

SUBMARINE COUNTERMEASURE VEHICLE WITH FOLDING PROPELLER

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN THAT WILLIAM P. BARKER, citizen of the United States of America, employee of the United States Government, and resident of Bristol, County of Bristol, State of Rhode Island, has invented certain new and useful improvements entitled as set forth above, of which the following is a specification.

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IN REPLY REFER TO:

Attorney Docket No. 83330
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The below identified patent application is available for licensing. Requests for information should be addressed to:

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1 Attorney Docket No. 83330

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5 STATEMENT OF GOVERNMENT INTEREST

6 The invention described herein may be manufactured and used
7 by and for the Government of the United States of America for
8 Governmental purposes without the payment of any royalties
9 thereon or therefor.
10

11 CROSS REFERENCE TO OTHER PATENT APPLICATIONS

12 This patent application is co-pending with one related
13 patent applications entitled SUBMARINE COUNTERMEASURE PROPELLER
14 PROTECTOR (Attorney Docket No. 83387), by the same inventor as
15 this application.
16

17 BACKGROUND OF THE INVENTION

18 (1) Field of the Invention

19 The invention relates to submarine underwater
20 countermeasures assemblies and is directed more particularly to
21 an improved countermeasure vehicle.

22 (2) Description of the Prior Art

23 In FIG. 1, there is shown a typical submarine countermeasure
24 apparatus 20. The apparatus 20 includes a launch tube 22 which,
25 in operation, is disposed outboard of the submarine pressure hull

1 (not shown). A countermeasure vehicle 24 is housed in the launch
2 tube 22 and includes an array assembly 26 and a tailcone assembly
3 28. The array assembly 26 is protected by a surrounding sabot
4 30. Disposed in the launch tube 22 is a ram plate 32 and a gas
5 generator 34. The launch tube 22 is closed by a forward tube
6 cover 36 and an after tube cover 38.

7 In operation, the gas generator 34 is activated by an
8 electrical pulse from the submarine fire control system and
9 generates sufficient gas pressure to move the ram plate 32
10 forward. The ram plate 32 in turn pushes the countermeasure
11 vehicle 24 forward, breaking away the forward tube cover 36 and
12 launching the countermeasure vehicle 24 from the launch tube 22.
13 In short order, the sabot 30 disengages from around the array
14 assembly 26 and the array assembly is deployed.

15 The tail cone assembly 28 includes a propulsion propeller
16 assembly (not shown in FIG. 1), and the countermeasure vehicle 24
17 houses a motor (not shown in FIG. 1) which drives the propeller
18 to position the countermeasure in a column of water.

19 It has been found that upon launch of the vehicle 24, a
20 combination of a high velocity launch, high forward speed of the
21 submarine, and strong underwater currents, can subject the
22 propeller blades to pressures and bending moments sufficient to
23 damage the blades. Damaged propeller blades can adversely affect
24 the ability of the countermeasure to hover at a selected depth in

1 the water column, and thereby cause mission failure which places
2 the submarine in a state of increased danger.

3 Accordingly, there is a need for an improved propeller
4 assembly which can withstand and survive the aforesaid launch
5 conditions and assume operations leading to a successful mission.
6

7 SUMMARY OF THE INVENTION

8 An object of the invention is, therefore, to provide an
9 improved submarine countermeasure vehicle, featuring a propulsion
10 assembly having facility to withstand the rigors of a launch and
11 provide the propulsion needed to successfully complete a mission.

12 With the above and other objects in view, as will
13 hereinafter appear, a feature of the present invention is the
14 provision of a submarine countermeasure vehicle comprising an
15 elongated body for supporting a countermeasure device, and a
16 propulsion assembly mounted on an after end of the body. The
17 propulsion assembly comprises a rotatable propeller hub,
18 propeller blades mounted on the hub and moveable between a first
19 position wherein the blades extend substantially radially
20 outwardly from the hub, and a second position wherein the blades
21 extend generally axially of the hub. A spring is mounted on each
22 of the blades and in the hub, the spring biasing the blades
23 toward the first position, but of sufficient flexibility to
24 permit the blades to move to the second position upon launch of
25 the vehicle from an underwater launch tube.

1 The above and other features of the invention, including
2 various novel details of construction and combinations of parts,
3 will now be more particularly described with reference to the
4 accompanying drawings and pointed out in the claims. It will be
5 understood that the particular device embodying the invention is
6 shown by way of illustration only and not as a limitation of the
7 invention. The principles and features of this invention may be
8 employed in various and numerous embodiments without departing
9 from the scope of the invention.

11 BRIEF DESCRIPTION OF THE DRAWINGS

12 Reference is made to the accompanying drawings in which is
13 shown an illustrative embodiment of the invention, from which its
14 novel features and advantages will be apparent, wherein
15 corresponding reference characters indicate corresponding parts
16 throughout the several views of the drawings and wherein:

17 FIG. 1 is an exploded perspective view of a submarine
18 countermeasure assembly, including a countermeasure vehicle,
19 known in the art;

20 FIG. 2 is a side elevational view of one form of vehicle
21 propulsion propeller assembly illustrative of an embodiment of
22 the invention;

23 FIG. 3 is a rear elevational view of the propeller assembly
24 of FIG. 2;

25 FIG. 4 is a sectional view taken along line IV-IV of FIG. 3;

FIG. 5 is a sectional view taken along line V-V of FIG. 2;
and

FIG. 6 is similar to FIG. 4, but shows propellers in a
different position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring again to FIG. 1, it will be seen that the
countermeasure vehicle 24 includes an elongated body portion 40
which houses a propulsion motor, not shown but known in the art.

Extending from the motor and from the after end of the body
portion 40 and into the tailcone assembly 28 is a propeller shaft
42 (FIGS. 2 and 3). Fixed on an after end of the shaft 42 is a
propeller hub 44 which is rotatable with the shaft 42.

The propeller hub 44 is provided with a plurality of
concavities 46 (FIGS 4-6). A base end portion 48 of each of a
plurality of propeller blades 50 is pivotally mounted in one of
the concavities 46. The propeller blades 50 are pivotally
moveable between a first position wherein the blades 50 extend
substantially radially outwardly from the hub 44 (FIGS. 2-5), and
a second position wherein the blades 50 extend generally axially
of the hub 44 (FIG. 6).

A spring 52 is disposed in each of the concavities 46 and is
mounted on each of the blade base ends 48 and in the hub 44. The
springs 52 preferably are coiled wire springs each having a first
end 54 disposed in a concavity 46, a mid-portion 56 coiled around

1 a spool 58 fixed to each of the propeller blade base end portions
2 48, and a second end 60 hooked around a propeller blade 50. It
3 will be apparent that other spring arrangements, including leaf
4 springs, and the like, may be used.

5 The springs 52 bias the blades 50 toward the first position
6 (FIGS. 2-5), but are sufficiently flexible to permit the blades
7 to move to the second position (FIG. 6) under extreme launch
8 conditions.

9 In a static condition, the countermeasure vehicle 24 rests
10 in the launch tube 22. Upon initiation of a launch, the ram
11 plate 32 forces the vehicle 24 to push away the forward tube
12 cover 36 and eject from the launch tube. As water moves into the
13 tailcone assembly 28, a combination of forces, as described
14 above, exercise undue pressure on the relatively fragile blades.
15 In accordance with the present invention, such forces overcome
16 the force of the springs 52 and cause the blades 50 to pivot
17 rearwardly to assume the position shown in FIG. 6. As soon as
18 the pressure on the blades is relieved, a matter of a few
19 seconds, the springs 52 snap the blades back into their operative
20 positions, the propulsion motor starts, and the propellers rotate
21 to provide the required thrust.

22 There is thus provided an improved submarine countermeasure
23 vehicle featuring a propeller assembly which survives an
24 unusually harsh launch and assumes normal operation.

1 It will be understood that many additional changes in the
2 details, materials, steps and arrangement of parts, which have
3 been herein described and illustrated in order to explain the
4 nature of the invention, may be made by those skilled in the art
5 within the principles and scope of the invention as expressed in
6 the appended claims.

CLAIMS NOT INCLUDED

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5 ABSTRACT OF THE DISCLOSURE

6 A submarine countermeasure vehicle includes an elongated
7 body for supporting a countermeasure device, and a propulsion
8 assembly mounted on an after end of the body. The propulsion
9 assembly includes a rotatable propeller hub, propeller blades
10 mounted on the hub and moveable between a first position wherein
11 the blades extend substantially radially outwardly from the hub,
12 and a second position wherein the blades extend generally axially
13 of the hub. A spring is mounted on each of the blades and in the
14 hub, the spring biasing the blades toward the first position, but
15 of sufficient flexibility to permit the blades to move to the
16 second position upon launch of the vehicle from an underwater
17 launch tube.

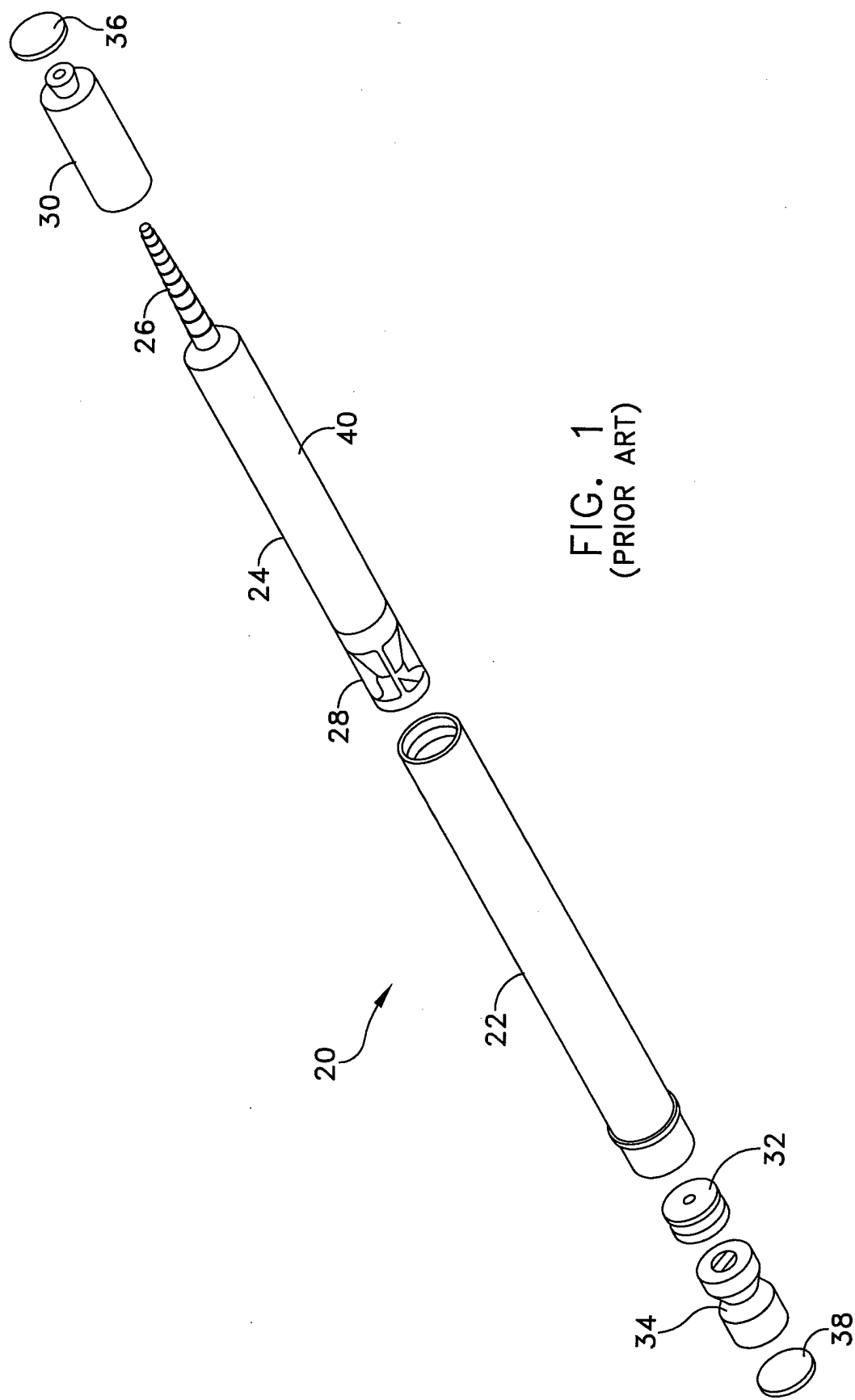


FIG. 1
(PRIOR ART)

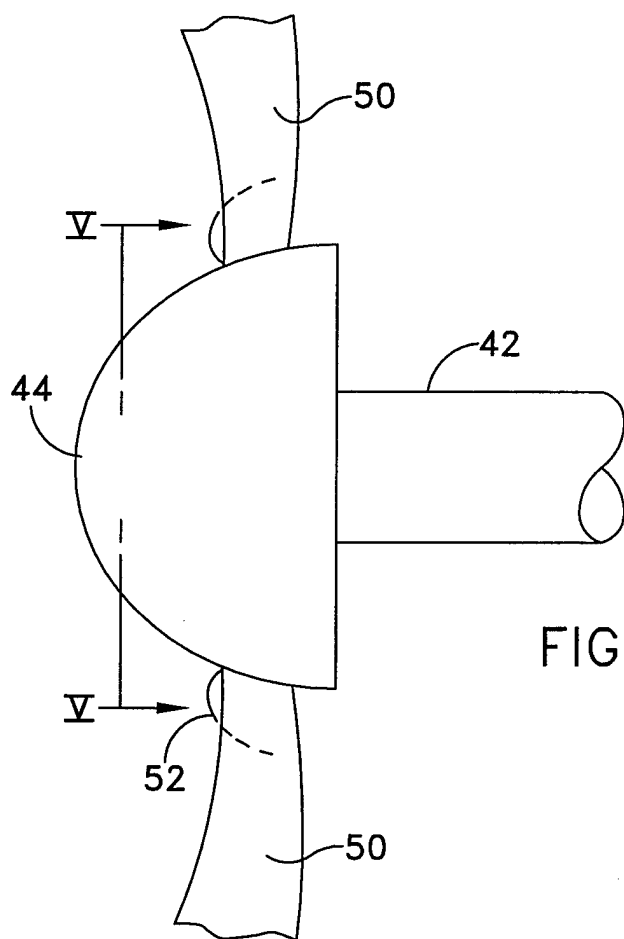


FIG. 2

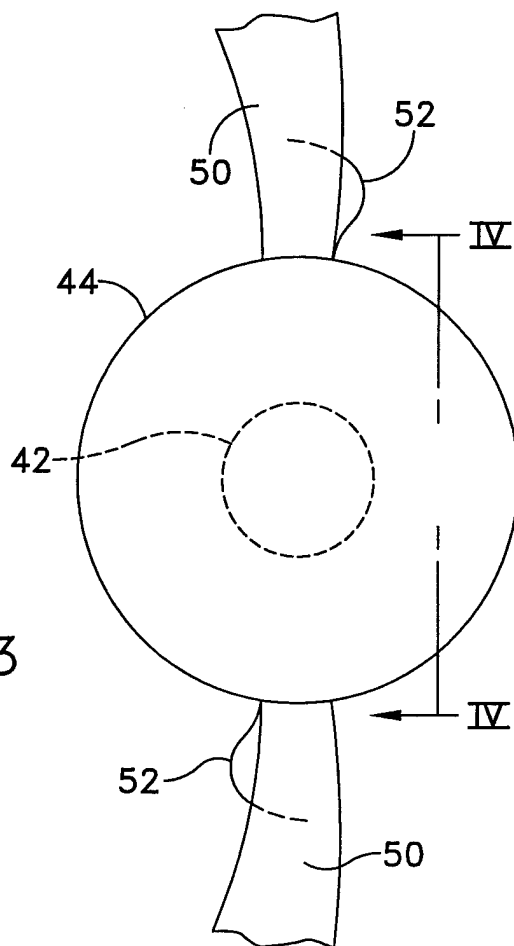
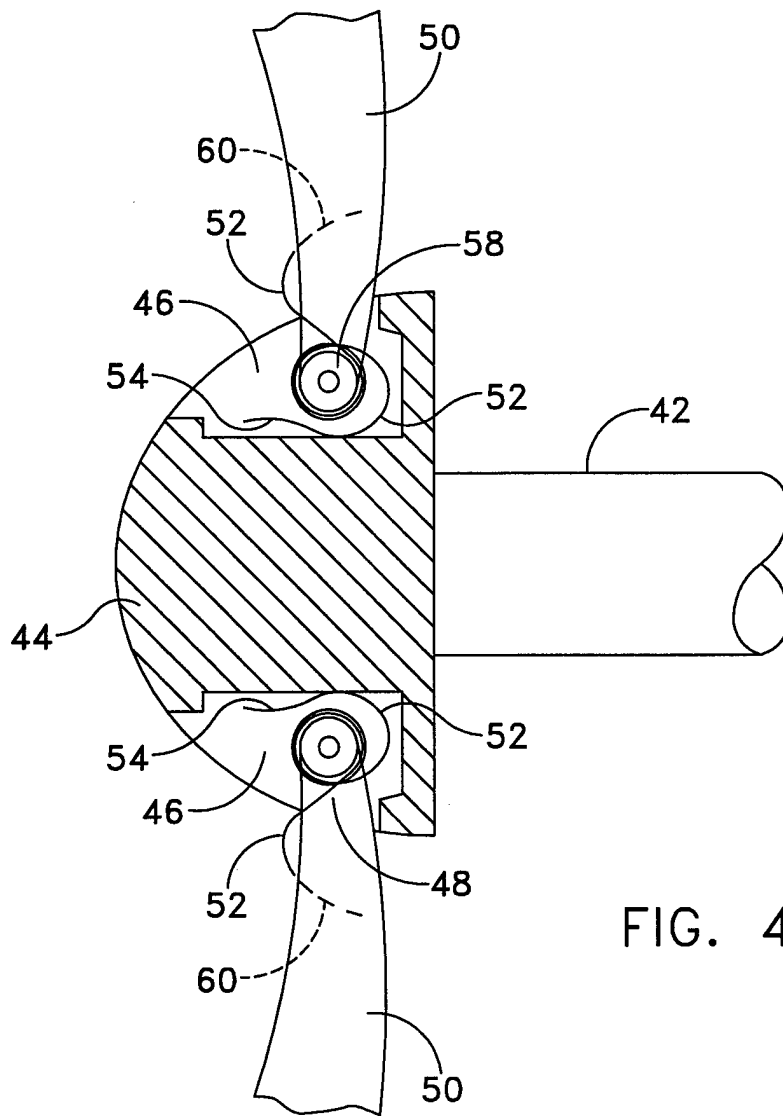


FIG. 3



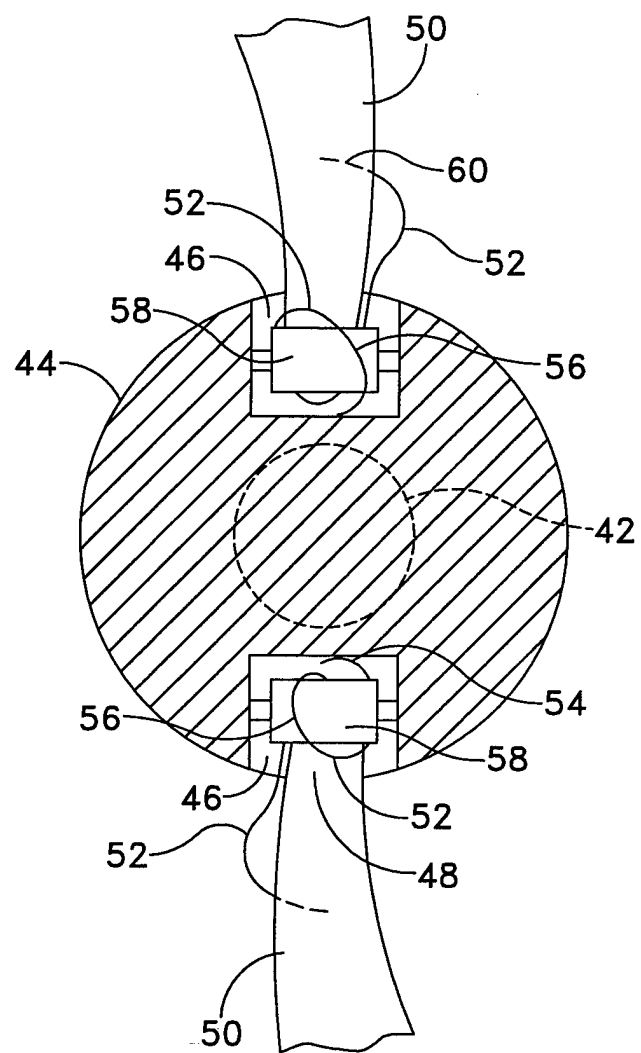


FIG. 5

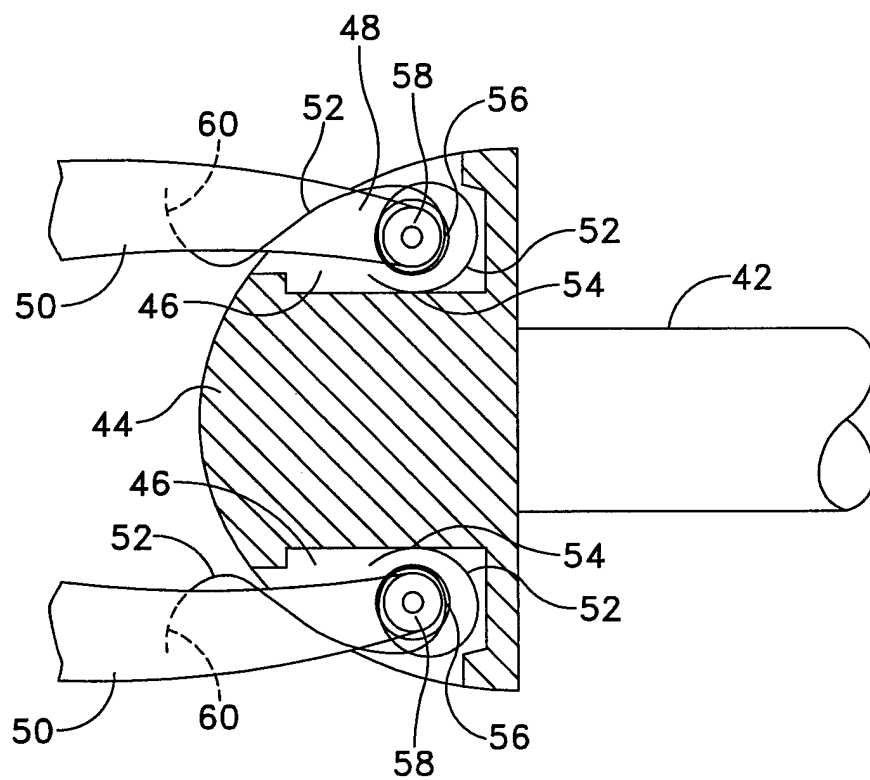


FIG. 6