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(54) **ROLLING MILL LAYING HEAD**

LEGEKOPF FÜR WALZWERK

TÊTE DE POSITIONNEMENT POUR LAMINOIR

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Description

BACKGROUND

1. Field

[0001] 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

[0002] 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 journalled 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.

[0003] 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.

[0004] 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.

[0005] 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.

[0006] 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.

[0007] 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'.

[0008] 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 with-

stand 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.

[0009] 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.

[0010] 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 journalled 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

[0011] 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.

[0012] 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

[0013]

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

[0014] 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.

[0015] 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.

[0016] 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 rearwardly and closer to the bearings 14, 16. Overall rigidity and resistance to vibration is thus beneficially enhanced.

[0017] 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.

[0018] When individual side wall segments 52 experience accelerated wear, they may be readily replaced without replacing others that experience lesser wear.

[0019] 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 fib-

ers, 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.

[0020] 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 laying head for forming an axially moving hot rolled product into a helical series of rings, said laying head comprising:

a quill (12) rotatable about an axis (X), said quill having a tubular body (12a) journaled for rotation between axially spaced bearings (14,16), and having a nose (36) projecting axially and forwardly from said body;

a product guide carried by said quill, said product guide having an entry end aligned with said axis and arranged to receive said product, and having an intermediate curved portion leading from said entry end to a delivery end spaced radially from said axis and from which said product is discharged as said helical series of rings;

a guide trough (50) providing a helical extension of said product guide,

the laying head being **characterized in that** the intermediate curved portion and delivery end of said product guide and said guide trough (50) are carried on a continuous helical support on the nose (36) of said quill

2. The laying head of claim 1 wherein the nose (36) of said quill comprises a unitary structure including said helical support.

3. The laying head of claim 2 wherein said helical support comprises an auger plate (42) configured as a spiral scroll projecting radially from said nose (36).

4. The laying head of claim 1 wherein said nose (36) is detachably secured to said tubular body.

5. The laying head of claim 2 wherein said helical support is a fabricated component integrally joined to said nose (36).

6. The laying head of claim 1 wherein said product guide comprises a pipe (22).

7. The laying head of claim 6 wherein said pipe (22) is

detachably secured to said helical support.

8. The laying head of claim 1 wherein said guide trough (50) comprises a bottom (48) defined by an outer rim of said helical support, with detachable side walls projecting radially outwardly from said bottom (48). 5
9. The laying head of claim 8 wherein said detachable side walls are subdivided into segments (52), particularly wherein said side wall segments (52) are substantially identical or wherein said side wall segments (52) are fabricated from aluminum or aluminum alloys or wherein said side wall segments (52) are fabricated from carbon fiber or wherein said side wall segments (52) are fabricated from thermoplastics or wherein said side wall segments (52) are coated with a wear resistant material. 10 15
10. The laying head of claim 9 wherein said wear resistant material comprises a nano metal. 20
11. A laying head according to one of claims 1-10 wherein said guide trough is channel shaped and said guide trough having a continuous bottom and segmented detachable side walls. 25
12. The laying head of claim 11 wherein the intermediate curved portion and delivery end of said product guide and said guide trough are carried on a continuous helical support fabricated as an integral component of said nose, particularly wherein the bottom of said guide trough comprises an outer rim of said helical support. 30 35
13. The laying head of claim 11 wherein said nose is detachably secured to said tubular body.
14. The laying head of claim 12 wherein said product guide comprises a pipe (22) detachably secured to an outer rim of said helical support 40

Patentansprüche

1. Legekopf zum Ausbilden eines sich axial bewegenden, warmgewalzten Produkts zu einer gewendelten Reihe von Ringen, der Legekopf Folgendes umfassend: 45 50

eine Hohlwelle (12), die um eine Achse (X) drehbar ist, wobei die Hohlwelle einen röhrenförmigen Körper (12a) aufweist, der drehbar gelagert ist zur Rotation zwischen axial beabstandeten Lagern (14, 16), und eine Nase (36) aufweist, die axial und nach vorne aus dem Körper vorsteht;

eine Produktführung, die durch die Hohlwelle getragen wird, wobei die Produktführung ein Eingangsende aufweist, das mit der Achse ausgerichtet ist und angeordnet ist, um das Produkt aufzunehmen, und einen gekrümmten Zwischenabschnitt aufweist, der aus dem Eingangsende an ein Lieferende führt, das radial von der Achse beabstandet ist und aus dem das Produkt als die gewendelte Reihe von Ringen ausgegeben wird; eine Führungsrinne (50), die eine gewendelte Erweiterung der Produktführung bereitstellt, wobei der Legekopf **dadurch gekennzeichnet ist, dass** der gekrümmte Zwischenabschnitt und das Lieferende der Produktführung und der Führungsrinne (50) auf einem durchgehenden gewendelten Träger auf der Nase (36) der Hohlwelle getragen werden.

2. Legekopf nach Anspruch 1, wobei die Nase (36) der Hohlwelle eine einheitliche Struktur umfasst, die den gewendelten Träger umfasst.
3. Legekopf nach Anspruch 2, wobei der gewendelte Träger eine Schneckenplatte (42) umfasst, die als ein Spiralkranz eingerichtet ist, der radial aus der Nase (36) vorsteht.
4. Legekopf nach Anspruch 1, wobei die Nase (36) abnehmbar an dem röhrenförmigen Körper befestigt ist.
5. Legekopf nach Anspruch 2, wobei der gewendelte Träger eine gefertigte Komponente ist, die integral mit der Nase (36) verbunden ist.
6. Legekopf nach Anspruch 1, wobei die Produktführung ein Rohr (22) umfasst.
7. Legekopf nach Anspruch 6, wobei das Rohr (22) abnehmbar an dem gewendelten Träger befestigt ist.
8. Legekopf nach Anspruch 1, wobei die Führungsrinne (50) einen Boden (48), der durch eine Außenkante des gewendelten Trägers definiert ist, mit abnehmbaren Seitenwänden umfasst, die radial nach außen aus dem Boden (48) vorstehen.
9. Legekopf nach Anspruch 8, wobei die abnehmbaren Seitenwände in Segmente (52) unterteilt sind, wobei insbesondere die Seitenwandsegmente (52) im Wesentlichen identisch sind oder wobei die Seitenwandsegmente (52) aus Aluminium oder Aluminium-Legierungen gefertigt sind oder wobei die Seitenwandsegmente (52) aus Kohlefaser gefertigt sind oder wobei die Seitenwandsegmente (52) aus Thermoplasten gefertigt sind oder wobei die Seitenwandsegmente (52) mit einem ver-

schleißfesten Material beschichtet sind.

10. Legekopf nach Anspruch 9, wobei das verschleißfeste Material ein Nanometall umfasst.
11. Legekopf nach einem der Ansprüche 1 bis 10, wobei die Führungsrinne kanalförmig ist und die Führungsrinne einen durchgehenden Boden und segmentierte abnehmbare Seitenwände aufweist.
12. Legekopf nach Anspruch 11, wobei der gekrümmte Zwischenabschnitt und das Lieferende der Produktführung und die Führungsrinne auf einem durchgehenden gewendelten Träger getragen werden, der als eine einstückige Komponente der Nase gefertigt ist, wobei insbesondere der Boden der Führungsrinne eine Außenkante des gewendelten Trägers umfasst.
13. Legekopf nach Anspruch 11, wobei die Nase abnehmbar an dem röhrenförmigen Körper befestigt ist.
14. Legekopf nach Anspruch 12, wobei die Produktführung ein Rohr (22) umfasst, das abnehmbar an einer Außenkante des gewendelten Trägers befestigt ist.

Revendications

1. Tête de positionnement destinée à transformer un produit laminé à chaud axialement mobile en une série hélicoïdale d'anneaux, ladite tête de positionnement comprenant :
 - un arbre creux (12) pouvant tourner autour d'un axe (X), ledit arbre creux comprenant un corps tubulaire (12a) monté sur palier d'une manière permettant une rotation entre des paliers (14, 16) espacés axialement, et comprenant un nez (36) saillant axialement et vers l'avant depuis ledit corps ;
 - un guide de produit porté par ledit arbre creux, ledit guide de produit comprenant une extrémité d'entrée alignée avec ledit axe et conçue pour recevoir ledit produit, et comprenant une partie courbe intermédiaire menant de ladite extrémité d'entrée à une extrémité de sortie espacée radialement par rapport audit axe et par laquelle ledit produit est déchargé sous forme de ladite série hélicoïdale d'anneaux ;
 - une auge de guidage (50) fournissant un prolongement hélicoïdal dudit guide de produit, la tête de positionnement étant **caractérisée en ce que** la partie courbe intermédiaire et l'extrémité de sortie dudit guide de produit et ladite auge de guidage (50) sont portées sur un support hélicoïdal continu sur le nez (36) dudit arbre

creux.

2. Tête de positionnement selon la revendication 1, dans laquelle le nez (36) dudit arbre creux comprend une structure unitaire incluant ledit support hélicoïdal.
3. Tête de positionnement selon la revendication 2, dans laquelle ledit support hélicoïdal comprend une plaque formant vis en auge (42) configurée en tant que volute en spirale saillant radialement depuis ledit nez (36).
4. Tête de positionnement selon la revendication 1, dans laquelle ledit nez (36) est fixé de manière détachable audit corps tubulaire.
5. Tête de positionnement selon la revendication 2, dans laquelle ledit support hélicoïdal est un composant fabriqué formant un seul bloc avec ledit nez (36).
6. Tête de positionnement selon la revendication 1, dans laquelle ledit guide de produit comprend un tuyau (22).
7. Tête de positionnement selon la revendication 6, dans laquelle ledit tuyau (22) est fixé de manière détachable audit support hélicoïdal.
8. Tête de positionnement selon la revendication 1, dans laquelle ladite auge de guidage (50) comprend un fond (48) défini par un bord extérieur dudit support hélicoïdal, avec des parois latérales détachables saillant radialement vers l'extérieur depuis ledit fond (48).
9. Tête de positionnement selon la revendication 8, dans laquelle lesdites parois latérales détachables sont subdivisées en segments (52), en particulier dans laquelle lesdits segments de paroi latérale (52) sont sensiblement identiques ou dans laquelle lesdits segments de paroi latérale (52) sont fabriqués en aluminium ou en alliages d'aluminium ou dans laquelle lesdits segments de paroi latérale (52) sont fabriqués en fibres de carbone ou dans laquelle lesdits segments de paroi latérale (52) sont fabriqués en thermoplastiques ou dans laquelle lesdits segments de paroi latérale (52) sont revêtus d'un matériau résistant à l'usure.
10. Tête de positionnement selon la revendication 9, dans laquelle ledit matériau résistant à l'usure comprend un nanométal.
11. Tête de positionnement selon l'une des revendications 1-10, dans laquelle ladite auge de guidage a la forme d'un canal et ladite auge de guidage possède un fond continu et des

parois latérales détachables segmentées.

12. Tête de positionnement selon la revendication 11, dans laquelle la partie courbe intermédiaire et l'extrémité de sortie dudit guide de produit et ladite auge de guidage sont portées sur un support hélicoïdal continu fabriqué en tant que composant d'une seule pièce avec ledit nez, en particulier dans laquelle le fond de ladite auge de guidage comprend un bord extérieur dudit support hélicoïdal. 5 10
13. Tête de positionnement selon la revendication 11, dans laquelle ledit nez est fixé de manière détachable audit corps tubulaire. 15
14. Tête de positionnement selon la revendication 12, dans laquelle ledit guide de produit comprend un tuyau (22) fixé de manière détachable à un bord extérieur dudit support hélicoïdal. 20

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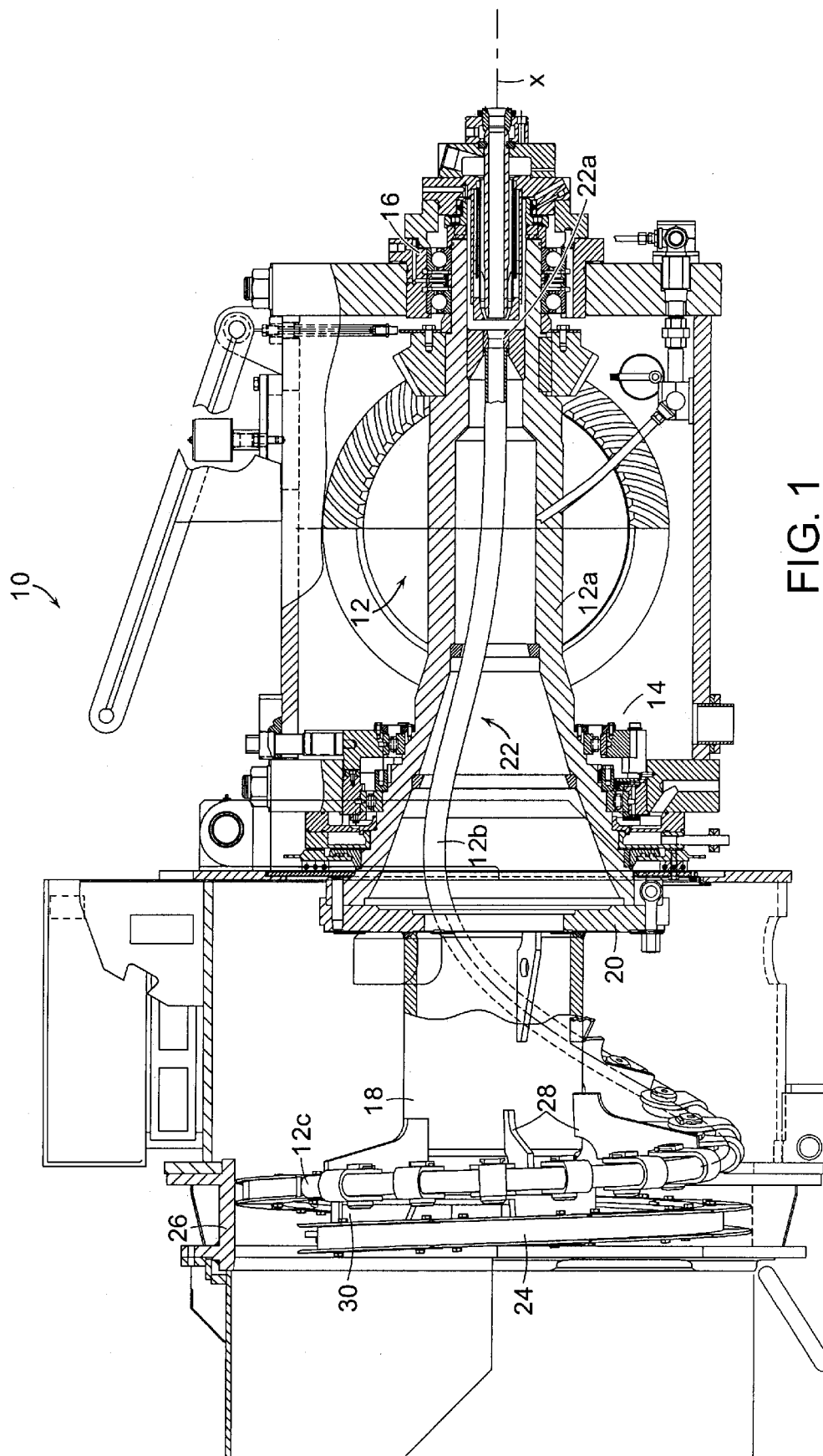
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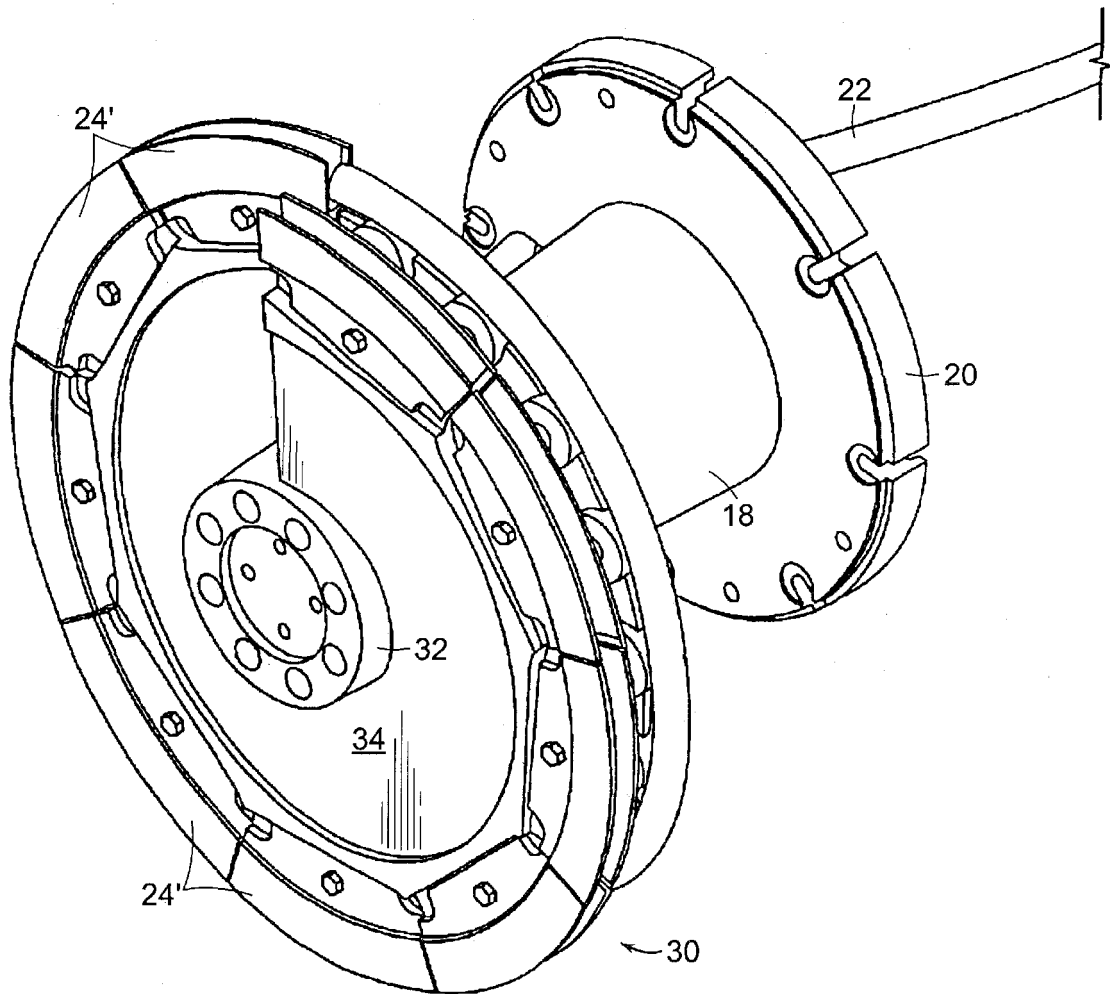


FIG. 2
PRIOR ART

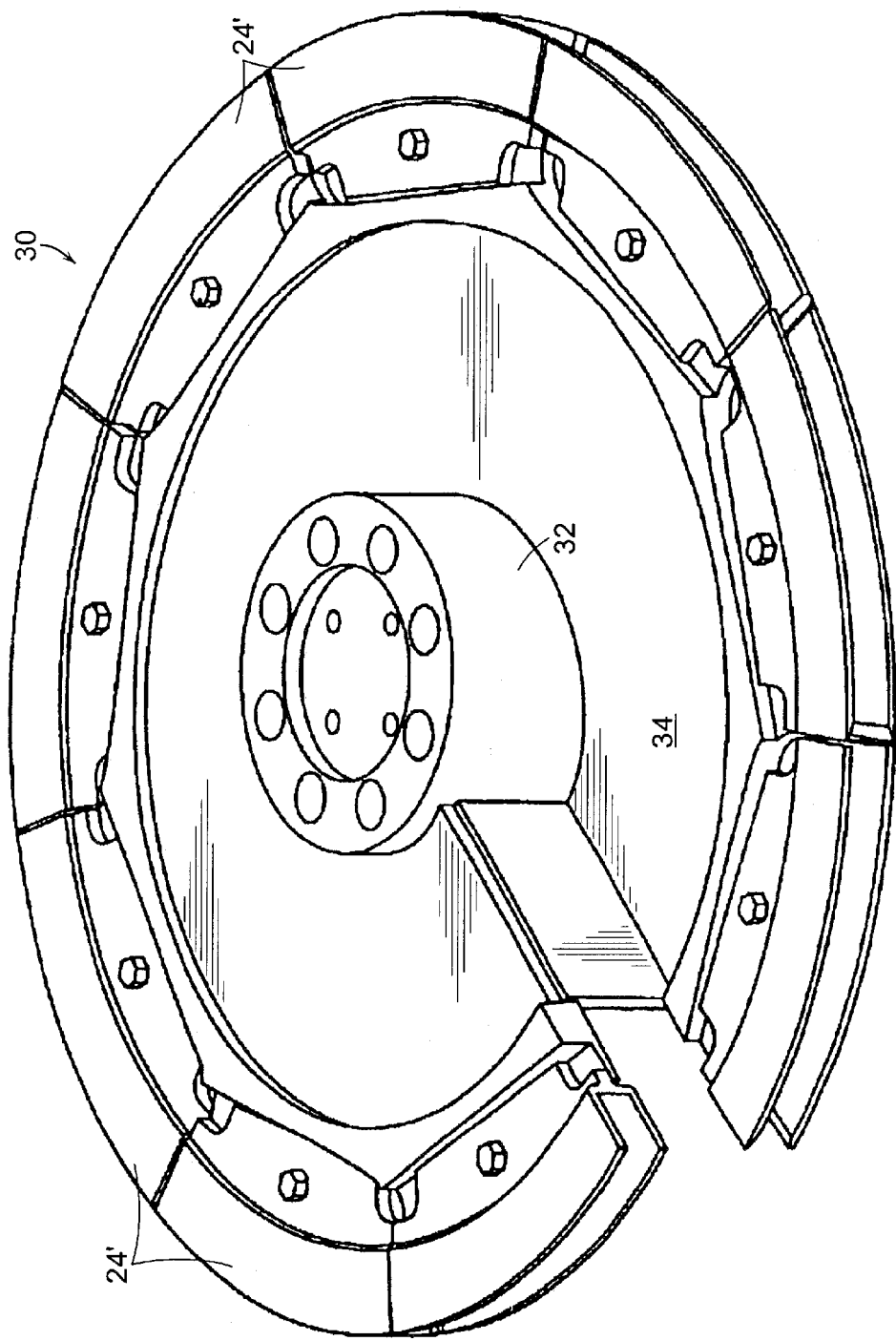


FIG. 3
PRIOR ART

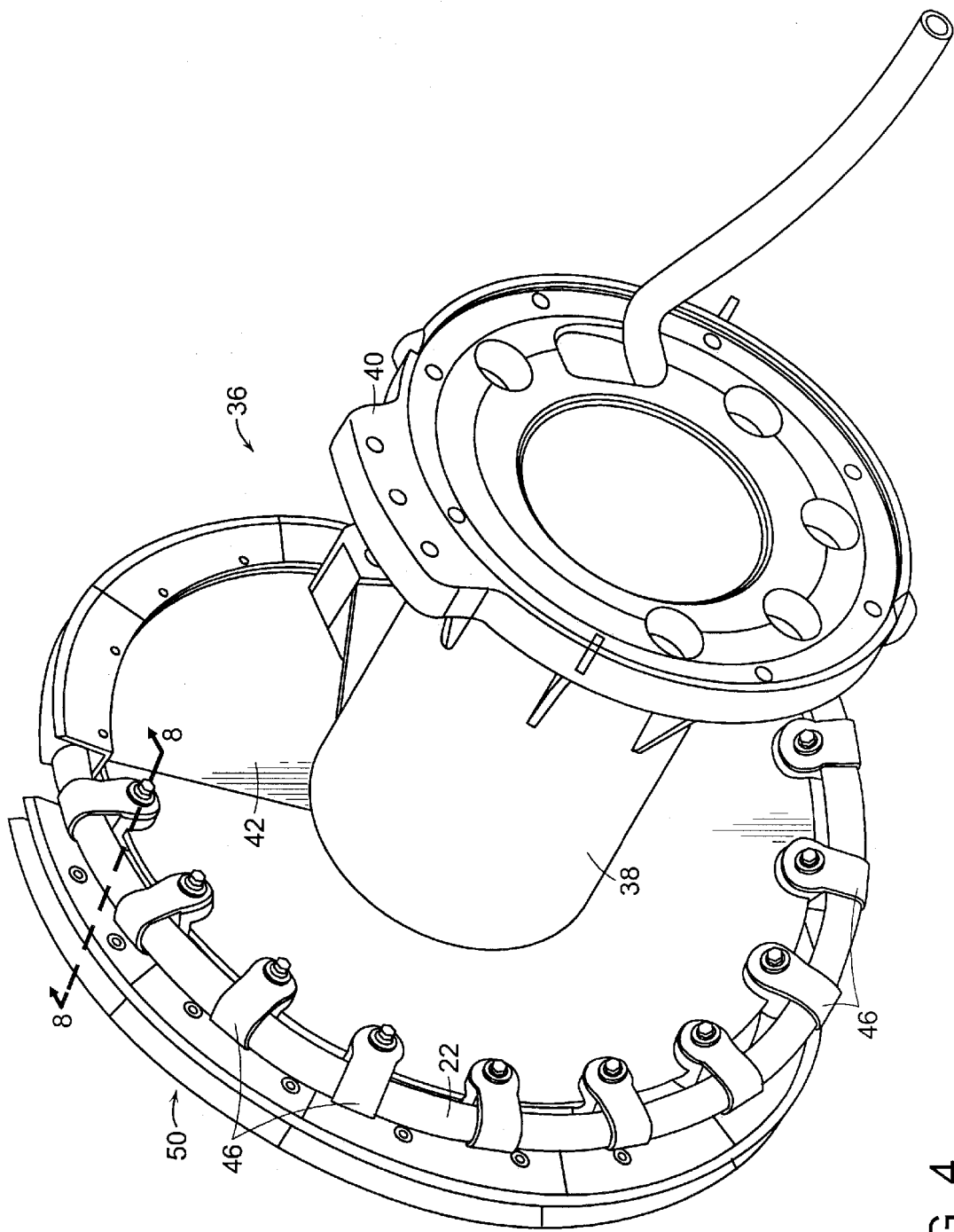


FIG. 4

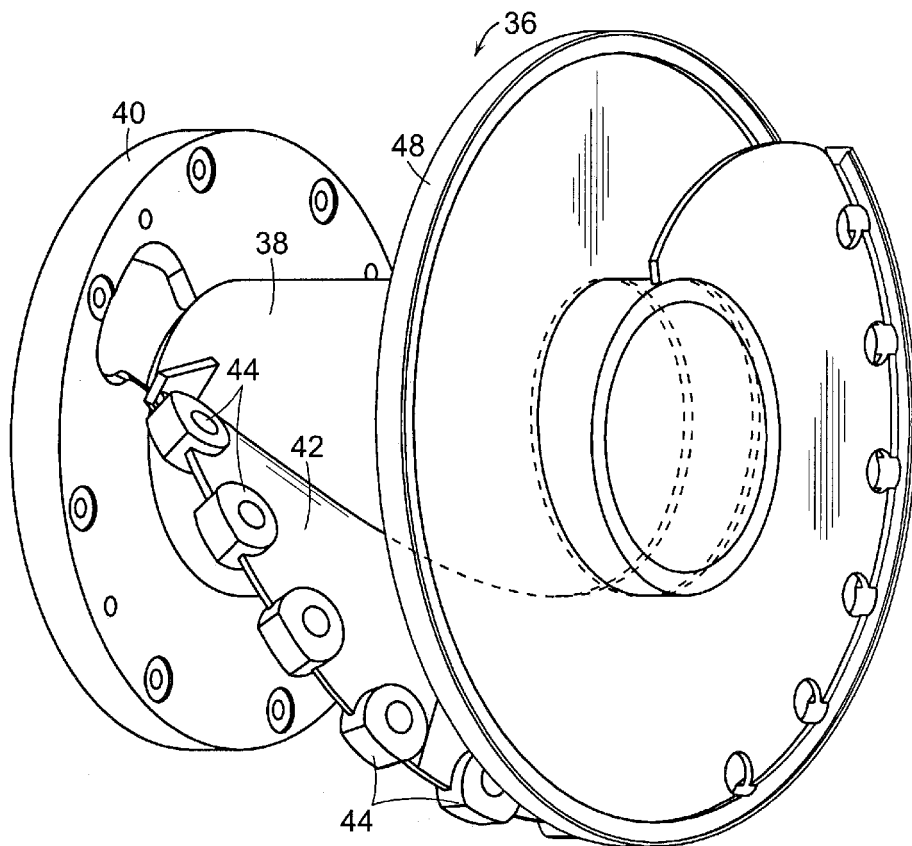


FIG. 5

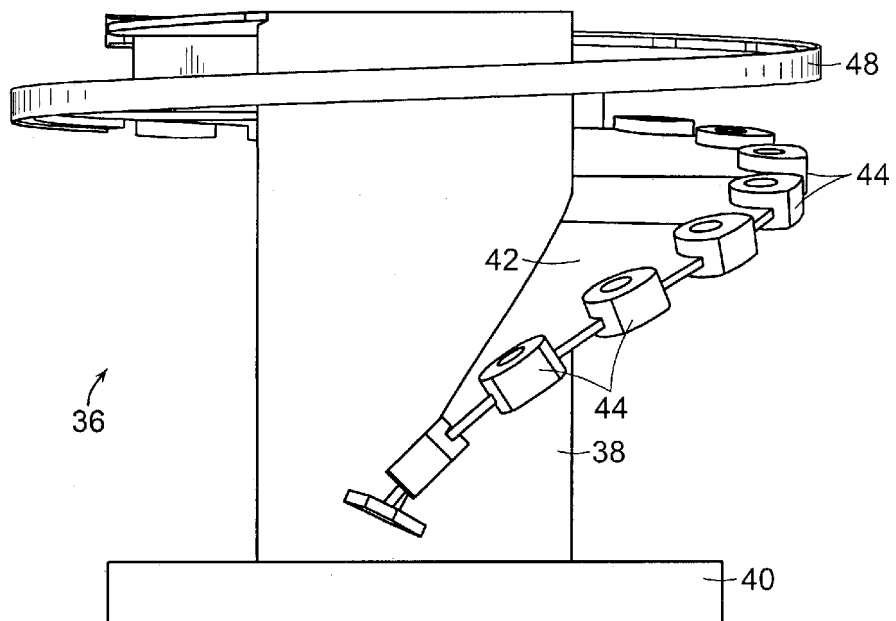


FIG. 6

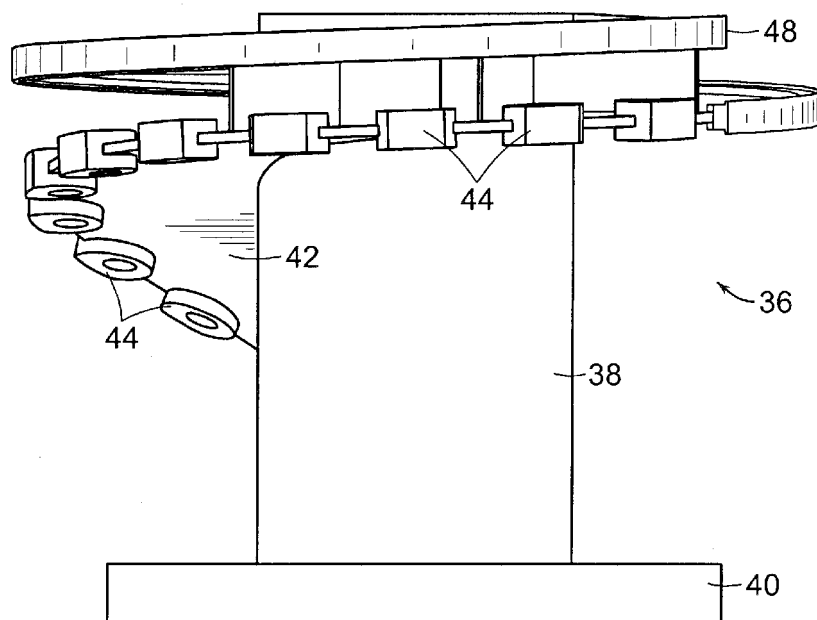


FIG. 7

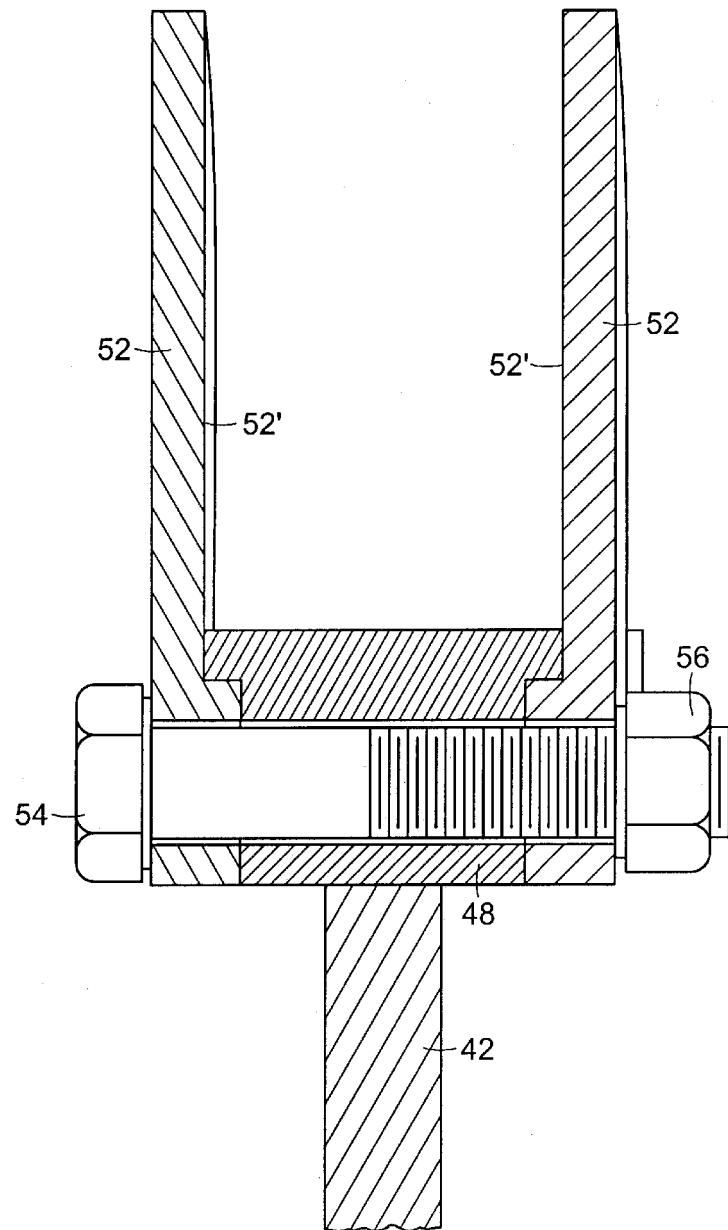


FIG. 8

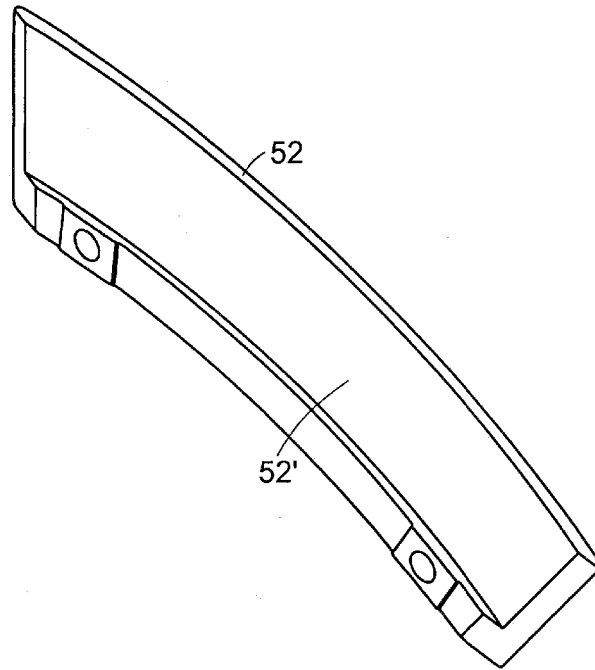


FIG. 9A

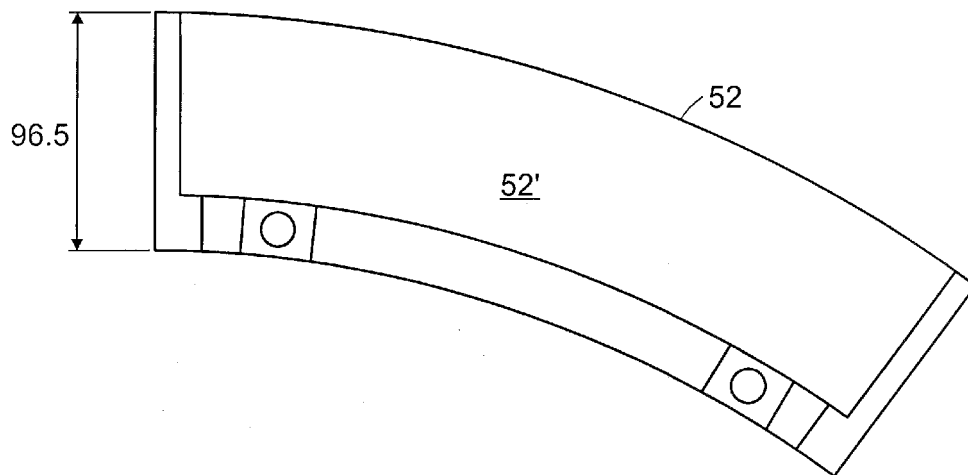


FIG. 9B

REFERENCES CITED IN THE DESCRIPTION

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