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Fastening Device for Securing Flexible Cover to Bed Liner

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ABSTRACT

A fastening device for securing a flexible cover to a bed liner includes the flexible cover which is large enough to cover the bed liner, bed liner side extended rails and a tailgate cover top extended rail. A fastening strip having cross-section which has two ends is used in conjunction with a cover retaining base. One end is sewn to a front edge of the cover while the other end is inserted into a groove in the cover retaining base. A number of snap fasteners include a lower fastener attached to a fastening sheet. An upper fastener attached to side and rear edges of the cover can be removably attached to the lower fastener. A number of fastening sheets are attached to the bed liner side extended rails and a tailgate cover top extended rail at corresponding positions to each upper fastener. A supporting beam set keeps the cover taut and cover straps are provided for holding the rolled-up cover.

Sheet 1 of 18

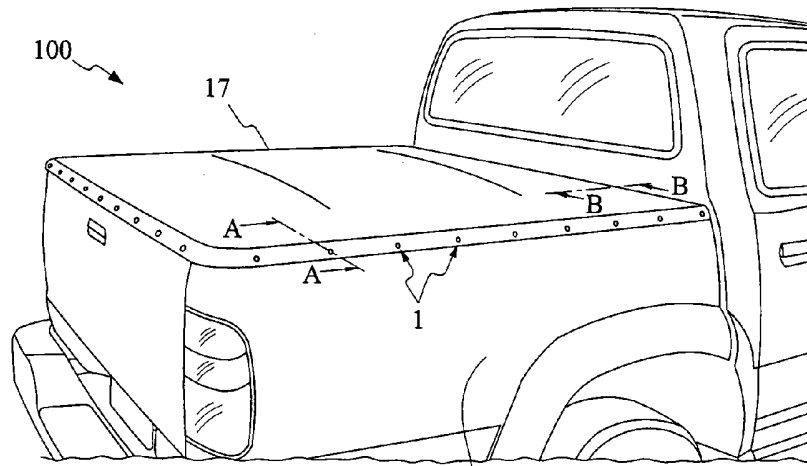


FIG. 1

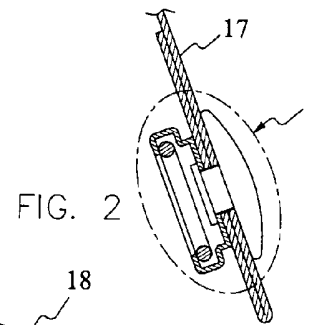


FIG. 2

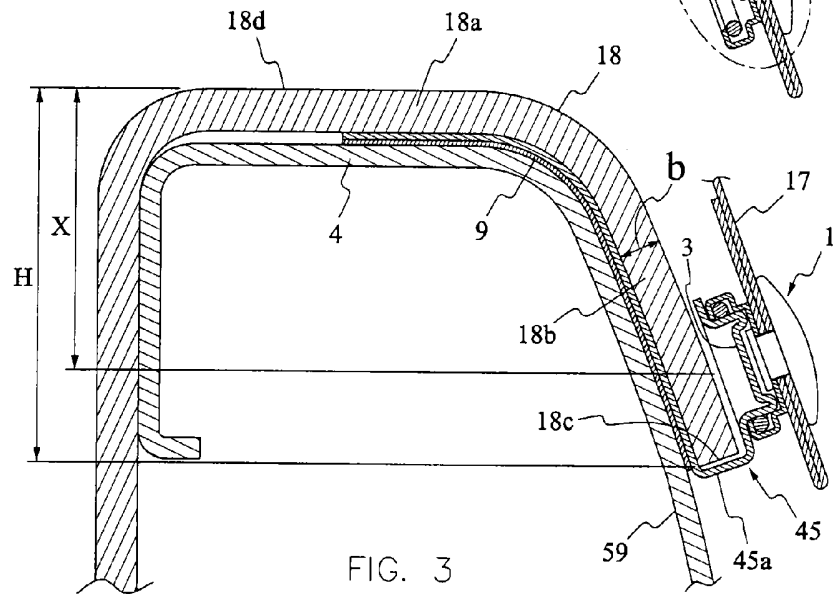


FIG. 3

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Regulation 3.2

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Invention Title: "Fastening Device for Securing Flexible Cover to Bed Liner"

The following statement is a full description of this invention, including the best method of performing it known to me:-

TITLE OF THE INVENTION

Fastening Device for Securing Flexible Cover to Bed Liner

BACKGROUND OF THE INVENTION

5 Pick-up truck users prefer to install a flexible cover to a truck bed to protect cargo from harmful effects of the environment such as sun and rain. A device to retain the flexible cover to the truck bed was developed to reduce exposure of the cargo to the environment. One example of such a device is described in U.S. Pat. No. 4,730,866, which discloses a device that fastens all four edges of the truck bed flexible cover, namely front, left, right and rear edges to the truck bed rails. The rails are installed on the front and side extended rails of the truck bed. The front, side
10 and rear rails are connected together by corner junctions. The rails are secured to the side extended rails of the truck bed by clamps. The left, right and rear edges of the flexible cover are attached to the left, right and rear rails, respectively, with a number of two-part snap fasteners. Each two-part snap fastener consists of one part fixed to a marginal edge of the cover and another part is longitudinally adjustable or slidable in the rail. An elongated rod is employed to
15 keep the flexible cover taut.

In addition, pick-up truck users prefer to install a bed liner to the truck bed to protect the bed surface from scratches and damage during loading and unloading cargo. The bed liner is typically comprised of a plastic sheet that is formed by a vacuum thermoforming process. The bed liners can be classified into two types by their edges, namely, the over rail bed liner and the
20 under rail bed liner. Figs. 23.1 and 23.2 show a truck bed 59 having an over rail bed liner 37 installed therein. Characteristics of the over rail bed liner 37 include side extended rails 39 for placement on the top edge of the truck bed walls, a front extended rail 40 for placement on a top edge of the truck bed front wall and a tailgate cover top extended rail 41, as shown in Fig. 26, for placement on the top edge of the tailgate 60. Figs. 24.1 and 24.2 show an under rail bed liner 38
25 installed in the truck bed 59. A characteristic of the under rail bed liner 38 is that a top edge of its side walls are positioned beneath the side extended rails of the truck bed 59.

U.S. Pat. No. 4,730,866 does not disclose a fastening device for securing a flexible cover to the over rail bed liner 37 while the disclosure of the present invention discloses such a device.

Referring to Figs. 18 and 19, general fastening devices for securing a flexible cover to truck beds include sets of supporting beams to keep the flexible cover taut. One example of the supporting beam set is comprised of a prior art middle beam 62 and two side beams 14. The middle beam 62 is made of a metal tube having through threaded holes in both ends for the insertion of screws 16. When the screws 16 are tightened in the threaded holes and pressed onto the ends of the side beams 14, which are inserted inside the middle beam 62, the side beams 14 are fixed to the middle beam 62. The length of the supporting beam set can be adjusted by releasing the screws 16 and sliding the side beams 14 in or out of the middle beam 62. The middle beam 62 has drawbacks, namely, both of its ends have sharp edges 61, which may scratch the underside of the cover. Continuous friction can cause a tear at a contact point between the sharp edges 61 and cover. These sharp edges 61 are higher than both side beams 14 resulting in the creation of unsightly bulges on the cover.

Referring to Figs. 20-22, the preferred embodiments of the present invention have corrected deficiencies caused by the middle beam 62 by using an aluminum extrusion middle beam 15. The middle beam 15 has a groove 63 running through the whole length of the middle beam 15. After the side beams 14 are assembled with the middle beam 15, they create a continuous curve for supporting the cover, thus eliminating unsightly bulges on the cover and reducing sharp edges that may cut the cover.

The preceding discussion to the invention is intended only to facilitate an understanding of the present invention. It should be appreciated that the discussion is not an acknowledgement or an admission that any of the material referred to was or is part of the common general knowledge in Australia as at the priority date of the application.

BRIEF SUMMARY OF THE INVENTION

The preferred embodiment of the present invention is directed to a device for securing a flexible cover to an over rail type bed liner. The device is used in conjunction with a bed liner and a tailgate cover of the over rail type. The device is also used in conjunction with a piece of flexible cover which is large enough to cover the bed liner, the bed liner side extended rails and the tailgate cover top extended rail. The device includes a fastening strip. The cross-section of the fastening strip has two ends. One end is sewn along the front edge of the cover while the

5 other end is attached to a cover retaining base, which is secured to the bed liner front extended rail. The device also has a number of snap fasteners. Each snap fastener is comprised of an upper fastener and a lower fastener. The upper fastener can be attached to the lower fastener in such a manner that it can be detached and reattached. The upper fasteners are attached to the two side edges and rear edge of the cover. Each of the lower fasteners is mounted to a fastening sheet. A number of fastening sheets with attached lower fasteners are attached to a bed liner side extended rails at corresponding positions to each of the upper fasteners on the two side edges of the cover. The other fastening sheet with attached lower fasteners are attached to the tailgate cover top extended rail at corresponding positions to each of the upper fasteners on the rear edge of the cover. The device provides supporting beam sets to keep the cover taut and to prevent water buildup.

15 To mount the flexible cover to the truck bed, a user presses the upper fasteners at the two side edges of the cover onto the lower fasteners at the bed liner side extended rails and presses the upper fasteners at the rear edge of the cover onto the lower fasteners at the tailgate cover top extended rail. The user can open the cover from the rear edge and two side edges of the cover by pulling the upper fasteners out of the lower fasteners. The whole of the front edge of the cover is preferably fixed to the bed liner front extended rail and will not be opened. In the case that the user wants to load a large piece of cargo into the bed of the truck, the cover can be rolled from the rear to the front of the bed liner. The present fastening device preferably provides a number of straps for fastening the rolled up cover along the front rail of the bed liner.

20 The present invention is also directed to providing a device for securing a flexible cover to a bed liner without drilling holes in the truck bed or damaging the truck bed in any other way.

25 Any method can be employed to firmly attach the bed liner to the truck bed and the tailgate cover to the tailgate. For example, U.S. Pat. No. 6,203,090 B1 discloses methods for firmly attaching a bed liner to a truck bed and methods for firm attachment of the tailgate cover to the tailgate without drilling any holes in the truck bed or otherwise damaging the bed. Firm attachment of the bed liner to the bed and the tailgate cover to the tailgate is preferred such that the bed liner and the tailgate cover are able to withstand a pulling force during the opening or closing of the flexible cover.

The present invention is further directed to improving the performance of the flexible cover supporting beam set, as was previously outlined in the Background of the Invention section.

The present invention is also directed to, as previously outlined, providing straps for fastening the rolled up flexible cover to the front rail of the truck bed.

- 5 The present invention is further directed to securing the flexible cover to the bed liner, which is installed on the bed of a pick-up truck. However, the device of the present invention can also be used for securing the flexible cover to a bed liner, which is installed on the bed of other types of vehicles or non-vehicles or in other applications where a cover is secured to a base structure.

- 10 In another aspect, the present invention is directed to a fastening device for securing a flexible cover to a bed liner of a truck bed. The truck bed has a tailgate which acts as a rear wall of the truck bed. The bed liner has a tailgate cover which acts as a rear wall of the bed liner. The bed liner has at least one extended rail that extends from a top edge of a wall for a length in a direction outwardly from the bed and slopes downwardly for a length and at an angle. The flexible cover is large enough to cover the bed liner and the bed liner extended rail. The
- 15 fastening device includes at least one snap fastener which is comprised of an upper fastener and a lower fastener. The upper fastener may be attached to the lower fastener in such a manner that it can be detached and reattached. The upper fastener is attached to the edge of the cover and the lower fastener is attached to a fastening sheet. The fastening sheet includes a first end and a second end. The first end is a top end and the second end is a lower end. The top end is shaped
- 20 to conform to a curve of a top edge of a truck bed wall. When installed, the top end is placed between the bed liner extended rail and the top edge of the truck bed wall. The lower end extends from the upper end and protrudes beyond a bottom tip of the bed liner extended rail for a length. The lower fastener is attached to a portion of the lower end that protrudes beyond the bottom tip of bed liner extended rail in a manner that faces outwardly from the bed for attaching
- 25 with the upper fastener. When the bed liner is secured to the truck bed, the bed liner extended rail presses on a top surface of the fastening sheet and fixes the fastening sheet in place on the truck bed wall. The upper fastener is attached to the lower fastener resulting in securing the cover to the bed liner.

In a further aspect, the present invention is directed to a fastening device for securing a front edge of a flexible cover to a bed liner front extended rail, the bed liner front extending rail extended from a top edge of a bed liner front wall for a length in a direction outwardly from the truck bed and sloping downwardly for a length and at an angle, the fastening device comprising:

- 5 a fastening strip which is made from a flexible material, the fastening strip cross-section having two ends, a first end being attached to the flexible cover and a second end being knob-shaped;
- at least one cover retaining base having a cross-section which has two ends, one end having a groove running through an entire length of at least one cover retaining base, the
- 10 groove having an opening running through an entire length of the groove, a width of the opening being less than a size of the groove, a size of the knob is less than the size of the groove, the knob can be slid into the groove in a direction parallel to the length of the groove, the at least one cover retaining base being attached to the bed liner front extended rail; and
- 15 two anti-theft screws, when the fastening strip is attached to the cover retaining base by inserting the knob in the groove in the cover retaining base, the width of the opening is less than the size of the knob, thus the groove keeps the knob from falling off the at least one cover retaining base in a direction perpendicular to the length of the at least one cover retaining base, tightening anti-theft screws into the threaded holes of the groove at
- 20 the two ends of the cover retaining base to block the fastening strip from sliding out of the groove.

In a further aspect, the present invention is directed to a supporting beam set for keeping a flexible cover taut, the flexible cover can be attached to a bed liner, the supporting beam set comprising:

- 25 a middle beam which is a tube having a groove running through an entire length of the middle beam, the groove having an opening running through the entire length of the groove, each end of the middle beam having a threaded hole that runs through the middle beam in a direction perpendicular to the length of the middle beam;
- two side beams which are comprised of rods having two ends, one end being bent
- 30 downward while the other end is insertable into the middle beam, the opening of the

groove of the middle beam being smaller than a size of the side beam resulting in blocking the side beam from falling off of the groove in a direction perpendicular to the length of the middle beam when the side beam is assembled to the middle beam, a top surface of the side beam lies flush with a top surface of the middle beam in an assembled configuration resulting in the creation of a continuous curve for supporting the flexible cover;

two supporting beam bases which include a hole for insertion of the bent end of the side beam, one of the supporting beam bases is attached to a bed liner wall and the other supporting beam base is attached to an opposite bed liner wall; and

screws releasably mounted to the threaded hole in the middle beam, when one of the screws is tightened into the threaded hole in the assembled configuration to apply pressure on the side beam, the side beam is fixed to the middle beam, when the screw is released from the threaded hole, the side beam is slidable in the groove of the middle beam.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

The foregoing summary, as well as the following detailed description of the preferred embodiments of the present invention, will be better understood when read in conjunction with the appended drawings. For the purposes of illustrating the fastening device of the present invention, there are shown in the drawings preferred embodiments. It should be understood, however, that the application is not limited to the precise arrangements and instrumentalities shown. In the drawings:

Fig. 1 is a perspective view of a flexible cover of the preferred embodiments of present invention attached to a bed liner with a cover fastening device;

Fig. 2 is a cross-sectional view of an upper fastener 1 attached to the cover 17 of Fig. 1, taken along line A-A of Fig. 1;

Fig. 3 is a cross-sectional view of a first preferred embodiment of a fastening sheet of the cover of Fig. 1 with a formed lower fastener for a long rail bed liner attached to the bed liner side extended rail, taken along liner A-A of Fig. 1;

- Fig. 4 is a cross-sectional view of a second preferred embodiment of a fastening sheet of the cover of Fig. 1 with a formed lower fastener for a short rail bed liner attached to the bed liner side extended rail, taken along line A-A of Fig. 1;
- 5 Fig. 5.1 is a perspective view of the fastening sheet of the first preferred embodiment of Fig. 3 with a formed lower fastener for a long rail bed liner;
- Fig. 5.2 is a cross-sectional view of the fastening sheet of the first preferred embodiment with a formed lower fastener for a long rail bed liner of Fig. 3, taken along line C-C of Fig. 5.1;
- Fig. 6.1 is a perspective view of the fastening sheet of the second preferred embodiment of Fig. 4 with a formed lower fastener for a short rail bed liner;
- 10 Fig. 6.2 is a cross-sectional view of the fastening sheet of the second preferred embodiment with a formed lower fastener for a short rail bed liner of Fig. 4, taken along line D-D of Fig. 6.1;
- Fig. 7.1 is a perspective view of a fastening sheet of the first preferred embodiment with a riveted lower fastener for a long rail bed liner;
- Fig. 7.2 is a perspective view of the fastening sheet of Fig. 7.1 of the first preferred embodiment with the lower fastener removed from a hole in the fastening sheet;
- 15 Fig. 7.3 is a cross-sectional view of the fastening sheet of the first preferred embodiment of Fig. 7.1 with a riveted lower fastener for a long rail bed liner, taken along line E-E of Fig. 7.1;
- Fig. 8.1 is a perspective view of a fastening sheet of the second preferred embodiment with a riveted lower fastener for a short rail bed liner;
- 20 Fig. 8.2 is a perspective view of the fastening sheet of Fig. 8.1 of the second preferred embodiment with the lower fastener removed from a hole in the fastening sheet;
- Fig. 8.3 is a cross-sectional view of the fastening sheet of the second preferred embodiment of Fig. 8.1 with a riveted lower fastener for the short rail bed liner, taken along line F-F of Fig. 8.1;
- Fig. 9.1 is a perspective view of a fastening sheet of the first preferred embodiment with a welded lower fastener for a long rail bed liner;
- 25

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Fig. 9.2 is a cross-sectional view of the fastening sheet of the first preferred embodiment of Fig. 9.1, taken along line G-G of Fig. 9.1;

Fig. 10.1 is a perspective view of a fastening sheet of the second preferred embodiment with a welded lower fastener for a short rail bed liner;

5 Fig. 10.2 is a cross-sectional view of the fastening sheet of the second preferred embodiment of Fig. 10.1, taken along line H-H of Fig. 10.1;

Fig. 11.1 is a perspective view of a fastening sheet of the first preferred embodiment with a screw securing a lower fastener to the fastening sheet for a long rail bed liner;

10 Fig. 11.2 is a perspective view of the fastening sheet of the first preferred embodiment of Fig. 11.1 with the lower fastener removed from a hole in the fastening sheet;

Fig. 11.3 is a cross-sectional view of the fastening sheet of the first preferred embodiment, taken along lines I-I of Fig. 11.1;

Fig. 12.1 is a perspective view of a fastening sheet of the second preferred embodiment with a screw securing a lower fastener to the fastening sheet for a short rail bed liner;

15 Fig. 12.2 is a perspective view of the fastening sheet of the second preferred embodiment of Fig. 12.1 with a lower fastener removed from a hole in the fastening sheet;

Fig. 12.3 is a cross-sectional view of the fastening sheet of the second preferred embodiment, taken along line J-J of Fig. 12.1;

20 Fig. 13 is a cross-sectional perspective view of an attachment of a front edge of the flexible cover to the bed liner front extended rail of Fig. 1, taken along line B-B of Fig. 1;

Fig. 14 is a front elevational view of a cover retaining base of the fastening device of Fig. 1;

Fig. 15 is a front elevational view of a watertight rubber strip of the fastening device of Fig. 1;

Fig. 16 is a front elevational view of a fastening strip of the fastening device of Fig. 1;

Fig. 17 is a back view of a supporting beam base of the fastening device of Fig. 1;

Fig. 18 is a front elevational view of a prior art middle beam with side beams inserted therein;

Fig. 19 is a cross-sectional view of the prior art middle beam of Fig. 18, taken along line N-N of Fig. 18;

5 Fig. 20 is a front elevational view of a middle beam of the fastening device of Fig. 1 with side beams inserted therein;

Fig. 21 is a side elevational view of the middle beam of Fig. 20;

Fig. 22 is a cross-sectional view of the middle beam of Fig. 20 with the side beam inserted therein, taken along line P-P of Fig. 20;

Fig. 23.1 is a perspective view of a prior art over rail bed liner installed to a truck bed;

10 Fig. 23.2 is a cross-sectional view of a bed liner side extended rail of Fig. 23.1 placed on a top edge of the truck bed side wall, taken along line K-K of Fig. 23.1;

Fig. 24.1 is a perspective view of a prior art under rail bed liner installed to a truck bed;

Fig. 24.2 is a cross-sectional view of a top edge of the bed liner side wall of Fig. 24.1 placed under the truck bed side extended rail, taken along line L-L of Fig. 24.1;

15 Fig. 25 is a perspective view of an installation step for securing the flexible cover of Fig. 1 to the bed liner when a protective tape is applied to the truck bed;

Fig. 26 is a partially exploded perspective view of an installation step for securing the flexible cover of Fig. 1 to the long rail bed liner with the fastening device of the first preferred embodiment;

20 Fig. 27 is a greatly enlarged fragmentary view taken from within a dashed line at a rear portion of the bed liner of Fig. 26, showing an installation of a supporting beam base to the bed liner;

Fig. 28 is a greatly enlarged fragmentary view taken from within a dashed line at a front corner of the bed liner of Fig. 26, showing an installation of a fastening device to the bed liner;

- Fig. 29 is a perspective view of a long rail bed liner of the first preferred embodiment with installed cover retaining bases and supporting beam bases of the fastening devices;
- Fig. 30 is a greatly enlarged fragmentary view taken from within a dashed line at a rear, inner side of the bed liner of Fig. 29, showing a supporting beam base installed to the bed liner wall;
- 5 Fig. 31 is a greatly enlarged fragmentary view taken from within a dashed line at a right-side front corner of the bed liner of Fig. 29, showing a cover retaining base installed to the bed liner front extended rail;
- Fig. 32 is a greatly enlarged fragmentary view taken from within a dashed line at a left-side front corner of the bed liner of Fig. 29, showing an anti-theft screw being tightened into a threaded
- 10 hole at the end of a groove on the cover retaining base;
- Fig. 33 is a partially exploded perspective view of an installation step in the insertion of the flexible cover with the fastening device of the first preferred embodiment to the cover retaining base for the long rail bed liner;
- Fig. 34 is a cross-sectional view of a fastening strip of the cover of Fig. 33, taken along line M-M
- 15 of Fig. 33;
- Fig. 35 is a perspective, partial cut away view of an anti-theft screw being tightened into a threaded hole at an end of a groove in the cover retaining base of the cover of Fig. 1;
- Fig. 36 is a perspective, partial cut away view of an anti-theft screw tightened to the threaded hole at the end of the groove in the cover retaining base of Fig. 35;
- 20 Fig. 37 is a partially exploded perspective view of an installation step of inserting the bed liner into a truck bed in accordance with the first preferred embodiment;
- Fig. 38 is a greatly magnified perspective view of an installation step of inserting a fastening sheet with a formed lower fastener of the first preferred embodiment under a bed liner side extended rail;

- Fig. 39 is a greatly magnified perspective view of an installation step of fastening a number of fastening sheets of the first preferred embodiment to the truck bed;
- Fig. 40 is a perspective view of an installation step of the fastening sheet of the first preferred embodiment after the sheets are slid to corresponding positions to each upper fastener of the cover;
- Fig. 41 is a greatly enlarged fragmentary view taken from within a dashed line of Fig. 40 showing the fastening sheet of the first preferred embodiment installed on a truck tailgate;
- Fig. 42 is a perspective view of an installation step of the fastening sheet of the second preferred embodiment after the sheets are slid to corresponding positions to each upper fastener on two side edges and a rear edge of the cover of Fig. 1;
- Fig. 43 is a greatly enlarged fragmentary view taken from within a dashed line of Fig. 42 showing the fastening sheet of the second preferred embodiment installed on a truck tailgate;
- Fig. 44 is an exploded perspective view of components of a supporting beam set of the cover of Fig. 1;
- Fig. 45 is a greatly enlarged fragmentary view taken from within the dashed line of Fig. 44 showing a method for securing side beams to a middle beam by tightening a screw into a threaded hole in the middle beam;
- Fig. 46 is a partially exploded perspective view of an installation step of the cover showing inserting bent ends of a side beam into holes in the supporting beam bases of the first preferred embodiment;
- Fig. 47 is a greatly enlarged fragmentary view taken from within a left-side rear dashed line of Fig. 46, showing insertion of a bent end of a side beam into a hole in the supporting beam base;
- Fig. 48 is a greatly enlarged fragmentary view taken from within a left-side front dashed line of Fig. 46, showing the bent end of the side beam after insertion into the supporting beam base;
- Fig. 49 is a partial perspective view of a rolled up flexible cover of Fig. 1;

Fig. 50 is a greatly enlarged fragmentary view taken from within a left-side dashed line of Fig. 49, showing a male lock and a female lock of the cover of Fig. 1; and

Fig. 51 is a greatly enlarged fragmentary view taken from within a right-side dashed line of Fig. 49, showing an attachment of the male and female locks of the cover of Fig. 1.

DETAIL DESCRIPTION OF THE INVENTION

Certain terminology is used in the following description for convenience only and is not limiting. The words "right", "left", "lower" and "upper" designate directions in the drawings to which reference is made. The words "inwardly" and "outwardly" refer to directions toward and away from, respectively, the geometric center of the fastening device of the bed liner cover, bed liner, vehicle and designated parts thereof. The terminology includes the above-listed words, derivatives thereof and words of similar import.

Referring to Figs. 1, 13 and 26-49, a fastening device for securing a flexible cover 17 to a bed liner 18 of a vehicle or pick-up truck 100 is disclosed.

The fastening device is used in conjunction with the bed liner 18, which includes bed liner side extended rails 18a that are placed onto top edges of truck bed side walls 4 and a front extended rail 18e of the bed liner 18 is placed on a top edge of a truck bed front wall 5. The fastening device is also used in conjunction with a tailgate cover 19. A top extended rail 41 of the tailgate cover 19 is typically placed on a top edge of the tailgate 60. The bed liner 18, as is shown in Figs. 26 and 37, is known as an over rail bed liner 18 with its side extended rail 18a, front extended rail 18e and tailgate cover top extended rail 41. The side extended rail 18a extends outwardly from the bed 59 and slope downwardly for a length and at an angle. The side extended rail 18a includes the side edge 18 b. The front extended rail 18e extends outward from the bed 59 and slopes downward for a length and at an angle. The tailgate cover top extended rail 41 extends outwardly from the bed 59 and slopes downward for a length and at an angle. The fastening device of the preferred embodiments is used in conjunction with the flexible cover 17, which is large enough to cover the bed liner 18 bed liner side extended rails 18a and tailgate cover top extended rail 41 in an assembled configuration.

Referring to Figs. 1, 13-16, 33 and 34, the principle for securing the front edge of the flexible cover 17 to the bed liner front extended rail 18e is shown. The fastening device utilizes a fastening strip 12 in conjunction with at least one cover retaining base 11. The fastening strip 12 is preferably constructed of a long strip of flexible material attached to the front edge of the cover 17. The cover retaining base 11 is preferably constructed of a material such as an aluminum extrusion sheet having a cross-section which has two ends. On one end is a groove 25 preferably running the whole length of the cover retaining base 11. The groove 25 has a size c and openings 67 in the groove 25 have a width d. The size c of the groove 25 is larger than the width d of the opening 67 ($c > d$). The fastening strip 12 has a cross-section having two ends 27, 26. One end 27 is preferably sewn to the entire length of the front edge of the flexible cover 17 by stitch lines 33 (Fig. 34). The other end 26 of the cross-section is comprised of a knob 26. The knob 26 has a size "e" and there is a knob base 68 next to the knob 26 having a size f. The size e of the knob 26 is preferably larger than the size f of knob base 68. The size of the knob 26 is also preferably at least slightly smaller than the size c of the groove 25 in the cover retaining base 11 ($e < c$). The size f of the knob base 68 is preferably at least slightly less than the width d of the opening 67 ($f < d$). When the knob 26 is inserted into the groove 25 in the cover retaining base 11 by sliding from one end and the fastening strip 12 is moved horizontally by sliding from one end toward the cover retaining base 11, the opening 67 prevents the fastening strip 12 from falling off the cover retaining base 11 in a direction perpendicular to the length of the cover retaining base 11.

Referring to Figs. 13 and 26-36, the cover retaining base 11 is attached to the bed liner front extended rail 18e by a number of screws 22 inserted through holes 36 in the cover retaining base 11 and holes 34 in the bed liner front extended rail 18e before being tightened into threaded holes in nuts 23. The fastening device of the present invention uses nuts of two sizes, namely nut 7 (Fig. 11.3) and nut 23 (Figs. 27 and 28). The nut 7 is preferably smaller than nut 23.

Referring to Figs. 3, 11.1-12.3, 25 and 26, the nut 7 has a base pad 7a, a stud 7b protrudes from the base pad 7a and there is a threaded hole in the stud 7b. Protective tapes 9 are applied to the surface of the truck bed 59 at positions that may come into contact with the nuts 7, 23 to prevent the bed 59 from being scratched by the nuts 7, 23. The fastening device of the present invention preferably uses two connecting cover retaining bases 11 instead of one long sheet for the purpose

of minimizing the length of the packing box of the cover retaining base 11. The same reason applies to the use of two watertight rubber sheets 10.

Referring to Figs. 15, 28-32, 35 and 36, anti-theft screws 24 are tightened into threaded holes 42 and 43 at both ends of the groove 25 in the cover retaining base 11 to prevent a thief from pulling the cover 17 horizontally off the cover retaining base 11. The preferred fastening device of the present invention is used with at least one watertight rubber sheet 10. The rubber sheet 10 is placed between the cover retaining base 11 and the top surface of the bed liner front extended rail 18e to prevent water from entering the cargo compartment of the bed liner 18. There are a number of holes 35 in the rubber sheet 10 for insertion of screws 22.

- 10 Referring to Figs. 1-12.3, 26 and 33, a number of snap fasteners are used to attach the two side edges of the cover 17 to the bed liner side extended rails 18a and another number of snap fasteners are used to attach the rear edge of the cover 17 to the tailgate cover top extended rail 41. The snap fasteners are comprised of an upper fastener 1 and a lower fastener 3. The upper fasteners 1 can be attached to the lower fasteners 3 in such a manner that they are detachable and
- 15 reattachable. The upper fasteners 1 are preferably attached to the left edge of the cover 17 (not shown in the drawing), the right edge and rear edge of the cover 17. The upper fasteners 1 are preferably attached to the edges of the cover 17 by a conventional method such as riveting while each lower fastener 3 is preferably attached to the fastening sheet. A number of fastening sheets with attached lower fasteners 3 are preferably attached to the bed liner side extended rails 18a at
- 20 corresponding positions to each of the upper fasteners 1 on the two side edges of the cover 17. Other fastening sheets with attached lower fasteners 3 are attached to the tailgate cover top extended rail 41 at corresponding positions to each of the upper fasteners 1 on the rear edge of the cover 17.

- The fastening device of the present invention relies on a principle of securing the fastening sheet
- 25 with lower fasteners 3 to the bed liner side extended rails 18a and tailgate cover top extended rail 41. The shape of the fastening sheet preferably conforms to a curve of the top edge of a truck bed wall. After the bed liner 18 is laid onto the truck bed 59 and the tailgate cover 19 is laid onto the tailgate 60, the bed liner side extended rails 18a are slightly raised for the insertion of the fastening sheet with attached lower fasteners 3 between the bed liner side extended rails 18a and

the top edges of bed side wall 4. The fastening sheets are positioned between the bed liner side extended rails 18a and the top edges of bed side wall 4. These fastening sheets with attached lower fasteners 3 can be slid under the bed liner side extended rail 18a until the lower fasteners 3 are at the corresponding positions to the upper fasteners 1 on the side edges of the cover 17. The bed liner 18 is then secured to the truck bed 59. The tailgate cover 19 is slightly raised for the insertion of other fastening sheets with attached lower fasteners 3 between the tailgate cover top extended rail 41 and the top edge of the tailgate 60. These fastening sheets with attached lower fasteners 3 can be slid under the tailgate cover top extended rail 41 until the lower fasteners 3 are at corresponding positions to the upper fasteners 1 on the rear edge of the cover 17. The tailgate cover 19 is then secured to the tailgate 60.

The fastening device of the present invention preferably adapts to the curving shape of the bed liner side extended rail 18a, which conforms to the curving shape of the surface of the top edge of bed side wall 4 and also the curving shape of the tailgate cover top extended rail 41, which conforms to the curving shape of the surface of top edge of the tailgate 60. When the bed liner 18 is secured to the bed 59, the bed liner side extended rail 18a will press on the top surface of the fastening sheet 45, 46, 48, 49, 53, 54, 56, 57 with attached lower fastener 3 resulting in the fastening sheet 45, 46, 48, 49, 53, 54, 56, 57 being mounted in place firmly. When the tailgate cover 19 is secured to the tailgate 60, the tailgate cover top extended rail 41 presses on the top surface of the fastening sheet 45, 46, 48, 49, 53, 54, 56, 57 with attached lower fastener 3 resulting in the fastening sheet 45, 46, 48, 49, 53, 54, 56, 57 being mounted in place firmly.

Referring to Figs. 5.1-12.3, the fastening sheet 45, 46, 48, 49, 53, 54, 56, 57 of the preferred fastening device of the invention is divided into two types, namely, a first type 45, 48, 53, 56 having a lower end 45a, 48a, 53a, 56a pointing upward, and a second type 46, 49, 54, 57 having a lower end 46a, 49a, 54a, 57a pointing downward.

Referring to Figs. 3, 5.1, 5.2, 7.1-7.3, 9.1, 9.2, 11.1-11.3, the fastening sheet of the first type 45, 48, 53, 56 of the first preferred embodiment with its lower end 45a, 48a, 53a, 56a pointing upwardly is designed for a long rail bed liner 18, the details of which will be discussed later. A top end 45b, 48b, 53b, 56b of the first type 45, 48, 53, 56 of fastening sheet is shaped to fit snugly to the curve of the top edge of the truck bed wall. The lower end 45a, 48a, 53a, 56a of the

- first type 45, 48, 53, 56 has a U-shape with a gap m between the two legs of the U-shape, as is shown in Figs. 5.2, 7.3, 9.2 and 11.3. The gap m is preferably larger than a thickness b of the bed liner edge 18b, as is shown in Fig. 3. The gap m is designed for accommodation of the bed liner edge 18b and also for smooth sliding of the fastening sheet of the first type 45, 48, 53, 56 along the bed liner edge 18b. There is a lower fastener 3 attached on the lower end 45a, 48a, 53a, 56a pointing upwardly such that the lower fastener 3 faces outward from the truck bed 59 so that the lower fastener 3 can be attached with the upper fastener 1 on the edge of the cover 17. Protective tape 9 is preferably applied to the surface of the fastening sheet of the first type 45, 48, 53, 56 to prevent scratching of the truck bed 59.
- 10 Referring to Figs. 4, 6.1, 6.2, 8.1-8.3, 10.1, 10.2, 12.1-12.3, 42, a second type 46, 49, 54, 57 of fastening sheet of the second preferred embodiment includes a lower end 46a, 49a, 54a, 57a pointing downwardly and is designed for a short rail bed liner 20 having short rail tailgate cover 21, the details of which will be discussed later. A top end 46b, 49b, 54b, 57b of the second type 46, 49, 54, 57 of fastening sheet is shaped to fit snugly to a curve of the top edge of the truck bed wall. The lower end 46a, 49a, 54a, 57a has an inverted L-shape with a length n at the base of the L-shape. The length n of the base of the L-shape is preferably the same distance as the gap m between the legs of the U-shape of the fastening sheet of the first type 45, 48, 53, 56 with its lower end 45a, 48a, 53a, 56a pointing upwardly. A lower fastener 3 is attached to the lower end 46a, 49a, 54a, 57a pointing downwardly such that the lower fastener 3 face outward from the truck bed so that it can be attached with the upper fastener 1 on the edge of the cover 17. Protective tape 9 is preferably applied to the surface of the second type 46, 49, 54, 57 of fastening sheet to prevent scratching the truck bed wall. One having ordinary skill in the art will realize that the protection tape 9 is mounted to the first and second type fastening sheet 45, 46, 48, 49, 53, 54, 56, 57 on the truck bed walls to limit scratching and is not required for the operation of the fastening device.

Referring to Figs. 3 and 4, the first and second type 45, 48, 53, 56 and 46, 49, 54, 57 of fastening sheets are utilized with the bed liner rails 18a, 20a, which may have a difference in height. A height H of the bed liner rail 18a of a long rail bed liner 18 (Fig. 3) is measured from a bottom tip 18c of bed liner rail 18a to a topmost surface 18d of bed liner rail 18a. A height H' of the bed liner rail 20a of a short rail bed liner 20 (Fig. 4) is measured from a bottom tip 20c of bed liner

5 rail 20a to a topmost surface 20d of bed liner rail 20a. The height H of the long rail bed liner 18 is typically greater than the height H' of the short rail bed liner 20 ($H > H'$).

When a single cover 17 is needed for the long and short rail bed liners 18, 20 whose edges 18b, 20b have different heights H, H', the position of lower fastener 3, which is defined by a distance X, X', is preferably equal for the long rail bed liner 18 and the short rail bed liner 20. The distance X, X' is measured between the topmost surface of the bed liner rail to the lower fastener 3.

Referring to Figs. 3 and 4, the first type of fastening sheet 45 with its lower end 45a pointing upwardly brings the lower fastener 3 toward the top most surface 18d of the bed liner rail 18a.

10 The second type of fastening sheet 46 with its lower end 46a pointing downwardly brings the lower fastener 3 away from the topmost surface 20d of the bed liner rail 20a. The first and second types of fastening sheets 45, 46 allow for using the same size cover 17 for bed liners 18, 20 which have different rail heights H, H'; therefore, there is no need to produce several sizes of the cover 17 resulting in saving production cost. The fastening devices of the present invention preferably use the first type of fastening sheet 45, 48, 53, 56 with the attached lower fastener 3 with the lower end 45a, 48a, 53a, 56a pointing upwardly for the long rail bed liner 18. The second type of fastening sheet 46, 49, 54, 57 with the attached lower fastener 3 with its lower end 46a, 49a, 54a, 57a pointing downwardly is preferably used for the short rail bed liner 20.

Referring to Figs. 5.1-12.3, the first and second type 45, 46, 48, 49, 53, 54, 56, 57 of fastening sheet are preferably constructed of a folded metal sheet. The preferred methods of securing the lower fastener 3 to the lower end 45a, 46a, 48a, 49a, 53a, 54a, 56a, 57a of the first and second type 45, 46, 48, 49, 53, 54, 56, 57 of fastening sheet are also disclosed.

Referring to Figs. 5.1-6.2, in a first preferred method, the lower fastener 3 is formed into a single fastening sheet on the lower end 45a, 46a of the first and second type 45, 46 of fastening sheet.

25 Referring to Figs. 7.1-8.3, in a second preferred method, the lower fastener 3 is riveted onto the lower end 48a, 49a of the first or second type 48, 49 of fastening sheet, respectively. A fastening base 50 is inserted through a hole 52, 65 in the lower end 48a, 49a of the first or second type 48, 49 of fastening sheet and a hole 3a in the lower fastener 3. Subsequently, an end 50a of the

fastening base 50 is hammered flat so that it spreads and holds the lower fastener 3 to the lower end 48a, 49a of the first or second type 48, 49 of fastening sheet.

Referring to Figs. 9.1-10.2, in a third preferred method, the lower fastener 3 is spot welded to the lower end 53a, 54a of the first or second type 53, 54 of a fastening sheet, exposing welded points 55.

Referring to Figs. 11.1-12.3, in a fourth preferred method, the lower fastener 3 is attached to the lower end 56a, 57a of the first or second type 56, 57 of fastening sheet by a screw fastener including a screw 6, a nut 7 and a washer 8. The screw 6 is inserted through the hole 3a in the lower fastener 3 and a hole 58, 66 in the lower end 56a, 57a of the first or second type 56, 57 of fastening sheet. The screw 6 is then tightened into the threaded hole in the nut 7 with the washer 8 and lower fasteners 3 placed between the screw 6 and the nut 7.

Referring to Figs. 17, 20-22, 26, 27, 29, 30 and 44-48, the preferred fastening device of the present invention also includes the use of supporting beam sets to keep the cover 17 taut for preventing water buildup on the cover 17. Preferably, at least one set of the supporting beams is utilized. The set of supporting beams is preferably comprised of two side beams 14, a middle beam 15 and two supporting beam bases 13. The supporting beam base 13 has a hole 29 running through the base 13 and grooves 28 on both sides for insertion of a screw 22. The base 13 acts as a support for the side and middle beams 14, 15. The bases 13 are preferably installed to the left and right bed liner walls adjacent to the side extended rails 18a. The number of supporting beam sets needed to support the cover 17 depends on the size of the truck bed 59; for example, three sets may be needed if the bed 59 is very long. The supporting beam base 13 is attached to the bed liner side wall by the screws 22 and nuts 23.

Referring to Figs. 20-22 and 44-48, the side beams 14 are preferably used in conjunction with the middle beam 15, as is shown in Fig. 44. The side beam 14 is preferably made of a metal rod having two ends 30, 14b. The first end 30 is bent downwardly for insertion into the hole 29 in the supporting beam base 13 while the second end 14b is preferably for inserting into the middle beam 15. The side beam 14 has a diameter i.

The middle beam 15 is preferably constructed of an aluminum extrusion and includes a groove 63 running through its entire length. The groove 63 has an opening 64 running through its length. A width g of the opening 64 is preferably smaller than a size h of groove 63, which is measured in a direction parallel to the width g of opening 64 ($h > g$). The size h of groove 63 is preferably more than the diameter i of the side beams 14 ($h > i$). The width g of the opening 64 is preferably less than the diameter i of the side beam 14 ($i > g$). When the side beam 14 is inserted into the groove 63, the smaller size g of the opening 64 will preferably prevent the side beam 14 from falling off the middle beam 15 in a direction perpendicular to the length of the middle beam 15. The middle beam 15 also includes a through threaded hole 31 (Fig. 45) in both ends for receiving screws 16. When the screw 16 is tightened into the threaded hole 31 and the side beam 14 is in the groove 63, the screw 16 presses on the side beam 14, resulting in firmly fixing the side beam 14 to the middle beam 15.

Referring to Fig. 26 and 49-51, cover straps 69 are preferably used to hold the cover 17 when it is rolled for storage. The straps 69 have a first end 69a attached with a male lock 71 and a second end 69b attached with a female lock 70. Both the male and female locks 71, 70 are preferably made of a polymeric or plastic material. The male lock 71 is releasably attached to the female lock 70 in an engaged configuration. The cover strap 69 is preferably placed between the cover retaining base 11 and bed liner front extended rail 18e. When the cover retaining base 11 is secured to the bed liner front extended rail 18e, the straps 69 are fastened to the cover retaining base 11. Another method for installing the cover straps 69 is by sewing the straps 69 with the male lock 71 to the bottom surface of the cover 17 and sewing the straps 69 with a female lock 70 to the top surface of the cover 17 near the front edge of the cover 17. Another type of releasably locking device that may be utilized to attach the first and second ends 69a, 69b is a snap fastener or another fastening mechanism that is releasable.

Referring to Figs. 5.1, 5.2, 7.1-7.3, 9.1, 9.2, 11.1-11.3, 25-40, a method for installation of the preferred fastening device for securing the flexible cover 17 to the long rail bed liner 18 is described below. This description cites the drawings which show the first type of fastening sheet with a formed lower fastener 3. The first type 45 of fastening sheet with other methods of attaching the lower fastener 3 will have the same or a similar installation method. The various

other methods of attaching the lower fastener 3 to the lower end 48a, 53a, 56a of first type 48, 53, 56 of fastener sheet are described above.

To install the fastening device of the first preferred embodiment, if the bed 59 of a pick-up truck 100 is already installed with the long rail bed liner 18, the bed liner 18 and the tailgate cover 19 are removed from the bed 59. In preparation for the installation of the cover 17 and retaining base 11, a number of holes 34 are drilled at predetermined positions on the bed liner front extended rail 18e (Figs. 26 and 28). In preparation for the installation of the supporting beam base 13, a number of holes 44 are drilled at predetermined positions on the left and right side walls of the long rail bed liner 18 adjacent the side extended rails 18a (Figs. 26 and 27).

- 10 Referring to Figs. 13 and 25, 26, 28, 29, 31, 32 protective tape 9 is preferably applied to surfaces of the truck bed 59 at the potential points of contact with the nuts 23, to prevent the truck bed 59 from scratching. The protection tape 9 is applied to the top surface of the truck bed front extended rail 5 and to the inner surface close to the top edge of bed side wall 4.

- 15 The cover retaining base 11, cover straps 69 and watertight rubber sheets 10 are installed onto the bed liner front extended rail 18e of the long rail bed liner 18. The straps 69 are placed between the cover retaining base 11 and the rubber sheet 10. The screws 22 are then inserted through the holes 36 in the cover retaining base 11, the holes 35 in the watertight rubber sheet 10 and the holes 34 in the bed liner front extended rail 18e and are tightened into the threaded hole in the nut 23. The anti-theft screw 24 is tightened into a threaded hole 42 at the end of the
20 groove 25 in the cover retaining base 11.

Referring to Figs. 17, 26, 27, 29, 30 and 44-48, the supporting beam base 13 is installed to the bed liner side walls adjacent the side rails 18a by inserting the screws 22 through the grooves 28 and the holes 44 and tightening the screws 22 into threaded holes in the nuts 23. The supporting beam bases 13 are installed at all points on the left and right walls of the long rail bed liner 18.

- 25 Referring Figs. 13, 14, 16 and 33-36, the cover 17 with the fastening strip 12 is attached to the long rail bed liner 18 by inserting the knob 26 into the groove 25 in the cover retaining base 11. The cover 17 is slid to the middle of the long rail bed liner 18 and the anti-theft screws 24 are tightened into the threaded hole 43 at the end of the groove 25 in the cover retaining base 11.

Referring to Figs. 26 and 37, the truck bed 59 is covered with the bed liner 18 and the tailgate cover 19 is placed into the tailgate 60 without attaching the bed liner 18 to the truck bed 59 or the tailgate cover 19 to the tailgate 60.

5 Referring to Figs. 3, 5.1, 5.2 and 38, 39 the bed liner side extended rail 18a of the long rail bed liner 18 is raised and the first type 45 of fastening sheet with the lower end 45a pointing upward is inserted between the bed liner side extended rail 18a and the top edge of bed side wall 4. A plurality of the first type 45 of fastening sheets are placed under the raised portion of the bed liner side extended rail 18a. The bed liner side extended rail 18a is laid onto the first type 45 of fastening sheets.

10 Referring to Figs. 5.1, 5.2, 26 and 37, the tailgate cover top extended rail 41 is raised above the tailgate 60 and the first type 45 of fastening sheet with attached lower fastener 3 with its lower end pointing upward is positioned between the tailgate cover top extended rail 41 and the top edge of the tailgate. A plurality of the first type 45 of fastening sheets are inserted under the tailgate cover top extended rail 41 and the top extended rail 41 is dropped to sandwich the
15 plurality of first type 45 of fastening sheets to the tailgate 60.

Referring to Figs. 1, 40 the cover 17 is spread over the bed liner 18, covering the tailgate cover top extended rail 41. The back edge of the cover 17 is then pulled tight. The first type 45 of fastening sheets are slid to the corresponding positions of each of the upper fasteners 1 along the two side edges and rear edge of flexible cover 17.

20 The long rail bed liner 18 is secured to the truck bed 59 and the tailgate cover 19 is secured to the tailgate 60 by any method. For example, a device of U.S. Pat. No. 6,203,090 B1 results in the bed liner side extended rail 18a of the long rail bed liner 18 being firmly pressed down on the first type 45 of fastening sheets, thus the first type 45 of fastening sheets are fixed in place firmly. The tailgate cover top extended rail 41 is also firmly pressed down on the first type 45 of
25 fastening sheets, thus the first type 45 of fastening sheets are also firmly fixed in place on the tailgate 60.

Referring to Figs. 20-22, 29, 30 and 44-48, the flexible cover supporting beam set is assembled by inserting the second end 30 of the side beams 14 into the left and right ends of the groove 63

of the middle beam 15. The screws 16 are loosely tightened into the threaded holes 31 so that the length of the supporting beam set can be adjusted by sliding the side beams 14 in or out of the middle beam 15.

The bent end 30 of the side beam 14 is placed into the hole 29 in the supporting beam base 13 on the left and right wall of the long rail bed liner 18. The middle beam 15 is moved to the center of the bed liner 18 and the screws 16 are tightened to secure the side beams 14 to the middle beam 15.

Referring to Figs. 1, 3 and 46, the side and rear edges of the flexible cover 17 are spread to cover the long rail bed liner 18 and the upper fasteners 1 are pressed to attach with the lower fasteners 3 at all positions on the bed liner side extended rails 18a and the tailgate cover top extended rail 41.

Referring to Figs. 4, 6.1, 6.2, 42 and 43, the installation steps of the fastening device for securing the flexible cover 17 to the short rail bed liner 20 are generally the same as the case of long rail bed liner 18 as was described above. The second type 46 of fastening sheet with the lower fastener 3 attached to the lower end 46a pointing downward are slid to corresponding positions of the upper fasteners 1 on the two side edges and rear edge of the flexible cover 17 similar to the installation of the first type 45 of fastening sheets onto the long rail bed liner 18. However, the lower ends 46a of the second type 46 of fastening sheets are bent downwardly to accommodate the same size cover 17 as was used with the long rail bed liner 18.

It will be appreciated by those skilled in the art that changes could be made to the embodiments described above without departing from the board inventive concept thereof. It is understood, therefore, this invention is not limited to the particular embodiments disclosed, but is intended to cover modifications within the spirit and scope of the present invention, as defined by the appended claims.

Throughout the specification, unless the context requires otherwise, the word "comprise" or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

CLAIMS

1. A fastening device for securing a flexible cover to a bed liner of a truck bed, the truck bed has a tailgate which acts as a rear wall of the truck bed, the bed liner has a tailgate cover which acts as a rear wall of the bed liner, the bed liner has at least one extended rail that
5 extends from a top edge of a wall for a length in a direction outwardly from the bed and slopes downward for a length and at an angle, the flexible cover is large enough to cover the bed liner and the bed liner extended rail, the fastening device comprises:

at least one snap fastener which is comprised of an upper fastener and a lower fastener, the upper fastener may be attached to the lower fastener in such a manner that it can be detached
10 and reattached, the upper fastener is attached to the edge of the cover, the lower fastener is attached to a fastening sheet; and

the fastening sheet includes a first end and a second end, the first end being a top end and the second end being a lower end, the top end is shaped to conform to a curve of a top edge of a truck bed wall, when installed, the top end is placed between the bed liner extended rail and the
15 top edge of the truck bed wall, the lower end extends from the upper end and protrudes beyond a bottom tip of the bed liner extended rail for a length, the lower fastener is attached to a portion of the lower end that protrudes beyond the bottom tip of bed liner extended rail in a manner that faces outwardly from the bed for attaching with the upper fastener, when the bed liner is secured to the truck bed, the bed liner extended rail presses on a top surface of the fastening sheet and
20 fixes the fastening sheet in place on the truck bed wall, the upper fastener is attached to the lower fastener resulting in securing the cover to the bed liner.

2. The fastening device of claim 1 wherein a plurality of snap fasteners are used, the upper fasteners are attached to edges of the cover at intervals, the fastening sheet with attached
25 lower fasteners is placed between the bed liner extended rails and the top edge of truck bed walls at corresponding positions to the upper fasteners.

3. The fastening device of claim 1 wherein the fastening sheet has the lower end which points upward, the cross-section of the lower end is U-shaped, one leg of the U-shaped lower end is extended from the top end for a length then curved in a direction outwardly the bed and extending upward to be the other leg of the U-shaped lower end, the distance between the
30 two legs of U-shaped lower end is larger than a thickness of an edge of the bed liner extended

rail for accommodating the edge of the bed liner extended rail when installed, the lower fastener is attached to an outer leg of the U-shaped lower end which points upwardly in a manner that faces outward from the bed for attachment with the upper fastener.

4. The fastening device of claim 1 wherein the fastening sheet has the lower end pointing downwardly, the cross-section of the lower end is an inverted L-shape, a base of the L-shape is extended from a top end for a length in the direction pointing outwardly from the bed, a leg of the L-shape is extended downwardly from the base of the L-shape, the lower fastener is attached to the leg of the L-shape in a manner that faces outward from the bed for attachment with the upper fastener.

5. The fastening device of claim 1 wherein the fastening sheet is made from one piece of metal sheet which is formed to have a lower fastener shaped on the lower end of the fastening sheet.

6. The fastening device of claim 1 wherein the fastening sheet is made from metal sheet and the lower fastener is attached to the lower end of the fastening sheet by a rivet.

7. The fastening device of claim 1 wherein the fastening sheet is made from metal sheet and the lower fastener is attached to the lower end of the fastening sheet by spot welding.

8. The fastening device of claim 1 wherein the fastening sheet is made from metal sheet and the lower fastener is attached to the lower end of the fastening sheet by a screw.

9. The fastening device of claim 1 further comprising:
a protective tape attached to the fastening sheet for preventing a surface of the truck bed from scratching through contact with the fastening sheet.

10. A fastening device for securing a front edge of a flexible cover to a bed liner front extended rail, the bed liner front extending rail extended from a top edge of a bed liner front wall for a length in a direction outwardly from the truck bed and sloping downwardly for a length and at an angle, the fastening device comprising:

a fastening strip which is made from a flexible material, the fastening strip cross-section having two ends, a first end being attached to the flexible cover and a second end being knob-shaped;

at least one cover retaining base having a cross-section which has two ends, one end having a groove running through an entire length of at least one cover retaining base, the groove having an opening running through an entire length of the groove, a width of the opening being less than a size of the groove, a size of the knob is less than the size of the groove, the knob can be slid into the groove in a direction parallel to the length of the groove, the at least one cover retaining base being attached to the bed liner front extended rail; and

two anti-theft screws, when the fastening strip is attached to the cover retaining base by inserting the knob in the groove in the cover retaining base, the width of the opening is less than the size of the knob, thus the groove keeps the knob from falling off the at least one cover retaining base in a direction perpendicular to the length of the at least one cover retaining base, tightening anti-theft screws into the threaded holes of the groove at the two ends of the cover retaining base to block the fastening strip from sliding out of the groove.

11. The fastening device of claim 10 further comprising:

at least one watertight rubber sheet placed between the at least one cover retaining base and the bed liner front extended rail.

12. A supporting beam set for keeping a flexible cover taut, the flexible cover can be attached to a bed liner, the supporting beam set comprising:

a middle beam which is a tube having a groove running through an entire length of the middle beam, the groove having an opening running through the entire length of the groove, each end of the middle beam having a threaded hole that runs through the middle beam in a direction perpendicular to the length of the middle beam;

two side beams which are comprised of rods having two ends, one end being bent downward while the other end is insertable into the middle beam, the opening of the groove of the middle beam being smaller than a size of the side beam resulting in blocking the side beam from falling off of the groove in a direction perpendicular to the length of the middle beam when the side beam is assembled to the middle beam, a top surface of the side beam lies flush with a top surface of the middle beam in an assembled configuration resulting in the creation of a continuous curve for supporting the flexible cover;

two supporting beam bases which include a hole for insertion of the bent end of the side beam, one of the supporting beam bases is attached to a bed liner wall and the other supporting beam base is attached to an opposite bed liner wall; and

screws releasably mounted to the threaded hole in the middle beam, when one of the screws is tightened into the threaded hole in the assembled configuration to apply pressure on the side beam, the side beam is fixed to the middle beam, when the screw is released from the threaded hole, the side beam is slidable in the groove of the middle beam.

5 13. A fastening device as substantially herein described with reference to the drawings excluding figures 18, 19, 23.1, 23.2, 24.1, 24.2.

14. A support beam set as substantially herein described with reference to the drawings excluding figures 18, 19, 23.1, 23.2, 24.1, 24.2.

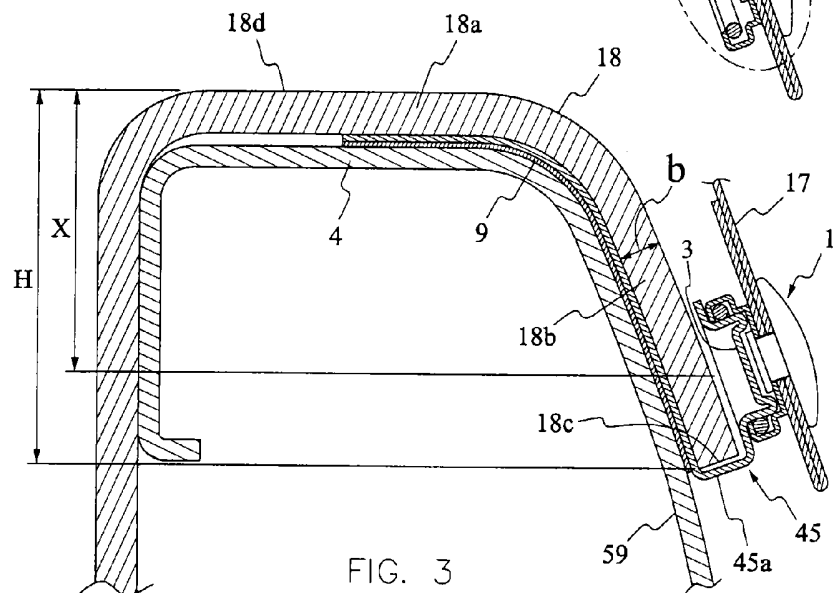
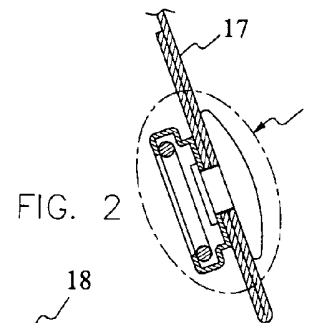
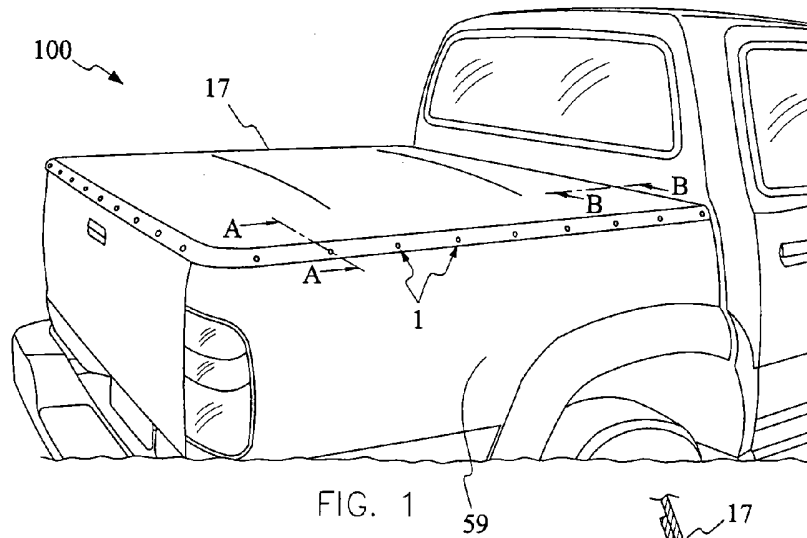
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Applicant

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Patent Attorneys for the Applicants

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Sheet 1 of 18



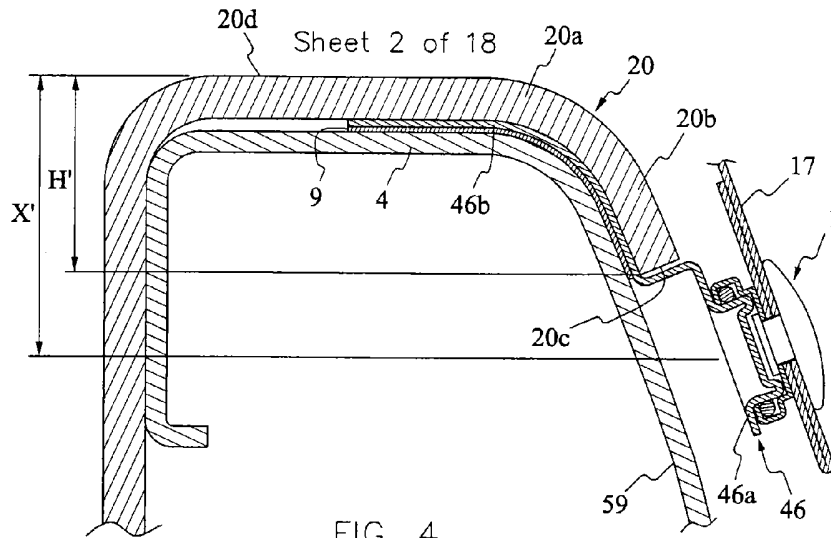


FIG. 4

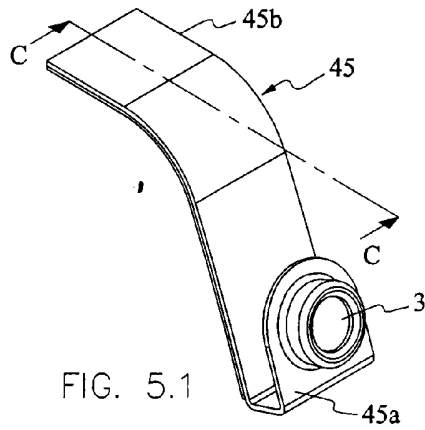


FIG. 5.1

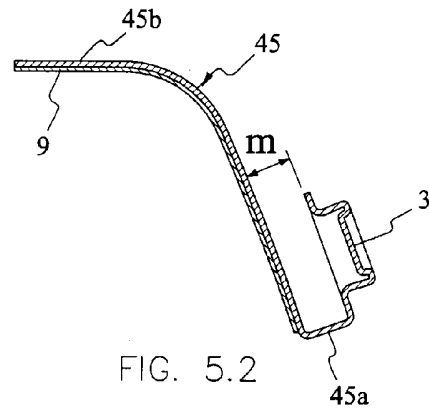


FIG. 5.2

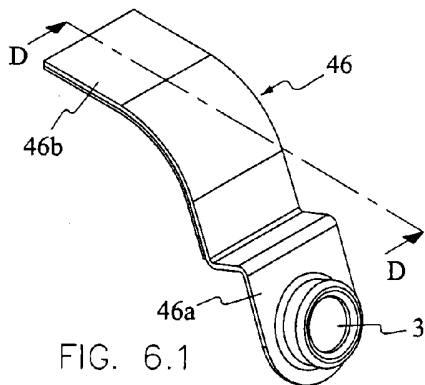


FIG. 6.1

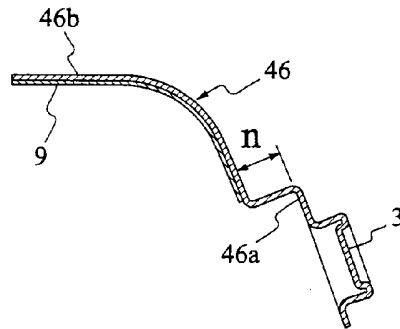
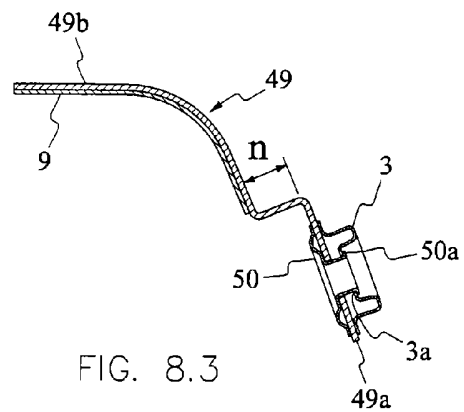
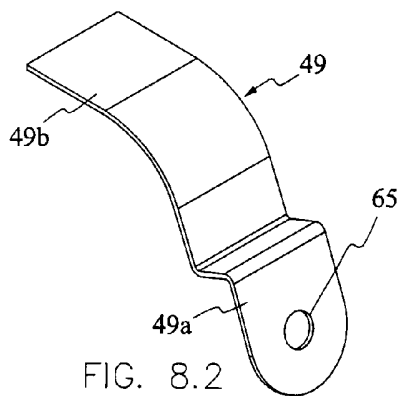
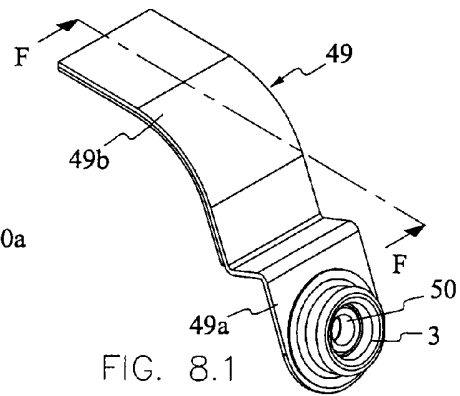
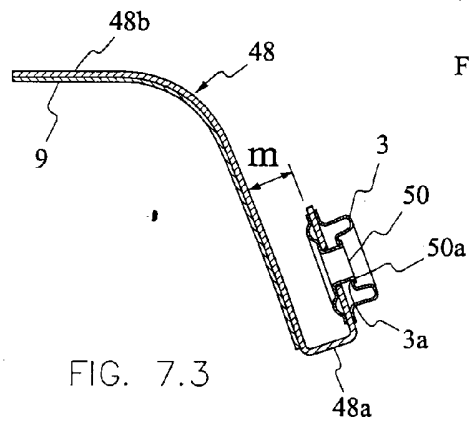
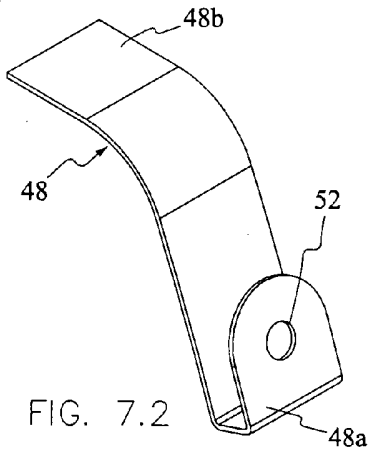
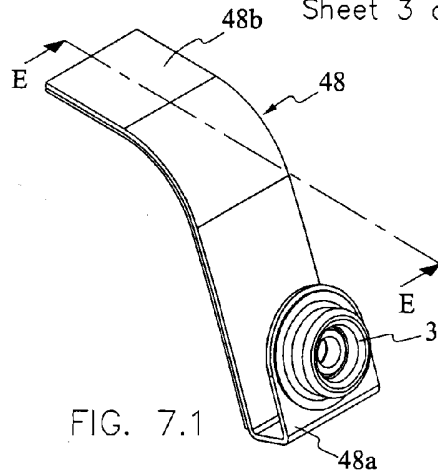
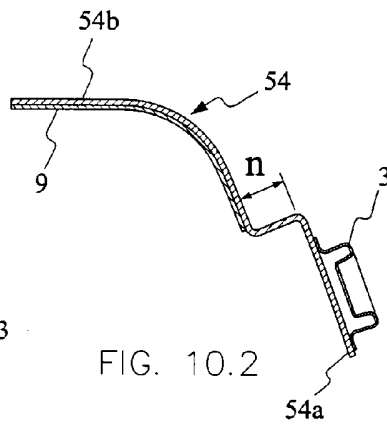
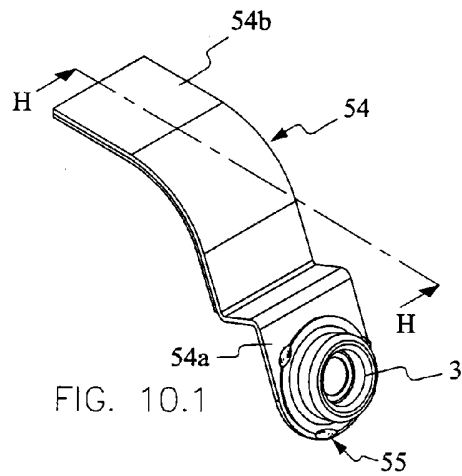
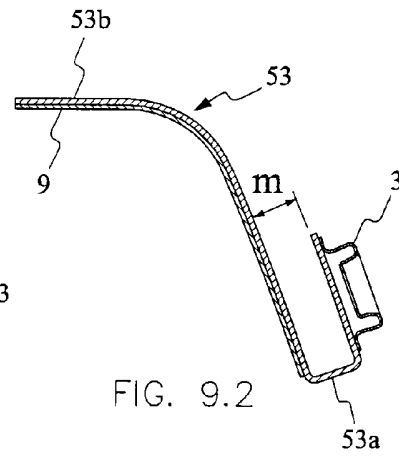
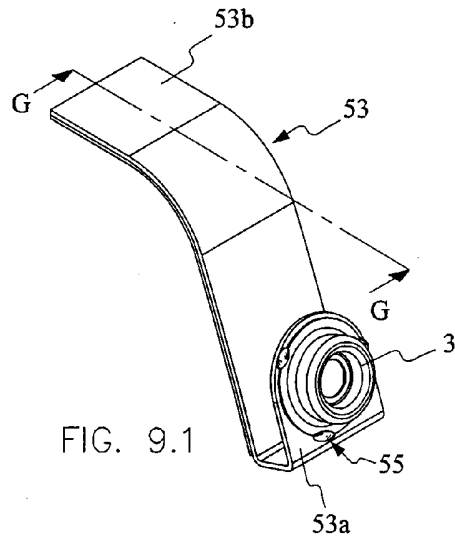
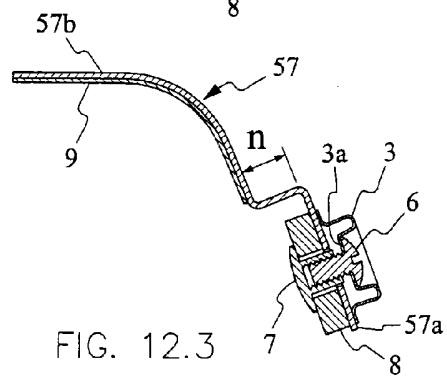
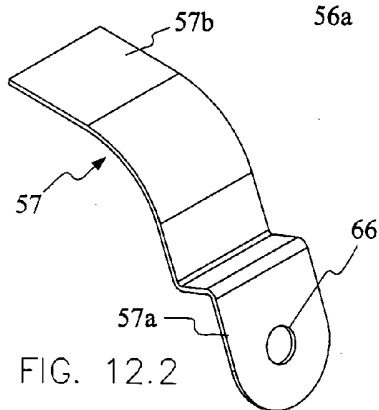
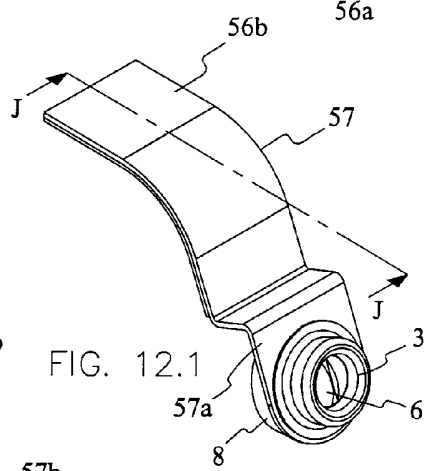
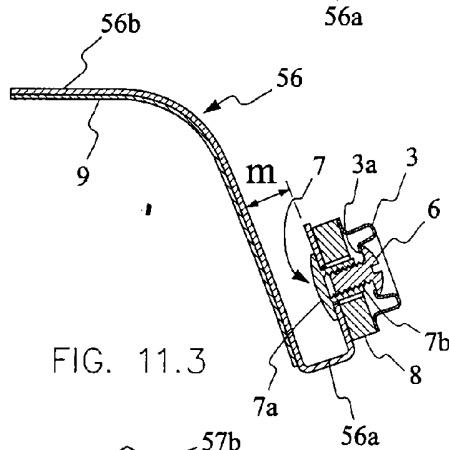
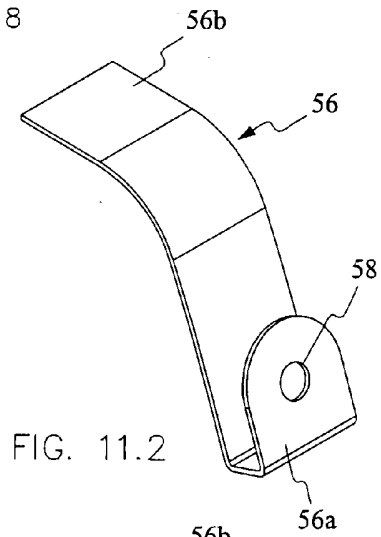
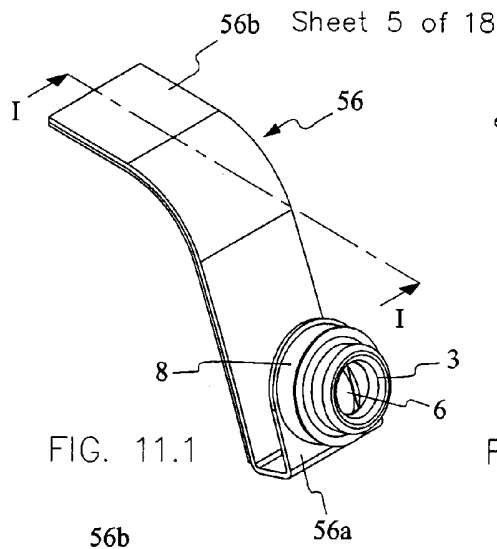


FIG. 6.2

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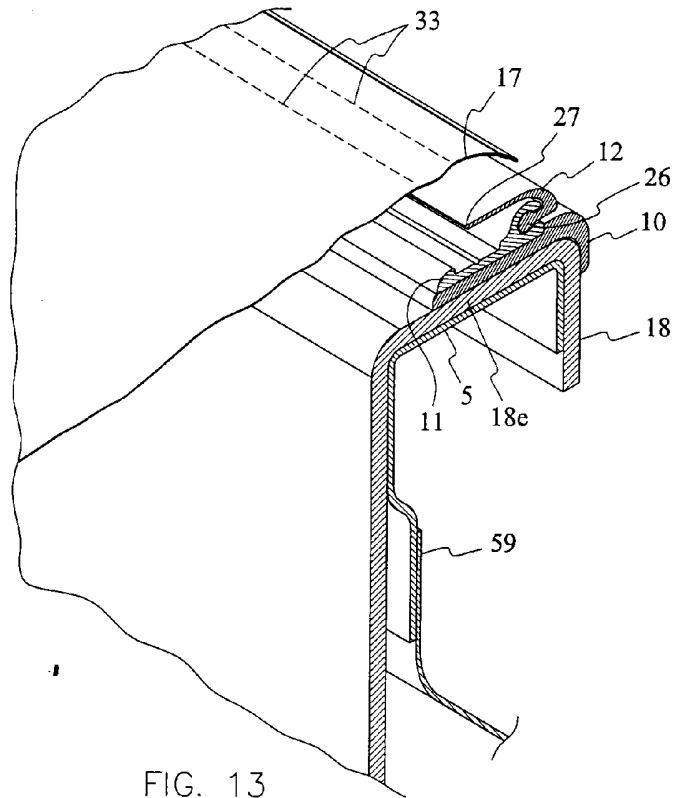


FIG. 13

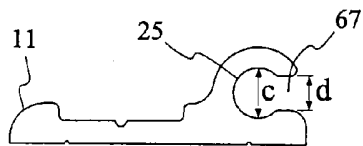


FIG. 14

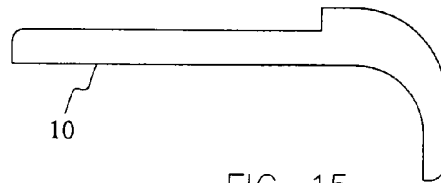


FIG. 15

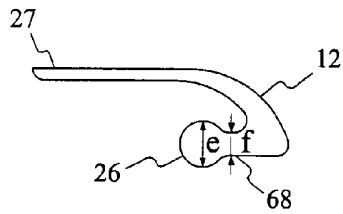


FIG. 16

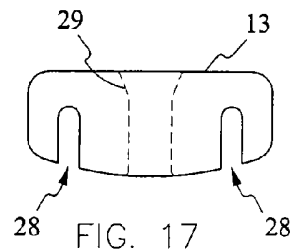


FIG. 17

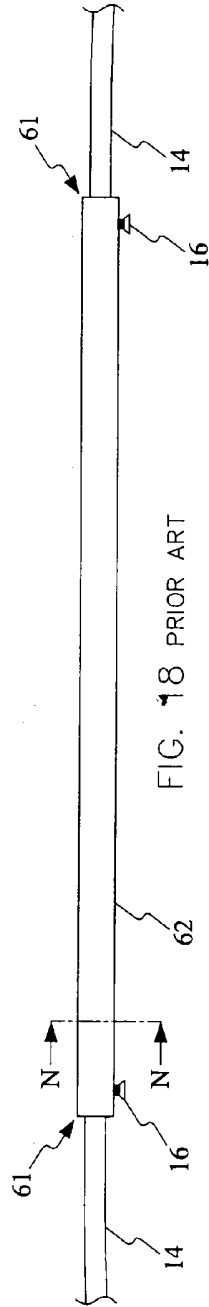


FIG. 18 PRIOR ART

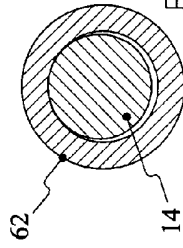


FIG. 19 PRIOR ART

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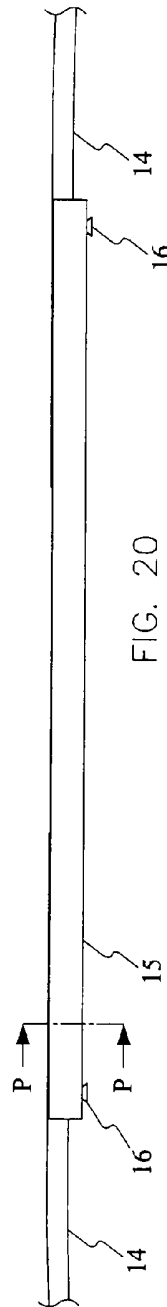


FIG. 20

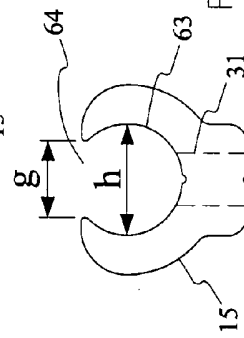


FIG. 21

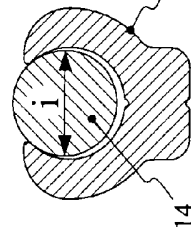


FIG. 22

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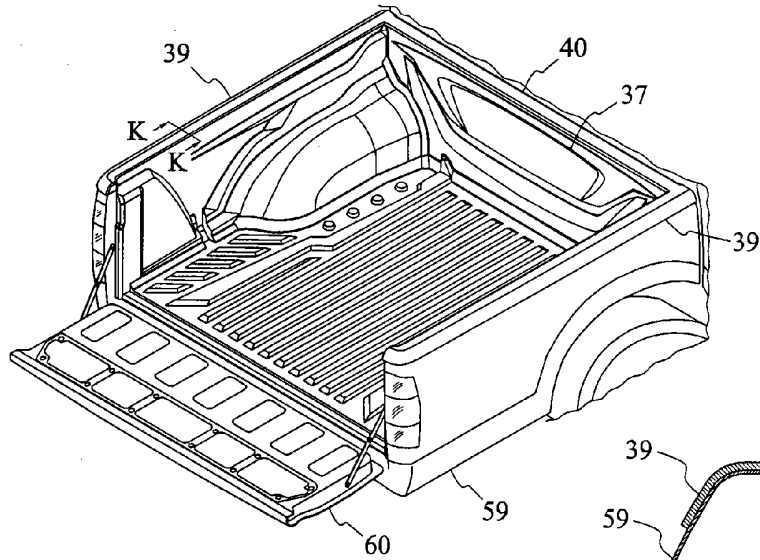


FIG. 23.1 PRIOR ART

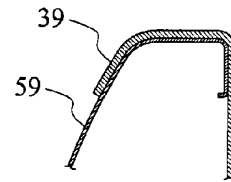


FIG. 23.2 PRIOR ART

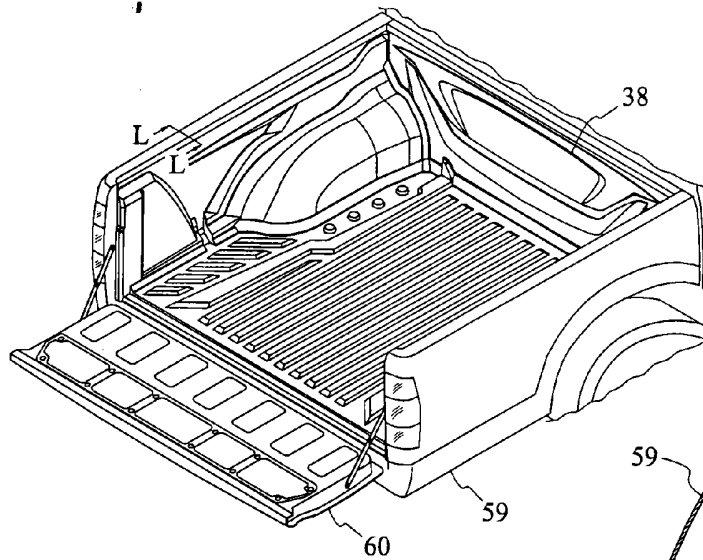


FIG. 24.1 PRIOR ART

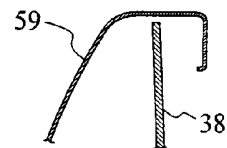
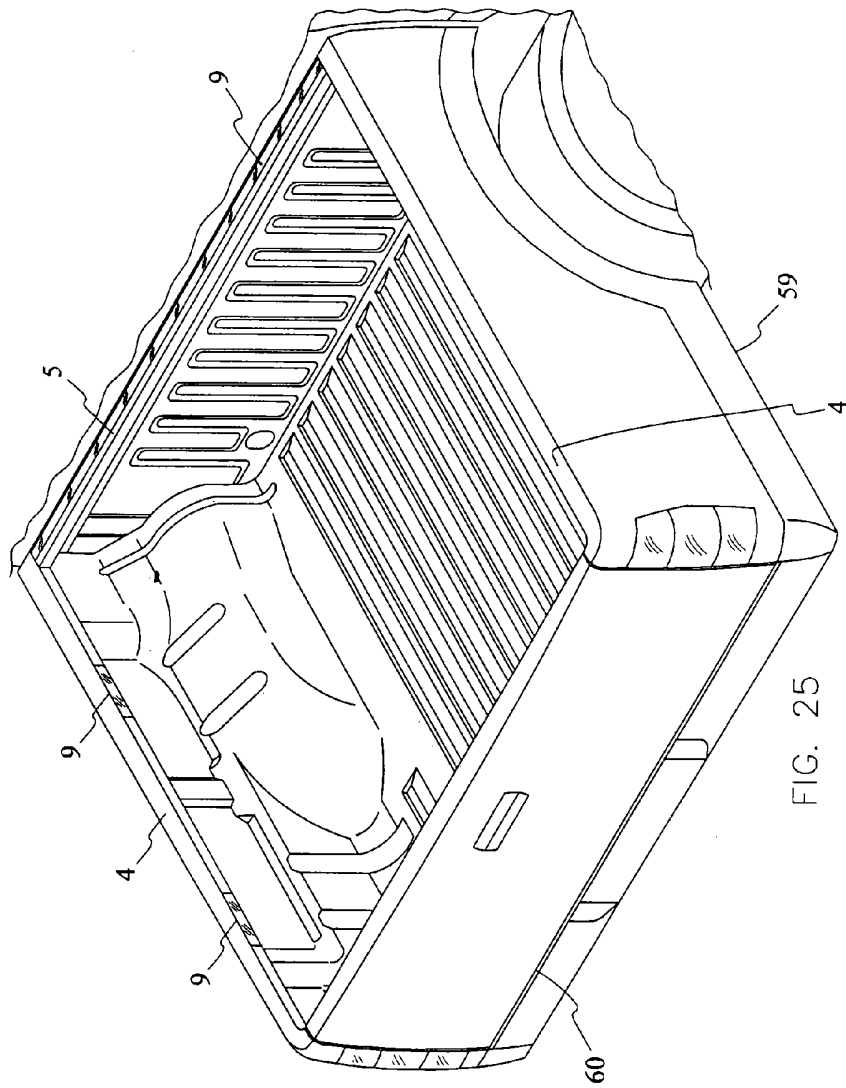
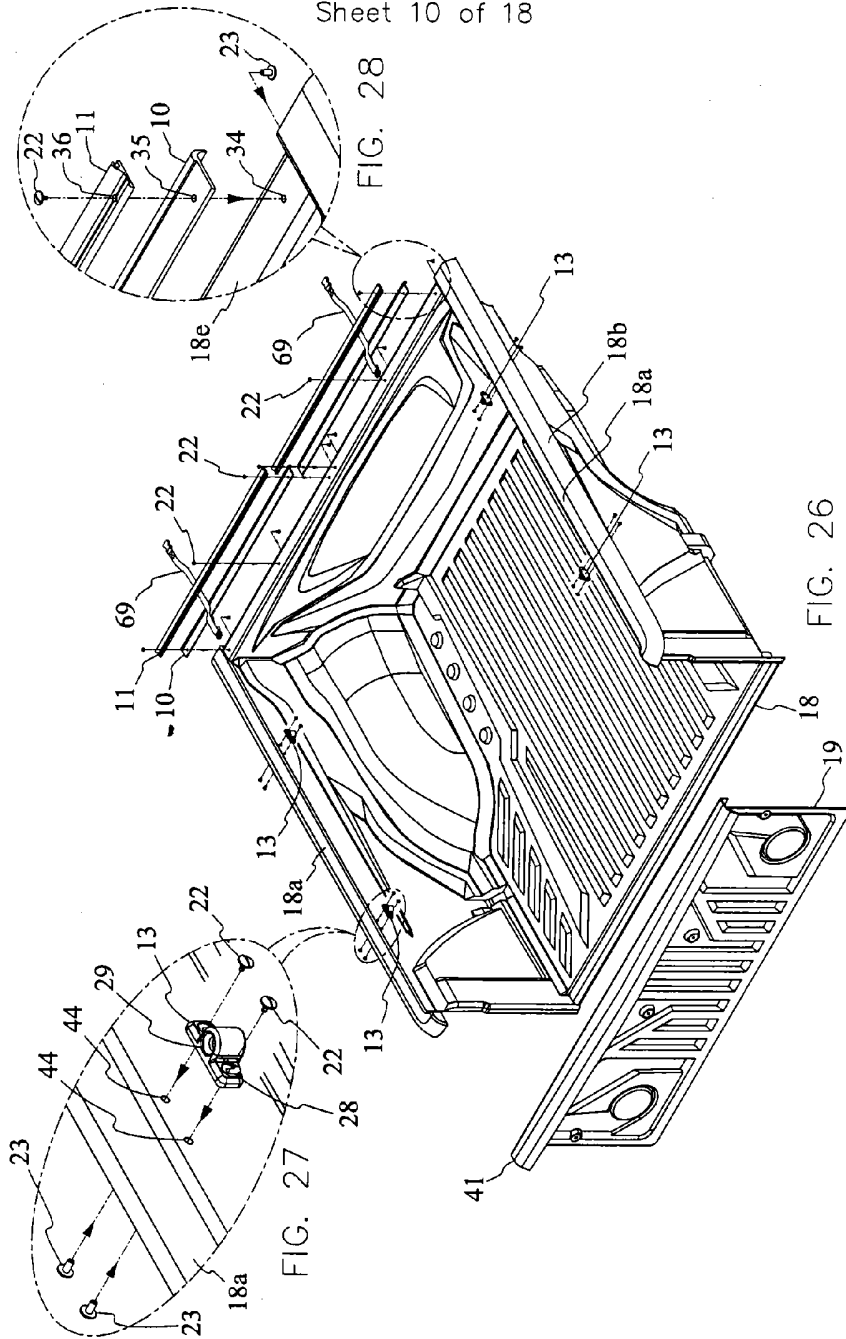


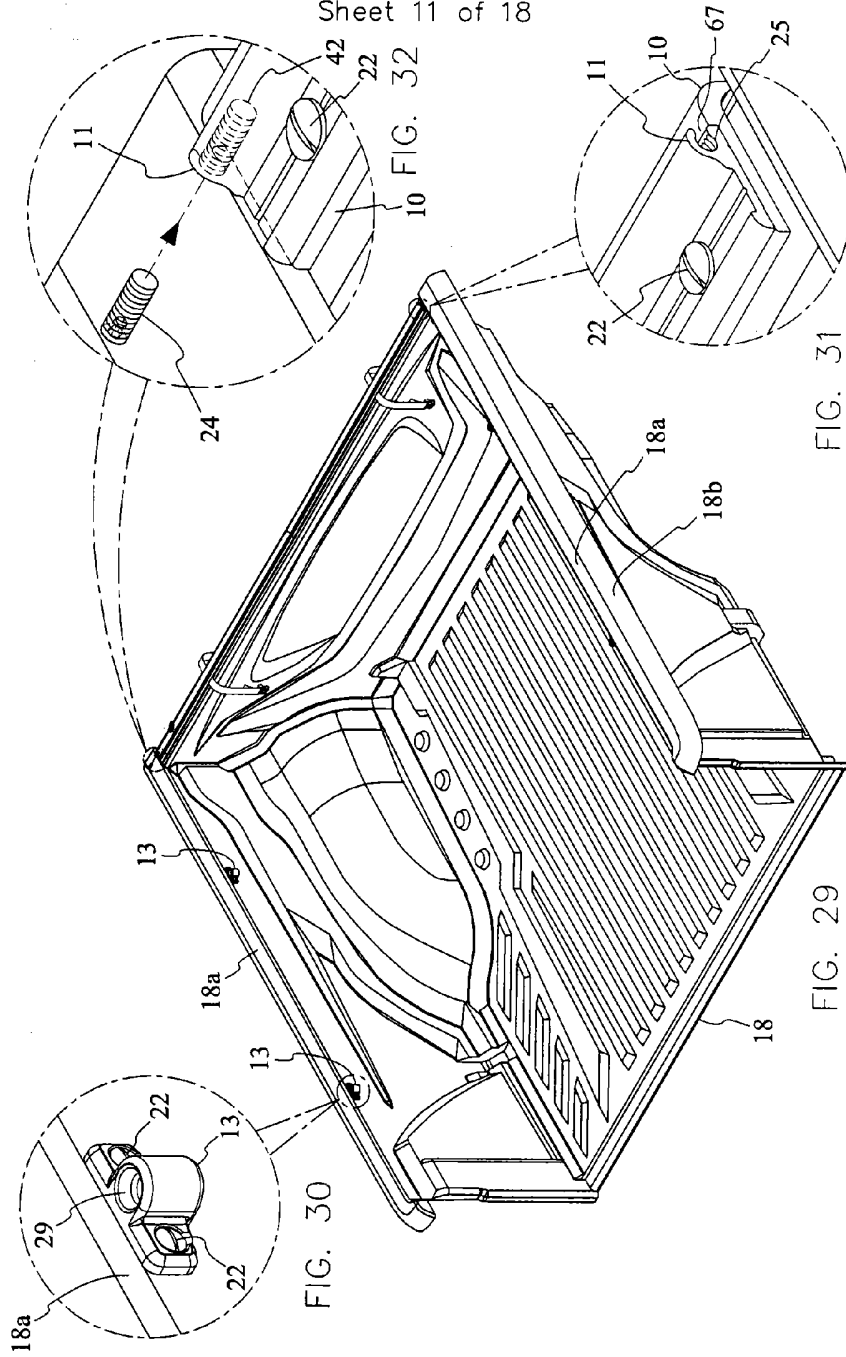
FIG. 24.2 PRIOR ART

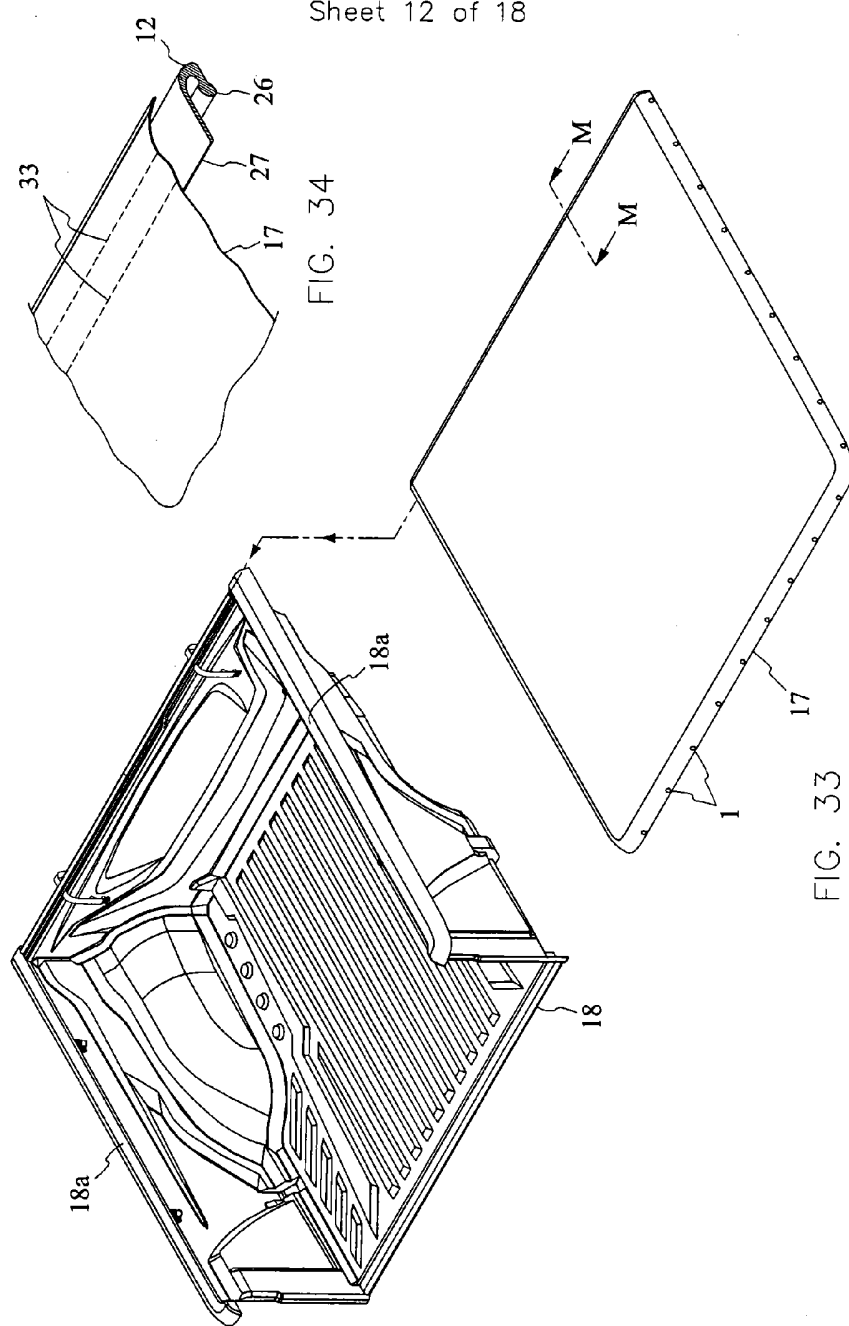


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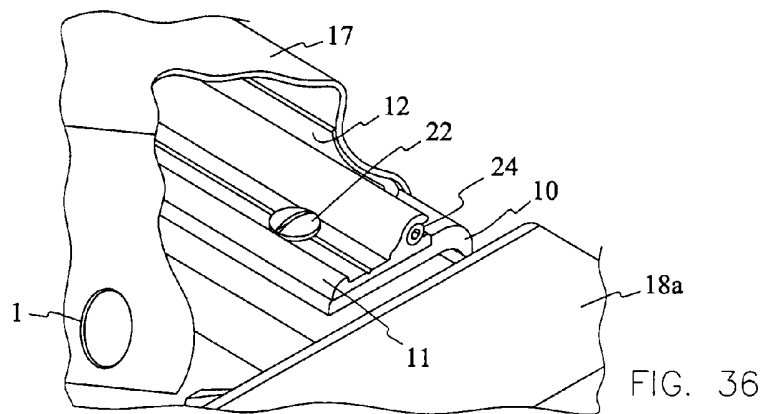
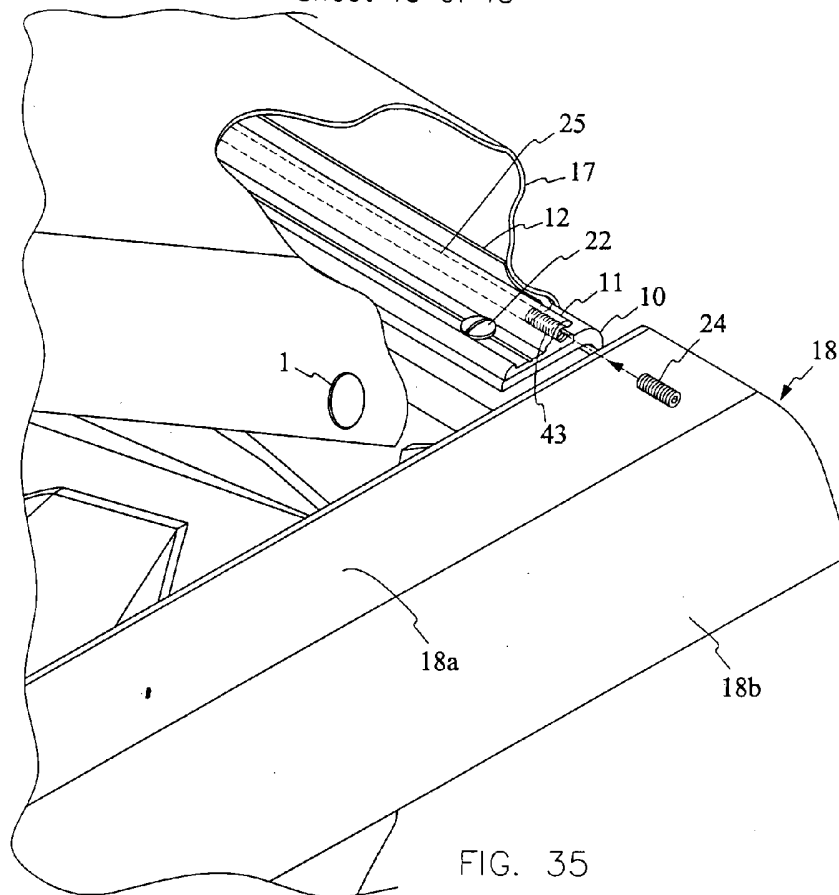


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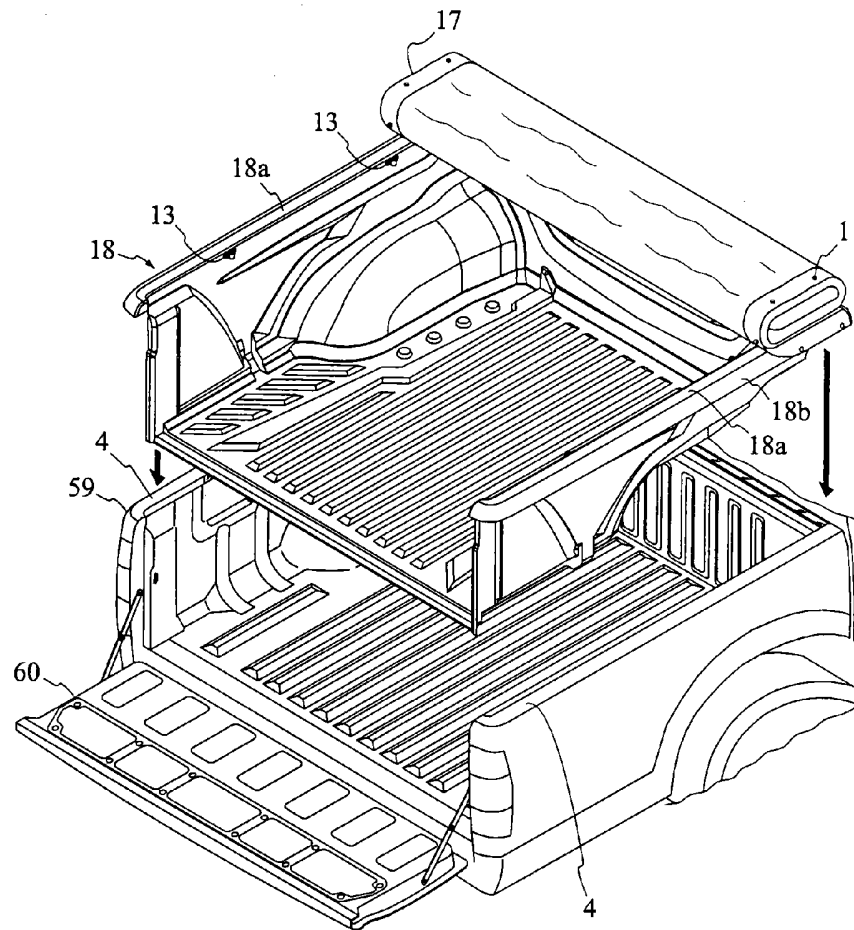


FIG. 37

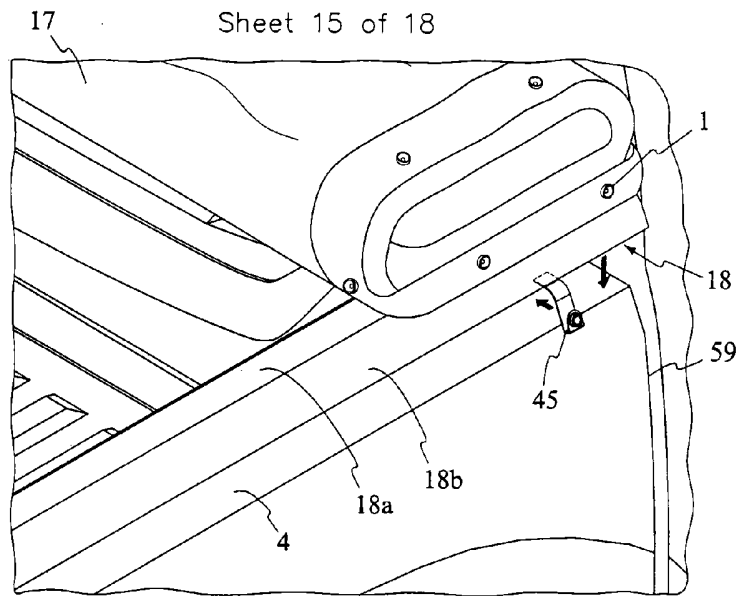


FIG. 38

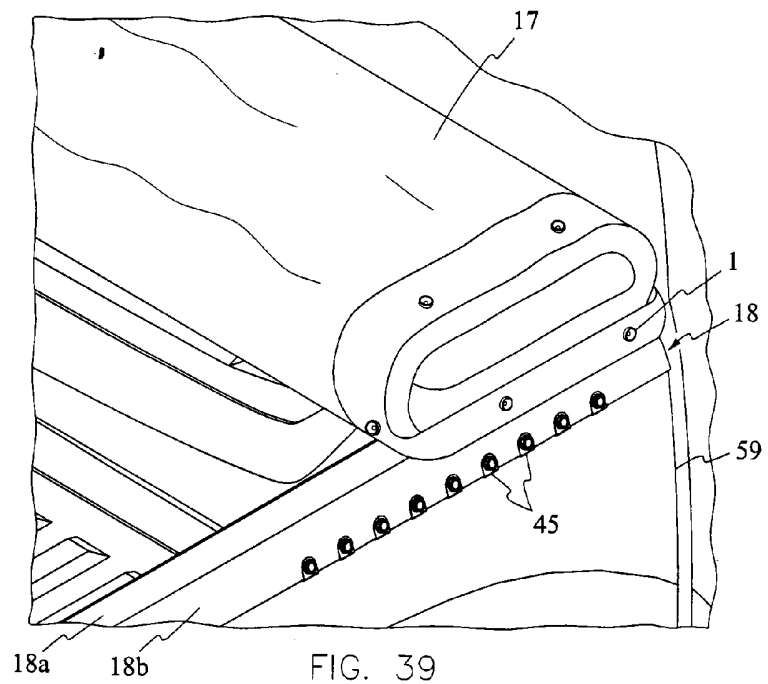
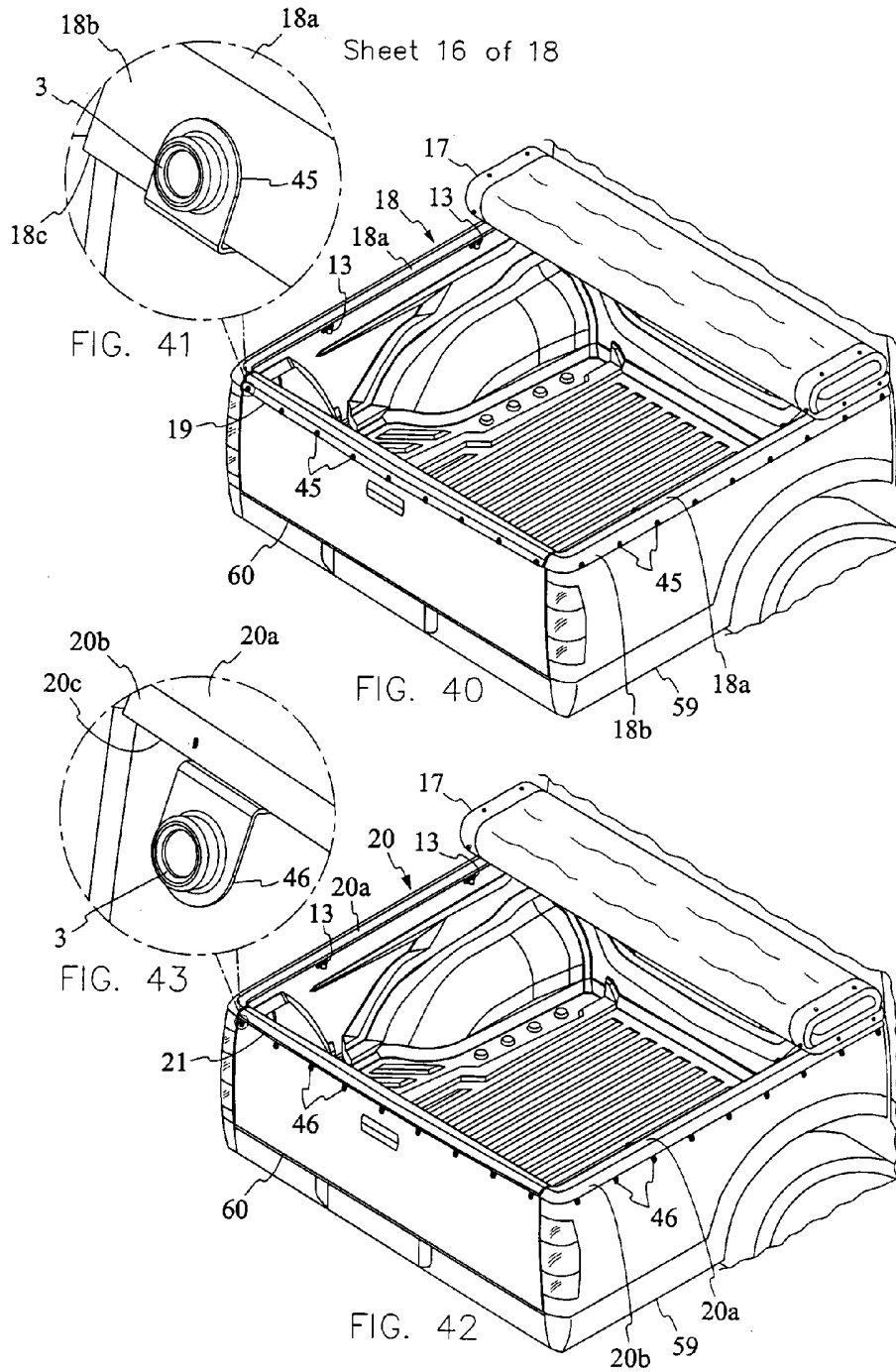
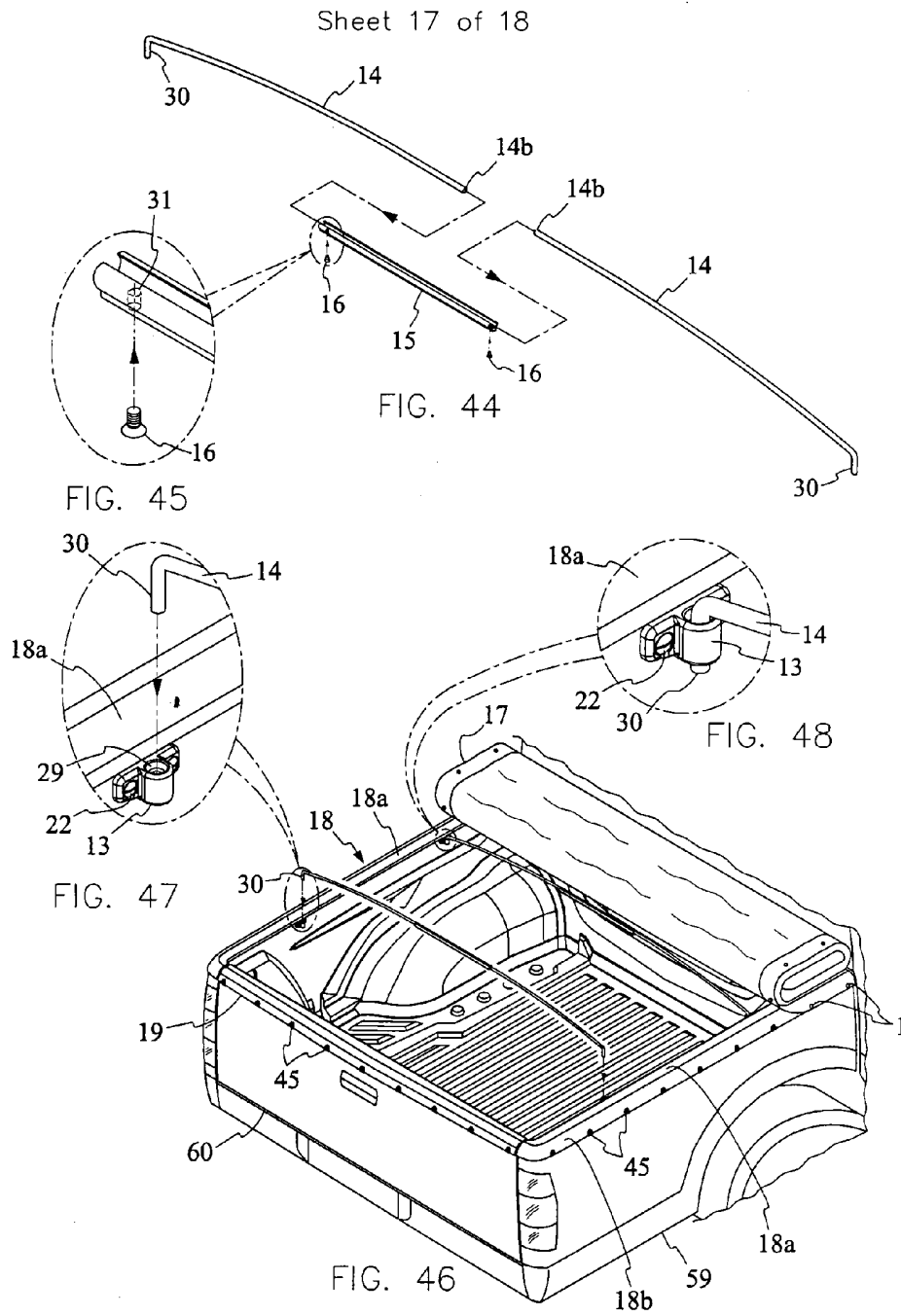


FIG. 39





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