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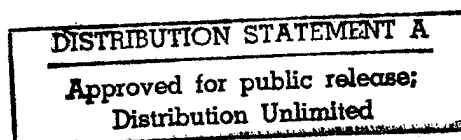
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1 N.C. 77096

2
3 AN UNDERWATER VEHICLE AND A FIN

4 ASSEMBLY THEREFOR

5
6 STATEMENT OF GOVERNMENT INTEREST

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

11
12 BACKGROUND OF THE INVENTION

13 (1) Field of the Invention

14 The invention relates to a fin assembly for an underwater
15 vehicle and to an underwater vehicle having a plurality of such
16 fin assemblies, and is directed more particularly to a fin
17 assembly facilitating stowage of the fin externally of the
18 vehicle and generally conformed to the vehicle body and operative
19 to move the fin to extend generally radially from the vehicle
20 with the fore-and-aft axis of the fin parallel to the fore-and-
21 aft axis of the vehicle.

22 (2) Description of the Prior Art

23 Fins for unmanned underwater vehicles and of the type
24 customarily used for directional control, have in practice been

1 stowed within the vehicle to leave a clean uncluttered hull for
2 expulsion from a submarine torpedo tube. After launch of the
3 vehicle, the fins spring outwardly through slots provided in the
4 hull. The stowage of the fins, which may number eight or more,
5 within the hull has engendered space problems in the vehicle and
6 it has been deemed desirable to locate such fins externally of
7 the hull, but in such a manner as to not interfere with the
8 launch of the vehicle from a torpedo tube.

9
10 SUMMARY OF THE INVENTION

11 It is, therefore, an object of the invention to provide a
12 fin assembly for an underwater vehicle wherein the fins are, when
13 not in operation, disposed outside the hull, but generally
14 conformed to the hull, and are movable to a position extending
15 outwardly from the hull.

16 A further object of the invention is to provide an
17 underwater vehicle provided with a plurality of fins, each of the
18 fins being movable from a position nested in a recess in the
19 hull, with the fore-and-aft axis of the fin disposed generally
20 normal to the fore-and-aft axis of the vehicle, to a position
21 extending radially outwardly from the vehicle with the fore-and-
22 aft axis of the fin generally parallel to the fore-and-aft axis
23 of the vehicle.

24 A still further object of the invention is to provide means
25 for movement of the fins from the nested position to the extended

1 position which is simple, inexpensive, rugged, and includes a
2 minimum of moving parts.

3 With the above and other objects in view, as will
4 hereinafter appear, a feature of the present invention is the
5 provision of a fin assembly for an underwater vehicle, the
6 assembly comprising a portion of the hull of the vehicle having a
7 recess therein, and a sleeve proximate a forward end of the
8 recess and inclined inwardly from the hull portion at an angle to
9 the hull portion and inclined transversely of the fore-and-aft
10 axis of the vehicle at an angle to the hull portion. The
11 assembly further comprises a fin having a mounting post at a base
12 end thereof, the post being at an angle to the lengthwise axis of
13 the fin, and at an angle to a fore-and-aft axis of the fin. The
14 post is disposed in the sleeve and turnable therein to move the
15 fin from a first position in the hull recess wherein the fin is
16 disposed generally axially of the vehicle and conformed to the
17 hull portion, to a second position in which the fin extends
18 outwardly from the hull in a position radial to the vehicle axis
19 and inclined rearwardly.

20 In accordance with a further feature of the invention, there
21 is provided an underwater vehicle comprising a hull having a
22 portion substantially cylindrical in configuration and having
23 therein a plurality of recesses, a sleeve proximate a forward end
24 of each of the recesses and inclined inwardly and transversely of
25 the hull. The vehicle further includes a plurality of fins equal

1 in number to the plurality of recesses, each of the fins having
2 at a base end thereof a post extending at an angle fore-and-aft
3 of the fin and at an angle widthwise of the fin. Each of the fin
4 posts is disposed in one of the sleeves. The angles are such
5 that rotation of the posts in the sleeves causes movement of each
6 of the fins from a position nested in one of the recesses with
7 the fore-and-aft axis of the fin disposed generally normal to the
8 fore-and-aft axis of the vehicle, to a position extending
9 outwardly from the vehicle with the fore-and-aft axis of the fin
10 generally parallel to the fore-and-aft axis of the vehicle.

11 The above and other features of the invention, including
12 various novel details of construction and combinations of parts,
13 will now be more particularly described with reference to the
14 accompanying drawings and pointed out in the claims. It will be
15 understood that the particular device embodying the invention is
16 shown by way of illustration only and not as a limitation of the
17 invention. The principles and features of this invention may be
18 employed in various and numerous embodiments without departing
19 from the scope of the invention.

20 21 BRIEF DESCRIPTION OF THE DRAWINGS

22 Reference is made to the accompanying drawings in which is
23 shown an illustrative embodiment of the invention, from which its
24 novel features and advantages will be apparent.

25 In the drawings:

1 FIG. 1 is a centerline sectional view of an underwater
2 vehicle hull portion;

3 FIG. 2 is a transverse sectional view, taken along line II-
4 II of FIG. 1;

5 FIG. 3 is a front elevational view of a fin;

6 FIG. 4 is a base end view of the fin of FIG. 3;

7 FIG. 5 is a partially sectional and partially elevational
8 view of a fin assembly wherein the fin of FIGS. 3 and 4 is shown
9 in combination with the hull portion of FIGS. 1 and 2, and is
10 illustrative of an embodiment of the invention;

11 FIG. 6 is a partially sectional and partially front
12 elevational view of the assembly of FIG. 5;

13 FIG. 7 is a perspective view of the assembly of FIGS. 5 and
14 6; and

15 FIG. 8 is a diagrammatic illustration of the positioning of
16 a plurality of fins in a vehicle.

17 DESCRIPTION OF THE PREFERRED EMBODIMENTS

18 Referring to FIGS. 1 and 2, it will be seen that the
19 assembly includes a portion 10 of a hull 12 of a vehicle 14. The
20 hull portion 10 has therein an elongated recess 16. A sleeve 18
21 is proximate a forward end 19 of recess 16 at a first angle a to
22 hull portion 10 (FIG. 1) and inclined transversely of the fore-
23 and-aft axis X of vehicle 14 at a second angle b to hull portion
24 10 (FIG. 2).
25

1 Referring to FIGS. 3 and 4, it will be seen that the
2 assembly includes a fin 20 having a leading edge 22 and a
3 trailing edge 24. The fin 20 is provided with a mounting post 26
4 at a base end 28 of fin 20. The post 26 is at a third angle c
5 (FIG. 3) to a lengthwise axis 30 of fin 20, and at a fourth angle
6 d (FIG. 4) to a fore-and-aft axis 32 of fin 20.

7 Referring to FIG. 5, it will be seen that mounting post 26
8 is disposed in sleeve 18 and is turnable in sleeve 18 to move fin
9 20 from a first position in hull recess 16 wherein fin 20 is
10 disposed generally axially of vehicle 14 and generally conformed
11 to hull portion 10, to a second position (FIG. 5 phantom) in
12 which fin 20 extends outwardly from hull 12 in a position radial
13 to the vehicle axis (FIG. 6) and inclined rearwardly at a fifth
14 angle e (FIG. 5) from a line λ extending radially from the
15 vehicle axis.

16 As seen in FIGS. 2, 6 and 7, hull portion 10 is, in
17 transverse section, of an arc-shaped configuration and recess 16
18 (FIGS. 1, 5 and 7) is elongated lengthwise of hull portion 10.
19 Recess 16 is of a depth 34 (FIG. 5) not less than the thickness
20 36 of fin 20, and is of a length 38 not less than the length 40
21 of fin 20, and is of a width 42 (FIG. 7) not less than the width
22 44 of fin 20, such that fin 20 is received by recess 16 with a
23 major surface 46 (FIG. 5) of fin 20 generally conforming to the
24 surface 48 of hull portion 10.

1 In the embodiment illustrated in FIGS. 1-7, sleeve 18
2 extends inwardly and transversely from a forward wall 50 of
3 recess 16 (FIGS. 1 and 5). To facilitate rotation of mounting
4 post 26, a free end 52 (FIG. 5) of post 26 is provided with an
5 arm 54 fixed to post 26, such that rotative movement of arm 54
6 about a pivot point 56, defined by post 26, causes rotational
7 movement of post 26, and thereby fin 20, to move fin 20 from the
8 aforesaid first position to the aforesaid second position, as
9 shown in FIG. 5.

10 In a preferred embodiment, angles a, b, c and d are
11 approximately 45°, and angle e is approximately 19.5°. It will be
12 apparent that the angles selected depend upon the desired second
13 position for the fin.

14 In virtually all instances a plurality of the above-
15 described fin assemblies is required, typically four or eight fin
16 assemblies. In FIG. 8, there is shown diagrammatically an
17 arrangement of eight fins 20 in recesses 16 disposed around the
18 circumference of hull 12. Each fin assembly of an arrangement as
19 depicted in FIG. 8 is in accordance with the above description.

20 In operation, the vehicle 14 is launched in the condition
21 illustrated in FIG. 8. After exiting the launch tube, a motive
22 means operates to rotate posts 26, as by rotation of arms 54.
23 Upon rotation of posts 26, all fins 20 extend from their recess
24 16 and turn so that the fore-and-aft axes 32 of the fins are
25 generally parallel with the fore-and-aft axis x of the vehicle

1 14. To return fins 20 to their nested positions, counter
2 rotation of posts 26 is undertaken.

3 It is to be understood that the present invention is by no
4 means limited to the particular construction herein disclosed
5 and/or shown in the drawings, but also comprises any
6 modifications or equivalents.

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3 AN UNDERWATER VEHICLE AND A FIN

4 ASSEMBLY THEREFORE

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6 ABSTRACT OF THE DISCLOSURE

7 A fin assembly for an underwater vehicle, the assembly
8 comprising a portion of the hull of the vehicle having a recess
9 therein, and a sleeve proximate a forward end of the recess and
10 inclined inwardly from the hull portion at an angle to the hull
11 portion and inclined transversely of the fore-and-aft axis of the
12 vehicle at an angle to the hull portion. The assembly further
13 comprises a fin having a mounting post at a base end thereof, the
14 post being at an angle to the lengthwise axis of the fin, and at
15 an angle to a fore-and-aft axis of the fin. The post is disposed
16 in the sleeve and turnable therein to move the fin from a first
17 position in the hull recess wherein the fin is disposed generally
18 axially of the vehicle and conformed to the hull portion, to a
19 second position in which the fin extends outwardly from the hull
20 in a position radial to the vehicle axis and inclined rearwardly
21 at an angle from a line extending radially of the vehicle axis.

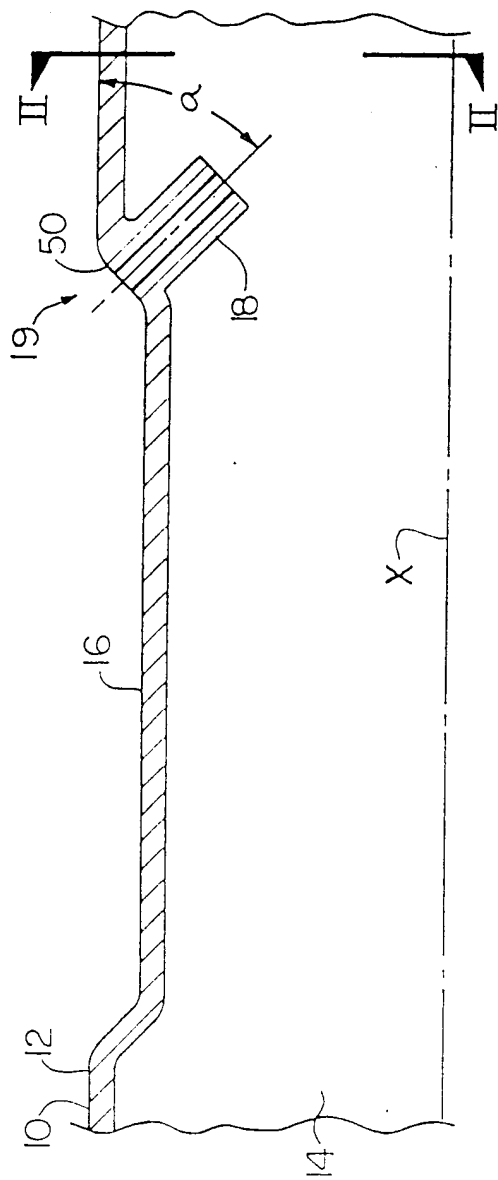


FIG. 1

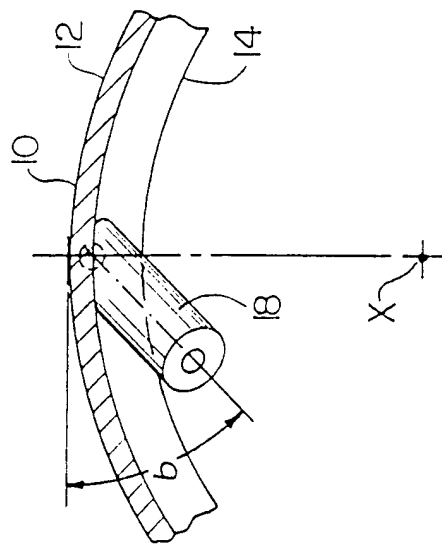


FIG. 2

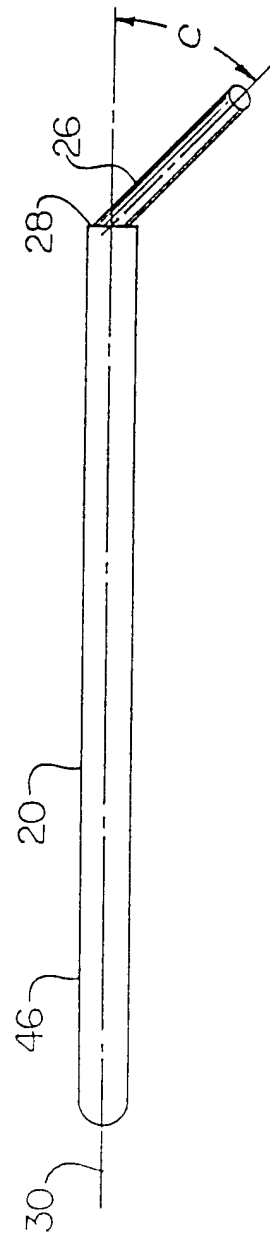


FIG. 3

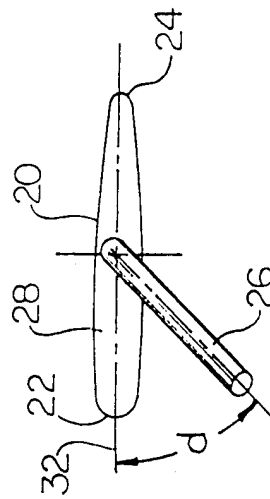


FIG. 4

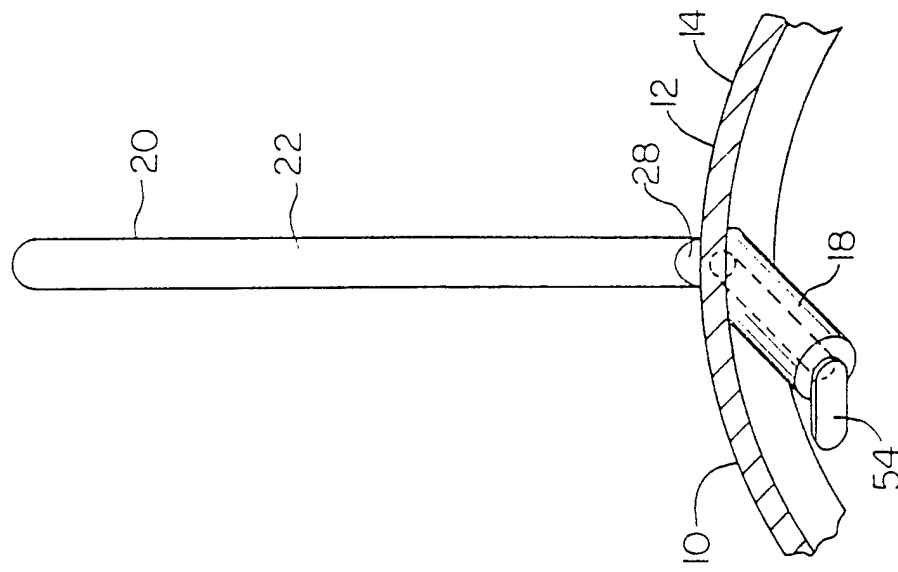


FIG. 6

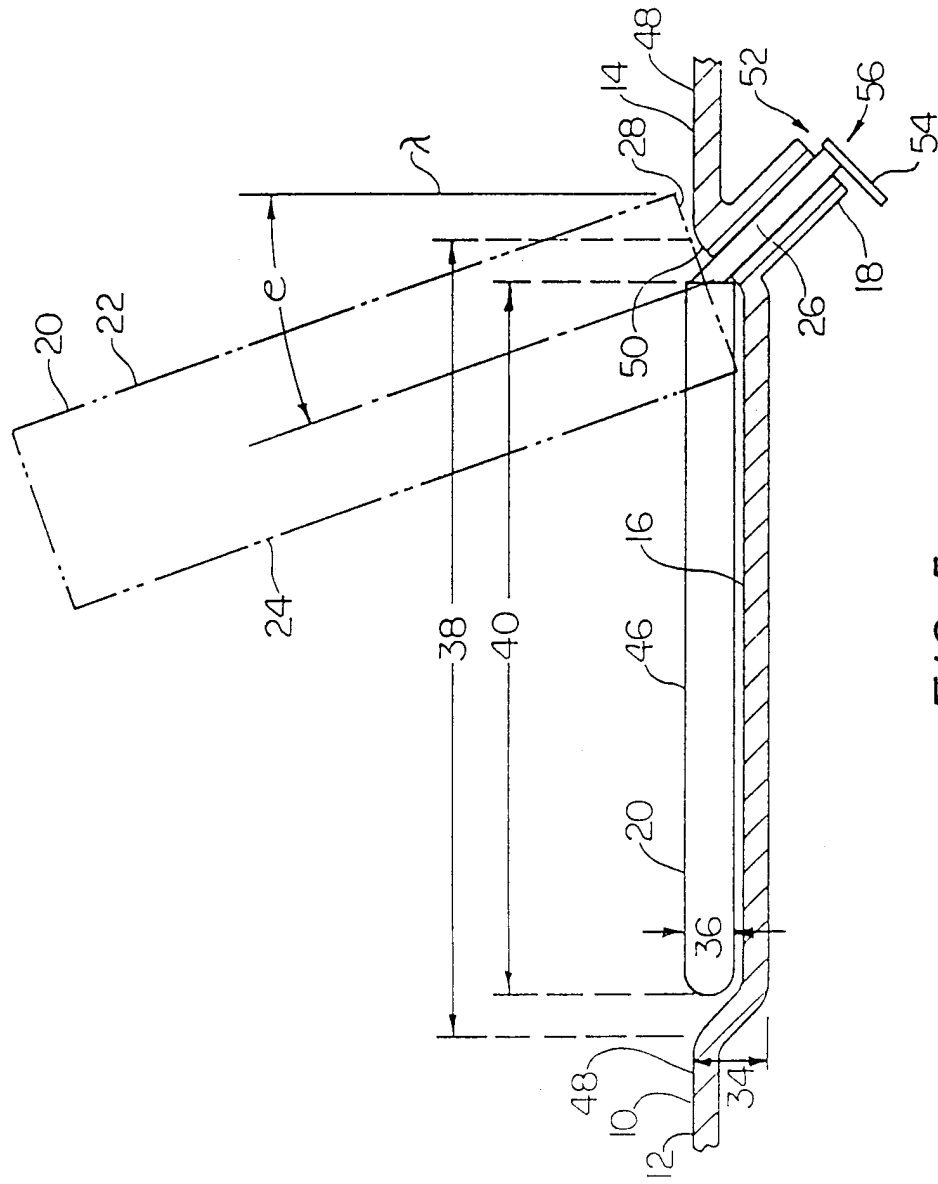


FIG. 5

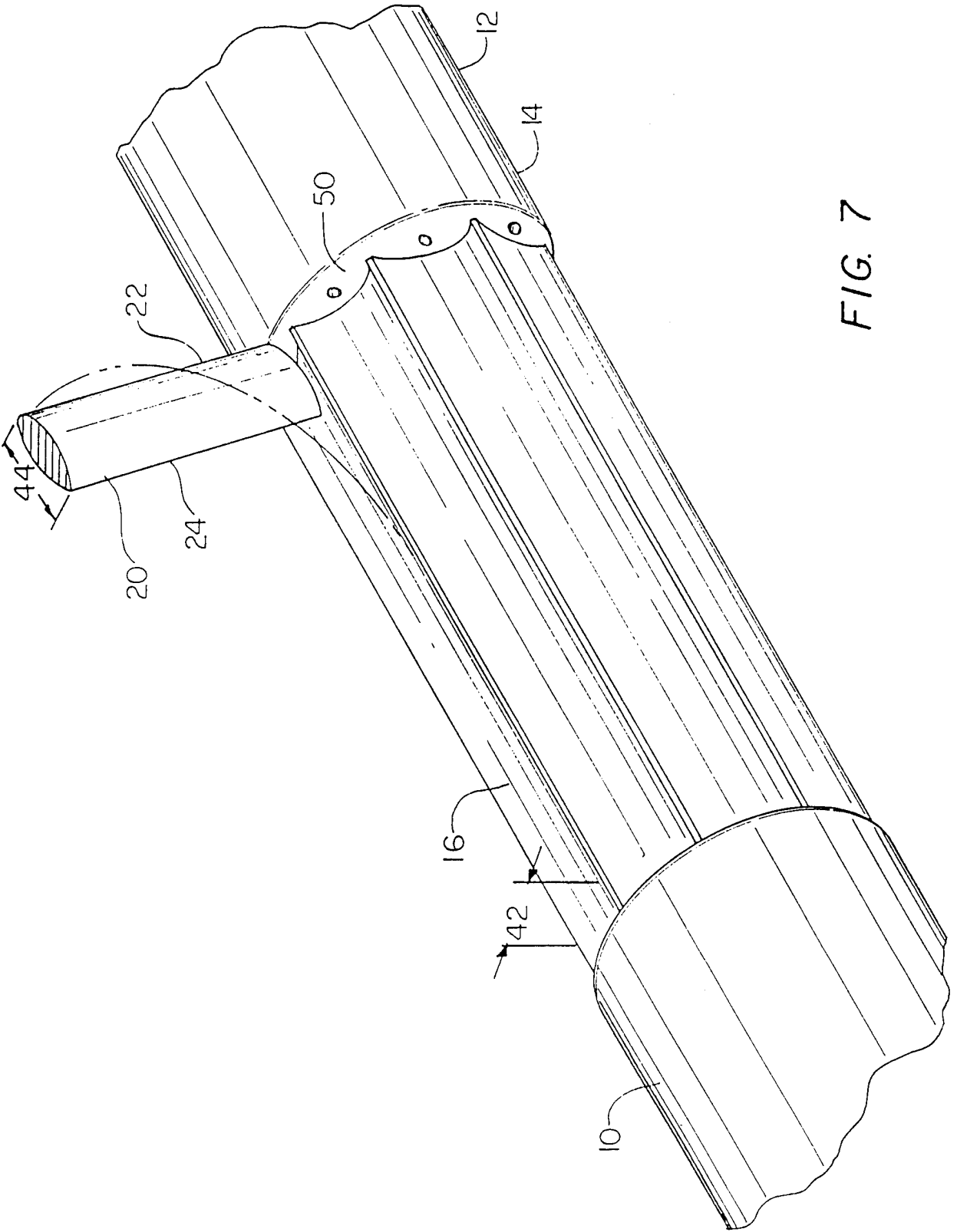


FIG. 7

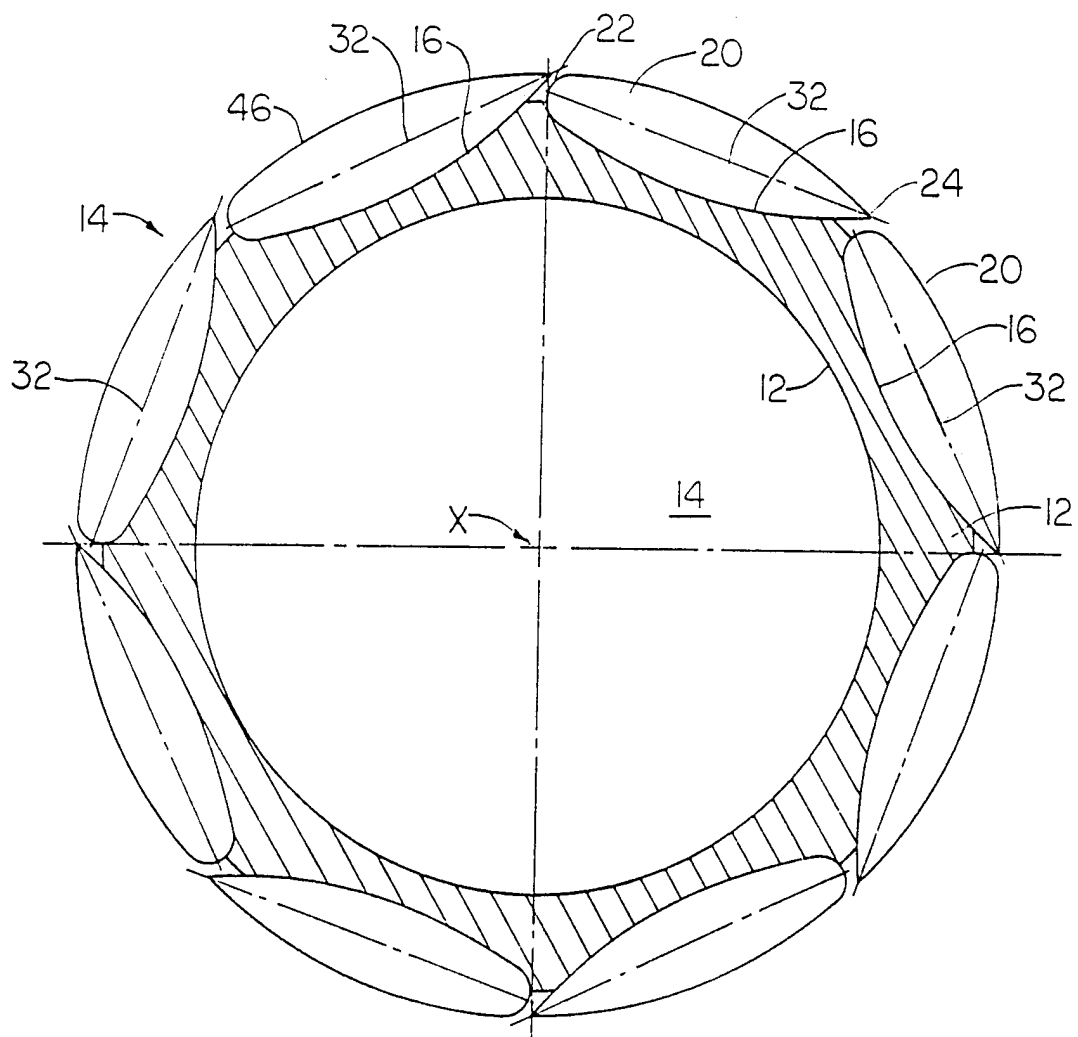


FIG. 8