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1 Attorney Docket No. 79455

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3 A SUBMARINE PERISCOPE EYE BOX CONNECTOR, MAST CONNECTOR, AND
4 CONNECTOR GUIDE FOR FACILITATING BLIND INTERCONNECTION

5

6 STATEMENT OF GOVERNMENT INTEREST

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

11

12 BACKGROUND OF THE INVENTION

13 (1) Field of the Invention

14 The invention relates to electrical connectors and is
15 directed more particularly to, in combination, a submarine
16 periscope eye box connector, a mast connector, and a connector
17 guide for facilitating blind interconnections thereof.

18 (2) Description of the Prior Art

19 Herein a vocabulary convention will be employed which
20 applies the term "male connector" to a first type of mating,
21 multiple connection, electrical connector (e.g., connectors 22,
22 FIG. 1) whose wall 34 (best shown in FIG. 4) is inserted in a

1 second-type of connector (e.g., connectors 26, FIG.2) whose wall
2 40 (best shown in FIG. 4) receives the wall of the first-type
3 connector. The term "female connector" is applied to this
4 second-type connector. Note that this runs contrary to the
5 extant situation at the level of the individual connector
6 elements, where the individual connector elements of the first-
7 type connector are pin receptors 36 (shown in FIG. 1) which
8 suggest a female-type structure, and where the individual
9 connector elements of the second-type connector are pins 42
10 (shown in FIG.2).

11 In the assembly of submarine periscopes, the eye box is
12 connected to the periscope mast such that electrical connectors
13 are joined inside a barrel, out of view of assembly personnel. In
14 FIG. 1, there is shown an eye box mating end 20 having male
15 electrical connectors 22 mounted thereon. In FIG. 2, there is
16 shown a periscope mast mating end 24 having female electrical
17 connectors 26 thereon. In assembly of a periscope, it is
18 necessary that the connectors 22, 26 be brought into proper
19 interengagement with each other. Given that perfect alignment is
20 seldom realized, the male connectors 22 are mounted in a manner
21 permitting some movement of the connectors 22 widthwise so as to
22 accommodate to slight misalignments.

1 As is shown in FIG. 3, each of the male electrical
2 connectors 22 comprises a plate 28 mounted on the mating end 20
3 of the eye box. The plate 28 is provided with slightly oversized
4 holes 30 through which extend headed fasteners 32. A wall 34
5 upstands from the plate 28 and surrounds eye box, pin receptor-
6 type, connector elements 36 (FIG. 1). Similarly, each of the
7 female electrical connectors 26 comprises a plate 38 (FIG. 3)
8 mounted on the mating end 24 of the mast. The plate 38 is
9 immovably affixed to the mast mating end 24. A wall 40 depends
10 from the plate 38 and surrounds mast, pin-type, connector
11 elements 42 (FIG. 2). The mast connector wall 40 is configured
12 to slidably receive the eye box connector wall 34 therein. In
13 the event of a slight misalignment, the male connector 22 can
14 move laterally into alignment with the female connector 26.

15 At times, the connectors 22 and 26 are not in proper
16 alignment and male connector 22 fails to move into alignment with
17 female connector 26, resulting in a misconnection or no
18 connection. When this occurs, the remedy is not simply moving
19 the eye box and mast apart and starting again. Because other
20 connections, not pertinent here, have been made, disassembly of
21 the joined eye box and mast is a laborious and time-consuming
22 procedure, in practice calling for shipment of the periscope to a

1 particular facility for disassembly. At times the mis-match of
2 connectors goes unnoticed until a test reveals a problem.

3 Accordingly, there is a need for a connector guide which
4 will serve to insure alignment of the connectors and, thereby,
5 proper interengagements of the connectors.

6

7 SUMMARY OF THE INVENTION

8 An object of the invention is, therefore, to provide, in
9 combination, a periscope eye box connector, mast connector, and
10 guide for facilitating accurate and reliable blind
11 interconnections of the eye box and mast connectors.

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, in combination, a male electrical connector, a
15 female electrical connector, and a connector guide for
16 facilitating blind interconnection of the male and female
17 connectors. The male electrical connector comprises a submarine
18 periscope eye box mating end electrical connector comprising a
19 first plate mounted on the mating end of the eye box and movable
20 in a plane of the eye box mounting end, and a first male wall
21 upstanding from the first plate and surrounding eye box connector
22 elements. The female electrical connector comprises a submarine

1 periscope mast mating end electrical connector, comprising a
2 second plate mounted on the mating end of the mast, and a second
3 wall depending from the second plate and surrounding mast
4 connector elements, the second wall being configured to slidably
5 receive the first wall therein. The connector guide comprises a
6 wall adapted to slidably engage outside surfaces of the second
7 wall, an outwardly flared skirt extending from an edge of the
8 guide wall opposed to the eye box mating end, and an inwardly
9 extending lip or collar disposed on inside surfaces of the guide
10 wall, the collar being adapted to abuttingly engage an edge of the
11 second wall. The connector guide is slidable onto the second
12 wall until the connector guide collar engages the edge of the
13 second wall, and the first wall is slidable into the connector
14 guide and is guided thereinto by the connector guide skirt, and
15 is guided by the connector guide into the second wall, such that
16 the eye box connector elements engage said mast connector
17 elements.

18 The above and other features of the invention, including
19 various novel details of construction and combinations of parts,
20 will now be more particularly described with reference to the
21 accompanying drawings and pointed out in the claims. It will be
22 understood that the particular device embodying the invention is

1 shown by way of illustration only and not as a limitation of the
2 invention. The principles and features of this invention may be
3 employed in various and numerous embodiments without departing
4 from the scope of the invention.

5

6 BRIEF DESCRIPTION OF THE DRAWINGS

7 Reference is made to the accompanying drawings in which is
8 shown an illustrative embodiment of the invention, from which its
9 novel features and advantages will be apparent, wherein
10 corresponding reference characters indicate corresponding parts
11 throughout the several views of the drawings and wherein:

12 FIG. 1 is a perspective view of a prior art submarine
13 periscope mating end of an eye box;

14 FIG. 2 is a perspective view of a prior art submarine
15 periscope mating end of a mast;

16 FIG. 3 is a diagrammatic sectional illustration of an eye
17 box electrical connector mounted on the mating end of the eye
18 box, as shown in FIG. 1, in position opposed to a mast electrical
19 connector mounted on the mating end of the mast, as shown in FIG.
20 2, the electrical connectors being illustrated in position for
21 joining together;

1 FIG. 4 is similar to FIG. 3, but shows in combination with
2 the electrical connectors, a connector guide illustrative of an
3 embodiment of the invention;

4 FIG. 5 is an exploded view of the opposed electrical
5 connector shells and the connector guide disposed therebetween;
6 and

7 FIG. 6 is a perspective view of the connectors and connector
8 guide of FIGS. 4 and 5 joined together.

9

10 DESCRIPTION OF THE PREFERRED EMBODIMENT

11 As noted earlier in this specification, the term "male
12 connector" as used in this specification and the appendent claims
13 refers to a component of a two-part, multiple connection assembly
14 whose wall is slidably inserted inside the wall of the other
15 component, which is referred to as the "female connector" (this
16 despite the extant situation at the level of individual
17 electrical connector elements of these connectors implying
18 contrary connotations).

19 Referring to FIG. 4, it will be seen that the illustrative
20 invention includes the aforementioned eye box mating end male
21 electrical connectors or connector subassemblies 22, and mast
22 mating end female electrical connectors or connector

1 subassemblies 26, in combination with a connector guide 50.
2 Connectors 22 and 26 are subassemblies of a standard commercially
3 available "D-type", two-part, connector assembly so named from
4 the "D" shape of the male and female walls 34 and 40 (shown in
5 FIGS. 4-6) of the subassemblies. Subassemblies 22 and 26 are
6 referred to in this specification and the appended claims as
7 "male connector" or "male connectors," and "female connector" or
8 "female connectors," respectively.

9 The guide 50 includes a wall 52 having a terminal edge 52a,
10 FIGS. 4 and 5, configured to slip over and slidingly engage the
11 outer surface 44 of female connector wall 40. The guide 50 fits
12 over connector 26 in a snug fashion, such that once fitted onto
13 connector 26, guide 50 remains in place through friction fit.

14 The guide 50 further includes an outwardly flared skirt 54
15 extending from an edge 58 of guide wall 52 opposed to eye box
16 mating end 20.

17 The guide 50 still further includes an inwardly-extending
18 lip or collar 56 protruding from wall 52. The wall 52, skirt 54
19 and collar 56 preferably are molded as a single unitary device,
20 which is of a material providing a degree of flexibility and
21 resiliency such as a plastic material.

1 In use, male connector plates 28 (FIGS. 1, 4-6) of
2 electrical connectors 22 are attached to eye box mating end 20 in
3 a known fashion which allows the connector to laterally "float",
4 by means of suitable fasteners 32 (FIGS. 1 and 4) extending
5 through oversized holes 30 being (FIGS. 4-6). More specifically,
6 to the extent that oversized holes 30 are larger than the
7 diameter of the stem of fasteners 32, plate 28 is unrestrained
8 against lateral motion in the plane of eye box mating end 20.
9 Male connectors 22 are thusly provided as "finger touch loose"
10 within the range of lateral movement allowed by oversized holes
11 30. However, female electrical connectors 26 are immovably
12 affixed to mast mating end 24 by conventional fasteners 32'
13 extending through holes (unnumbered) in female connector plates
14 38 (FIGS. 2-6).

15 As part of assembling the eye box to the mast, an artisan
16 presses the unflared edge of each of the guides 50 onto a female
17 connector 26 until the guide's connector collar 56 engages an
18 edge 48 of female connector wall 40. The guide 50 is then
19 released, and remains held in place by the resilient restraining
20 force provided by the molded plastic unit.

21 The mast mating end 24, before being connected to the eye
22 box mating end 20, is disposed in a mast barrel (not shown) and

1 is about fourteen inches from the lower end of the barrel. The
2 eye box mating end is slid into the barrel and mates with the
3 mast mating end in a blind location, that is, at a location not
4 susceptible to viewing by the artisan.

5 As the male connector 22 approaches the female connector 26,
6 the male connector wall 34 approaches and engages connector skirt
7 54 which guides male connector 22 into alignment with female
8 connector 26, the male connector 22 being adapted to laterally
9 shift its positions slightly due to the relative motion allowed
10 by the arrangement of fasteners 32 and oversized holes 30.

11 Inasmuch as guide collar 56 covers the female connector wall edge
12 48, there is no edge-to-edge contact between the connector walls
13 34, 40. Upon further translatory motion of eye box mating end 20
14 toward mast mating end 24 the male connector wall 34 (FIGS. 4-6)
15 is guided into the female connector wall 40 (FIGS. 4 and 5), with
16 a correctly aligned relation of the connector's respective
17 individual connector elements (i.e., pin receptors 36, FIG. 1 and
18 pins 42, FIG. 2) to interengage.

19 As alluded to earlier, there is a need for connector guide
20 50 to have a degree of flexibility and resiliency in connection
21 with the requirement that it be pressable onto female connector
22 wall 40 and thereafter be resiliently retained thereon. On the

1 other hand, it must be sufficiently hard and stiff to cause male
2 connectors 20 to laterally shift upon the latter's lateral
3 engagement with the flared skirt 54 of guide 50. It has been
4 found that a plastic material having a durometer measured
5 hardness in the range 40-60 on the Shore A scale provides the
6 desired combination of characteristics. Any known thermosetting
7 or cold curing plastic material known in the art providing this
8 combination of characteristics may be employed.

9 There is thus provided, in combination, a periscope eye box
10 connector, mast connector, and guide for facilitating accurate
11 and reliable blind interconnection of the eye box and mast
12 connectors. This improves quality control in the assembly of
13 submarine periscope, and essentially eliminates costly and time
14 consuming remedial work at remote specialized repair facilities
15 due to misconnection in the mating of connectors 22 and 26.

16 Upon servicing of the periscope, if any damage to, or wear
17 of, the connector guide 50 is noted, the guide 50 can be
18 discarded and replaced. The cost of a connector guide is
19 negligible.

20 It will be understood that many additional changes in the
21 details, materials, steps and arrangement of parts, which have
22 been herein described and illustrated in order to explain the

- 1 nature of the invention, may be made by those skilled in the art
- 2 within the principles and scope of the invention.
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6 ABSTRACT OF THE DISCLOSURE

7 In combination, a male, multiple connection-type, electrical
8 connector, a female, multiple connection-type, electrical
9 connector, and a connector guide for facilitating blind
10 interconnection of the male and female connectors. The male
11 electrical connector comprises a submarine periscope eye box
12 mating end electrical connector. The female electrical connector
13 comprises a submarine periscope mast mating end electrical
14 connector. The connector guide comprises a wall adapted to
15 slidably engage outside surfaces of the female connector, and an
16 outwardly flared skirt extending from an edge of the guide wall
17 opposed to the eye box mating end. The connector guide is
18 slidable onto the female connector and the male connector is
19 slidable into the connector guide and is guided therein by the
20 connector guide skirt, and is guided by the connector guide into
21 the female connector, such that the eye box connector elements
22 engage the mast connector elements. The connector guide also has

- 1 general utility for interconnections of multiple connector-type
- 2 male and female connectors under other circumstances where this
- 3 operation will be blind to the artisan performing it.

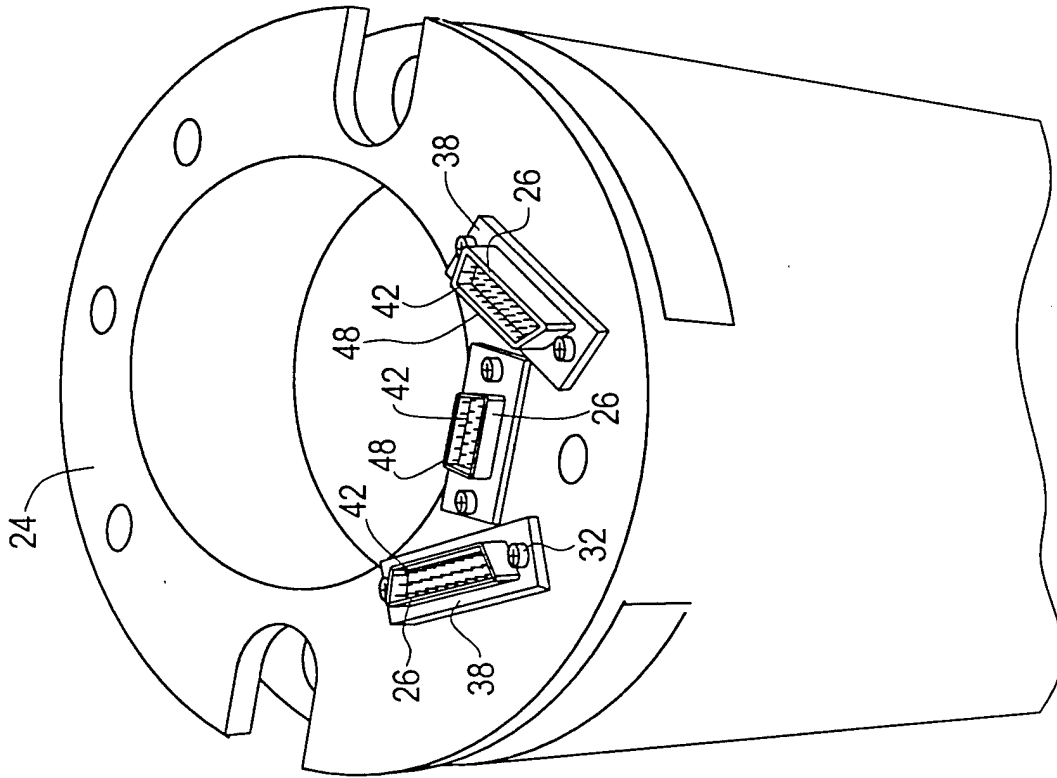


FIG. 2
PRIOR ART

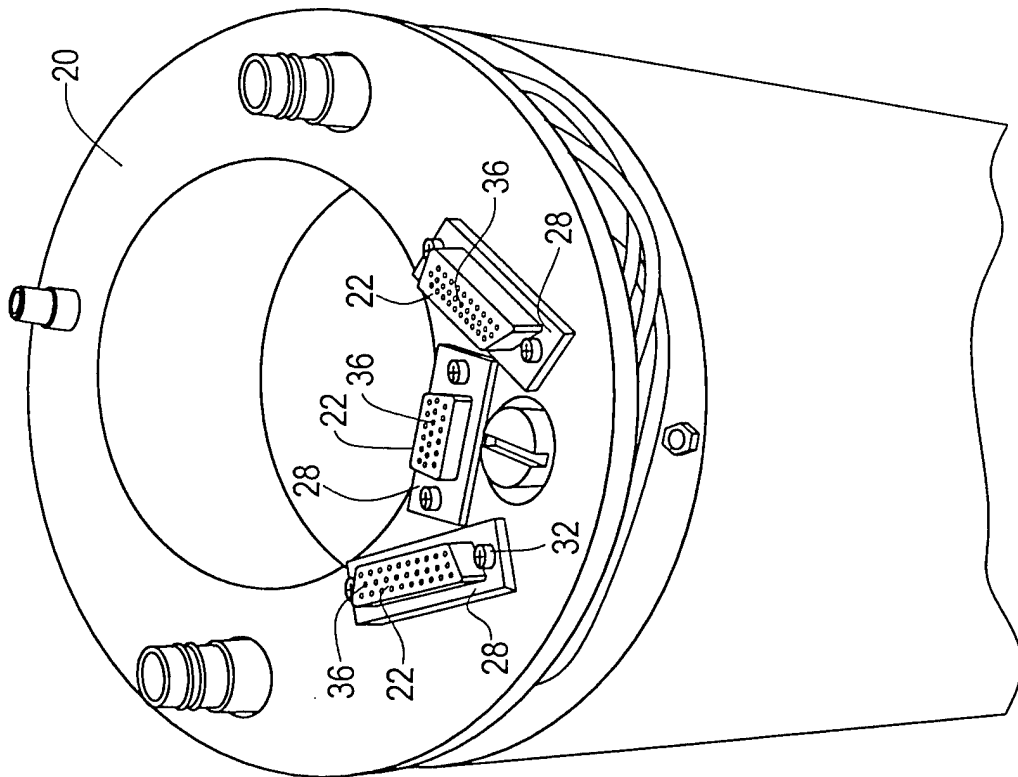


FIG. 1
PRIOR ART

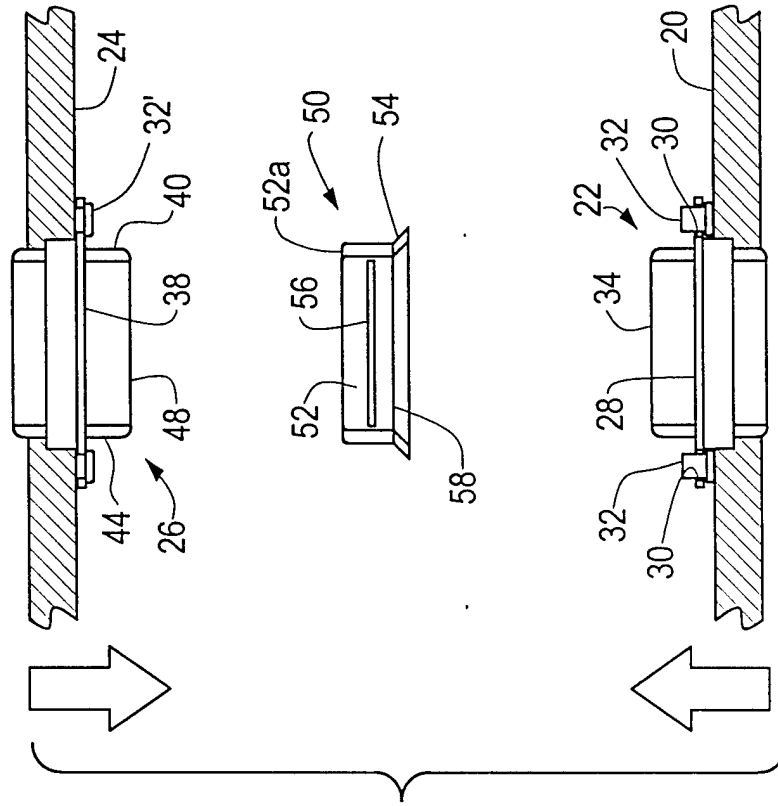


FIG. 4

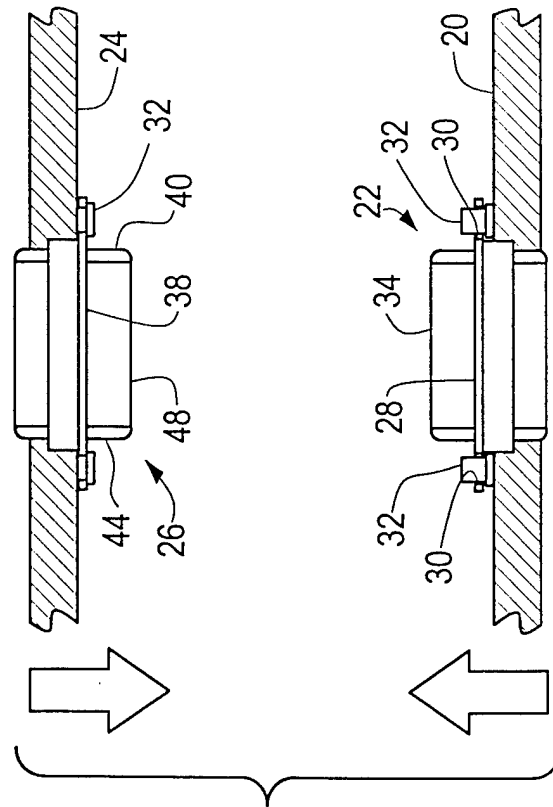
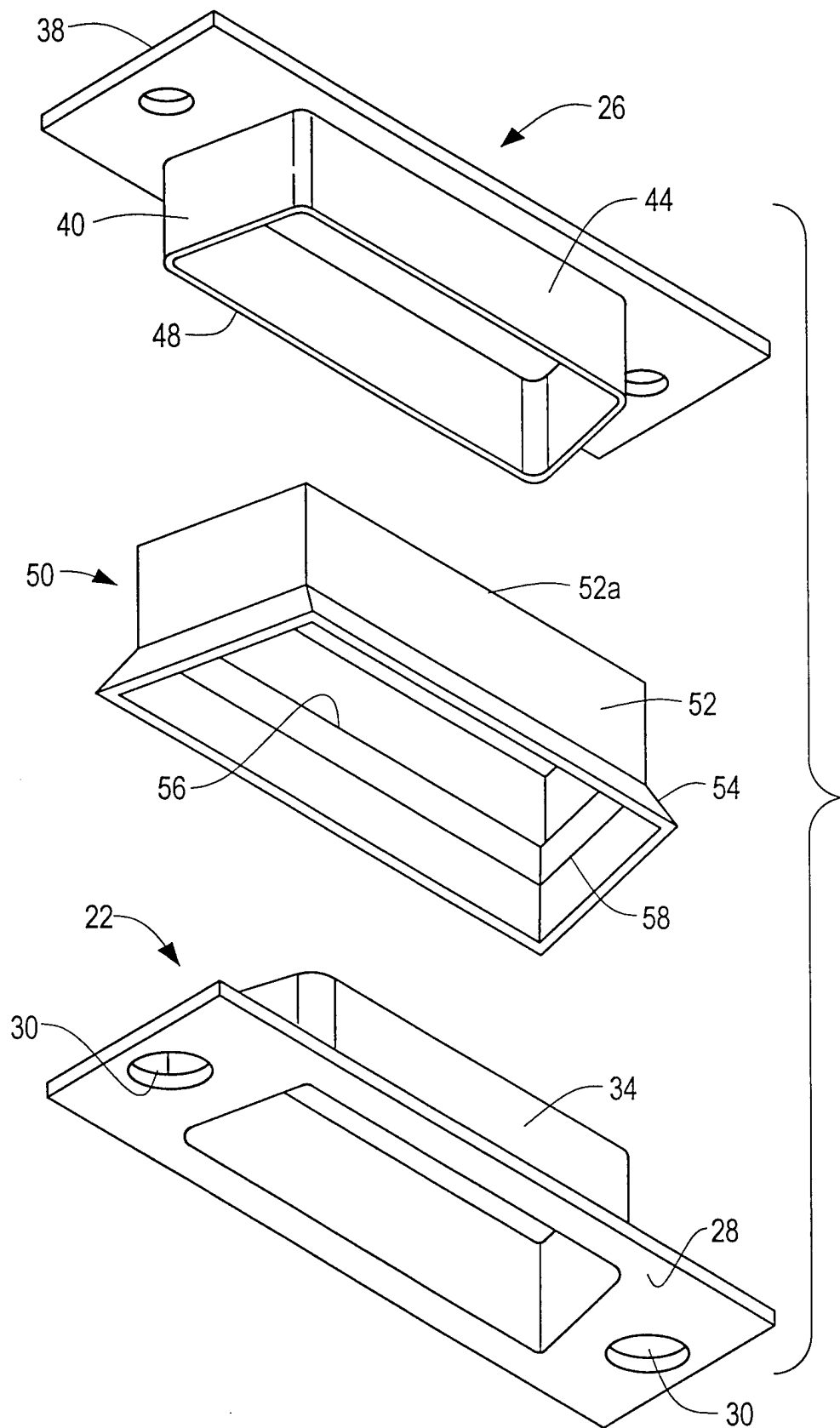
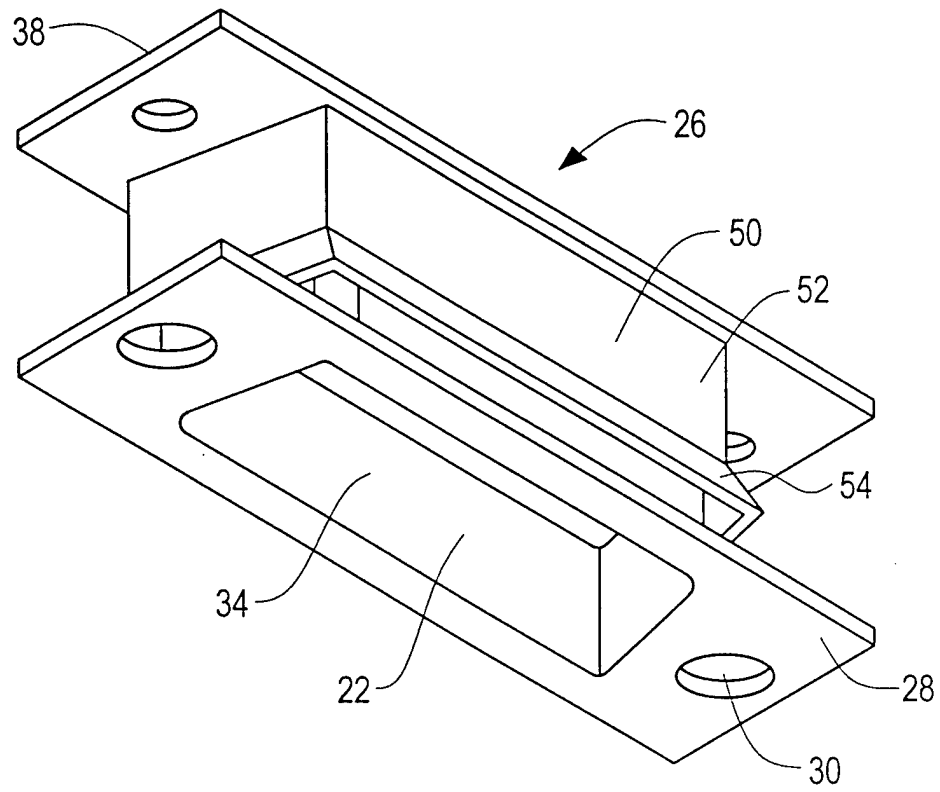


FIG. 3
PRIOR ART

**FIG. 5**

**FIG. 6**