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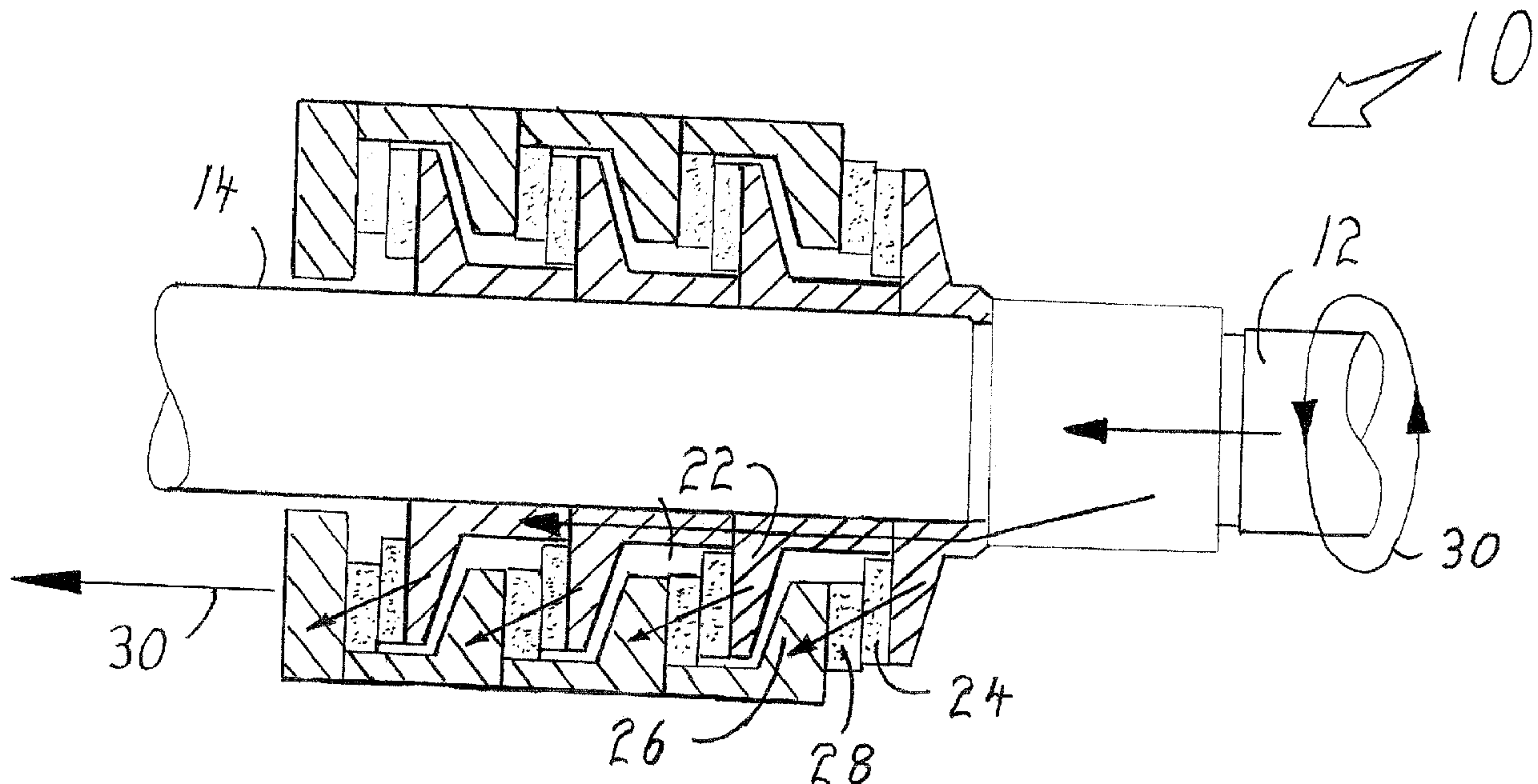
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(54) Titre : PALIER DE BUTEE POUR PIECES ROTATIVES

(54) Title: THRUST BEARING ASSEMBLY FOR ROTARY APPLICATIONS



(57) Abrégé/Abstract:

A thrust bearing configuration for rotary applications includes a shaft having an external surface and a housing having an internal surface. The housing and the shaft are adapted for relative rotational movement. Inner bearing support members extend radially outwardly from the external surface of the shaft in axially spaced relation. Outer bearing support members extend radially inwardly from the internal surface of the housing. A bearing pad is disposed between each one of the inner bearing support members and an adjacent one of the outer bearing support members. With the described configuration an axial force exerted upon the shaft is transmitted from the shaft through each of the inner bearing support members and bearing pads to the outer bearing support members and the housing. This thrust bearing acts like a bearing stack. It is possible to stack any number of these bearing pads to withstand anticipated axial loads.

ABSTRACT OF THE DISCLOSURE

A thrust bearing configuration for rotary applications includes a shaft having an external surface and a housing having an internal surface. The housing and the shaft are adapted for relative rotational movement. Inner bearing support members extend radially outwardly from the external surface of the shaft in axially spaced relation. Outer bearing support members extend radially inwardly from the internal surface of the housing. A bearing pad is disposed between each one of the inner bearing support members and an adjacent one of the outer bearing support members. With the described configuration an axial force exerted upon the shaft is transmitted from the shaft through each of the inner bearing support members and bearing pads to the outer bearing support members and the housing. This thrust bearing acts like a bearing stack. It is possible to stack any number of these bearing pads to withstand anticipated axial loads.

TITLE OF THE INVENTION:

Thrust Bearing Assembly For Rotary Applications

FIELD OF THE INVENTION

5 The present invention relates to a thrust bearing assembly for rotary applications and, in particular, in applications in which space is limited.

BACKGROUND OF THE INVENTION

10 In some rotary applications, the space available for thrust bearings is limited. An example of such a space limited application relates to electric submersible pumps positioned down oil wells to pump liquid to surface. With such pumps, the thrust bearings must be positioned in the
15 annular space between the shaft and the housing.

SUMMARY OF THE INVENTION

20 What is required is a thrust bearing assembly for rotary applications which can fit in a relatively confined space.

25 According to the present invention there is provided a thrust bearing configuration for rotary applications includes a shaft having an external surface and a housing having an internal surface. The housing and the shaft are adapted for relative rotational movement. At least two inner bearing support members are fixedly secured to and extend radially outwardly from the external surface of the shaft in axially spaced relation. At least two outer bearing support members are fixedly secured to and extend radially inwardly from the
30 internal surface of the housing. At least one bearing pad is disposed between each one of the inner bearing support members and an adjacent one of the outer bearing support members. With the described configuration an axial force exerted upon the shaft is transmitted from the shaft through
35 each of the inner bearing support members and bearing pads to

the outer bearing support members and the housing.

The thrust bearing, as described above, acts like a bearing stack. It is possible to stack any number of these bearing pads in order to withstand anticipated axial loads.

The bearing pads may be secured to either one of the inner bearing support members or to one of the outer bearing support members. It is preferred, however, that there be provided an inner bearing pad secured to each of the inner bearing support members and an outer bearing pad secured to each of the outer bearing support members. With this configuration the inner bearing pad bearing and the outer bearing pad bear against each other.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features of the invention will become more apparent from the following description in which reference is made to the appended drawings, the drawings are for the purpose of illustration only and are not intended to in any way limit the scope of the invention to the particular embodiment or embodiments shown, wherein:

FIGURE 1 is a side elevation view, in section, of a thrust bearing assembly for rotary applications constructed in accordance with the teachings of the present invention.

FIGURE 2 is a side elevation view, in section, of two thrust bearing assemblies as illustrated in **FIGURE 1** stacked in close proximity as if in a confined space.

FIGURE 3 is a side elevation view, in section, of a housing for two thrust bearing assemblies as illustrated in **FIGURE 2**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The preferred embodiment, a thrust bearing assembly for rotary applications generally identified by reference numeral

10, will now be described with reference to **FIGURES 1** through **3**.

Structure and Relationship of Parts:

5 Referring to **FIGURE 1**, thrust bearing assembly 10 includes a shaft 12 having an external surface 14. Referring to **FIGURE 3**, a housing 16 has an internal surface 18. Shaft 12 and housing 16 are adapted for relative rotational movement. In the illustrated embodiment, housing
10 16 is adapted to receive two thrust bearing assemblies 10 as shown in **FIGURE 2** within two annular spaces 20 situate between shaft 12 and housing 16. Referring to **FIGURE 1**, several inner bearing support members 22 are fixedly secured to and extend radially outwardly from external surface 14 of
15 shaft 12. An inner bearing pad 24 is secured to each of inner bearing support members 22. Several outer bearing support members 26 are fixedly secured to and extend radially inwardly from internal surface 18 of housing 16. An outer bearing pad 28 is secured to each of outer bearing support
20 members 26. Referring to **FIGURES 1** through **3**, each of outer bearing pad 28 bears against inner bearing pad 24 on each adjacent one of inner bearing support members 22, such that an axial force 30, exerted upon shaft 12, is transmitted from shaft 12 through each of inner bearing support members 22,
25 inner bearing pads 24 and outer bearing pads 28 to outer bearing support members 26 and housing 16.

Operation:

30 The use and operation of thrust bearing assembly 10 will now be described with reference to **FIGURES 1** through **3**. Referring to **FIGURE 1**, as axial force 30 is applied to shaft 12, thrust is transferred to plurality of inner bearing support members 22 and inner bearing pads 24. Each inner bearing pad 24 makes contact with each outer bearing pad 28

transferring axial force 30 to plurality of outer bearing support members 26. Referring to **FIGURES 2** and **3**, thrust bearing assemblies may be stacked in close proximity and housed within one housing.

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In this patent document, the word "comprising" is used in its non-limiting sense to mean that items following the word are included, but items not specifically mentioned are not excluded. A reference to an element by the indefinite article "a" does not exclude the possibility that more than one of the element is present, unless the context clearly requires that there be one and only one of the elements.

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It will be apparent to one skilled in the art that modifications may be made to the illustrated embodiment without departing from the spirit and scope of the invention as hereinafter defined in the Claims.

**THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOW:**

1. A thrust bearing configuration for rotary applications,
5 comprising:

at least two parallel shafts, each shaft having an
external surface;

a housing having an internal surface, each shaft being
mounted for axial rotation within the housing;

10 at least one inner bearing support member fixedly
secured to and extending radially outwardly from the
external surface of each shaft in axially spaced relation;

an outer bearing support member engaging each inner
bearing support member, the outer bearing support members
15 being fixedly secured to and extending radially inwardly
from the internal surface of the housing, the at least one
inner and outer bearing support members on each shaft being
offset in an axial direction from other at least one inner
and outer bearing support members on the other at least one
20 shaft, the at least two parallel shafts being positioned
such that the inner and outer bearing support members of
different shafts overlap in a radial direction; and

at least one bearing pad disposed between each one of
the inner bearing support members and an adjacent one of the
25 outer bearing support members, such that an axial force
exerted upon each shaft is transmitted from each shaft
through each of the inner bearing support members and
bearing pads to the respective outer bearing support members
of the housing.

30

2. The thrust bearing as defined in claim 1, wherein each
bearing pad is secured to one of the inner bearing support
members or to one of the outer bearing support members.

35 3. The thrust bearing as defined in claim 1, wherein an
inner bearing pad is secured to each of the inner bearing

support members and an outer bearing pad is secured to each of the outer bearing support members with the inner bearing pad bearing against the outer bearing pad.

- 5 4. A thrust bearing configuration for rotary applications, comprising:

at least two parallel shafts, each shaft having an external surface;

10 a housing having an internal surface, each shaft being mounted for axial rotation within the housing;

an annular space between each shaft and the housing;

15 several inner bearing support members fixedly secured to and extending radially outwardly from the external surface of each shaft into the annular space in axially spaced relation;

an inner bearing pad secured to each of the inner bearing support members;

20 several outer bearing support members fixedly secured to and extending radially inwardly from the internal surface of the housing into the annular space in axially spaced relation, the inner and outer bearing support members on each shaft being offset in an axial direction from other inner and outer bearing support members on the other at least one shaft, the at least two parallel shafts being
25 positioned such that the inner and outer bearing support members of different shafts overlap in a radial direction;

30 an outer bearing pad secured to each of the outer bearing support members and bearing against the inner bearing pad on an adjacent one of the inner bearing support members, such that an axial force exerted upon each shaft is transmitted from each shaft through each of the inner bearing support members and bearing pads to the respective outer bearing support members of the housing thereby acting as a bearing stack within the annular space.

FIG. 1

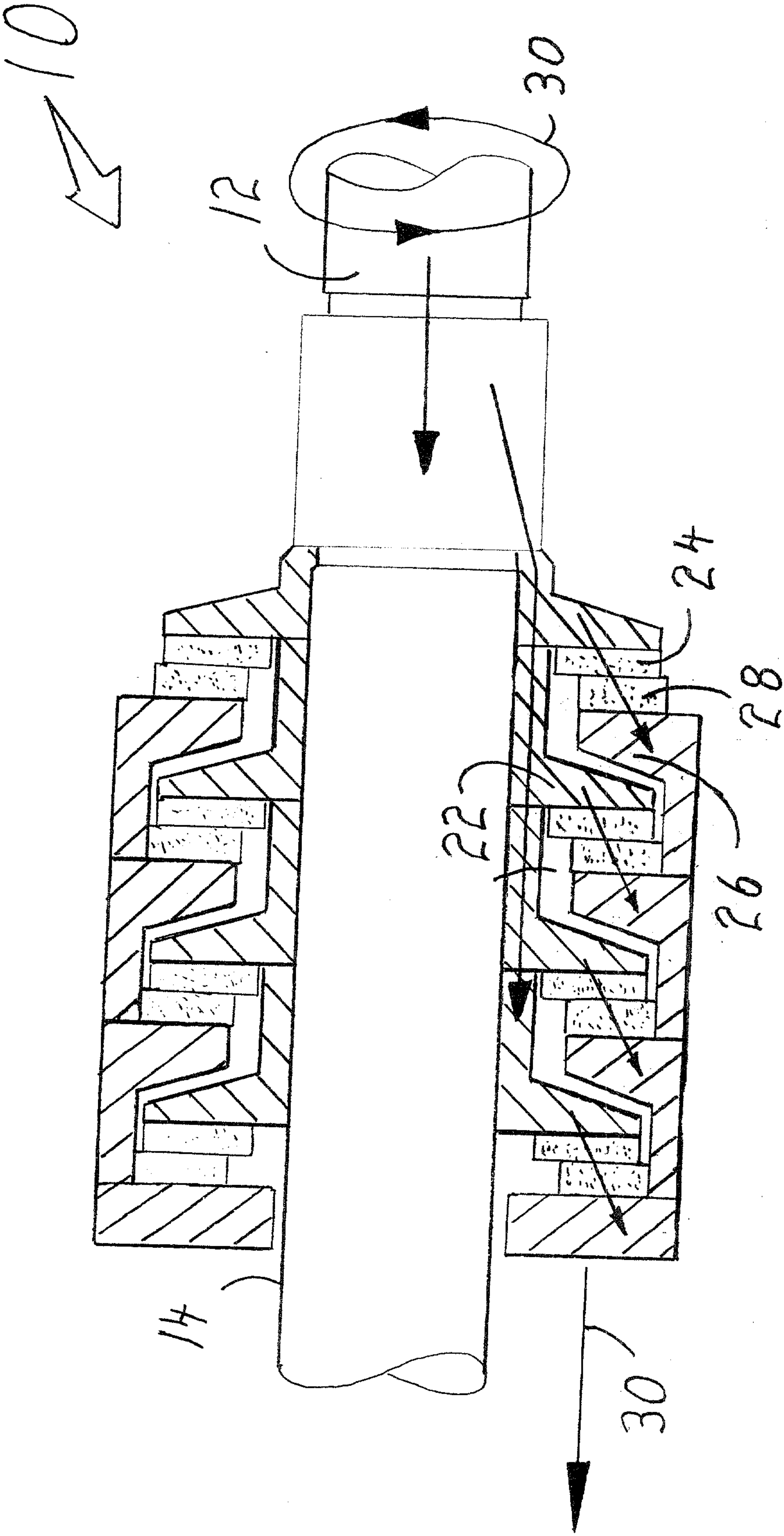


FIG. 2

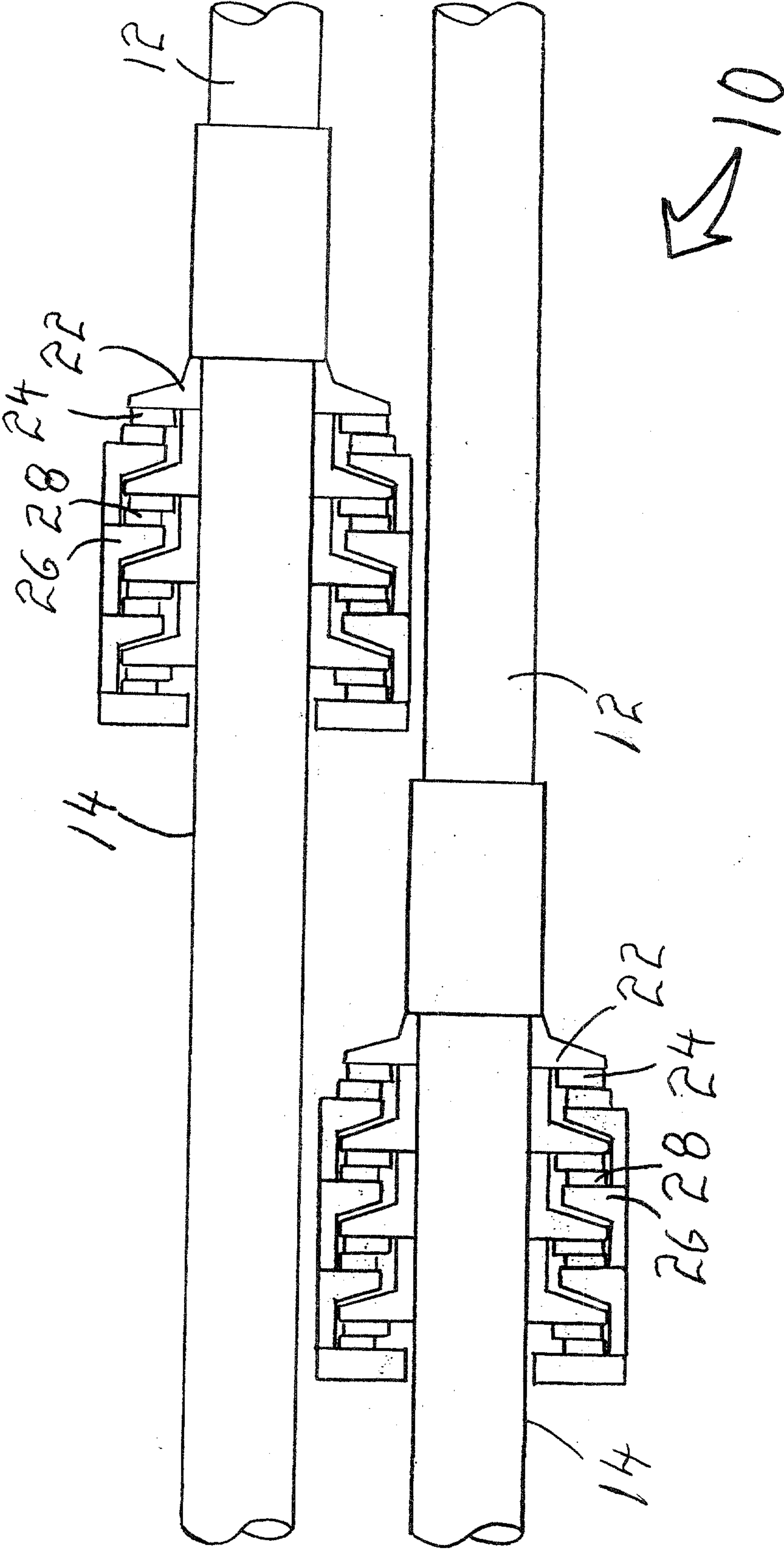


FIG. 3

