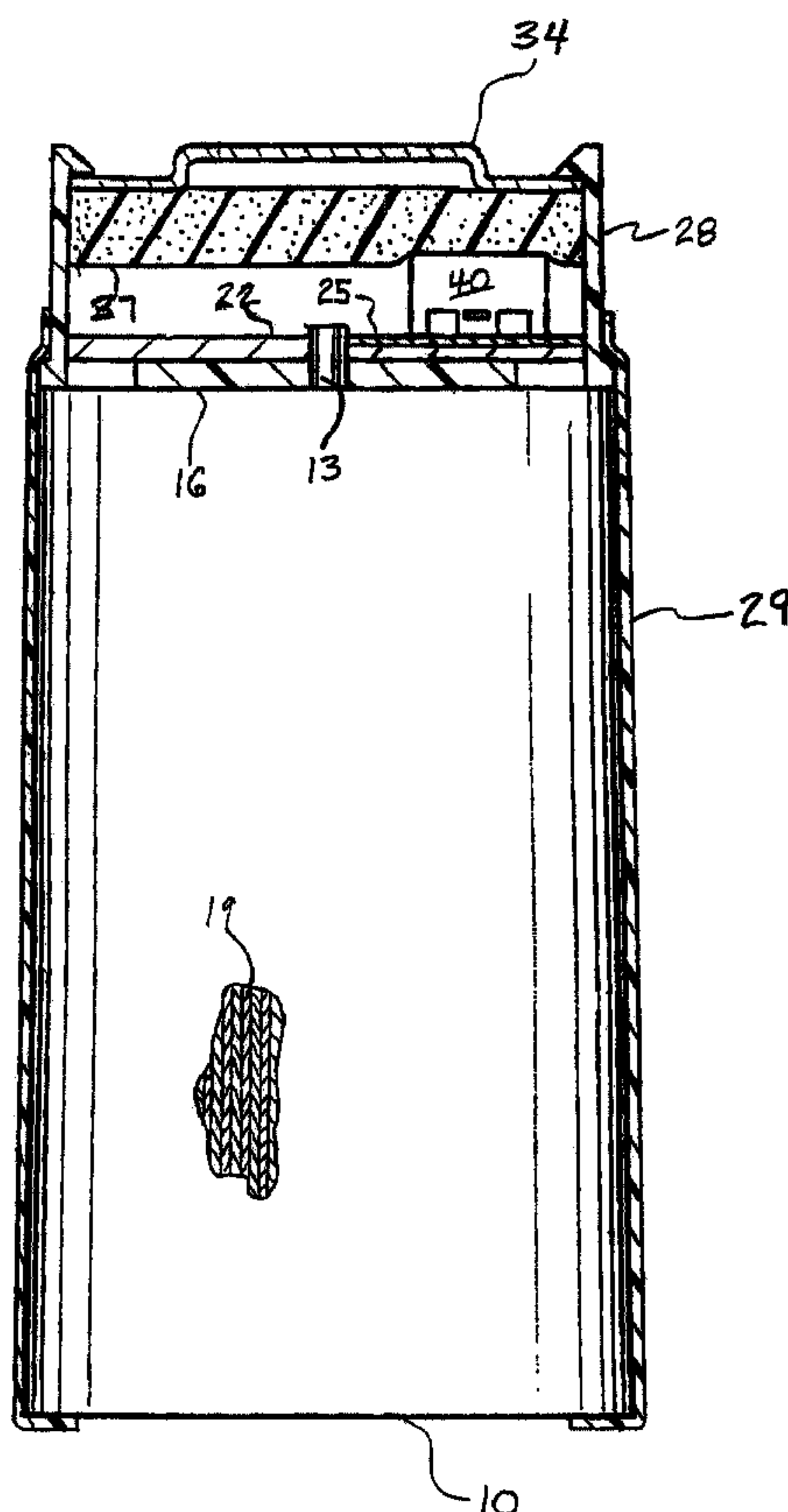




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(54) Titre : FUSIBLE A CONDUCTEUR
 (54) Title: TRACE FUSE FOR A BATTERY TERMINATION



(57) Abrégé/Abstract:

A power providing device that has a battery, a protective housing, a terminal cap, and a fuse on a substrate. The battery has a terminal pin extending from a header. The substrate is attached to the battery. A trace fuse supported by the substrate has a fusible portion intermediate first and second ends. The first end is directly electrically connected to the terminal pin and the second end is connectable to an electrical device powered by the battery.

ABSTRACT

A power providing device that has a battery, a protective housing, a terminal cap, and a fuse on a substrate. The battery
5 has a terminal pin extending from a header. The substrate is attached to the battery. A trace fuse supported by the substrate has a fusible portion intermediate first and second ends. The first end is directly electrically connected to the terminal pin and the second end is connectable to an electrical
10 device powered by the battery.

5 TRACE FUSE FOR A BATTERY TERMINATION

BACKGROUND INFORMATION

The invention relates generally to fuses.

BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature and
10 objects of the invention, reference should be made to
the following detailed description taken in conjunction
with the accompanying drawings, in which:

Figure 1 is a partially cross sectioned side view
of a device in accordance with one embodiment of the
invention;

15 Figure 2 is a perspective view of a housing in
accordance with one embodiment of the invention;

Figure 3 is a perspective view of a device in
accordance with one embodiment of the invention;

20 Figure 4A shows a substrate with a fuse in
accordance with one embodiment of the invention;

Figure 4B is a cross sectional side view of the
substrate and fuse shown in figure 4A taken along the
line 4B -- 4B;

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5 Figure 5A shows a substrate with a fuse in accordance with one embodiment of the invention;

 Figure 5B is a cross sectional side view of the substrate and fuse shown in figure 5B taken along the line 5B -- 5B; and

10 Figure 6 shows a substrate with several fuses in accordance with one embodiment of the invention.

DETAILED DESCRIPTION

 The present invention is a power providing device. Figures 1, 2 and 3 show an embodiment of the invention
15 that includes a battery 10 having a terminal pin 13 extending from a header 16. The battery 10 may include an electrode 19 having lithium. The battery 10 may be a primary (non-rechargeable) battery, or may be a secondary battery (rechargeable).

20 A substrate 22 may be attached to the battery 10, and a fuse 25 may be attached to the substrate 22 and electrically connected to the terminal pin 13. Figures 4A and 4B show a substrate and a fuse. The fuse 25 may include copper or tin, or both. The fuse 25 may be
25 designed to separate at less than about 20 amps of electric current.

 The protective housing 28 may be attached to the battery 10, for example with shrink wrap 29. The substrate 22 may contact the housing 28. The protective
30 housing 28 may have an orifice 31 within which the

5 terminal pin 13 may reside. A conductive terminal cap 34 may be attached to the housing 28. The substrate 22 may reside between the terminal cap 34 and the battery 10. The substrate 22 may reside between the terminal cap 34 and the housing 28.

10 Figures 4A and 4B show a fuse having a substantially straight conductive path. Figure 5 shows a fuse 25 that provides a zig-zag conductive path. In this manner, the size of the substrate 22 need not change to accommodate fuses 25 of differing lengths.

15 Figures 4A and 4B show an embodiment of the invention in which the fuse 25 is embedded in the substrate 22. In this fashion, the fuse 25 may be protected from damage that might otherwise be caused, for example, during assembly of the substrate 22 with
20 the battery 10. The customary glass enclosure found in many fuses may not be present.

Figure 6 shows an embodiment of the invention in which several fuses 25a, 25b, 25c each having a different current limit, may be placed on a single
25 substrate 22. For example, a single substrate 22 may have fuses 25a, 25b, 25c of differing cross sectional area, length or material so as to provide fuses 25a, 25b, 25c each having a different current limit. In assembling such a substrate 22 with the battery 10, the
30 fuse (25a, 25b, or 25c) having the desired current limit may be electrically connected to the battery 10 and, for example, an electrical device 40. The other fuses may

5 not be electrically connected to provide a conductive
path from the battery 10, although they may be connected
to the terminal pin 13 of the battery 10. In this
fashion, a single type of substrate 22 may be stocked
for use with many different types of batteries 10 or
10 electrical devices 40, or both.

The substrate 22 may include a ceramic material, a
polyamide material, polytetraflouroethylene, glass
reinforced hydrocarbon/ceramic laminate, or some
combination of the foregoing materials. Examples of
15 glass reinforced hydrocarbon/ceramic laminates include
those made by Rogers Corporation of Chandler, Arizona
and marketed under the trademark R04000® Series.

A compressible pad 37 may be included to firmly
hold the substrate 22 within the housing 28. As shown
20 in figure 1, the compressible pad 37 may contact an
electrical device 40 in order to hold the substrate 22.
However, it should be noted that the compressible pad 37
may also contact the substrate 22.

Although the invention has been described with
25 respect to one or more particular embodiments, it will
be understood that other embodiments of the invention
may be made without departing from the scope of the claims
appended hereto.

What is claimed is:

1. A power providing device, comprising:

a battery having a terminal pin extending from a header;

5 a substrate attached to the battery; and

a fuse attached to the substrate and comprising a first end electrically connected to the terminal pin and a second end connectable to an electrical device powered by the battery, wherein the entire length of the fuse is in
10 direct, support contact with the substrate.

2. The power providing device of claim 1, wherein the fuse providing a zig-zag conductive path.

3. The power providing device of claim 1, wherein the fuse provides a substantially straight conductive path.

15 4. The power providing device of claim 1, wherein the fuse is embedded in the substrate.

5. The power providing device of claim 1, wherein the fuse includes copper.

20 6. The power providing device of claim 4, wherein the fuse includes tin.

7. The power providing device of claim 1, wherein the battery includes an electrode having lithium.

25 8. The power providing device of claim 1, wherein the fuse will separate at less than about 20 amps of electric current.

9. The power providing device of claim 1, wherein the substrate resides between a terminal cap and the battery.

10. The power providing device of claim 1, further comprising a housing attached to the battery, and the substrate contacts the housing.

11. The power providing device of claim 1, further comprising a terminal cap attached to the housing, wherein the substrate resides between the terminal cap and the housing.

12. The power providing device of claim 1, wherein the housing has an orifice, and the terminal pin resides in the orifice.

13. The power providing device of claim 1, wherein the substrate includes a ceramic material.

14. The power providing device of claim 1, wherein the substrate includes a polyamide material.

15. The power providing device of claim 1, wherein the substrate includes polytetraflouroethylene.

16. The power providing device of claim 1, wherein the substrate includes glass reinforced hydrocarbon/ceramic laminate.

17. The power providing device of claim 1, wherein the substrate includes at least two fuses, one of which is not electrically connected to provide a conductive path from the terminal pin.

18. The power providing device of claim 17, each fuse has a different current rating.

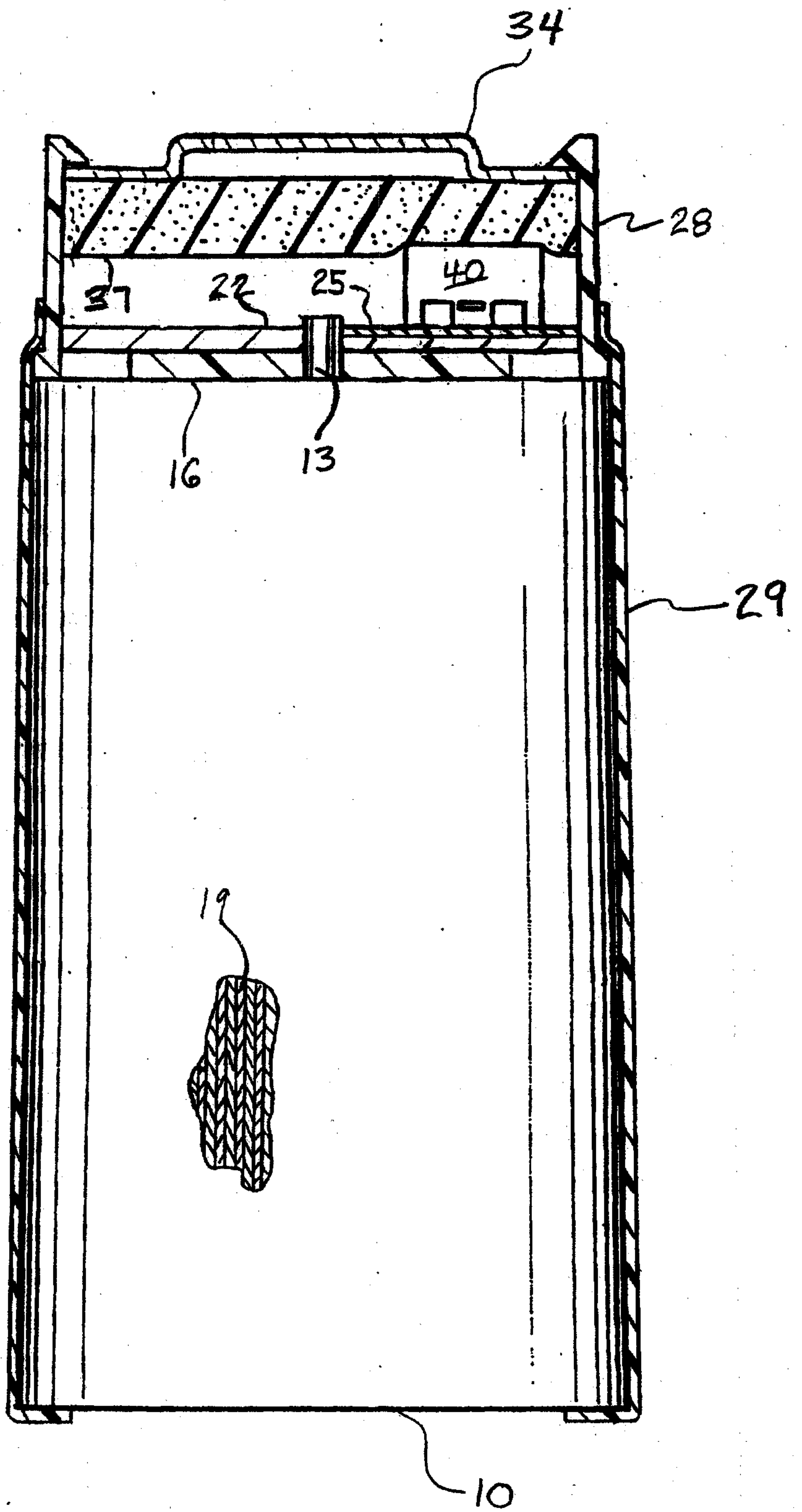


FIG. 1

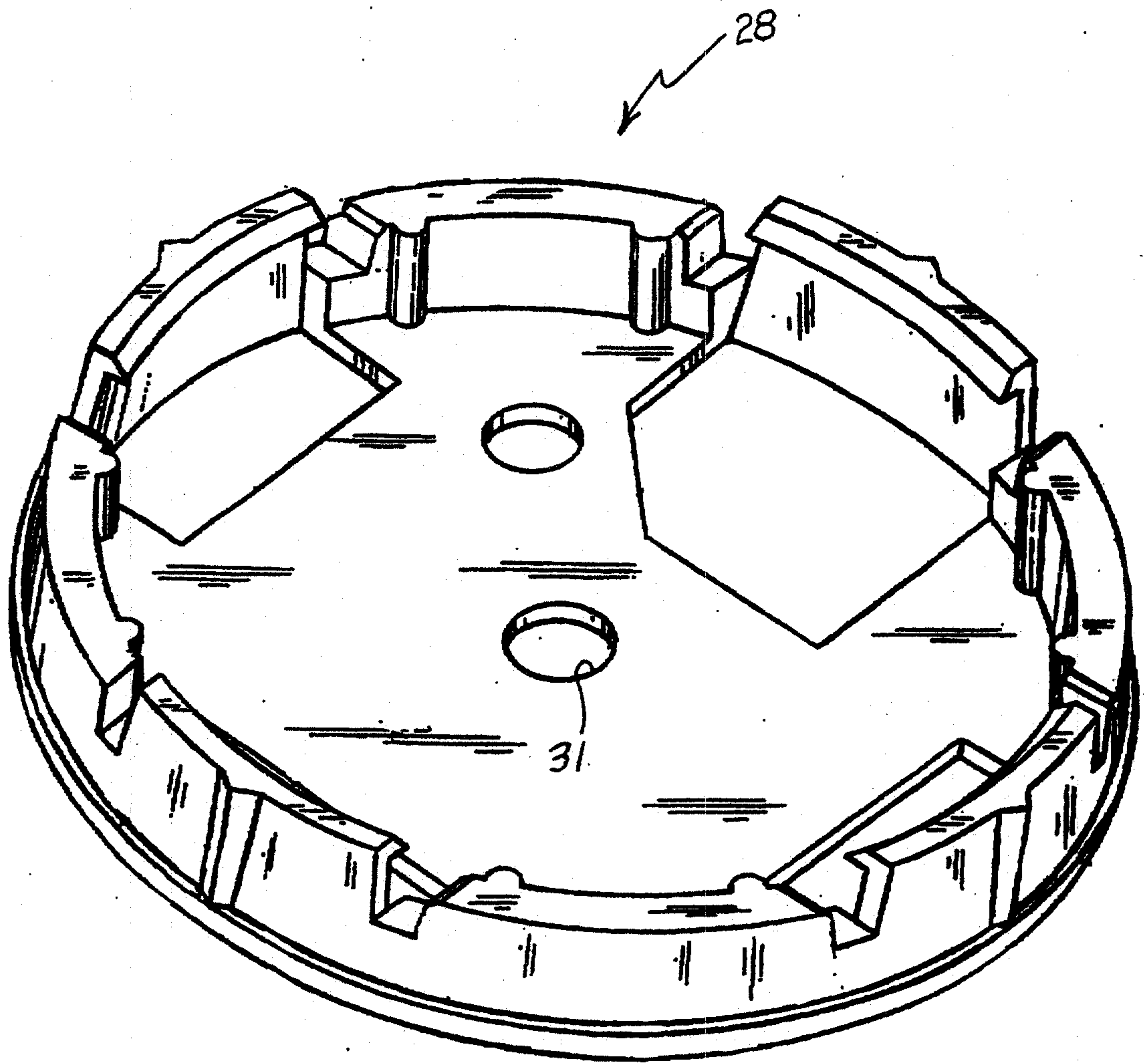


FIG. 2

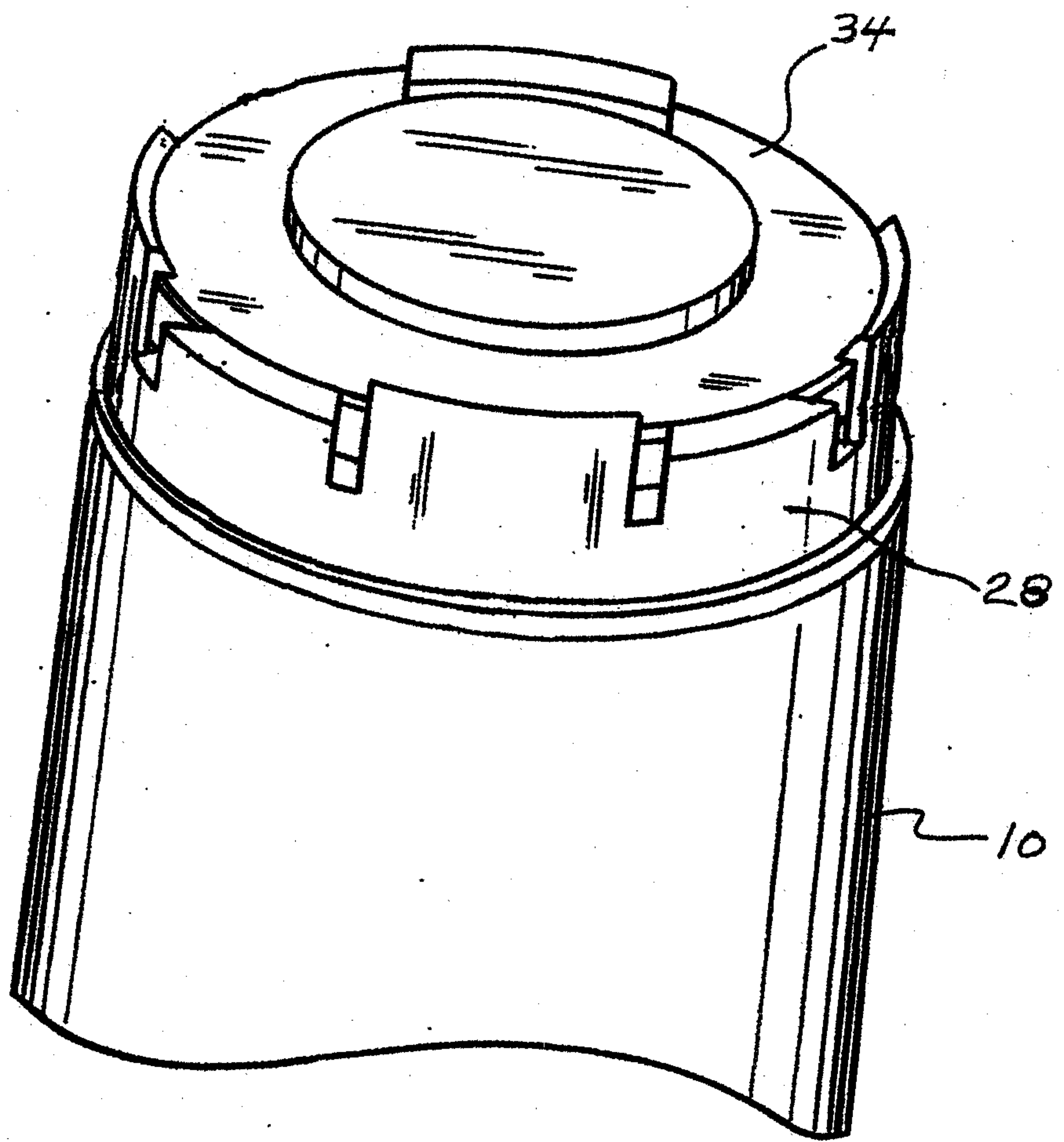


FIG. 3

FIG. 4A

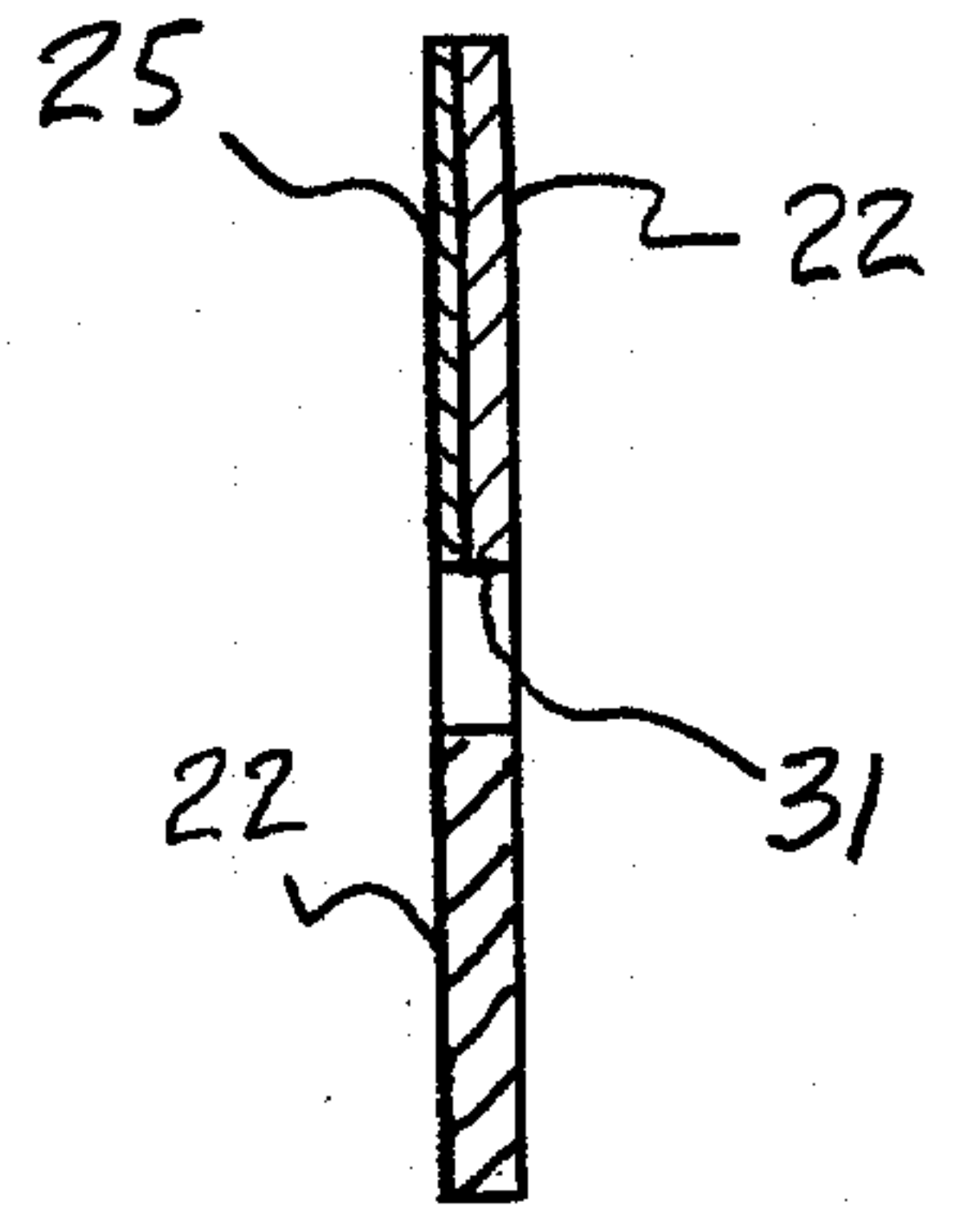
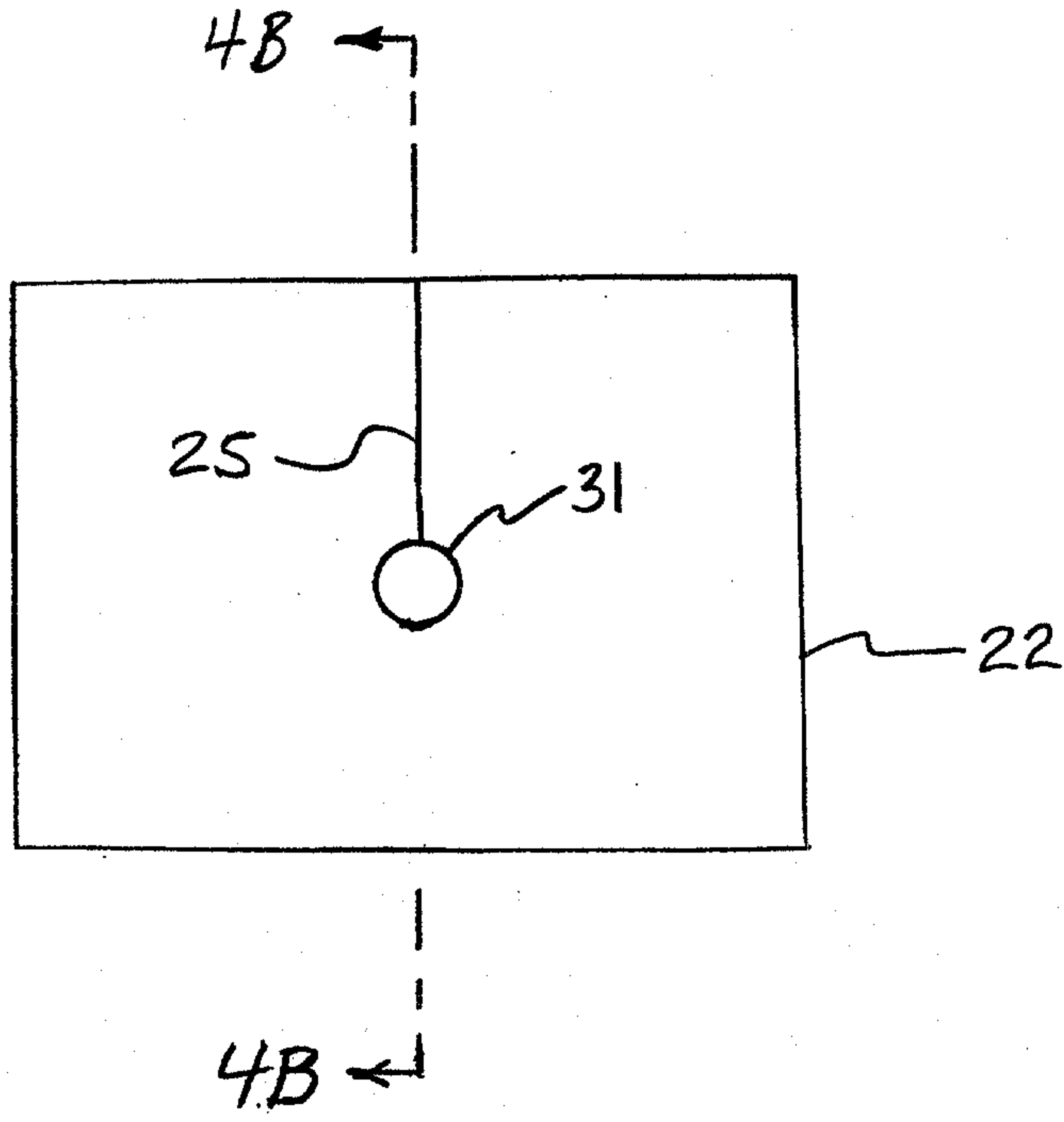


FIG. 4B

FIG. 5A

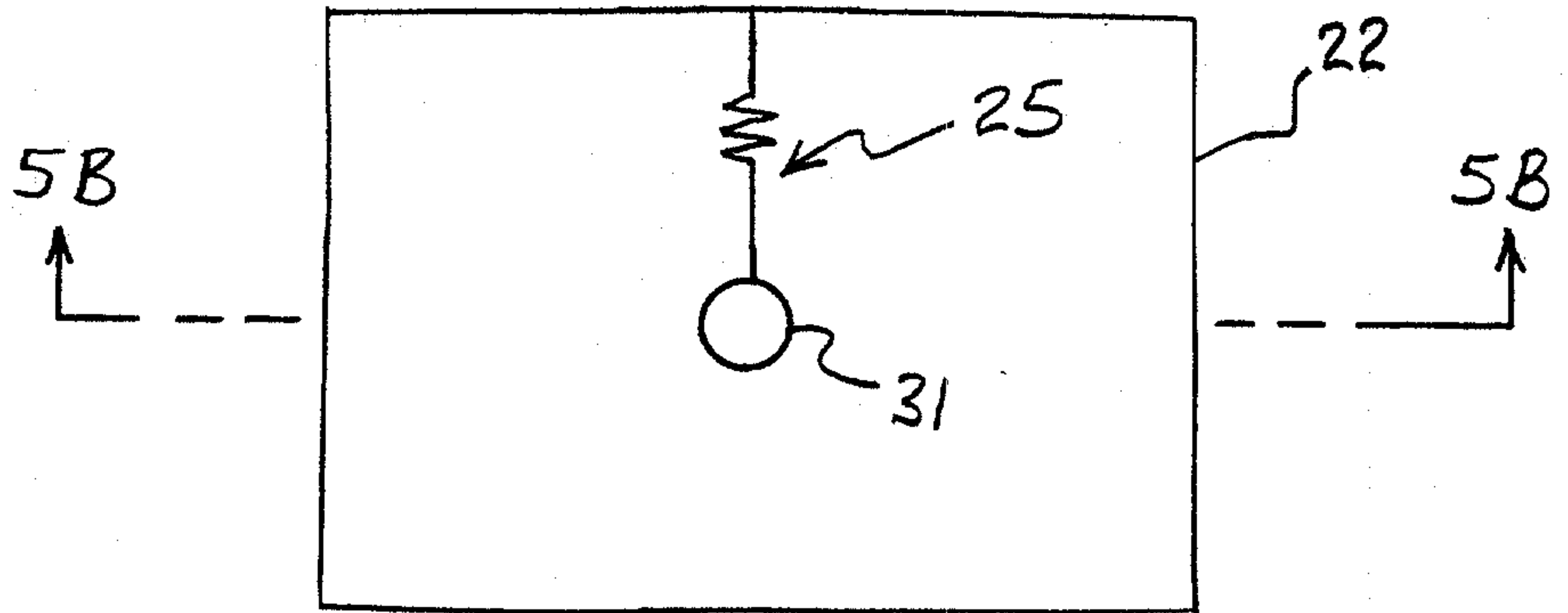


FIG. 5B

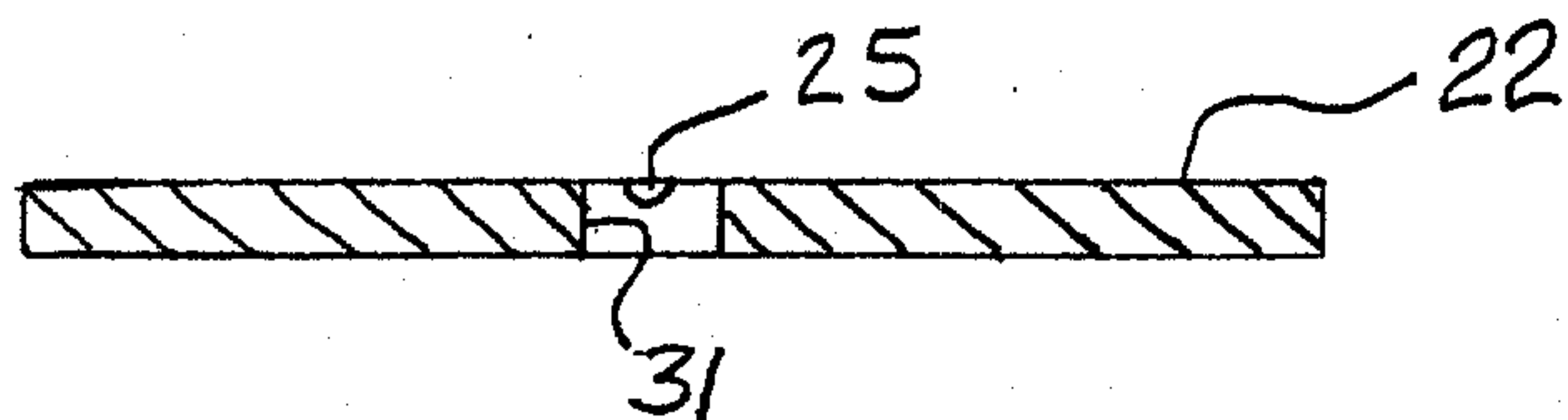


FIG. 6

