

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
20 December 2001 (20.12.2001)

PCT

(10) International Publication Number
WO 01/96144 A1

(51) International Patent Classification⁷: **B60P 7/08**

(21) International Application Number: PCT/US01/18935

(22) International Filing Date: 12 June 2001 (12.06.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/210,740 12 June 2000 (12.06.2000) US
60/221,349 26 July 2000 (26.07.2000) US

(71) Applicant: **SOUTHCO, INC.** [US/US]; 210 N. Brinton Lake Road, Concordville, PA 19331 (US).

(72) Inventors: **HYP, Eric, D.**; 817 E. Company Farm Road, Aspers, PA 17304 (US). **ABIGAIL, Kelly**; 320 Bishop Ave., Secane, PA 19018 (US). **SOKURENKO, William**,

E.; 1702 N. Glen Drive, Glen Mills, PA 19342 (US). **DRAYER, Kevin**; 14821 Willy Road, Waterford, PA 16441 (US). **TALUKDAR, Robin**; 101 Sheldon Dr., Newark, DE 19711 (US).

(74) Agents: **OJAN, Ourmazd, S.** et al.; Paul & Paul, 2900 Two Thousand Market Street, Philadelphia, PA 19103 (US).

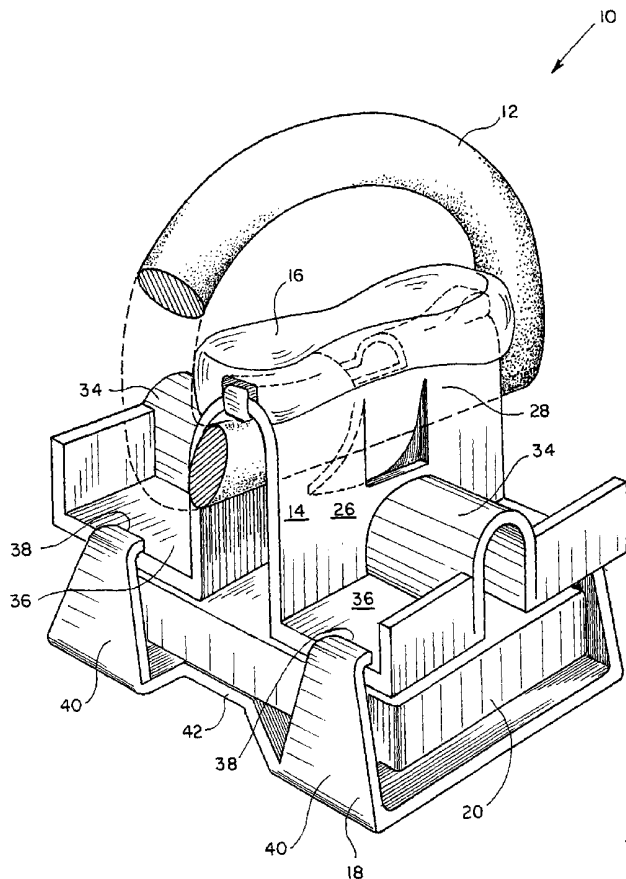
(81) Designated State (*national*): DE.

(84) Designated States (*regional*): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR).

Published:
— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: TIE-DOWN HOOP



(57) Abstract: The invention is a tie-down hoop (10) for slidably mounting within a guide rail (50). An embodiment of the tie-down hoop (10) includes a hoop (12), a button (16), a bezel (14), an elastomeric spring (20), and a sliding plate (18). Other embodiments of the tie-down hoop may include a hoop (12), a bezel (14), possibly a bushing (62) between the hoop and bezel, a sliding plate (18), and at least one elastomeric spring (20). The bezel (14) is biased towards the top of the guide rail (50) by the spring (20). The top of the guide rail (50) includes a plurality of detents (60) for securing the tie-down hoop (10) in a desired position.



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TIE-DOWN HOOP

BACKGROUND OF THE INVENTION

1. Field of the invention.

The invention is a tie-down hoop slidably mounted within a guide rail. The hoop may
5 be slid to a desired position along the rail, and secured in that position.

2. Description of the related art.

Tie-down hoops and pulls are commonly used to prevent loads from shifting within a
vehicle. Examples of presently available pulls include those illustrated in the Southco
Handbook 2000, pp. 304-305. None of the illustrated tie-down hoops is slidably mounted for
10 use at different locations within a vehicle storage area.

None of the above-referenced publications, taken singly or in combination, is seen to
describe the present invention as claimed.

SUMMARY OF THE INVENTION

15 The invention is a tie-down hoop slidably mounted inside a guide rail or track. An
embodiment of the tie-down hoop may comprise a hoop, a button, a bezel, a sliding plate, and
an elastomeric spring between the bezel and sliding plate.

The hoop is preferably a D-shaped wire form hoop. The bottom portion of the hoop is
secured within the central portion of the bezel, possibly with a tab. The bezel includes a lug
20 on either side, dimensioned and configured to engage a detent in the guide rail. A button may
be secured on top of the bezel's central portion. The hoop may be surrounded by a bushing
within the bezel, for providing friction and detents for securing the hoop in desired
orientations.

The sliding plate is secured to the bottom of the bezel, with an elastomeric spring, such as a foam block or leaf spring, in between. The bezel is thereby biased away from the elastomeric spring.

5 The guide rail includes a bottom, a pair of sides, and a top section adjacent to each side. Each top section extends horizontally across the top adjacent to the side of the rail, leaving an opening between the two top sections dimensioned and configured to permit the D-shaped wire hoop and the portion of the bezel containing the hoop to slide between them. A flange extends downward from each top section. The flange includes a plurality of detents dimensioned and configured to mate with the lugs on the bezel to secure the tie-down hoop in
10 position.

In use, the bezel will be biased upward so that its lugs engage a pair of detents in the guide rail. The tie-down hoop is thereby prevented from sliding within the rail. Downward pressure on the button compresses the elastomeric spring, thereby moving the bezel's lugs out of the detents and permitting the tie-down hoop to slide within the rail. When pressure on the
15 button is released, the bezel's lugs are biased against the guide rail's flanges. When the tie-down hoop reaches the next pair of detents, the elastomeric spring will push the bezel's lugs into the spring.

Some users may find it advantageous to position the tie-down hoops within the same guide rails that secure the seats within the vehicle.

20 It is therefore an object of the present invention to provide a tie-down hoop for use within a vehicle storage compartment.

It is a second object of the invention to provide a tie-down hoop slidably mounted within a guide rail.

It is a third object of the present invention to provide a tie-down hoop engaging a pair
25 of detents within the guide rail to remain in a desired location.

It is a fourth object of the present invention to provide a tie-down hoop that uses the same guide rail as the seat within a vehicle.

These and other objects of the invention will become apparent through the following description and claims.

5

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a first embodiment of a tie-down hoop according to the present invention.

FIG. 2 is an exploded, perspective view of first embodiment of a tie-down hoop
10 according to the present invention.

FIG. 3 is an environmental, partially cutaway perspective view of a first embodiment of a tie-down hoop according to the present invention, showing one hoop within the guide rail in a detent position, and a second hoop sliding between detents.

FIG. 4 is a perspective view of a second embodiment of a tie-down hoop according to
15 the present invention, showing the parts in their fixed positions.

FIG. 5 is a side view of a second embodiment of a tie-down hoop according to the present invention, showing the parts in their fixed positions.

FIG. 6 is an end view of a second embodiment of a tie-down hoop according to the present invention, showing the parts in their fixed positions.

FIG. 7 is a perspective view of a second embodiment of a tie-down hoop according to
20 the present invention, showing the parts in their sliding positions.

FIG. 8 is a side view of a second embodiment of a tie-down hoop according to the present invention, showing the parts in their sliding positions.

FIG. 9 is an end view of a second embodiment of a tie-down hoop according to the
25 present invention, showing the parts in their sliding positions.

FIG. 10 is a perspective view of a third embodiment of a tie-down hoop according to the present invention, showing the parts in their locked positions.

FIG. 11 is a perspective view of a third embodiment of a tie-down hoop according to the present invention, showing the parts in their sliding positions.

5 **FIG. 12** is a perspective view of a bezel for a second embodiment of a tie-down hoop according to the present invention.

FIG. 13 is a bottom view of a bezel for a second embodiment of a tie-down hoop according to the present invention.

10 **FIG. 14** is an end view of a bezel for a second embodiment of a tie-down hoop according to the present invention.

FIG. 15 is a perspective view of a bushing for a second embodiment of a tie-down hoop according to the present invention.

FIG. 16 is a perspective view of a sliding plate for a second embodiment of a tie-down hoop according to the present invention.

15 **FIG. 17** is a perspective view of a bezel for a third embodiment of a tie-down hoop according to the present invention.

FIG. 18 is a side view of a bezel for a third embodiment of a tie-down hoop according to the present invention.

20 **FIG. 19** is a perspective view of a sliding plate for a third embodiment of a tie-down hoop according to the present invention.

FIG. 20 is a perspective view of a hoop for a tie-down hoop according to the present invention.

FIG. 21 is a perspective view of a leaf spring for a second and third embodiment of a tie-down hoop according to the present invention.

FIG. 22 is an exploded perspective view of a second embodiment of a tie-down hoop according to the present invention.

FIG. 23 is an environmental, partially cutaway perspective view of a second embodiment of a tie-down hoop according to the present invention, showing a hoop within
5 the guide rail sliding between detents.

FIG. 24 is an environmental, partially cutaway perspective view of a second embodiment of a tie-down hoop according to the present invention, showing a hoop within the guide rail in a detent position.

FIGS. 25-32 are views of a fourth embodiment of a tie-down hoop according to the
10 present invention, showing a tie-down hoop in the released or depressed configuration.

FIGS. 33-40 are views of a fourth embodiment of a tie-down hoop according to the present invention, showing a tie-down hoop in the locked configuration.

FIGS. 41-47 are views of the bezel of the fourth embodiment of a tie-down hoop according to the present invention.

FIGS. 48-54 are views of the bushing of the fourth embodiment of a tie-down hoop
15 according to the present invention.

FIG. 55 is an exploded view of the fourth embodiment of a tie-down hoop according to the present invention.

FIG. 56 is a perspective view of the hoop of the fourth embodiment of a tie-down
20 hoop according to the present invention.

FIGS. 57-63 are views of the slide plate of the fourth embodiment of a tie-down hoop according to the present invention.

FIGS. 64-65 are views of the leaf spring of the fourth embodiment of a tie-down hoop according to the present invention.

FIGS. 66-68 are views of the channel or guide rail of the fourth embodiment of a tie-down hoop according to the present invention.

Like reference numbers denote like elements throughout the drawings.

5 **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Referring to **FIGS. 1-2**, a first embodiment of the tie-down hoop **10** includes a hoop **12**, a bezel **14**, a button **16**, a sliding plate **18**, and means for biasing the bezel **14** away from the sliding plate **18**, preferably an elastomeric spring **20**.

The hoop **12** is preferably a D-shaped wire hoop, with the straight portion **22** on the
10 bottom. A preferred means for forming the hoop **12** is to weld the wire at the center **24** of the straight portion **22**.

The bezel **14** includes a central arch **26**, and is dimensioned and configured to receive the hoop's straight portion **22**. The central arch **26** preferably includes a tab **28** defined within one side, and is dimensioned and configured to fold over the hoop's straight portion
15 **22**. The central arch **26** also defines a button opening **30**, and a hook-receiving portion **32** at each end. The bezel **14** includes at least one lug **34**, with a preferred embodiment including a pair of lugs **34** located on opposite sides of central arch **26**. The bottom portion of the bezel **36** preferably defines a plurality of hook-receiving openings **38**. A preferred material for the bezel **14** is stamped steel.

20 The button **16** includes a top surface **44**, a location peg **46** dimensioned and configured to fit within the button hole **30** of the bezel **14**, and a hook **46** at each end being dimensioned and configured to mate with the hook receiving portions **32** of the bezel **14**.

The sliding plate **18** includes a plurality of hooks **40**, corresponding to the openings **38** in the bezel **14**, and dimensioned and configured to secure the elastomeric spring **20**
25 between the bezel **14** and sliding plate **18**. The sliding plate **18** also defines an arch **42**

dimensioned and configured to prevent interference between the sliding plate **18** and the heads of any bolts (not shown, and well-known) used to secure the guide rails within which the tie-down hoop **10** slides to the floor of a vehicle.

The elastomeric spring **20** is preferably a foam block. It is dimensioned and
5 configured to bias the bezel **14** away from the sliding plate **18**.

A preferred guide rail **50** for use with all embodiments of the tie-down hoop **10**, **110** is illustrated in **FIG. 3**. The guide rail **50** includes a bottom **52**, a pair of sides **54**, and a top section **56** projecting horizontally from each side **54**. The top sections **56** define a space between them dimensioned and configured to receive the hoop **12** and bezel's central arch **26**.
10 A flange **58** extends downwardly from an edge of each top section **56**. Each flange **58** defines a plurality of detents **60**, dimensioned and configured to engage the bezel's lugs **34** or detent bumps **134**. In the preferred embodiment, the detents **60** on one flange **58** correspond to the detents **60** on the opposing flange **58**.

The operation of the tie-down hoop **10** is also best illustrated in **FIG. 3**. A first tie-
15 down hoop **10**, hereinafter referred to as **10a**, is illustrated secured in place at one of the detents **60**. The elastomeric spring **20** biases the bezel **14** upwardly, so that the bezel's lugs **34** engage the detents **60**, thereby securing the tie-down hoop **10a** in place. Pushing down on the button **16** compresses the elastomeric spring **20**, thereby allowing the bezel's lugs **34** to exit the detents **60**, permitting the tie-down hoop **10a** to slide within the rail **50**, illustrated by
20 the hoop **10b** in **FIG. 3**. Pushing the hoop **12** in the desired direction will cause the bezel **14** to move in the desired direction, which in turn pushes on the hooks **40** of the sliding plate **18**, thereby moving the sliding plate **18** as well. Releasing the button **16** permits the elastomeric spring **20** to bias the bezel **14** upwardly, so that when the next pair detents **60** are reached, the bezel's lugs **34** will engage the detents **60**, thereby securing the tie-down hoop **10b** in place.
25 The hoop **12** may be rotated upwardly for use (see the hoop **12** within tie-down hoop **10b**), or

downwardly so that it remains out of the way when not in use (see the hoop 12 within tie-down hoop 10a).

Second and third embodiments of the invention are illustrated in **FIGS. 4-24**. The second and third embodiments differ primarily in the presence or absence of a bushing 62 between the hoop 12 and bezel 14, and will therefore be described together. Referring to **FIGS. 4-11** and the exploded view of **FIG. 22**, the second and third embodiments of the tie-down hoop 10 include a hoop 12, a bezel 14, possibly a bushing 62 between the hoop 12 and bezel 14, a sliding plate 18, and means for biasing the bezel 14 away from the sliding plate 18, preferably a pair of leaf springs 64.

As illustrated in **FIG. 20**, the hoop 12 is preferably a D-shaped wire hoop, with the straight portion 22 on the bottom, having a flat surface 66 facing towards the hoop's top 67. A preferred means for forming the hoop 12 is to weld the wire at the center 24 of the straight portion 22.

Referring to **FIGS. 12-14** and **17-18**, the bezel 14 includes a central arch 26, and is dimensioned and configured to receive the hoop's straight portion 22, possibly with the hoop's straight portion 22 surrounded by the bezel 14. The central arch 26 preferably includes a tab 28 defined within each side, and is dimensioned and configured to fold over the bushing 62 (if the bushing 62 is present) and the hoop's straight portion 22. The tabs 28 are preferably offset towards opposing ends of the central arch 26, thereby preventing the hoop 12 from rocking back and forth. The top surface 68 of the central arch 26 may be flat, and preferably includes indicia 70 showing the operation of the hoop. Alternately, the central arch 26 may include a pair of bulges 78, which define a channel 80 therebetween having a width less than the width of the hoop 12, to retain the hoop 12. The bezel 14 includes at least one lug 34, with a preferred embodiment including a pair of lugs 34 located on opposite sides

of the central arch 26. The bottom portion 36 of the bezel 14 preferably defines a plurality of hook-receiving openings 38. A preferred material for the bezel 14 is stamped steel or plastic.

The bushing 62 is illustrated in FIG. 15. The bushing 62 is dimensioned and configured to fit nonrotatably within the central arch 26 of the bezel 14. The rotation of the bushing 62 may be prevented by a flat surface 72 corresponding to the flat top surface 68 of the bezel 14. The bushing 62 defines a longitudinal channel 74 that is dimensioned and configured to receive the hoop 12. A flat top portion 76 is preferably defined within the channel 74, corresponding to the flat surface 66 of the hoop 12. Referring to FIGS. 4-11 and 22, the bushing 62 will fit between the hoop 12 and bezel 14. The bushing 62 will permit rotation of the hoop 12, and the combination of flat surfaces 66, 76 provides a detent to secure the hoop 12 in a vertical position.

Referring to FIGS. 16 and 19, the sliding plate 18 includes a plurality of hooks 40 that correspond to the openings 38 in the bezel 14, and is dimensioned and configured to secure the leaf spring 64 between the bezel 14 and sliding plate 18. The sliding plate 18 also defines an arch 42 that is dimensioned and configured to prevent interference between the sliding plate 18 and the heads of any bolts used to secure the guide rails within which the tie-down hoop 10 slides to the floor of a vehicle (not shown). A guide 82 projects upwardly from the center of arch 42, and is dimensioned and configured to fit within the central arch 26 of the bezel 14, thereby preventing the bezel 14 and sliding plate 18 from rocking with respect to each other (best illustrated in FIGS. 6 and 9). Each side of the sliding plate 18 includes a depression 84 that is dimensioned and configured to retain a leaf spring 64. The sliding plate 18 may also include windows 86 adjacent to hooks 40 to facilitate molding of the sliding plate 18.

The means for biasing the bezel 14 away from the sliding plate 18 is preferably a pair of leaf springs 64, as illustrated in FIG. 21, positioned on opposing sides of the tie-down

hoop 10. Each leaf spring 64 is dimensioned and configured to bias the bezel 14 away from the sliding plate 18.

The operation of the tie-down hoop 10 is also best illustrated in FIGS. 4-11 and 23-24. A tie-down hoop 10 is illustrated in FIG. 24 secured in place at one of the detents 60.

5 The leaf springs 64 biases the bezel 14 upward, so that the bezel's lugs 34 engage the detents 60, thereby securing the tie-down hoop 10 in place. Pushing down on the bezel 14 compresses the leaf springs 64, thereby allowing the bezel's lugs 34 to exit the detents 60, permitting the tie-down hoop 10 to slide within the rail 50, illustrated in FIG. 23. Pushing the hoop 12 in the desired direction will cause the bezel 14 to move in the desired direction, 10 which in turn pushes on the hooks 40 of the sliding plate 18, thereby moving the sliding plate 18 as well. Releasing the bezel 14 permits the leaf springs 64 to bias the bezel 14 upward, so that when the next pair detents 60 are reached, the bezel's lugs 34 will engage the detents 60, thereby securing the tie-down hoop 10 in place. The hoop 12 may be rotated upward for use, or downward so that it remains out of the way when not in use.

15 A fourth embodiment of the invention is illustrated in FIGS. 25-68. The fourth embodiment of the tie-down hoop 110 include a hoop 12, a bezel 114, a bushing 162 between the hoop 12 and bezel 114, a sliding plate 118, and means for biasing the bezel 114 away from the sliding plate 118, preferably a leaf spring 164.

As illustrated in FIG. 56, the hoop 12 is preferably a D-shaped wire hoop, with the 20 straight portion 22 on the bottom. A preferred means for forming the hoop 12 is to weld the wire at the center 24 of the straight portion 22.

Referring to FIGS. 25-68, the bezel 114 has a longer length than the bezel 114 of the first, second, or third embodiment. The bezel 114 includes a central arch 26, and is dimensioned and configured to receive the hoop's straight portion 22, possibly with the 25 hoop's straight portion 22 surrounded by the bezel 114. The central arch 26 preferably

includes a pair of tabs **28** defined within each side, and is dimensioned and configured to fold over the bushing **162** and the hoop's straight portion **22**. The tabs **28** defined within each side are preferably offset towards opposing ends of the central arch **26**, thereby acting as additional retaining means in preventing the hoop **12** from rocking back and forth. The top surface **68** of the central arch **26** is preferably of round shape to accommodate the bushing **162**. The bezel **114** includes at least one detent bump **134**, with a preferred embodiment including a pair of detent bumps **134** located on opposite sides of the central arch **26**. Preferably, the detent bumps **134** has a generally triangular shape. The bottom portion **36** of the bezel **114** preferably defines a plurality of hook-receiving platforms **138**. A preferred material for the bezel **114** is stamped steel or plastic.

The bushing **162** is illustrated in **FIGS. 48-54**. The bushing **162** has a substantially open top side **164** that is of generally round shape to correspond with the top surface **68** of the central arch **26** of the bezel **114**. The bushing **162** is dimensioned and configured to fit generally nonrotatably within the central arch **26** of the bezel **114**. The bushing **162** defines a longitudinal channel **174** that is dimensioned and configured to receive the hoop **12**. Referring to **FIGS. 27** and **28**, the bushing **162** will fit between the hoop **12** and bezel **114**. The bushing **162** will permit rotation of the hoop **12**. The rotation of the bushing **162** may be prevented by a flat surface **172** on the bottom side **176** of the bushing **162**. The flat surface **172** provides the spring **64** a smooth surface to slide against. It is preferred that the bushing **162** can be snapped onto the hoop **12** from the bottom of the straight portion **22** of the hoop **12**.

Referring to **FIGS. 25-40, 55** and **57-63**, the sliding plate **118** includes a central platform **120**, a base **122**, and a plurality of hooks **140** that correspond to the platforms **138** in the bezel **114**. The sliding plate **118** is dimensioned and configured to secure the leaf spring **64** between the bezel **114** and sliding plate **118**. The sliding plate **118** also defines an arch

142 that is dimensioned and configured to prevent interference between the sliding plate 118 and the heads of any bolts used to secure the guide rails within which the tie-down hoop 110 slides to the floor of a vehicle (not shown). The central platform 120 has a top wall 124, a pair of side walls 126, 127, and a pair of end walls 128, 129. The central platform 120 projects upwardly from the center of the arch 142, and is dimensioned and configured to fit within the central arch 26 of the bezel 114, thereby preventing the bezel 114 and sliding plate 118 from rocking with respect to each other. The top wall 124 has a slot 130 to receive a portion of the leaf spring 164. The slot 130 is dimensioned and configured to help retain the leaf spring 164 in a stable position when the tie-down hoop 110 is assembled. The base 122 of the sliding plate 118 are provided with rails 132 to reduce frictional drag between the sliding plate 118 and the floor of the channel (not shown).

The means for biasing the bezel 114 away from the sliding plate 118 is preferably a leaf spring 164, as illustrated in FIGS. 64 and 65, having a retention tab 166 at one of the ends 170, 171. The leaf spring 164 is dimensioned and configured to bias the bezel 114 away from the sliding plate 118. The retention tab 166 is to be inserted through the slot 130 in the sliding plate 118. If the retention tab 166 proves to be insufficient to hold the leaf spring 164 in place during operation, the retention tab 166 may be bent over as a secondary operation. This additional operation may ensure that the leaf spring 164 remains in place, between the bezel 114 and sliding plate 118.

The operation of the tie-down hoop 110 is also best illustrated in FIGS. 25-40. A tie-down hoop 110 is illustrated in FIG. 40 secured in place at one of the detents 60. The leaf spring 64 biases the bezel 114 upward, so that the detent bumps 134 engage the detents 60, thereby securing the tie-down hoop 110 in place. Pushing down on the bezel 114 compresses the leaf spring 64, thereby allowing the detent bumps 134 to exit the detents 60, permitting the tie-down hoop 110 to slide within the rail 50, illustrated in FIG. 32. Pushing the hoop 12

in the desired direction will cause the bezel **114** to move in the desired direction, which in turn pushes on the hooks **140** of the sliding plate **118**, thereby moving the sliding plate **118** as well. Releasing the bezel **114** permits the leaf spring **64** to bias the bezel **114** upward, so that when the next pair detents **60** are reached, the detent bumps **134** will engage the detents **60**,
5 thereby securing the tie-down hoop **110** in place. The hoop **12** may be rotated upward for use, or downward so that it remains out of the way when not in use.

It is to be understood that the invention is not limited to the preferred embodiments described herein, but encompasses all embodiments within the scope of the following claims.

10

15

CLAIMS

What is claimed is:

- 5 1. A tie-down hoop having a locked configuration and a sliding configuration,
said tie-down hoop comprising:
 a hoop;
 a receiver; and
 a sliding mechanism being engageable with said hoop and said receiver, said sliding
10 mechanism being capable of assuming a locked configuration and a sliding configuration,
said sliding mechanism being movable relative to said receiver when said sliding mechanism
is in said sliding configuration, and being retained in a fixed position relative to said receiver
when said sliding mechanism is in said locked configuration and engaged to said receiver.
- 15 2. The tie-down hoop according to claim 1, wherein said receiver is an elongated
guide rail.
3. The tie-down hoop according to claim 2, wherein said guide rail includes a
bottom, a pair of sides, and a top section projecting horizontally from each side of said pair of
20 sides wherein a space is defined therebetween, said space is dimensioned and configured to
receive said hoop and a portion of said sliding mechanism, a flange extends downwardly
from an edge of each top section, said flange defines a plurality of detents dimensioned and
configured to engage at least one detent structure of said sliding mechanism.

4. The tie-down hoop according to claim 1, wherein said receiver is a mounting bracket.

5. The tie-down hoop according to claim 1, wherein said hoop is a D-shaped
5 hoop.

6. The tie-down hoop according to claim 5, wherein said D-shaped hoop has a generally curved longitudinal portion, and a generally straight longitudinal portion being receivable by said sliding mechanism.

10

7. The tie-down hoop according to claim 5, wherein said generally straight longitudinal portion has a generally flat surface facing toward said generally curved longitudinal portion.

15 8. The tie-down hoop according to claim 1, wherein said sliding mechanism includes:

a bezel being dimensioned and configured to receive at least a portion of said hoop;

a sliding plate being engageable with said bezel; and

20 means for biasing said bezel away from said sliding plate, said means for biasing being positioned between said bezel and said sliding plate when said tie-down hoop is assembled.

9. The tie-down hoop according to claim 8, wherein said bezel includes an arch
25 being dimensioned and configured to receive said at least a portion of said hoop.

10. The tie-down hoop according to claim 9, wherein said arch is positioned about a central position of said bezel.

11. The tie-down hoop according to claim 9, wherein said arch includes at least one tab defined within one side.

12. The tie-down hoop according to claim 9, wherein said sliding mechanism further includes a button being engageable with said arch of said bezel, said button being capable of causing said means for biasing to be compressed when said button is pushed toward said means for biasing and to be uncompressed when said button is released.

13. The tie-down hoop according to claim 12, wherein said button includes a top surface, a location peg, and a hook positioned about at least one end of said button, said arch defines a button aperture and a hook-receiving portion, said button aperture is dimensioned and configured to receive said location peg, said hook-receiving portion is dimensioned and configured to engage with said hook of said button.

14. The tie-down hoop according to claim 9, wherein said sliding mechanism further includes a bushing being dimensioned and configured to fit nonrotatably within said arch of said bezel, said bushing defines a longitudinal channel being dimensioned and configured to receive said at least a portion of said hoop.

15. The tie-down hoop according to claim 14, wherein a top surface of said bushing has a generally similar shape as a top surface of said arch of said bezel.

25

16. The tie-down hoop according to claim 15, wherein said bushing permits rotation of said hoop and said shape is capable of providing a detent to secure said hoop in a predetermined position.

5 17. The tie-down hoop according to claim 9, wherein said arch includes a pair of bulges that define a channel therebetween having a width less than a width of said hoop.

18. The tie-down hoop according to claim 8, wherein said bezel includes at least one detent structure being engageable with said receiver for retaining said sliding mechanism
10 in said fixed position relative to said receiver when said sliding mechanism is in said locked configuration and engaged to said receiver.

19. The tie-down hoop according to claim 8, wherein a bottom portion of said bezel includes at least one hook-receiving aperture, said sliding plate includes at least one
15 hook adapted for engaging with said at least one hook-receiving aperture of said bottom portion of said bezel.

20. The tie-down hoop according to claim 8, wherein said sliding plate is dimensioned and configured to retain said means for biasing between said bezel and said
20 sliding plate, said sliding plate defines an arch at a bottom surface of said sliding plate wherein said arch is dimensioned and configured to prevent interference between said sliding plate and means for securing said receiver to a panel.

21. The tie-down hoop according to claim 9, wherein said sliding plate defines an
25 arch at a bottom surface of said sliding plate wherein said arch at said bottom surface is

dimensioned and configured to prevent interference between said sliding plate and means for securing said receiver to a panel, said sliding plate further defines a guide projecting upwardly from a central portion of said arch at said bottom surface, said guide is dimensioned and configured to fit within said arch of said bezel.

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22. The tie-down hoop according to claim 21, wherein said means for biasing is a leaf spring having a retention tab at an end of said leaf spring, said guide has at least a top wall and a pair of side walls, said top wall of said guide has a slot to receive and retain said retention tab.

10

23. The tie-down hoop according to claim 8, wherein said sliding plate includes a base with rails.

24. The tie-down hoop according to claim 8, wherein said means for biasing is a pair of leaf springs, each side of said sliding plate includes a depression that is dimensioned and configured to retain a corresponding leaf spring.

15

25. The tie-down hoop according to claim 8, wherein means for biasing is an elastomeric spring.

20

26. The tie-down hoop according to claim 25, wherein said elastomeric spring is a foam block.

27. The tie-down hoop according to claim 25, wherein said elastomeric spring is at least one leaf spring.

25

28. A tie-down hoop having a locked configuration and a sliding configuration, said tie-down hoop being mountable within a receiver, said tie-down hoop comprising:

a hoop; and

a sliding mechanism being engageable with said hoop and the receiver, said sliding
5 mechanism being capable of assuming a locked configuration and a sliding configuration, said sliding mechanism being movable relative to the receiver when said sliding mechanism is in said sliding configuration and being retained in a fixed position relative to the receiver when said sliding mechanism is in said locked configuration and engaged to the receiver.

10 29. The tie-down hoop according to claim 28, wherein said hoop is a D-shaped hoop.

30. The tie-down hoop according to claim 29, wherein said D-shaped hoop has a generally curved longitudinal portion, and a generally straight longitudinal portion being
15 receivable by said sliding mechanism.

31. The tie-down hoop according to claim 30, wherein said generally straight longitudinal portion has a generally flat surface facing toward said generally curved longitudinal portion.

20 32. The tie-down hoop according to claim 28, wherein said sliding mechanism includes:

a bezel being dimensioned and configured to receive at least a portion of said hoop;

25 a sliding plate being engageable with said bezel; and

means for biasing said bezel away from said sliding plate, said means for biasing being positioned between said bezel and said sliding plate when said tie-down hoop is assembled.

5 33. The tie-down hoop according to claim 32, wherein said bezel includes an arch being dimensioned and configured to receive said at least a portion of said hoop.

 34. The tie-down hoop according to claim 33, wherein said arch is positioned about a central position of said bezel.

10

 35. The tie-down hoop according to claim 33, wherein said arch includes at least one tab defined within one side.

 36. The tie-down hoop according to claim 33, wherein said sliding mechanism
15 further includes a button being engageable with said arch of said bezel, said button being capable of causing said means for biasing to be compressed when said button is pushed toward said means for biasing and to be uncompressed when said button is released.

 37. The tie-down hoop according to claim 36, wherein said button includes a top
20 surface, a location peg, and a hook positioned about at least one end of said button, said arch defines a button aperture and a hook-receiving portion, said button aperture is dimensioned and configured to receive said location peg, said hook-receiving portion is dimensioned and configured to engage with said hook of said button.

38. The tie-down hoop according to claim 33, wherein said sliding mechanism further includes a bushing being dimensioned and configured to fit nonrotatably within said arch of said bezel, said bushing defines a longitudinal channel being dimensioned and configured to receive said at least a portion of said hoop.

5

39. The tie-down hoop according to claim 38, wherein a top surface of said bushing has a generally similar shape as a top surface of said arch of said bezel.

40. The tie-down hoop according to claim 39, wherein said bushing permits
10 rotation of said hoop and said shape is capable of providing a detent to secure said hoop in a predetermined position.

41. The tie-down hoop according to claim 33, wherein said arch includes a pair of bulges that define a channel therebetween having a width less than a width of said hoop.

15

42. The tie-down hoop according to claim 32, wherein said bezel includes at least one detent structure being engageable with the receiver for retaining said sliding mechanism in said fixed position relative to the receiver when said sliding mechanism is in said locked configuration and engaged to the receiver.

20

43. The tie-down hoop according to claim 32, wherein a bottom portion of said bezel includes at least one hook-receiving aperture, said sliding plate includes at least one hook adapted for engaging with said at least one hook-receiving aperture of said bottom portion of said bezel.

25

44. The tie-down hoop according to claim 32, wherein said sliding plate is dimensioned and configured to retain said means for biasing between said bezel and said sliding plate, said sliding plate defines an arch at a bottom surface of said sliding plate wherein said arch is dimensioned and configured to prevent interference between said sliding
5 plate and means for securing said receiver to a panel.

45. The tie-down hoop according to claim 33, wherein said sliding plate defines an arch at a bottom surface of said sliding plate wherein said arch at said bottom surface is dimensioned and configured to prevent interference between said sliding plate and means for
10 securing the receiver to a panel, said sliding plate further defines a guide projecting upwardly from a central portion of said arch at said bottom surface, said guide is dimensioned and configured to fit within said arch of said bezel.

46. The tie-down hoop according to claim 45, wherein said means for biasing is a
15 leaf spring having a retention tab at an end of said leaf spring, said guide has at least a top wall and a pair of side walls, said top wall of said guide has a slot to receive and retain said retention tab.

47. The tie-down hoop according to claim 32, wherein said sliding plate includes a
20 base with rails.

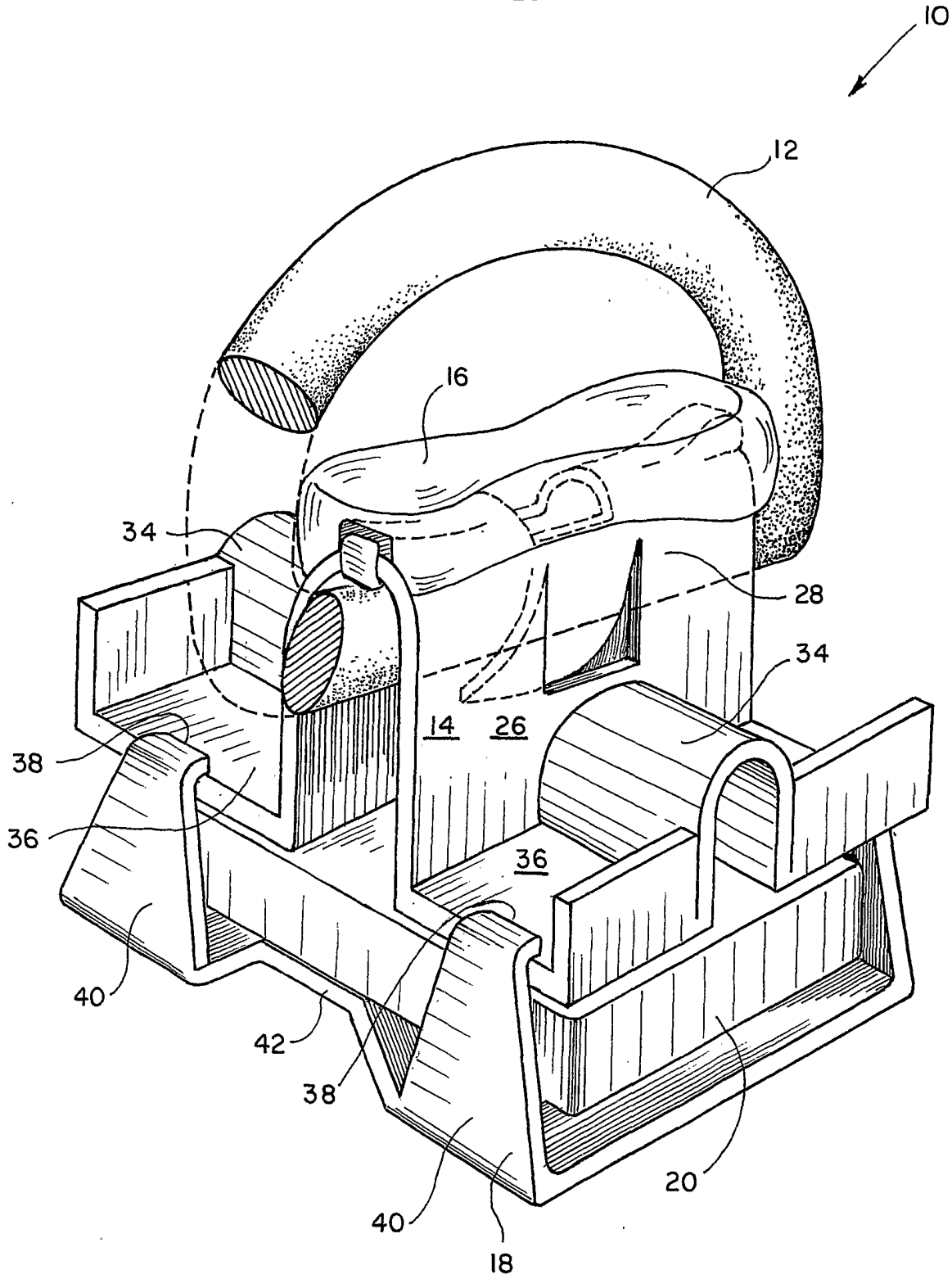
48. The tie-down hoop according to claim 32, wherein said means for biasing is a pair of leaf springs, each side of said sliding plate includes a depression that is dimensioned and configured to retain a corresponding leaf spring.

49. The tie-down hoop according to claim 32, wherein means for biasing is an elastomeric spring.

50. The tie-down hoop according to claim 49, wherein said elastomeric spring is a
5 foam block.

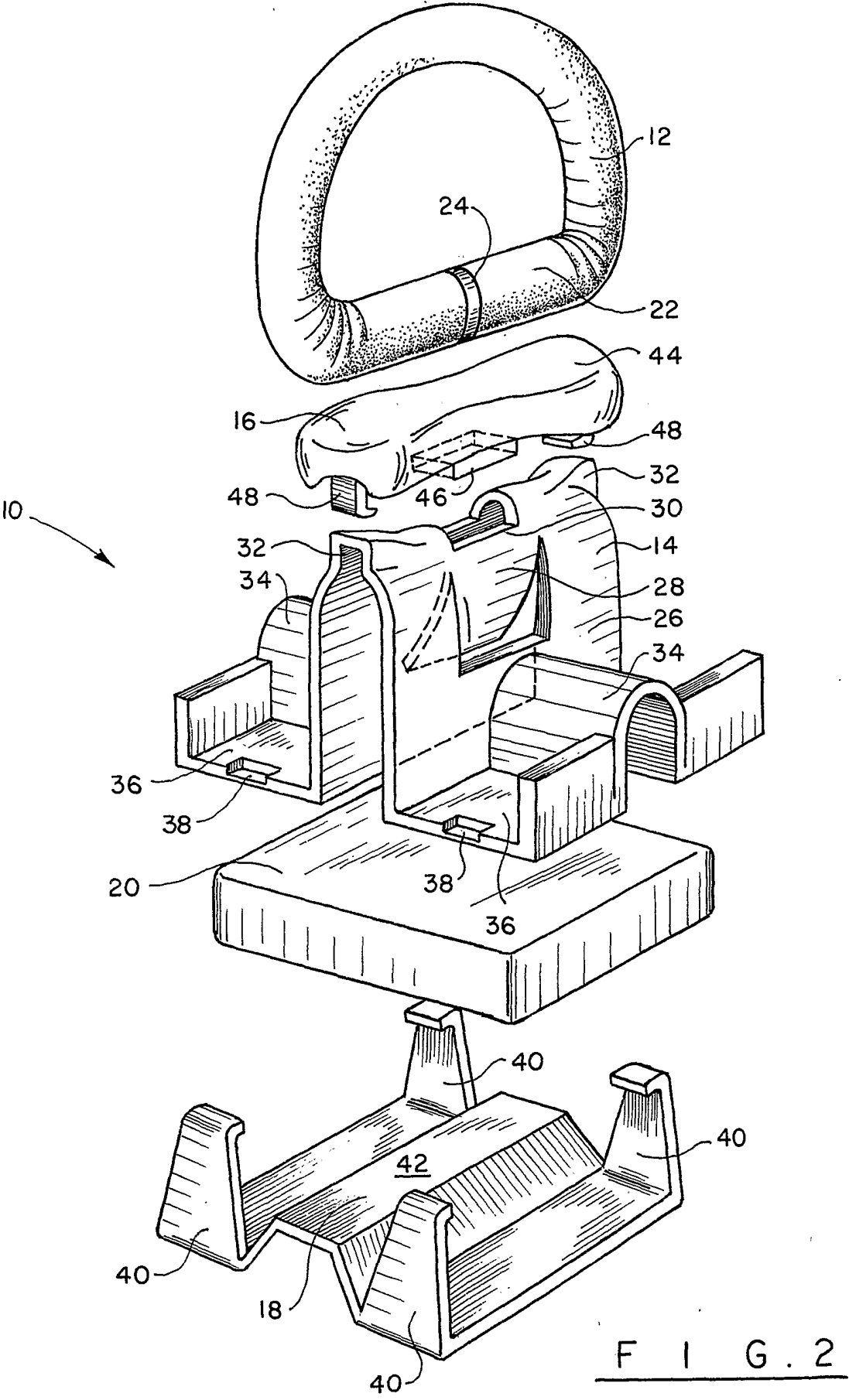
51. The tie-down hoop according to claim 49, wherein said elastomeric spring is at least one leaf spring.

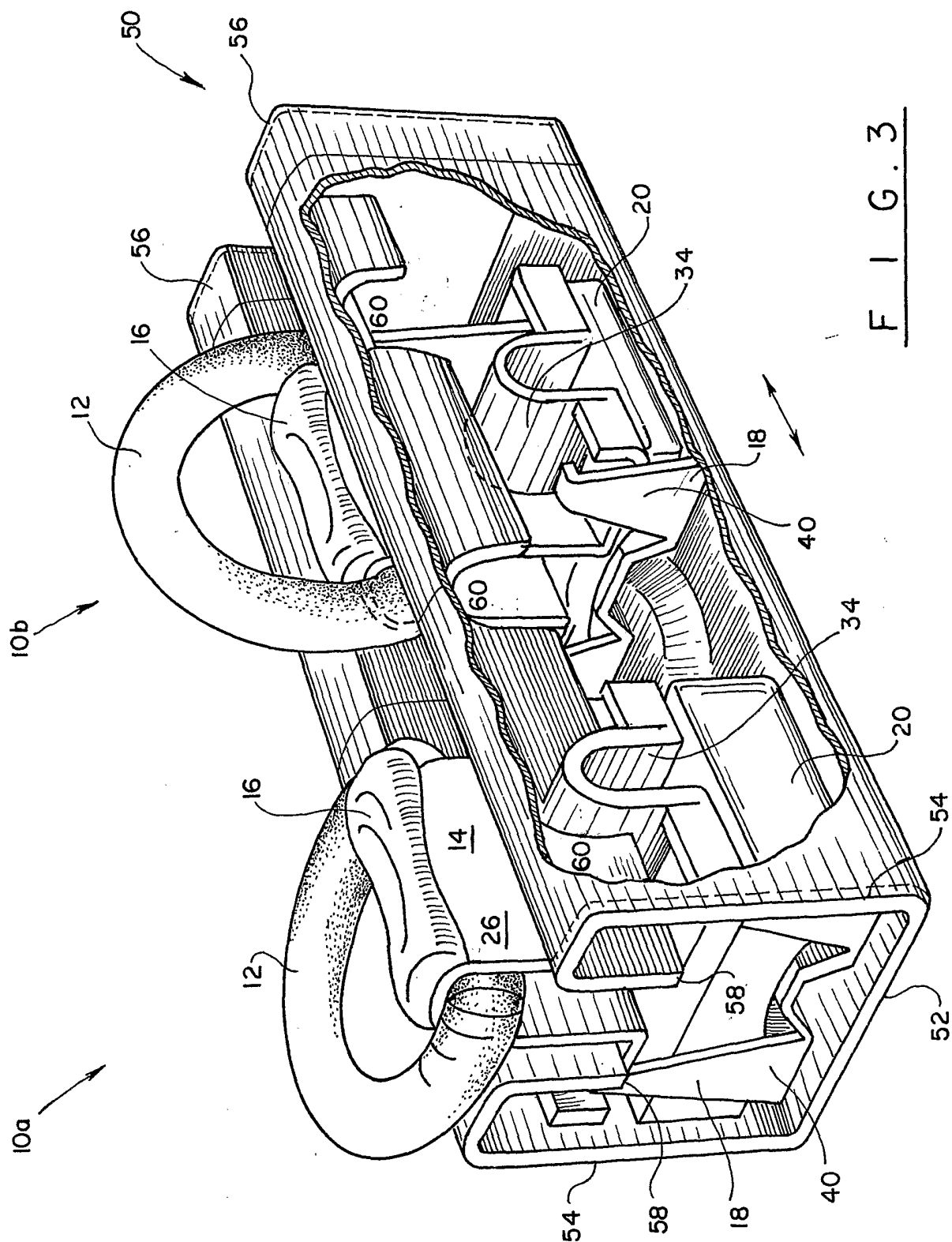
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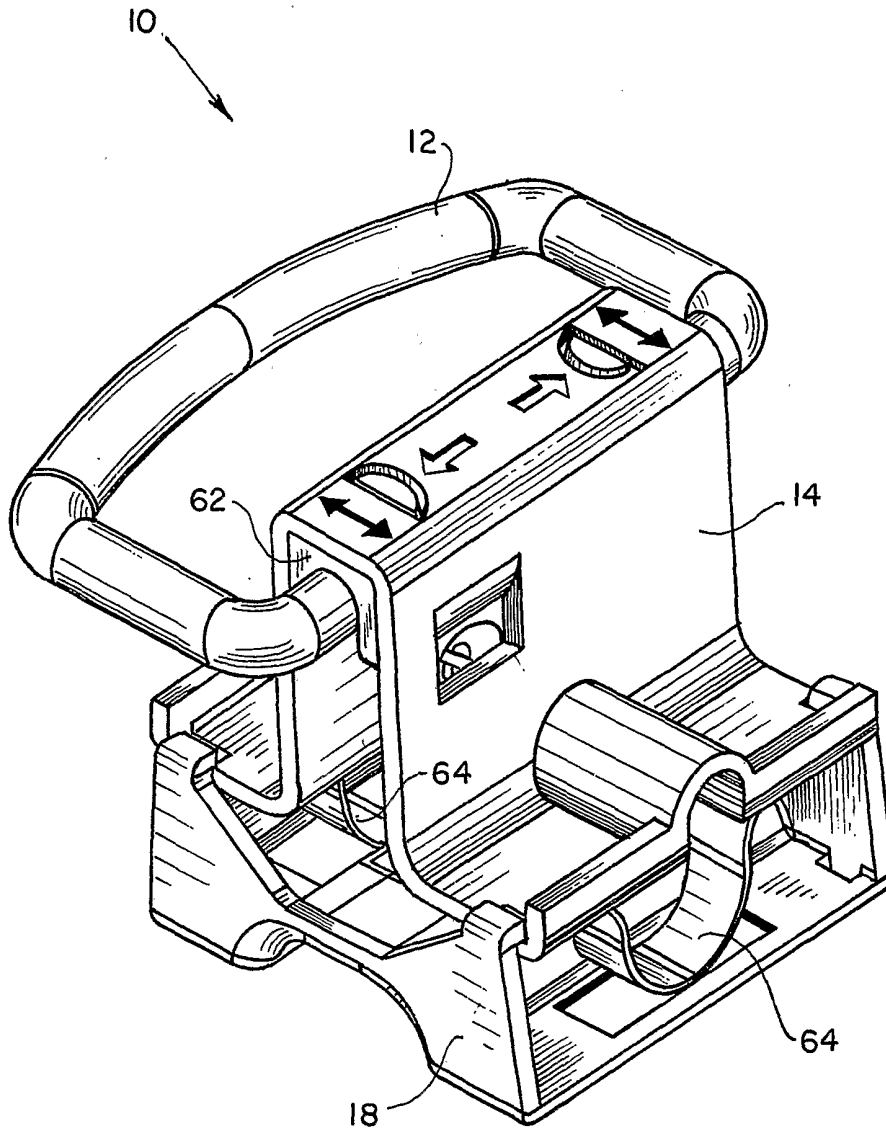
F I G . 1

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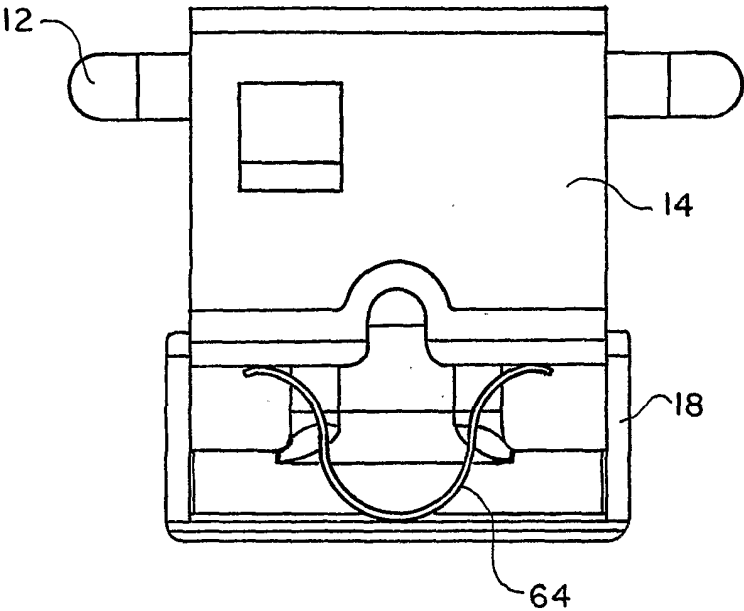


E - G. 3



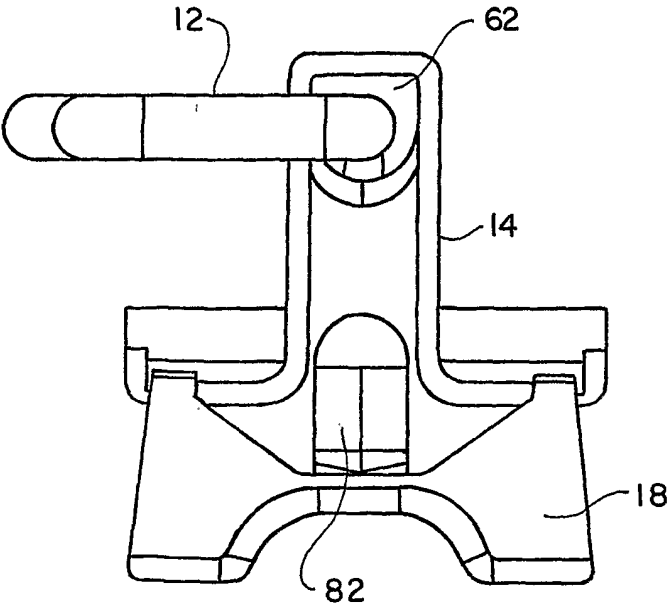
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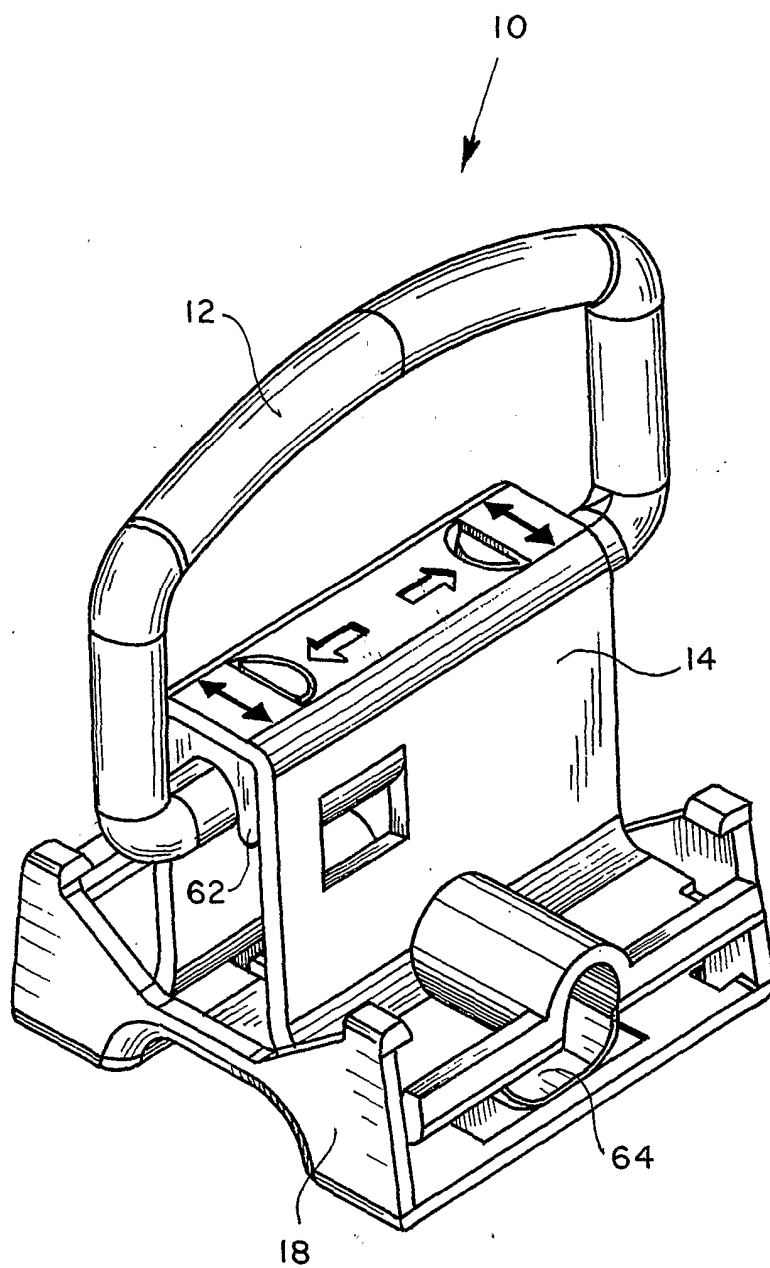
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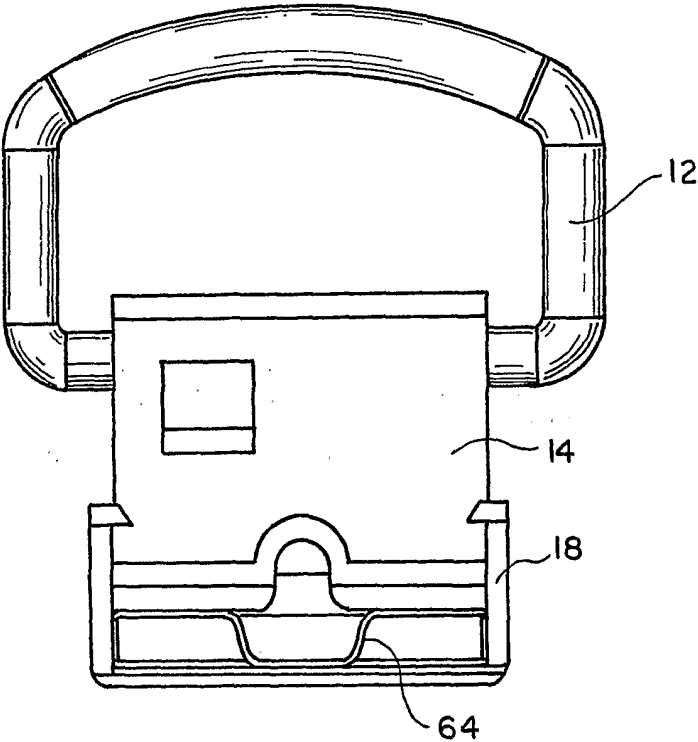
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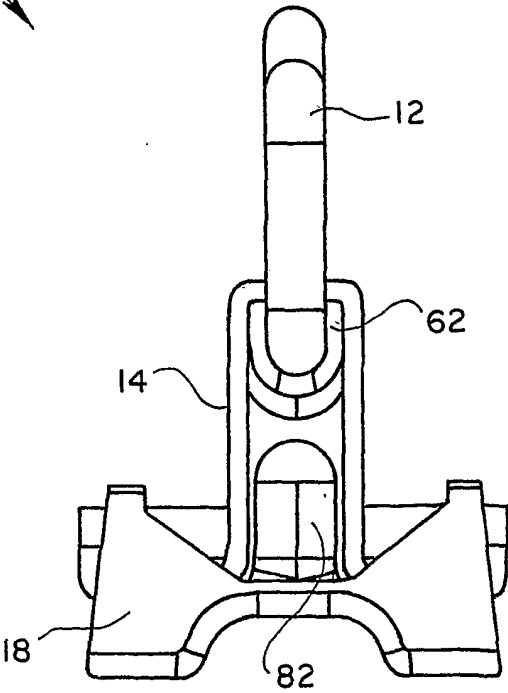
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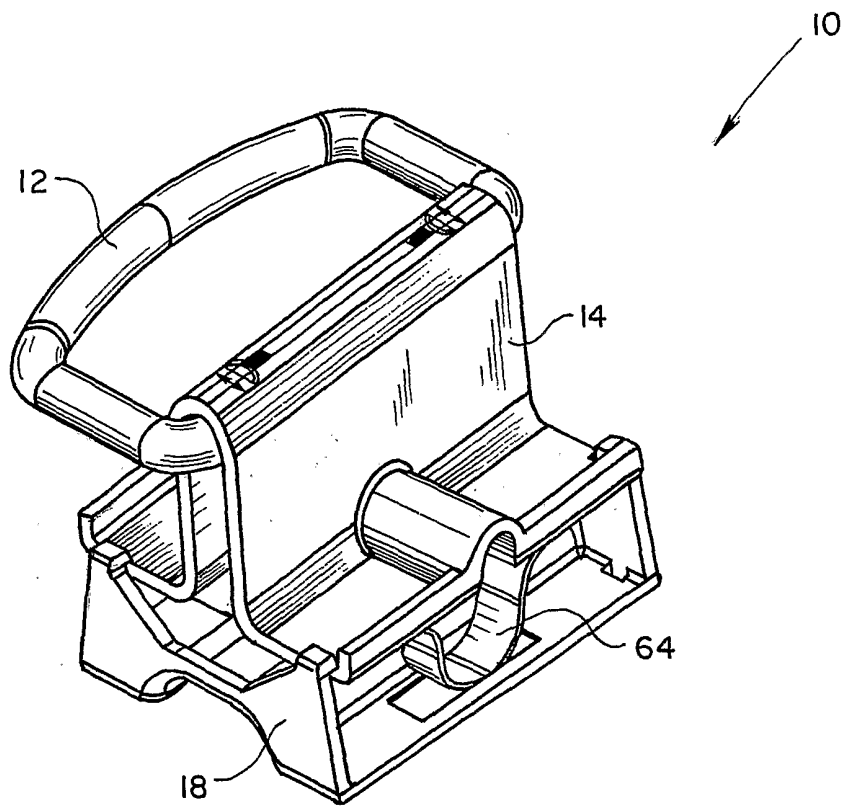
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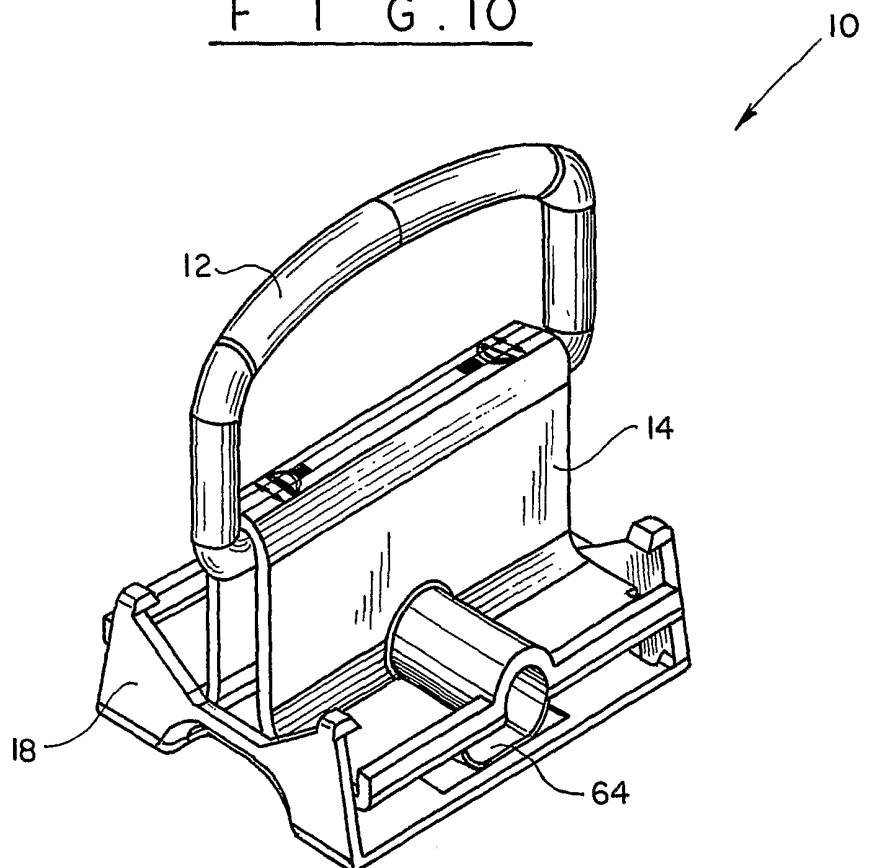


F I G . 9

8 / 23

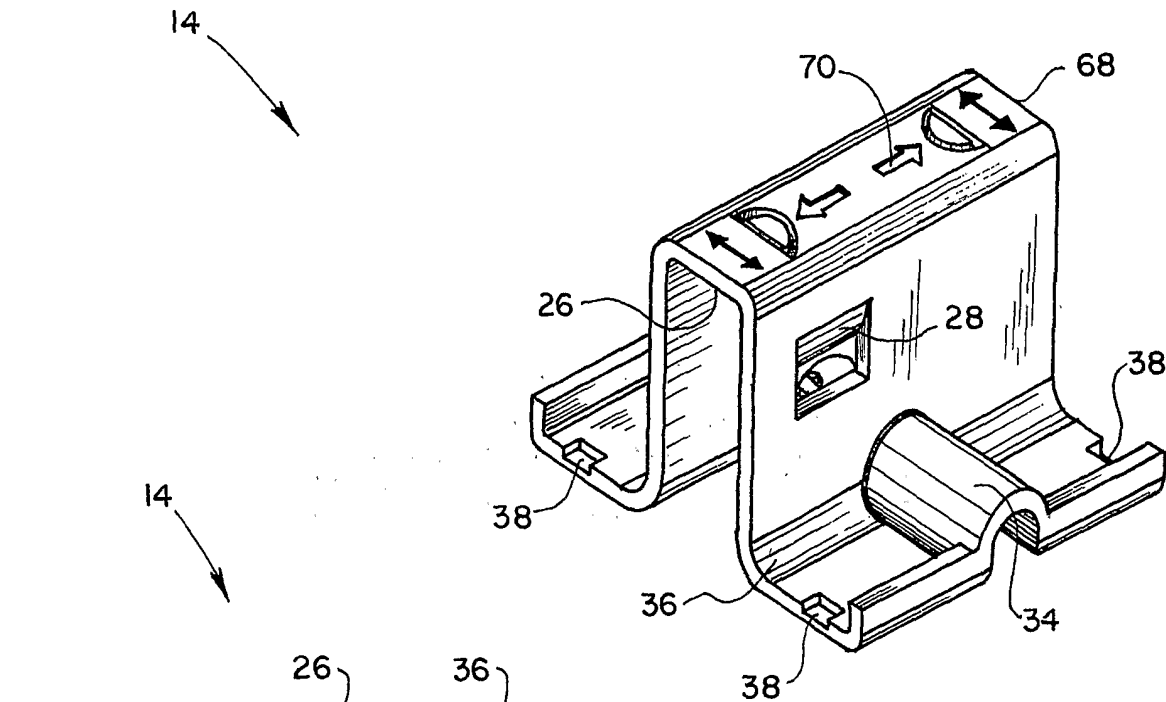


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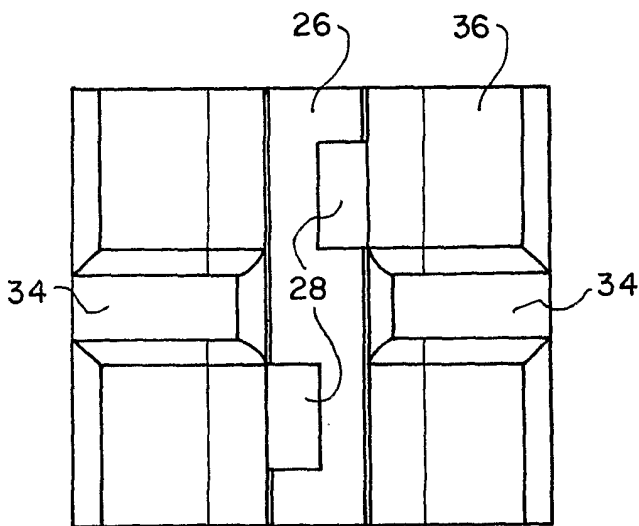


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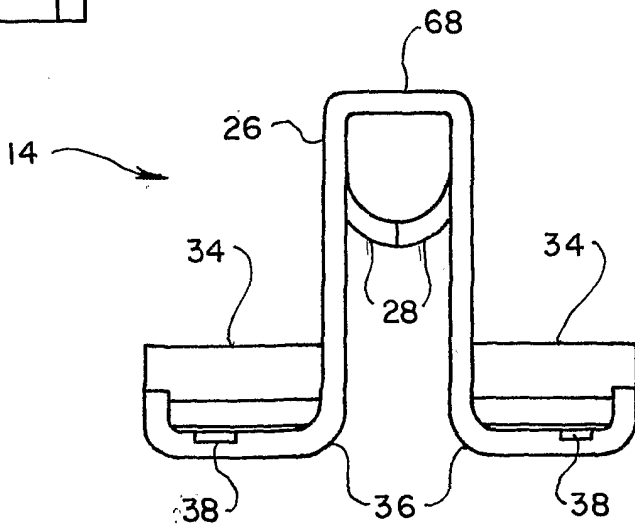
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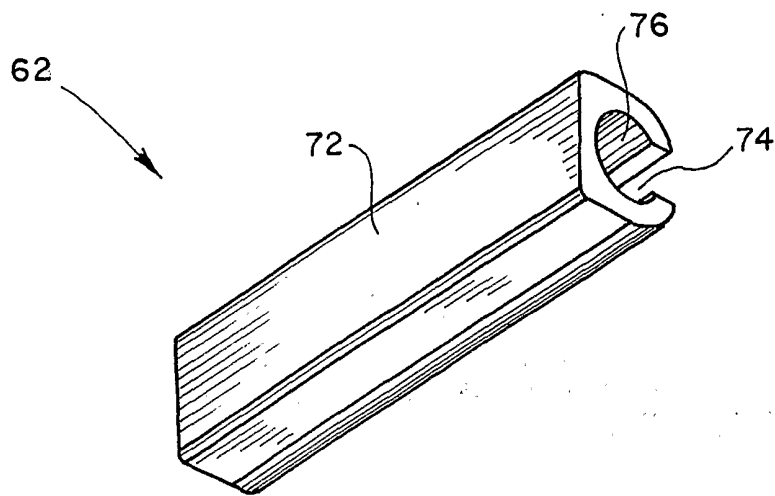


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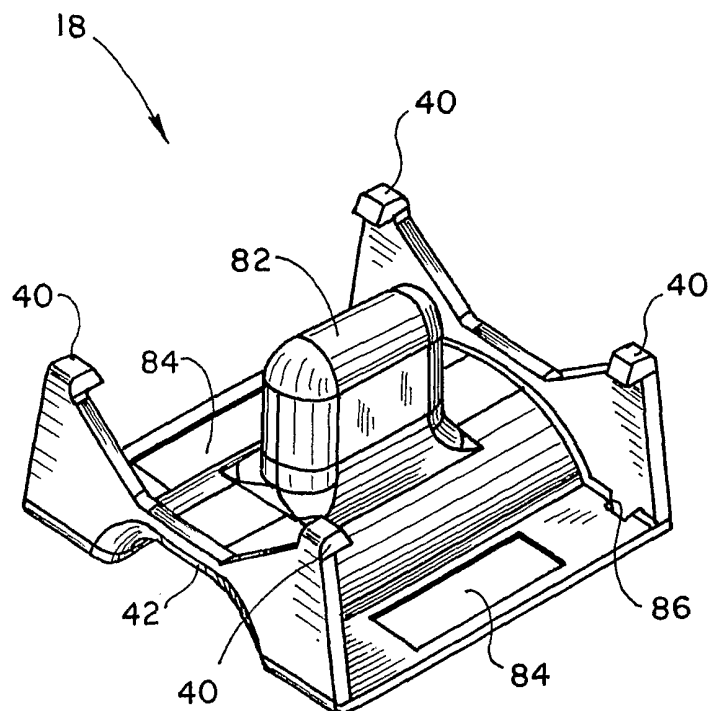


F I G . 14

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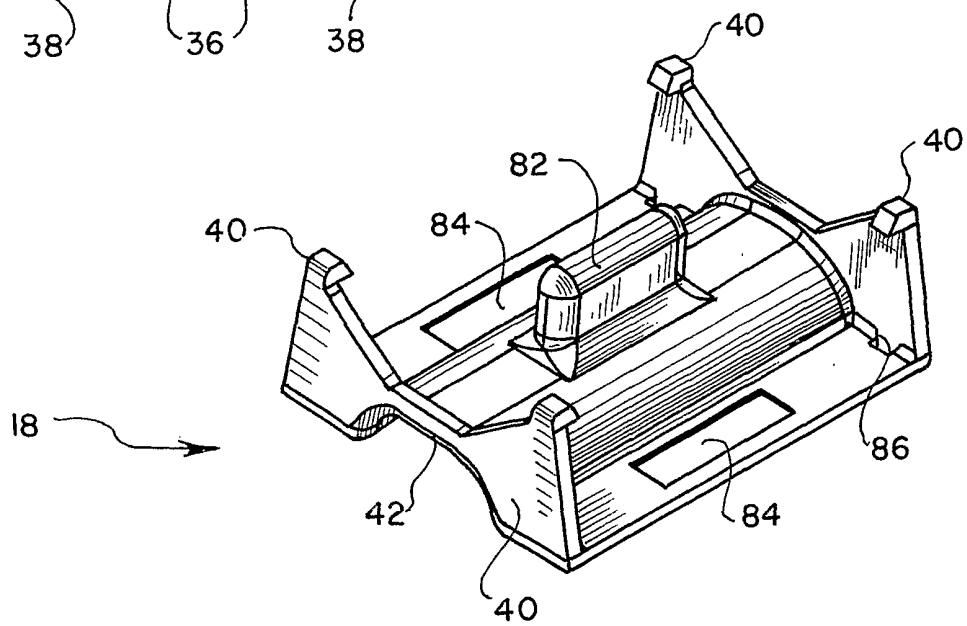
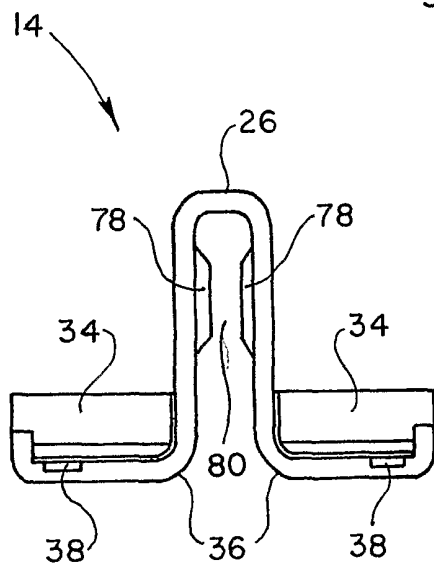
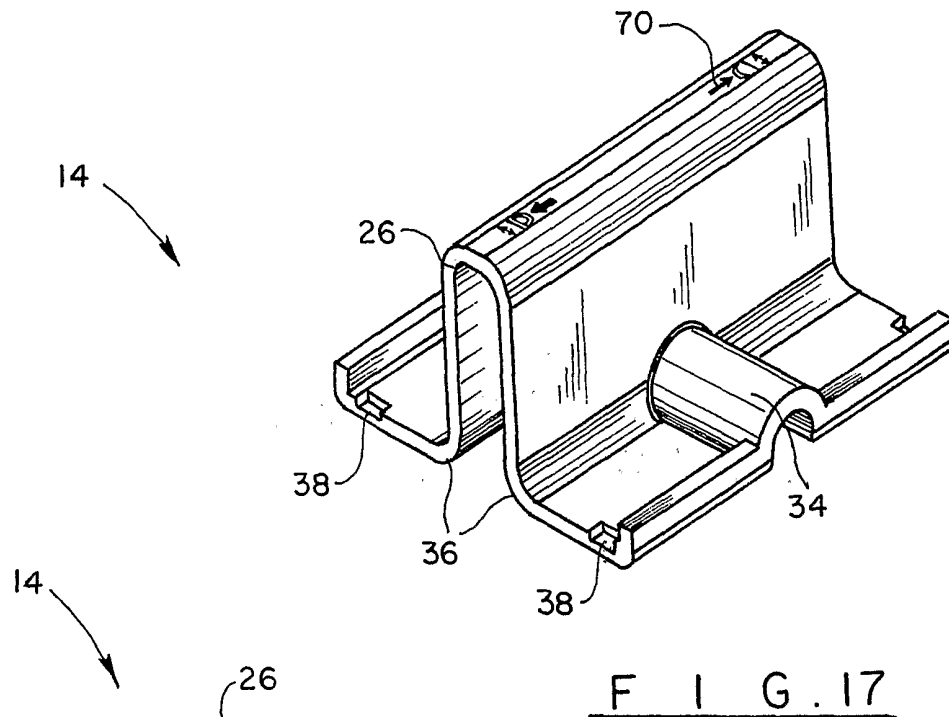


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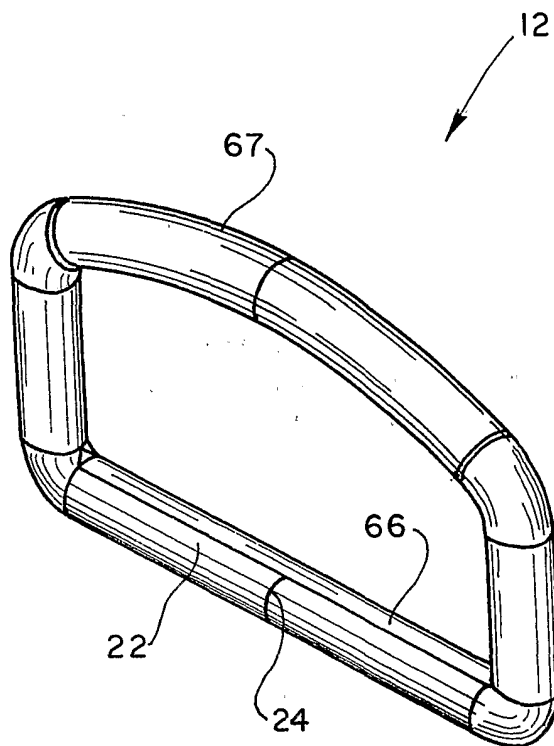


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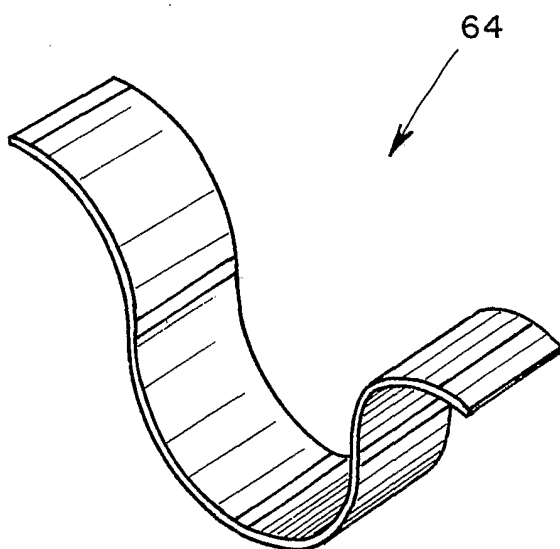
11 / 23



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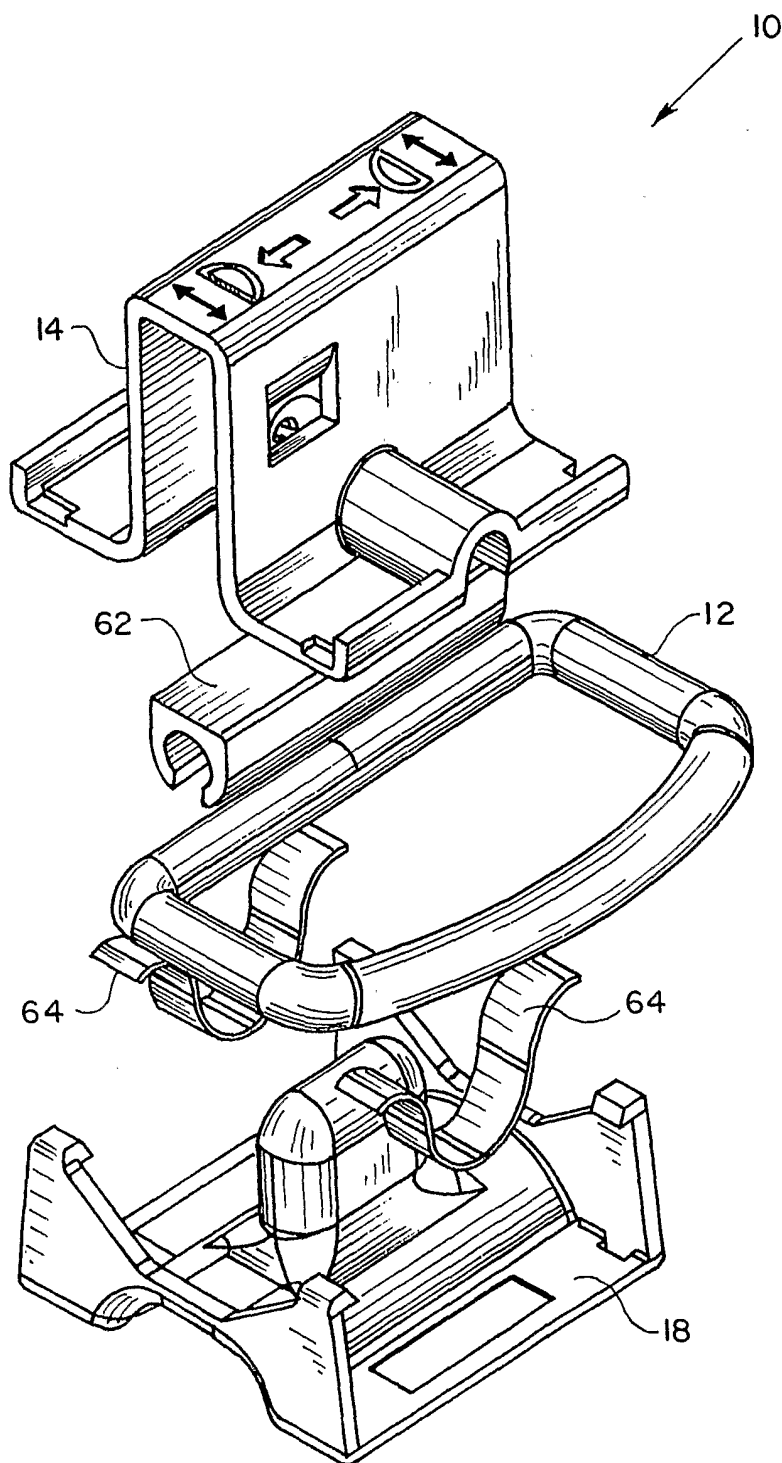


F I G . 20



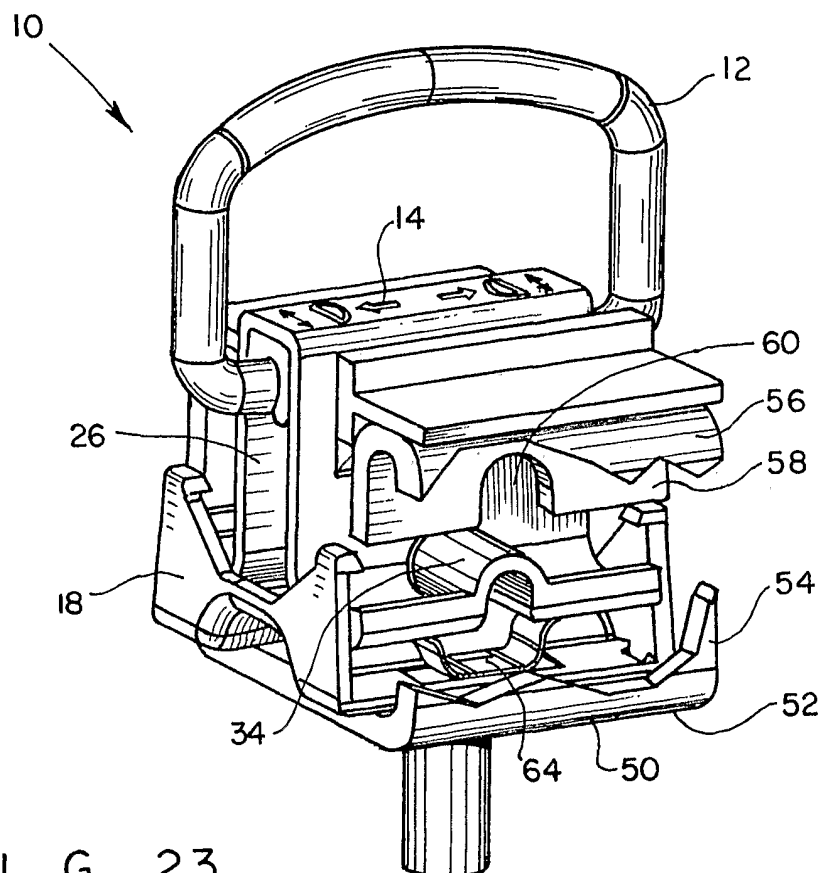
F I G . 21

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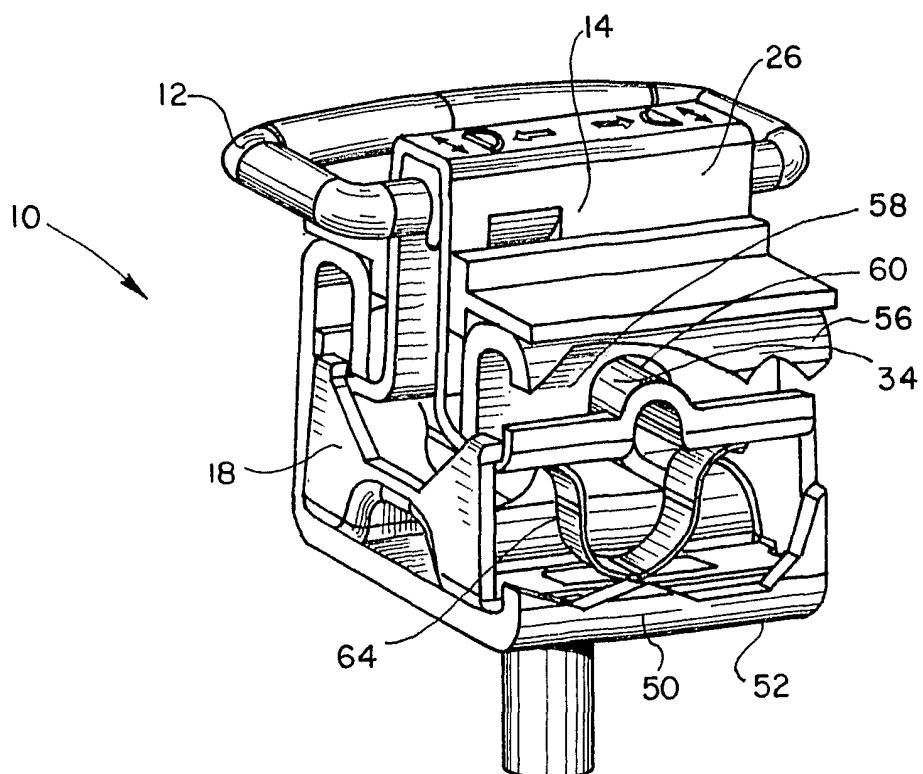


F I G . 22

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F I G . 23



F I G . 24

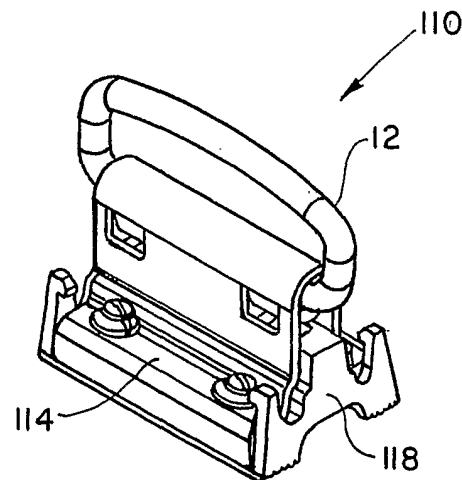


FIG. 25

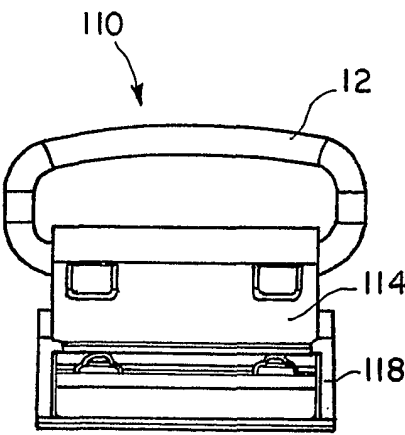


FIG. 29

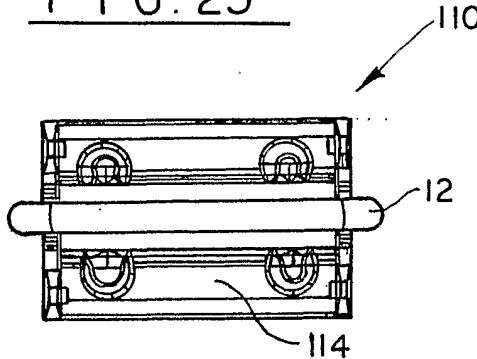


FIG. 26

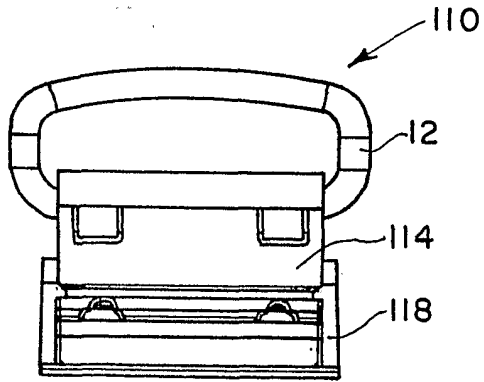


FIG. 30

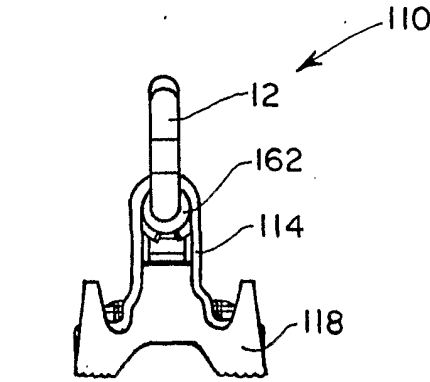


FIG. 27

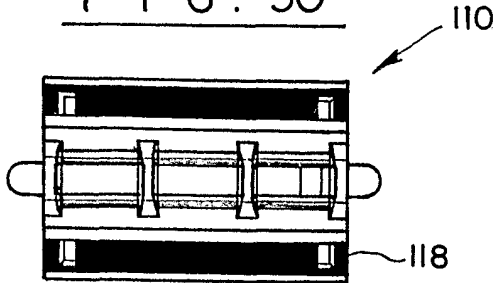


FIG. 31

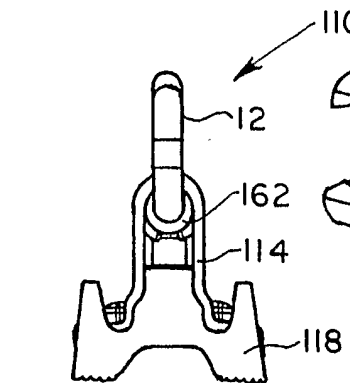


FIG. 28

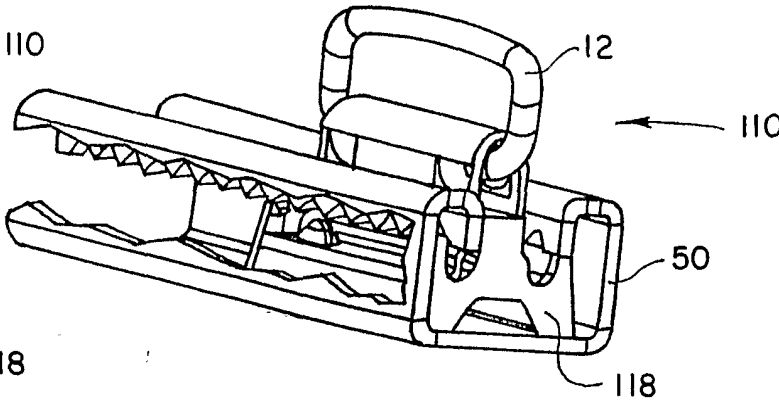


FIG. 32

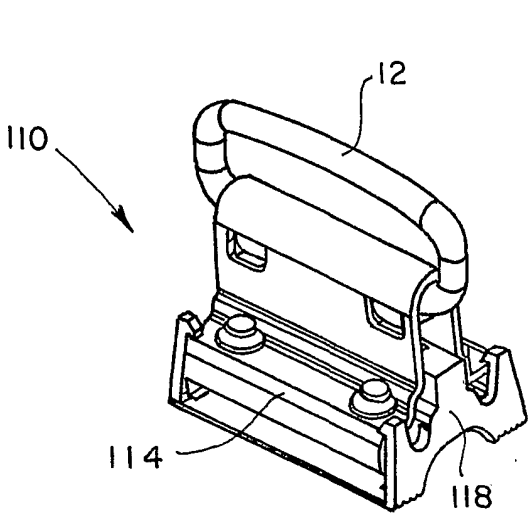


FIG. 33

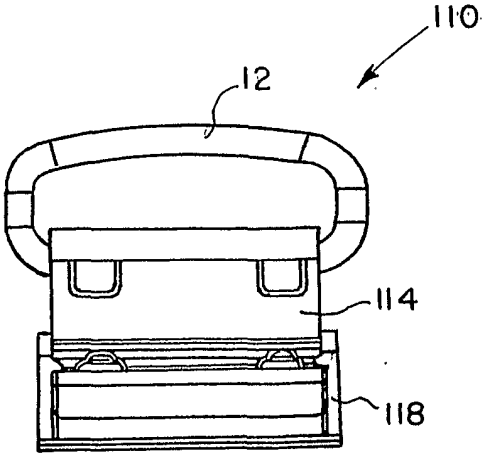


FIG. 37

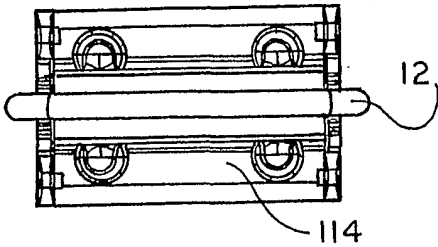


FIG. 34

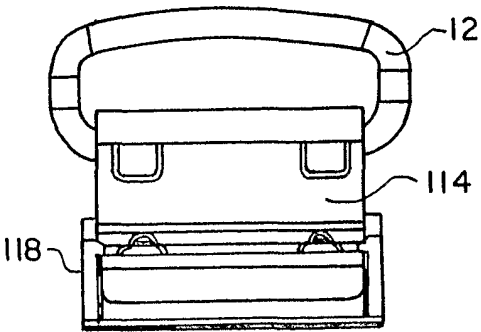


FIG. 38

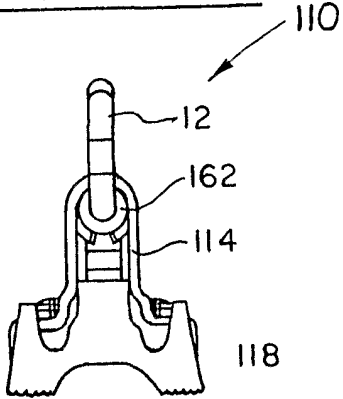


FIG. 35

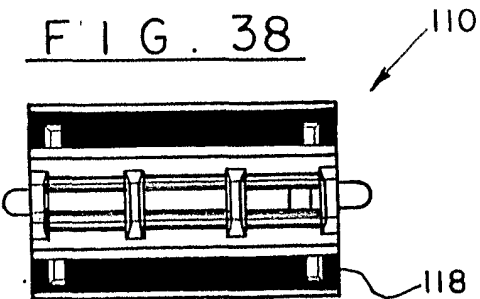


FIG. 39

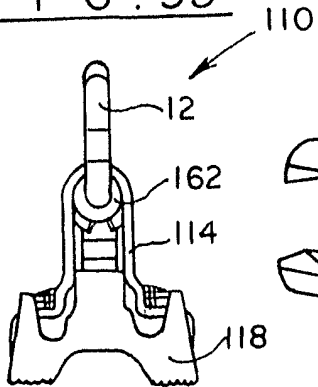


FIG. 36

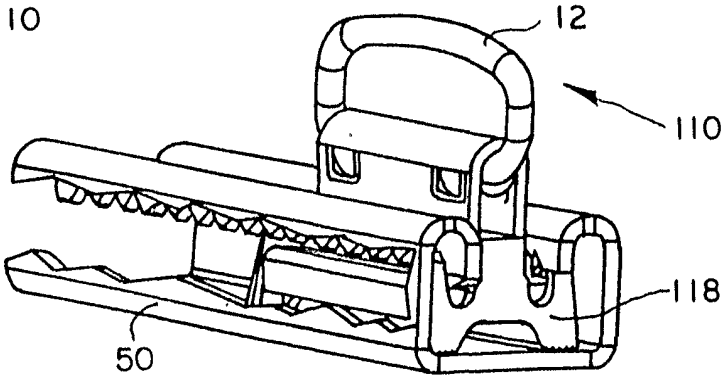
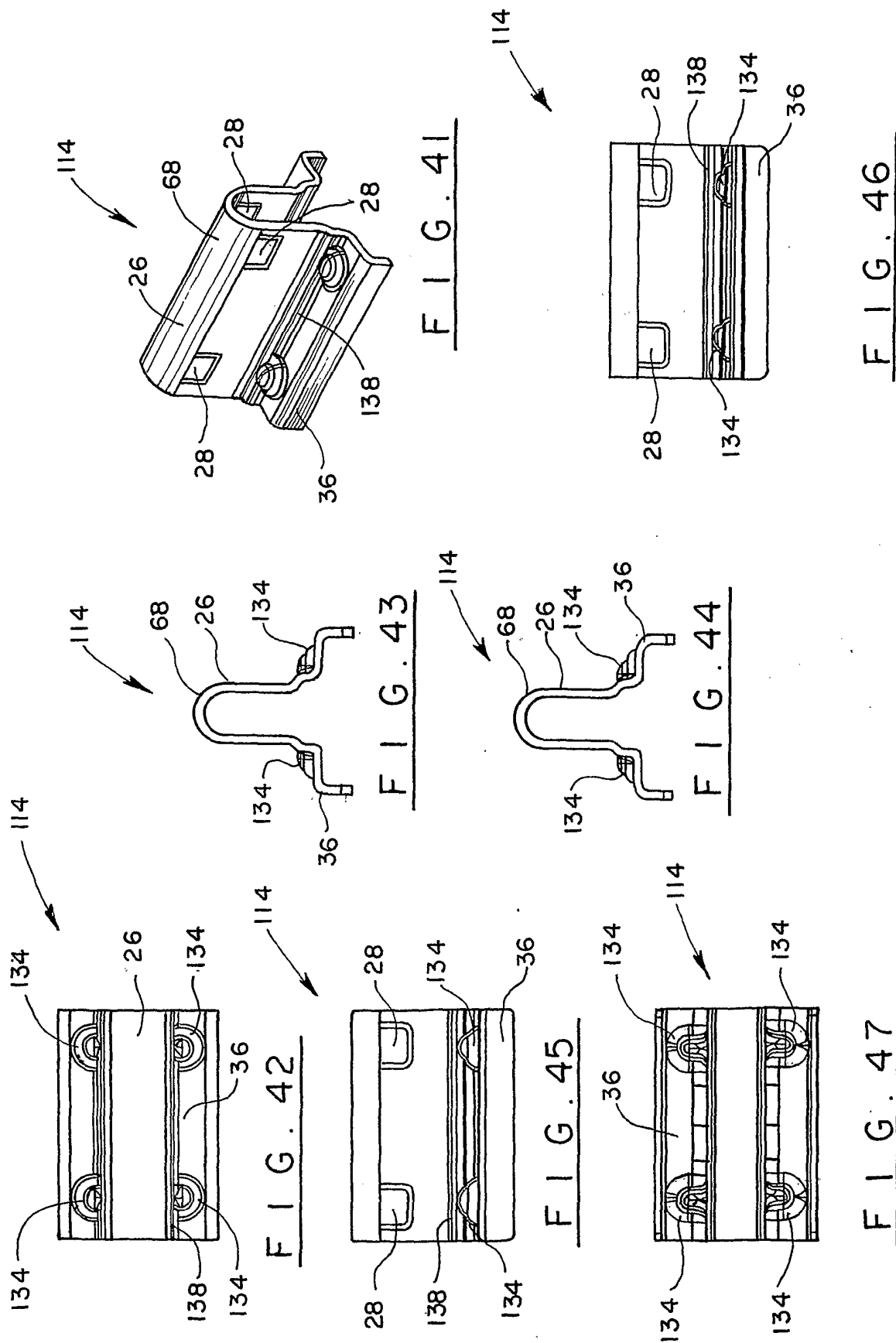


FIG. 40



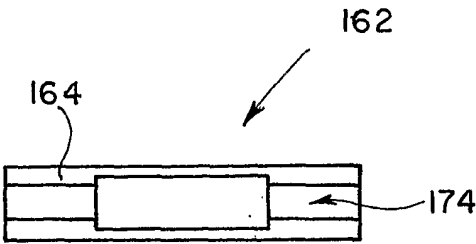


FIG. 49

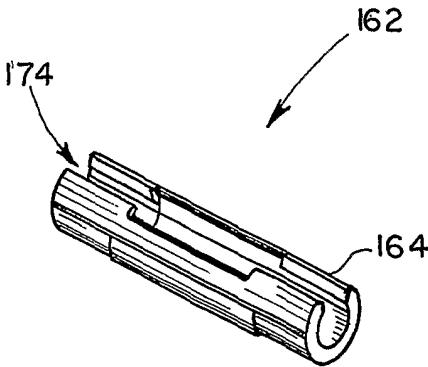


FIG. 48

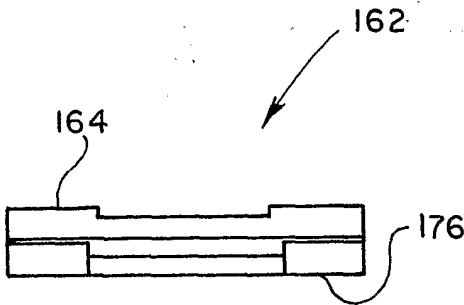


FIG. 52

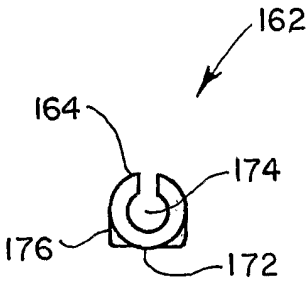


FIG. 50

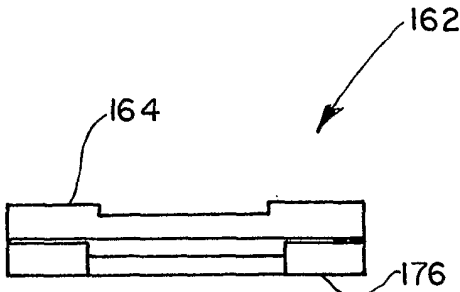


FIG. 53

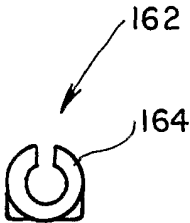


FIG. 51

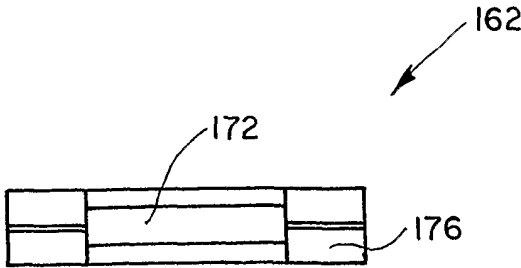
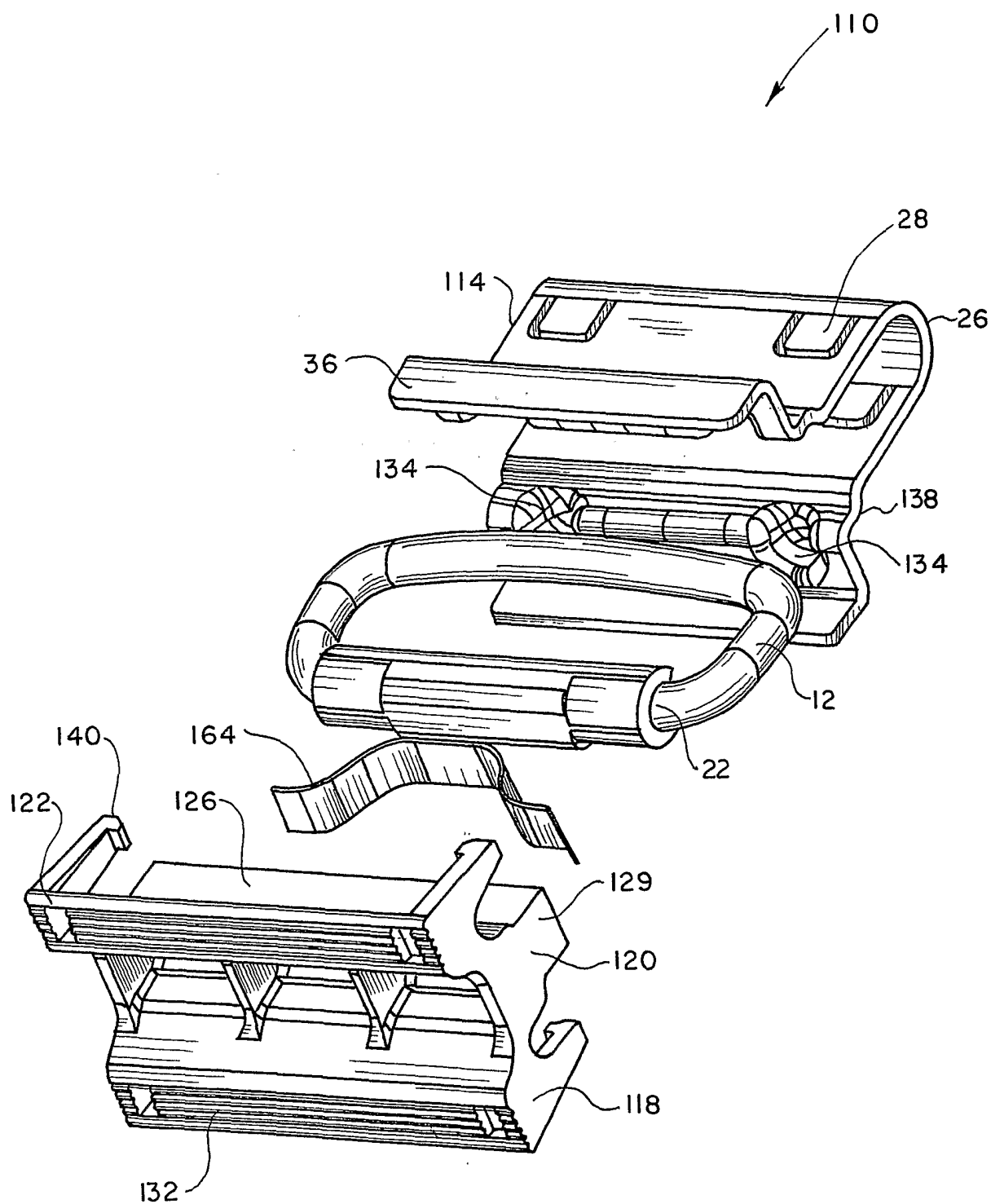
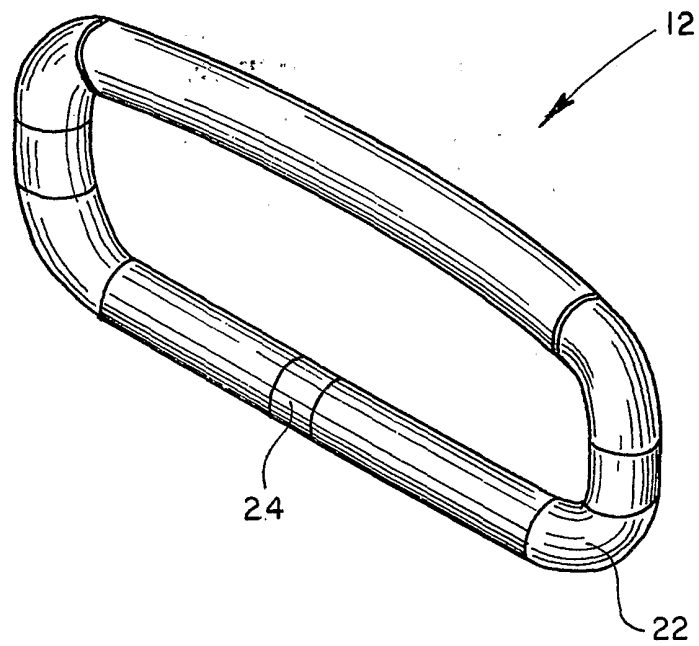


FIG. 54

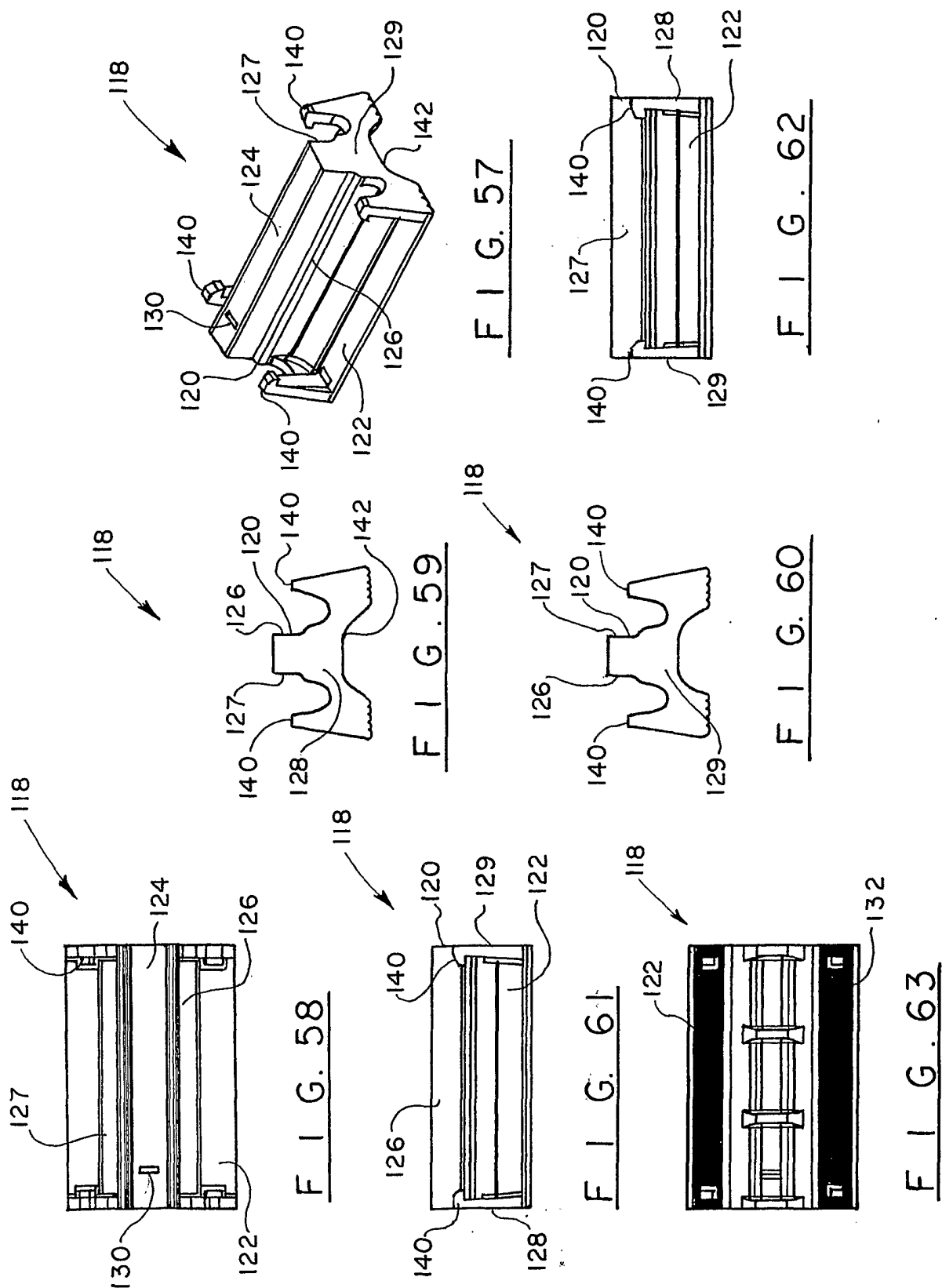
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F I G . 55



F I G . 56



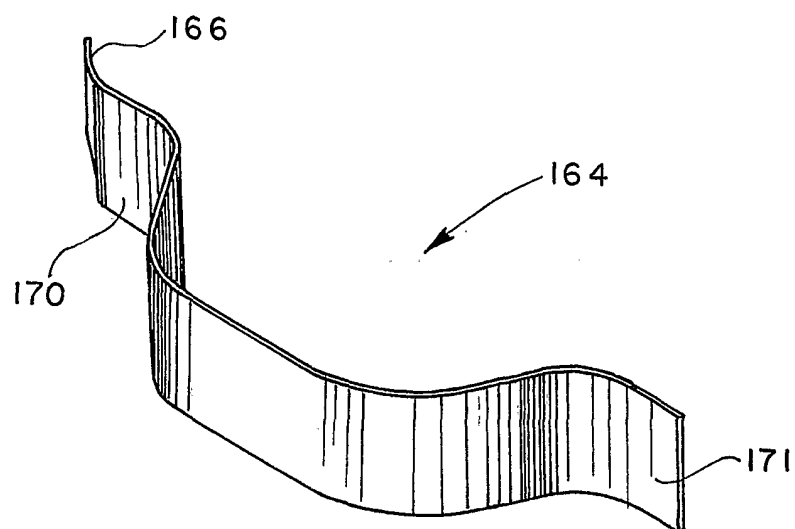


FIG. 64

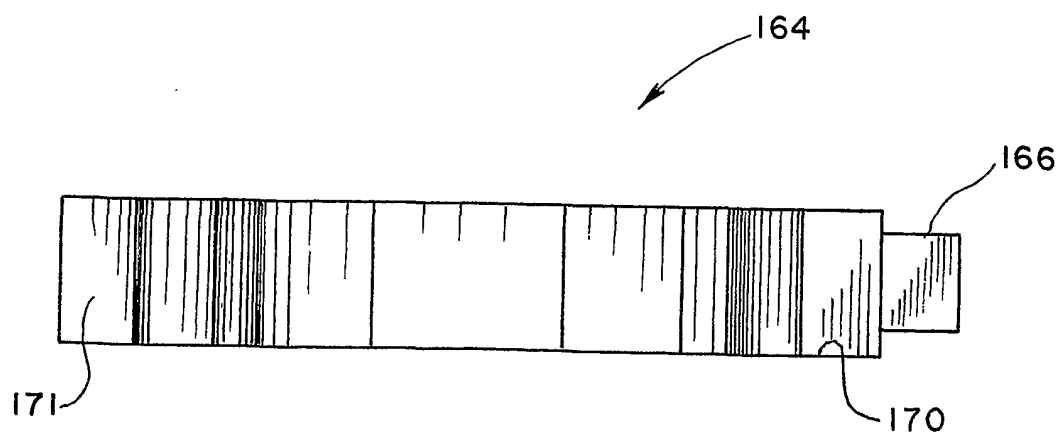
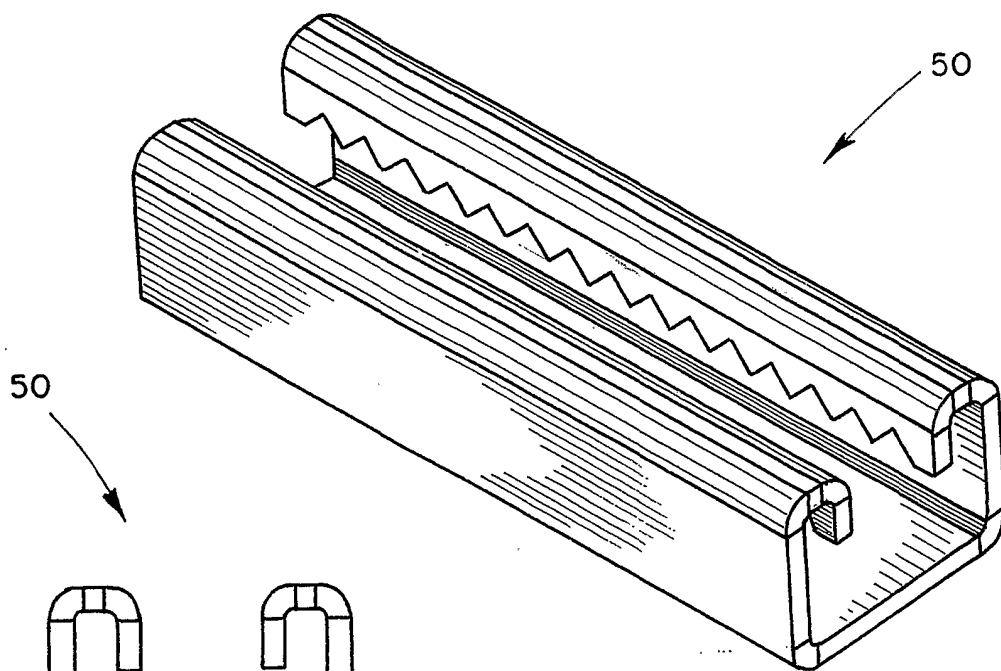
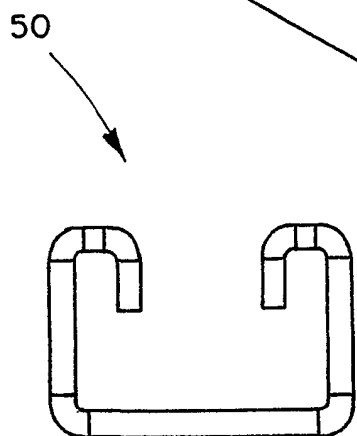


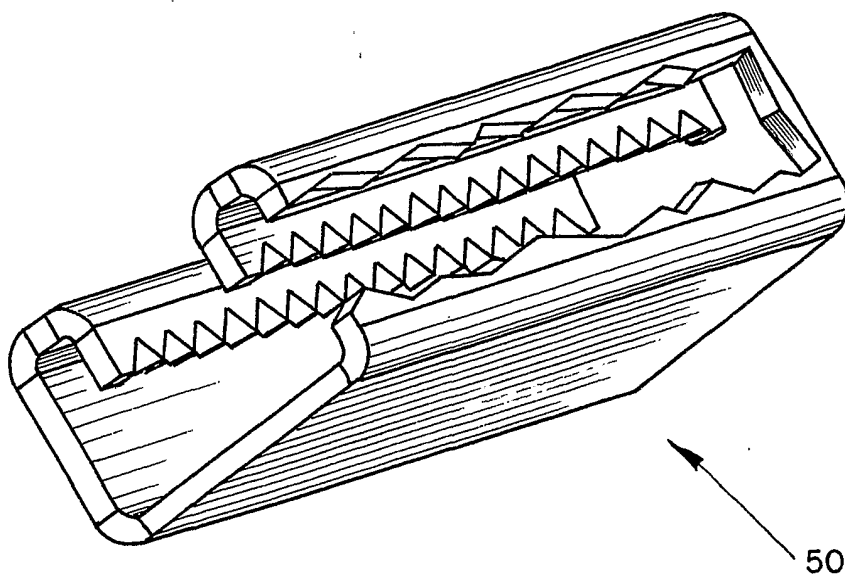
FIG. 65



F I G. 66



F I G. 68



F I G. 67

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US01/18935

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :B60P 7/08

US CL :410/105

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 410/105, 104, 101, 106, 110, 116; 24/115k,265cd; 248/499

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,409,335 A (BECK) 25 April 1995, figure 1.	1-51
A	US 5,259,711 A (BECK) 09 November 1993, abstract.	1-51
A	US 5,674,033 A (RUEGG) 07 October 1997, figures 1-2.	1-51

☐ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

* Special categories of cited documents:		"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"G"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

10 AUGUST 2001

Date of mailing of the international search report

28 AUG 2001

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Facsimile No. (703) 305-3230

Authorized officer

STEPHEN GORDON *Diane Smith*

Telephone No. (703) 308-1113