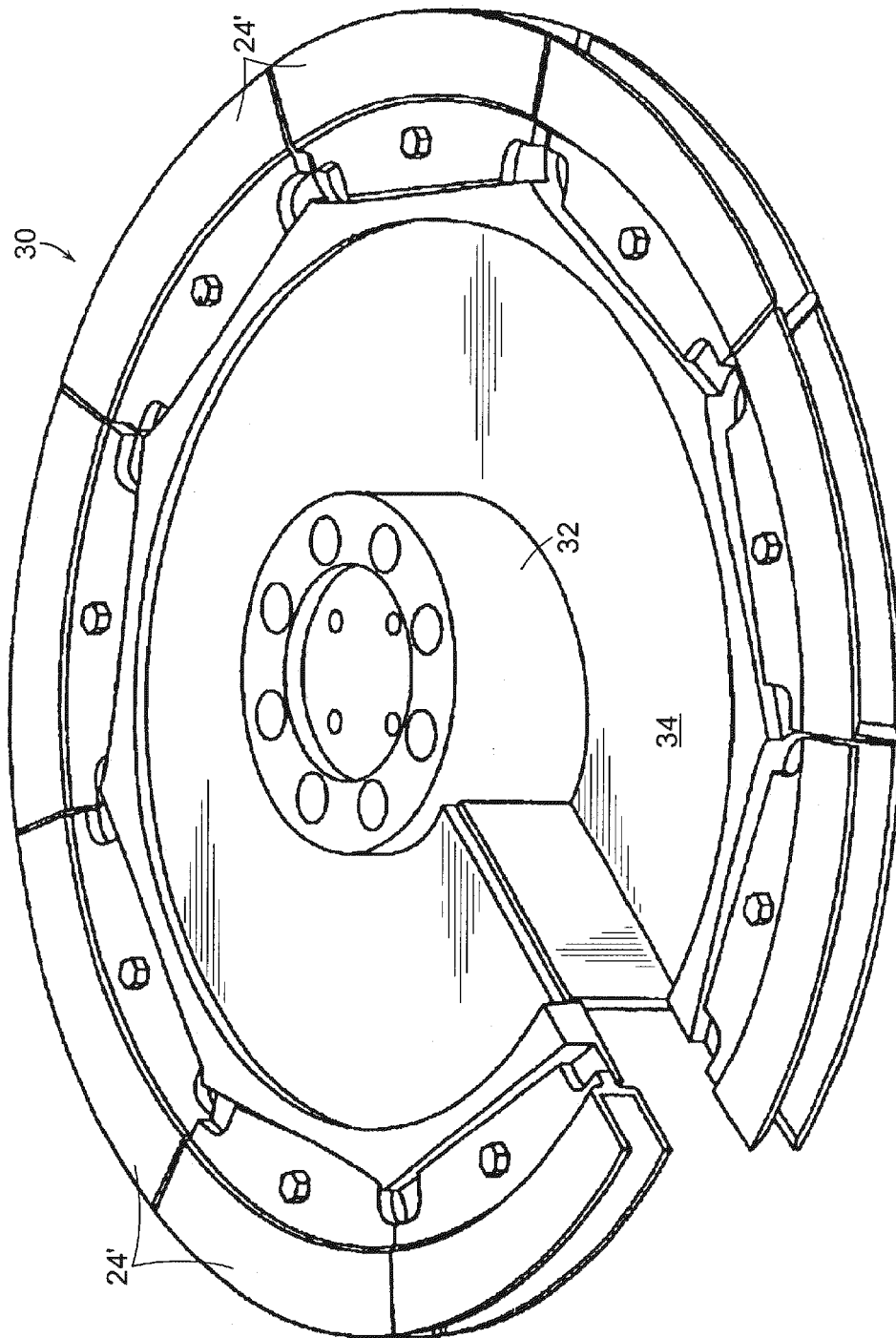


FIG. 3
PRIOR ART

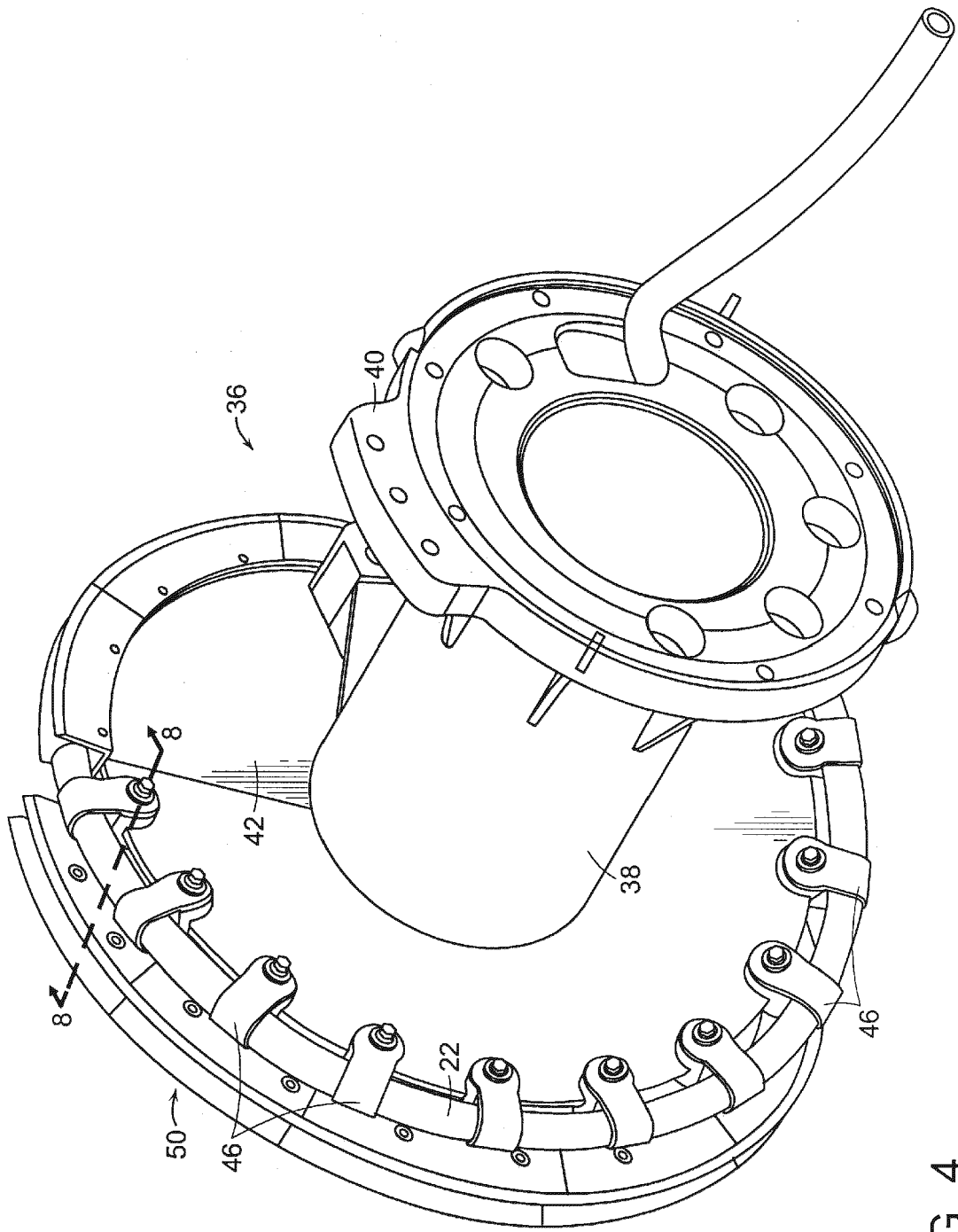


FIG. 4

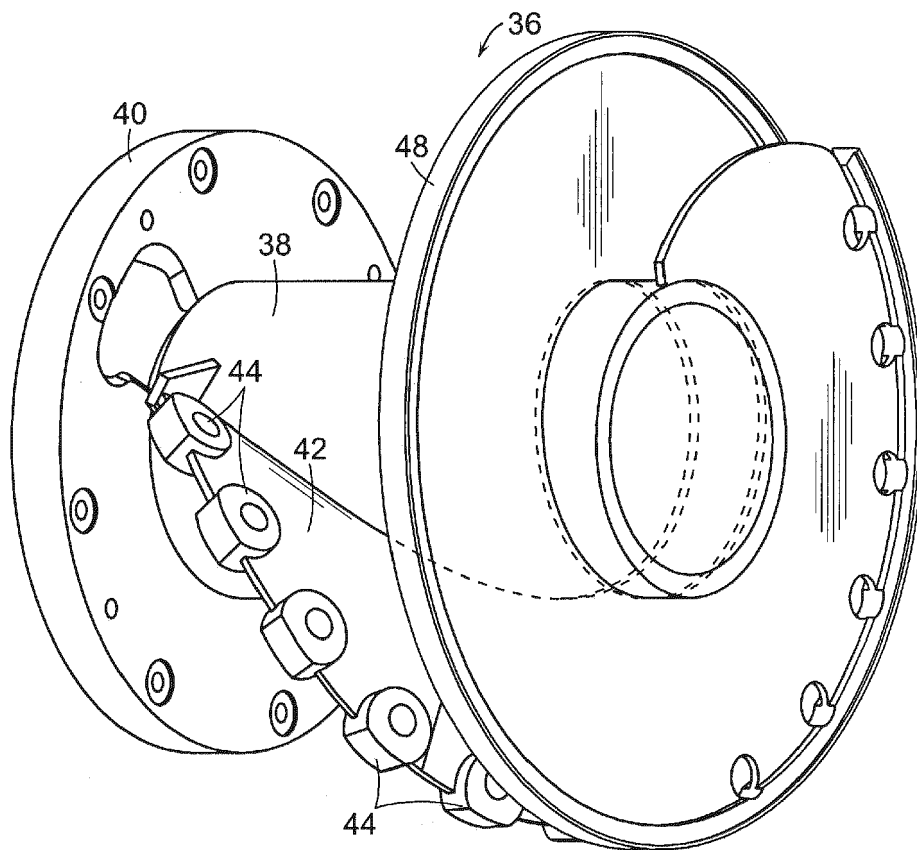


FIG. 5

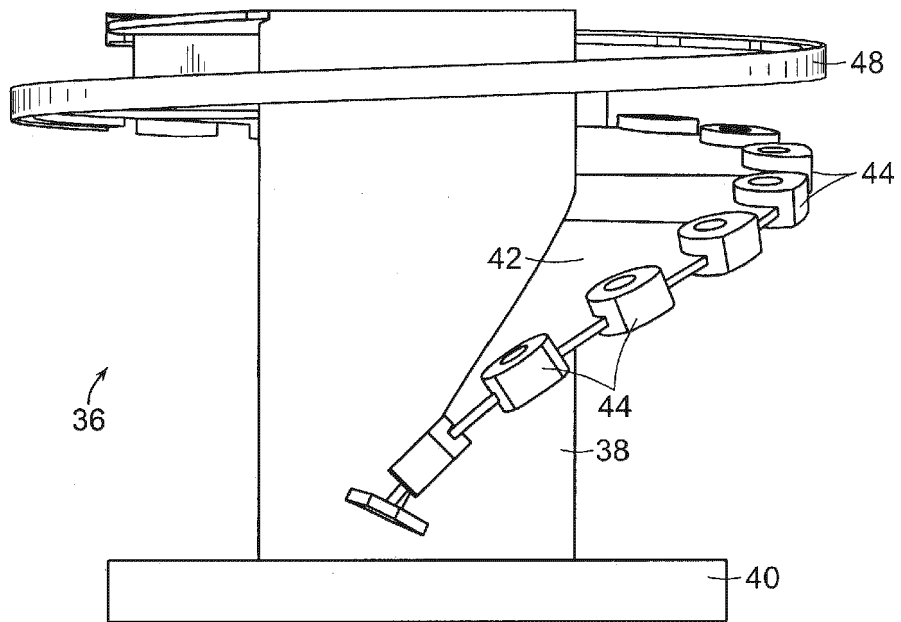


FIG. 6

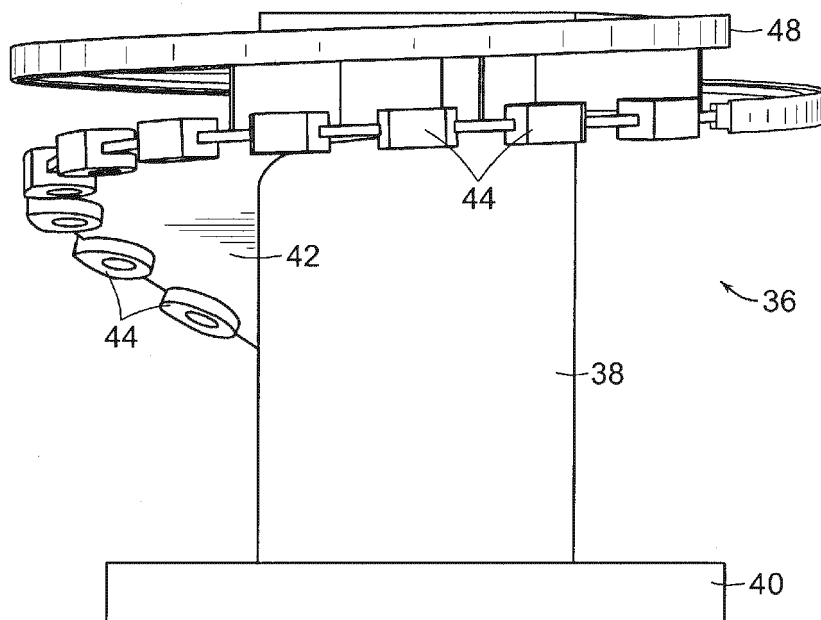


FIG. 7

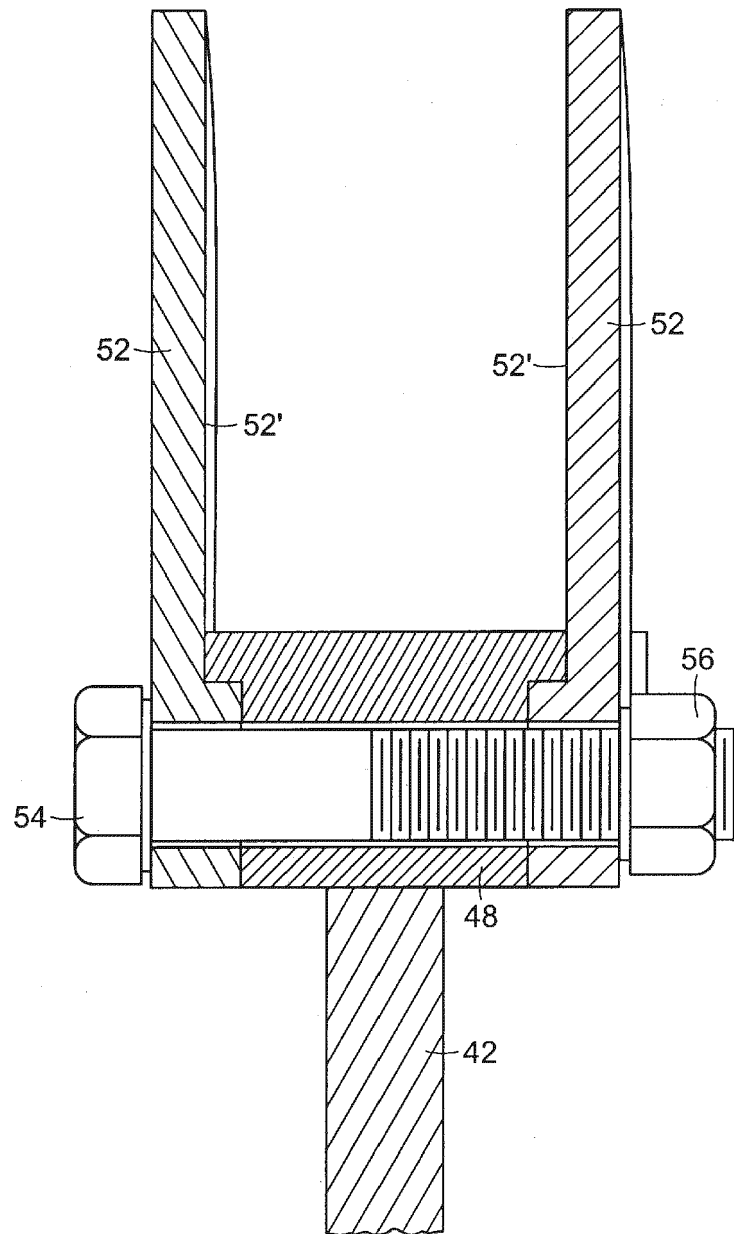


FIG. 8

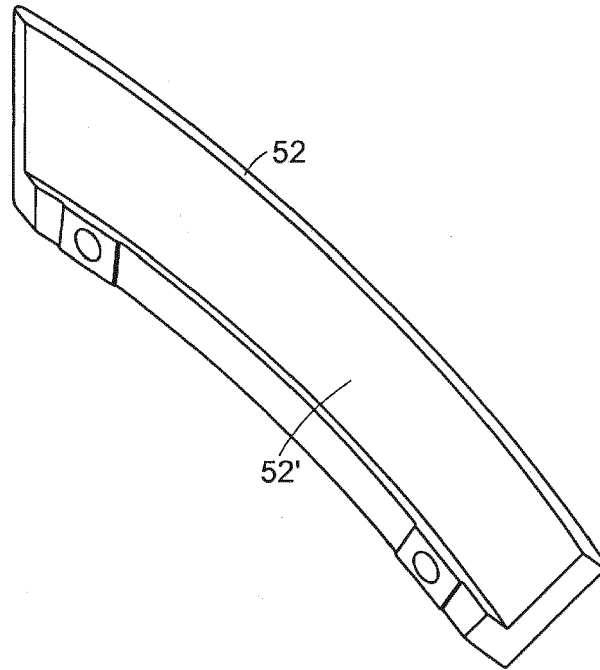


FIG. 9A

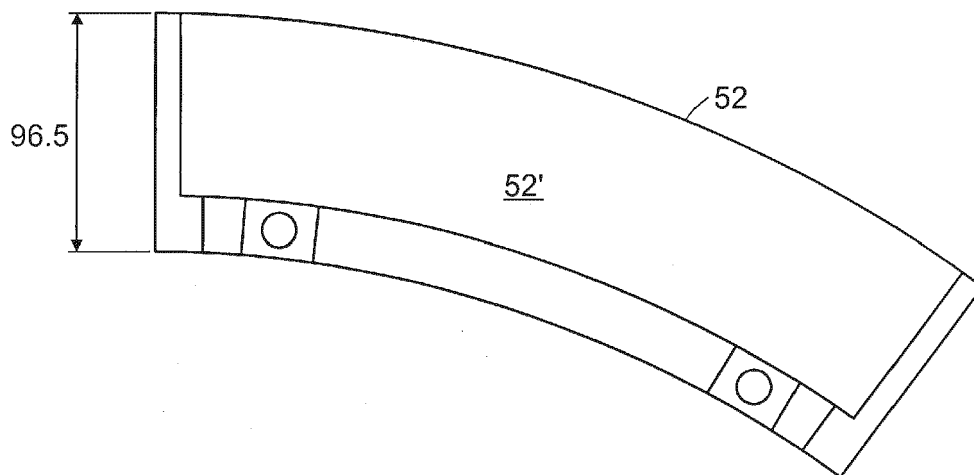


FIG. 9B



EUROPEAN SEARCH REPORT

Application Number
EP 20 19 5272

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 03/051553 A1 (MORGAN CONSTRUCTION CO [US]) 26 June 2003 (2003-06-26) * the whole document *	1-5	INV. B21C47/14
A	EP 0 554 976 A1 (MORGAN CONSTRUCTION CO [US]) 11 August 1993 (1993-08-11) * the whole document *	1-5	
			TECHNICAL FIELDS SEARCHED (IPC)
			B21C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 8 February 2021	Examiner Ritter, Florian
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 20 19 5272

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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