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(54) Title: AN ASSEMBLY FOR MOUNTING A HANDLE ON A VEHICLE DOOR

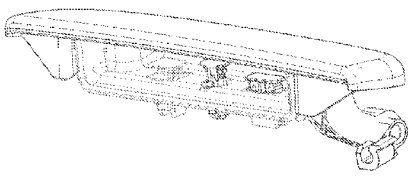


FIG. 1

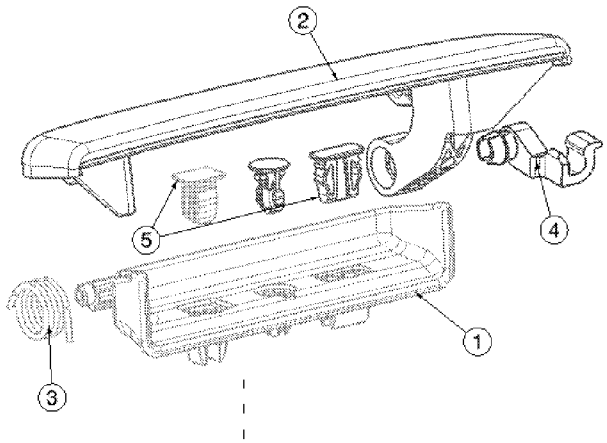


FIG. 2

(57) Abstract: A vehicle door handle assembly comprising a handle part, a base part, handle part being provided with means for forming an operable connection to door latching mechanism of vehicle, handle part being pivotally connected to the base part for executing a pivoting movement between door latching position and door unlatching position, and the base part is provided with at least a restraining means for restricting movement of the base part relative to the plane of the abutting surface and at least a retaining means for securing said assembly to the vehicle door, the retaining means is configured to engage with corresponding aperture provided on the surface of the vehicle door.

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AN ASSEMBLY FOR MOUNTING A HANDLE ON A VEHICLE DOOR

FIELD OF THE INVENTION

The present invention relates to the field of vehicle door handles. The invention finds particular application in mounting a handle on a vehicle door and will be described with particular reference thereto. However, the principle of the invention finds application in a variety of applications where a handle fixture is required that is easy to install and maintain without the use of specialist tools.

BACKGROUND OF THE INVENTION

In general vehicle doors are provided with a handle assembly, to allow the user to easily open and close the door. Normally, in conventional approaches, the handle assembly is mounted to the vehicle door using a combination of two hooks and a snap to make hands free and finally mounted with a screw, a combination of two locators and two screws, or a combination of two hooks and one screws. Such combinations of handle assemblies firmly secure the handle into the vehicle door.

However, with respect to these conventional approaches, it is very difficult and time consuming to affix and remove the handle assembly to or from the vehicle door as it is fixed using hooks, screws and special tools, which burden the operator in the assembly line process. Furthermore, during maintenance and servicing the removal and re-fixing of the handle is tedious and time consuming. Moreover, the mounting is decided based on the over load requirements, cost and space available for the mounting features. Therefore, it is desirable to provide a vehicle door handle assembly, which is capable of overcoming the aforementioned drawbacks.

SUMMARY OF THE INVENTION

An object of the present invention is to provide an assembly for mounting a handle on a door, which enable easy and rapid mounting of the door handle without the need for hooks, screws and specialist tools.

According to one aspect, the present invention achieves the objectives, relates to an assembly for mounting a handle on a door. The exterior door handle assembly includes a housing part with integral male pivoting features, a lever part with integral female pivoting features, a torsion spring to ensure the lever comes back to its home position after release, abatements to keep the link rod intact with the lever arm, and locking plugs. The locking plugs include, but are not limited to square shaped locking lugs, round shaped locking plugs and rectangular locking plugs. In the base part, two round projections are made to act as pivots. In one corner of the pivot, space is created for a spring assembly and the pivot is longer at this end to fix the spring. Steps are provided over the pivot projection to control the lateral movement between the handle part and the base part. On the surface of the base part abutting the vehicle body a rib is provided to locate one of the spring arms/legs. There is a stopper rib above the pivot axis to control the degree of rotation for the handle part. 2 and 4 way locators are provided to ensure the position of the handle with respect to the vehicle door. Two sets of snaps are designed on the surface of the base part abutting the vehicle body with an aperture therein to receive a locking plug.

The handle part includes an arm integrally formed with two pivot pockets. The pivot projections of the base part are assembled into the pivot pockets of the handle part allowing only rotational movement along this axis. There are two ribs to locate the one arm of the spring. The swan neck arm has the provision to allow the link rod to the vehicles latching/un-latching mechanism to be connected with the assistance of an abatement part. The torsion spring is assembled over the base part pivot projection and together assembled on to the handle part. The spring facilitates the lever to return to the home position after release. The abatement is the part which allows free

rotation of the link rod inside the hole of the swan neck arm of the handle part and keeps the joint between the link rod and lever secured. The locking plugs are designed to ensure the positive mounting of the handle assembly on the vehicles body.

A vehicle door handle assembly comprising a handle part and a base part, wherein said handle part being provided with means for forming an operable connection to door latching mechanism of vehicle, said handle part being pivotally connected to said base part for executing a pivoting movement between door latching position and door unlatching position, and said base part being provided with restraining means for locating said base part in position on the vehicle door panel and also to restrict the lateral movement of said base part relative to the plane of abutment of the handle assembly with the vehicle door panel and retaining means for releasably securing said assembly to the vehicle door panel.

The handle part is biased to return to its home position following actuation of said door latching mechanism. The resilient means is a torsion spring, provided with two legs opposed to each other to facilitate return of the handle part to the home position. The restraining means is integrally formed with the base part and configured to pass through corresponding locator recess provided on the vehicle door panel for restricting the lateral movement of the base plate relative to the plane of abutment. The base part is provided with a plurality of retaining means, wherein at least one of the retaining means is integrally formed with the base part, and comprises resilient outwardly protruding tabs, the resilient outwardly protruding tabs being configured to snap fit into corresponding recesses provided with the vehicle door panel.

The base part is provided with at least an integrally formed flexible outwardly protruding tab assembly configured to receive a locking plug, the locking plug on primary insertion creates a pre-clipped condition of the flexible outwardly protruding tab assembly, thereby allowing the flexible outwardly protruding tabs to pass through the aperture in the vehicle body, and upon application of additional force on the locking plug the passes further into the

aperture of the flexible outwardly protruding tab assembly forming a releasable firm clipped condition of the base part with the vehicle body. The means for forming an operable connection to door latching mechanism of vehicle is an elongated arm provided on the base part, the elongated arm, on installation of the vehicle door handle assembly, extends through an opening provided on the vehicle body for establishing an operable connection with the vehicle door latching mechanism. The base part and handle part have integrally formed stopper ribs to restrict the pivotal movement of the handle part relative to the base part, so that when desired unlatching position is achieved said stopper ribs abut each other thereby preventing any further angular movement of the handle part.

The base part is provided with a hook arrangement adapted to engage with a corresponding hole provided on the vehicle door panel; the hook arrangement together with at least one of the retaining means is adapted to releasably secure the base part with the vehicle door panel. The base part is provided with at least one flexible outwardly protruding tab assembly, comprising at least two flexible outwardly protruding tabs disposed opposite to each other, each having a flat inside surface configured to receive a locking plug and an outside surface having a protrusion perpendicular to the angle of the inside surface configured to engage with the vehicle door panel on insertion of the locking plug between the flexible outwardly protruding tabs, the locking plug on initial insertion is adapted to create a pre-clipped condition, allowing the flexible outwardly protruding tab assembly to pass through corresponding aperture formed with the vehicle door panel; on application of additional force, the locking plug passes further into the flexible outwardly protruding tab assembly forming a releasable firm clipped condition of the base part with the vehicle door panel. The locking plug is provided with taper ribs for engaging the locking plug in pre-clipped position between the flexible outwardly protruding tabs. The base part is provided with a cavity adjacent to the flexible outwardly protruding tabs to allow easy leverage and removal of the locking plug. The locking plug has a square, or rectangular, or circular cross section.

The base part is arranged with a pair of pressure ribs that are spaced apart each other and placed adjacent to the flexible outwardly protruding tab assembly and the hook arrangement to induce a pressure on the vehicle door panel when the vehicle door handle assembly is fitted on the vehicle door panel. The base part is arranged with a snap that is deflected and engaged on an opening in the vehicle door panel while inserting the hook arrangement into the vehicle door panel to fit the vehicle door handle assembly on the vehicle door panel, which precludes disengagement of the hook arrangement from the vehicle door panel.

Another embodiment of this invention uses a hook design and assembly to create a secure connection with the vehicle body. The hook design is made in the direction of travel and can an integral feature of the base part. Normally the hooks would be designed to carry the maximum load. The hook(s) are inserted through an aperture provided on the vehicle body panel by making the handle assembly inclined and pressed flat into place at the snap fit end. The hook design size is dependent on the size of the aperture provided on the vehicle body panel by the manufacturer. One or more hooks could be used for fixing the handles. Different combinations of the locking plugs with hook designs are illustrated in the drawings.

The assembly process of the present invention is as follows. The abatement part is assembled onto the handle part through the swam neck arm hole. The spring is assembled over the pivot projection of the base part. The spring end of the housing is first located at one pivot pocket of the handle part and pushed down at the other end to locate and secure it in the other pivot pocket. The locking plugs are pre-assembled into a pre-clipped position within the provided aperture of the snap lugs and the complete handle assembly is dispatched to the vehicle assembly line. At the vehicle assembly line, the handle assembly is located with the help of 2 and 4 way locators over the provided apertures in the vehicle body. The snaps are inserted into the sheet through corresponding provided apertures in the vehicle body and rested against the vehicle body panel. The locking plugs that have are already present in the aperture provided within the snap lugs are further

pressed inside expanding the flexible outwardly protruding tabs of the snap lugs ensuring a positive solid connection with the vehicle body, and preventing the snap lugs from disengaging from the vehicle body during operation of the handle.

BRIEF DESCRIPTION OF THE DRAWINGS

For better understanding illustrative embodiments of the invention will now be described with reference to the accompanying drawings. It will however, be appreciated that the embodiments exemplified in the drawings are merely illustrative and not limitative to the scope of the invention, because it is quite possible, indeed often desirable, to introduce a number of variations in the illustrative embodiments that have been shown in the drawings.

Accompanying drawings:

Fig. 1 illustrates an isometric view of a vehicle door handle assembly;

Fig. 2 illustrates an exploded view of the door handle assembly;

Fig. 3 illustrates an isometric view of the door handle assembly base part showing snap fit connection;

Fig. 4 illustrates an isometric view of the door handle assembly base part showing one snap fit retaining means and the hook type connection;

Fig. 5 illustrates an isometric view of a handle part;

Fig. 6 illustrates an isometric view of a torsion spring;

Fig. 7 illustrates an isometric view of handle and base part showing it attachment to vehicle body in pre-clipped condition;

Fig. 8 illustrates a sectional view of handle and base part showing retaining means in pre-clipped and firm clipped conditions;

Fig. 9 illustrates isometric and sectional views of rectangle type plug retaining means;

Fig. 10 illustrates isometric and sectional views of square type retaining means;

Fig. 11 illustrates isometric and sectional views of round type retaining means;

Fig. 12 illustrates isometric and sectional views of hook and round type retaining means with base and handle part;

Fig. 13 illustrates isometric and sectional views of hook and square type retaining means with base and handle part;

Fig. 14 illustrates isometric and sectional views of hook and rectangular type retaining means with base and handle part;

Fig. 15 illustrates isometric and sectional views of square and rectangular retaining means with base and handle part;

Fig. 16 illustrates isometric and sectional views of round and square retaining means with base and handle part;

Fig. 17 illustrates isometric and sectional views of round and rectangular retaining means with base and handle part;

Fig. 18 illustrates isometric and sectional views of round and round retaining means with base and handle part;

Fig. 19 illustrates isometric and sectional views of square and square retaining means with base and handle part;

Fig. 20 illustrates isometric and sectional views of rectangular and rectangular retaining means with base and handle part;

Fig. 21 illustrates an isometric plan view of hook and rectangular type retaining means with non-return snap; and

Fig. 22 illustrates an isometric view of hook and hook type retaining means with non-return snap.

DETAILED DESCRIPTION OF THE INVENTION

The present invention will be described below with reference to the accompanying drawings.

Referring to figures 1-22, different aspects of a vehicle door handle assembly are illustrated, in accordance with an exemplary embodiment of the present invention. The vehicle door handle assembly included a base part (1), acting as a housing, with inbuilt male pivoting features (7), a handle part (2), acting as a lever, with inbuilt female pivoting features (14), a torsion spring (3) to ensure the handle part returns to the home position after release, an

abatement (4) to keep the link rod intact with the lever arm, and locking plugs (5). The locking plugs (5) include, but are not limited to square shaped locking plugs, round shaped locking plugs and rectangular shaped locking plugs. In the base part (1), two round projections (7) are formed to act as pivots. In one corner of the pivot, space is created for a torsion spring (3) assembly and the pivot (7) at this end is longer to accommodate the fixing of the torsion spring (3). Steps are provided over the pivot projections (7) to control the lateral movement between the handle part (2) and the base part (1). On the vehicle body side of the base part (1) a rib (11) is provided to locate one of the torsion spring (3) legs. On the handle part (2) a corresponding rib (15) is located to locate the other leg of the torsion spring (3). On the handle part a stopper rib (16) is provided to control the degree of rotation of the handle part (2). 4 way (8) and 2 way (9) locators are provided on the base part, with corresponding recesses on the vehicle body to ensure the position of the handle with respect to the vehicle door. Two sets of snaps (12) defining the flexible outwardly protruding tabs, are provided on the vehicle body panel side of the base part (1) with internal apertures to receive locking plugs (5).

The base part also includes at least two sets of pressure ribs (19) that are integrally formed with the vehicle body panel side of the base part (1). The pressure ribs (19) are spaced apart each other and placed adjacent to the snaps (12) and the hooks (20). The pressure ribs (19) is designed as a rectangular sheet and is angularly and inclinedly disposed on the vehicle body panel side of the base part (1) in relation to the snaps (12) and the hooks (20). These pressure ribs (19) are designed in such a way that it always placed under tension/force to push the vehicle door panel when the vehicle door handle assembly is fitted on the vehicle door panel, which helps in avoiding the loosening of the locking plugs (5) over the period of usage of the door handle assembly. As these pressure ribs (19) are placed under tension, the door handle assembly helps in avoiding development Rattle, Buzz and Squeak noise when the assembly is fitted on the vehicle body.

The handle part (2) includes two integrally formed pivot pockets (14). The pivot projections (7) of the base part (1) get assembled into the pivot

pockets (14) of the handle part (2) allowing only rotational movement free. There are two ribs (15) to locate one arm (18) of the torsion spring (3). The swan neck arm (13), defining the elongated arm, has the provision to allow the vehicle doors link rod to get assembled by means of the abatement part (4). The torsion spring (3) is assembled over the base part (1) projection (7) and together assembled on to the handle part (2). The torsion spring arm (17) and (18) are rested on the handle part (2) and base part (1) projections, (15) and (11) respectively. The torsion spring (3) facilitates the handle part (2) return to the home position after release. The abatement (4) allows free rotation of the link rod inside the hole of the swan neck arm (13) of the handle part (2) and keeps the joint between the link rod and lever/handle secure. The locking plugs (5) are designed to ensure a firm mounting of the handle part (2) and base part (1) on the vehicle body panel.

Figure 4 shows an embodiment of the invention where a hook assembly is used. The hook (20) is made in the direction of assembly travel and it is an integral feature of the base part (1). Normally hooks are designed to carry the maximum load and are the first members of the assembly process of fixing the handle on the vehicle body. The hook(s) are inserted through cut outs in the body panel of the vehicle by making the handle assembly inclined and pressed at the snap end. The hook design is dependent on the size of the cut out provided on the vehicle body panel by the customer. One or more hooks could be used for fixing the handles. Different combinations of locking plugs with hook designs are shown in the figures.

In cases of either two hooks or one hook type design, a snap (21) is provided and disposed on the vehicle body panel side of the base part (1), especially at the centre of the base part (1), as shown in Figs. 21 and 22. While fixing the door handle assembly on to the vehicle body panel, the snap (21) are initially deflected. Then, the snap (21) are properly engaged in an opening (22) provided in the vehicle body panel after completely inserting the hooks (20) into the vehicle body panel. The snap (21) is provided to act as a stopper, which prevents the hooks to disengage from the vehicle body panel

after assembly. This snap (21) helps in avoiding assembly coming out from the vehicle body panel engagement.

To assembly the handle the abatement (4) part is assembled on the handle part (2) in the provided hole of the swan neck arm (13). The torsion spring (3) is assembled over the pivot projection (7) on the base part (1). The torsion spring end of the base part (1) is first located at one pivot pocket (14) and pushed down at the other end to locate and secure the handle part (2) into the pivot pocket (14). The locking plugs (5) are preassembled by inserting them into the provided aperture on the base part (1) to form a pre-clipped condition and the preassembled housing is dispatched to the assembly line. At the vehicle assembly line, the handle assembly is located with the help of 2 way (9) and 4 way (8) locators defined by the restraining means. The snaps are inserted in the sheet metal cut outs, and then the handle assembly is rested on to the vehicle door panel. The locking plugs (5) on application of further force pass further into the aperture provided between the snap lugs (12) to ensure a positive locking of the snap lugs (12) with the vehicle body. The locking plugs (5) ensure that the snap lugs (12) of the base part (1) do not disengage during the operation of the handle.

In the present embodiment the requirements for screw mounting the handle is eliminated. Two sets of integrated snaps (12) on the vehicle side of the base part (1). The handle assembly is positioned correctly with the help of 2 way (9) and 4 way (8) locators. Then the complete entry of the snaps (12) is ensured by butting the assembly against the body side panel. Preassembly of the locking plug (5) takes place prior to dispatch. At the vehicle assembly line the preassembled locking plugs (5) are pushed further into the provided aperture ensuring a positive mounting of the snaps with the vehicle body. To ensure the position of the preassembled plug (5) the base part (1) has a half round projection rib at the collar and respective groove on the thin wall of the plug part. The thin wall is designed to act as a spring. When the plugs (5) are initially located and pushed inside the thin wall gets compressed, when the grooves are concentric to the housing ribs the thin wall gets expanded hence there is no chance of the plugs falling out and become missing from the

transition of the part. At the plugs pre-clipped/pre-assembled position the flexible outwardly protruding tabs or snaps have sufficient space to be passed through a provided aperture in the vehicle sheet metal body. The plugs (5) have taper ribs with respect to taper grooves on the base part (1) flexibly outwardly protruding tabs, so when the plugs (5) are pushed further the tabs get expanded respectively up to the limit of interference with the plug (5). When plugs (5) are pushed fully up to the final limit of the ribs the plugs override the ribs of the housing and get locked positively. Hence there is no need for special tools for screwing. To have possibility of serviceability a groove, defined by the cavity on the base part (1) is provided to allow a screwdriver or similar tool to remove the plug (5) and handle assembly. All the possible combinations of the snap plugs (5) have to be fine-tuned as per varying geometry conditions during the assembling of the door handle assembly.

In the present embodiment the requirement of a metal or plastic plug in the handle assembly is eliminated. Normally the function of the pivot is to keep the two separate parts (handle part (2) and base part (1)) in the same axis and allow free rotation of the handle part (2). In this embodiment the pivot like features are integrated into the base part (1) and handle part (2). These features are robustly constructed to meet the load requirements and easily replace a separate metal pivot plug as conventionally used. Normally the separate pivot plug is inserted through the preassembled base part (1), lever handle part (2), and torsion spring (3). In this embodiment, the plug-less pivot design, the torsion spring (3) is assembled on one end and the end is located on the respective handle part (2) hole. After confirming the correct position and orientation of the torsion spring (3), the other end of the pivot is brought near the second hole (14) of the handle part (2) and pressed down to secure the pivot feature in the hole (14). To allow this press fit design the end to end distance of the integrated pivots on the base part (1) is critical and face to face distance between the holes (14) on the handle part (2) are also critical. The plug-less design eliminates the requirement of a separate metal or plastic pivot plug. Here the pivot is integrated in the base part (1) and the handle part (2) and is designed to meet all load requirements for such an assembly.

The foregoing description is of some embodiments of the present invention. It should be appreciated that these embodiments are described for purposes of illustration only, and that numerous alterations and modifications may be practiced by those skilled in the art without departing from the spirit and scope of the invention as claimed or the equivalent thereof.

WE CLAIM:

1. A vehicle door handle assembly comprising a handle part and a base part, wherein said handle part being provided with means for forming an operable connection to door latching mechanism of vehicle, said handle part being pivotally connected to said base part for executing a pivoting movement between door latching position and door unlatching position, and said base part being provided with restraining means for locating said base part in position on the vehicle door panel and also to restrict the lateral movement of said base part relative to the plane of abutment of the handle assembly with the vehicle door panel and retaining means for releasably securing said assembly to the vehicle door panel.

2. The vehicle door handle assembly as claimed in claim 1, wherein said handle part is biased to return to its home position following actuation of said door latching mechanism.

3. The vehicle door handle assembly as claimed in any of the preceding claims, wherein said resilient means is a torsion spring, provided with two legs opposed to each other to facilitate return of said handle part to the home position.

4. The vehicle door handle assembly as claimed in any of the preceding claims, wherein said restraining means is integrally formed with the base part and configured to pass through corresponding locator recess provided on the vehicle door panel for restricting the lateral movement of said base plate relative to said plane of abutment.

5. The vehicle door handle assembly as claimed in any of the preceding claims, wherein said base part is provided with a plurality of retaining means, wherein at least one of said retaining means is integrally formed with the base part, and comprises resilient outwardly protruding tabs, said resilient outwardly protruding tabs being configured to snap fit into corresponding recesses provided with the vehicle door panel.

6. The vehicle door handle assembly as claimed in any of the above claims, wherein said base part is provided with at least an integrally formed flexible outwardly protruding tab assembly configured to receive a locking plug, said locking plug on primary insertion creates a pre-clipped condition of said flexible outwardly protruding tab assembly, thereby allowing said flexible outwardly protruding tabs to pass through said aperture in said vehicle body, and upon application of additional force on said locking plug the passes further into said aperture of said flexible outwardly protruding tab assembly forming a releasable firm clipped condition of said base part with said vehicle body.

7. The vehicle door handle assembly as claimed in any of the preceding claims, wherein said means for forming an operable connection to door latching mechanism of vehicle is an elongated arm provided on said base part, said elongated arm, on installation of said vehicle door handle assembly, extends through an opening provided on said vehicle body for establishing an operable connection with said vehicle door latching mechanism.

8. The vehicle door handle assembly as claimed in any of the preceding claims, wherein said base part and handle part have integrally formed stopper ribs to restrict the pivotal movement of said handle part relative to said base part, so that when desired unlatching position is achieved said stopper ribs abut each other thereby preventing any further angular movement of the handle part.

9. The vehicle door handle assembly as claimed in any of the preceding claims, wherein said base part is provided with a hook arrangement adapted to engage with a corresponding hole provided on said vehicle door panel, said hook arrangement together with at least one of said retaining means is adapted to releasably secure said base part with said vehicle door panel.

10. The vehicle door handle assembly as claimed in any of the preceding claims, wherein said base part is provided with at least one flexible outwardly protruding tab assembly, comprising at least two flexible outwardly protruding

tabs disposed opposite to each other, each having a flat inside surface configured to receive a locking plug and an outside surface having a protrusion perpendicular to the angle of the inside surface configured to engage with the vehicle door panel on insertion of said locking plug between said flexible outwardly protruding tabs, said locking plug on initial insertion is adapted to create a pre-clipped condition, allowing said flexible outwardly protruding tab assembly to pass through corresponding aperture formed with said vehicle door panel; on application of additional force, said locking plug passes further into said flexible outwardly protruding tab assembly forming a releasable firm clipped condition of said base part with said vehicle door panel.

11. The vehicle door handle assembly as claimed in any of the preceding claims, wherein said locking plug is provided with taper ribs for engaging said locking plug in pre-clipped position between said flexible outwardly protruding tabs.

12. The vehicle door handle assembly as claimed in any of the preceding claims, wherein said base part is provided with a cavity adjacent to said flexible outwardly protruding tabs to allow easy leverage and removal of said locking plug.

13. The vehicle door handle assembly as claimed in any of the preceding claims, wherein said locking plug has a square, or rectangular, or circular cross section.

14. The vehicle door handle assembly as claimed in any of the preceding claims, wherein said base part is arranged with a pair of pressure ribs that are spaced apart each other and placed adjacent to said flexible outwardly protruding tab assembly and said hook arrangement to induce a pressure on the vehicle door panel when said assembly is fitted on the vehicle door panel.

15. The vehicle door handle assembly as claimed in any of the preceding claims, wherein said base part is arranged with a snap that is deflected and engaged on an opening in the vehicle door panel while inserting said hook

arrangement into the vehicle door panel to fit said assembly on the vehicle door panel, which precludes disengagement of said hook arrangement from the vehicle door panel.

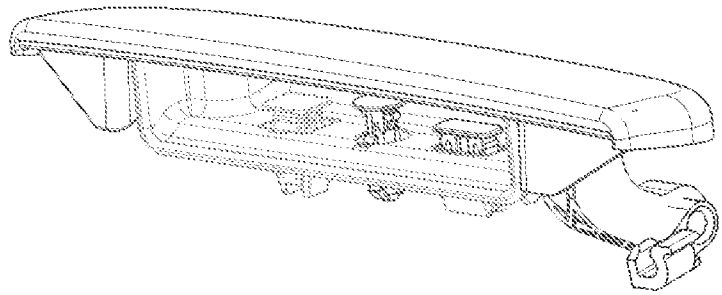


FIG. 1

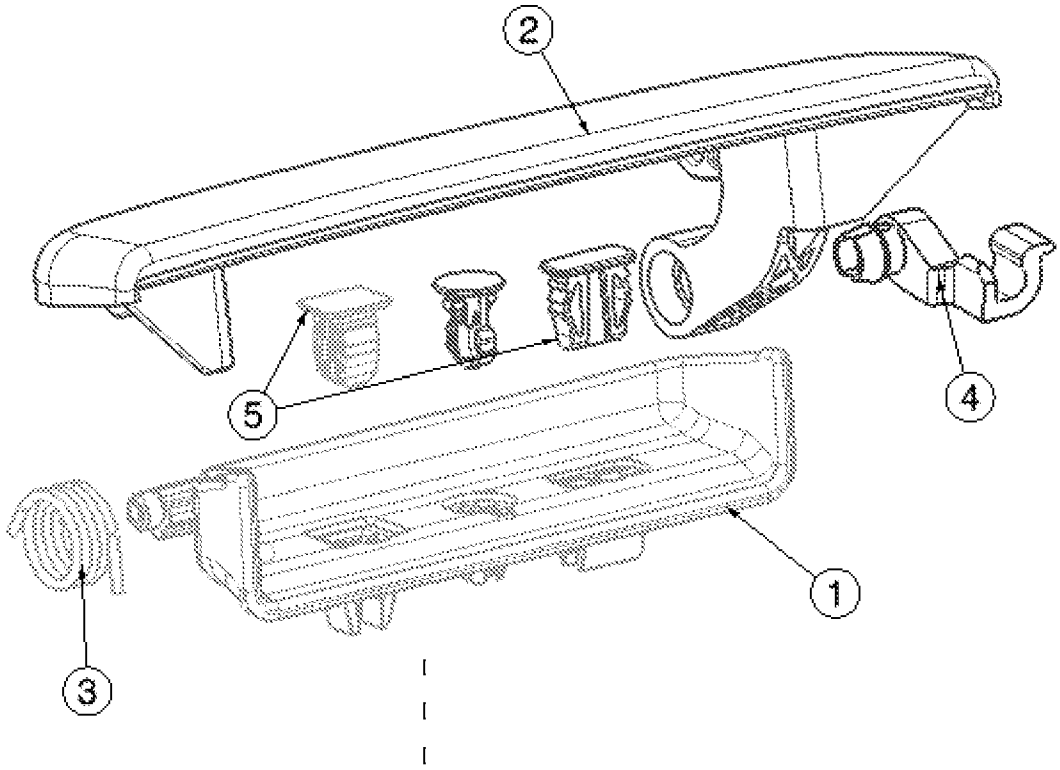


FIG. 2

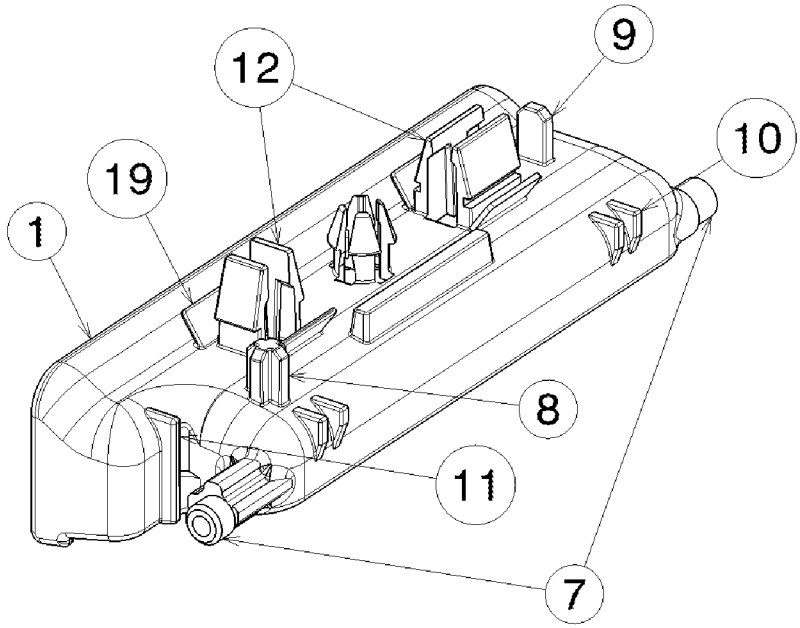


FIG. 3

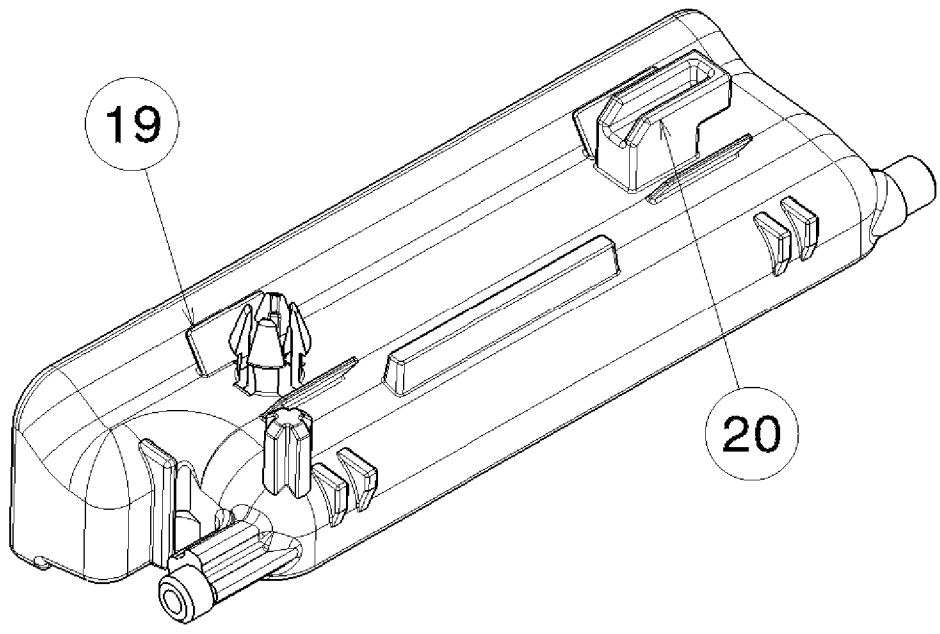


FIG. 4

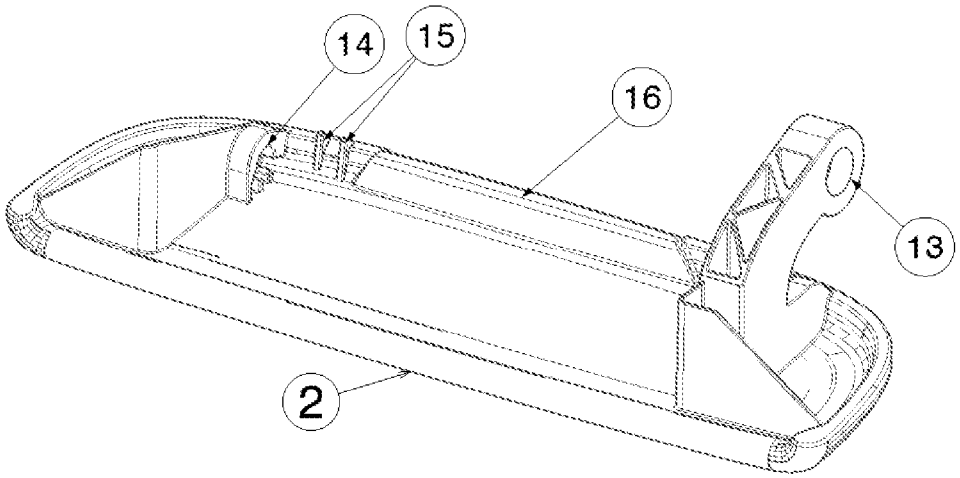


FIG. 5

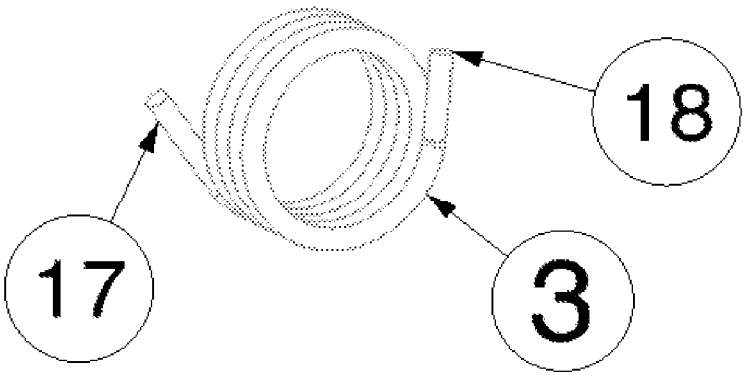


FIG. 6

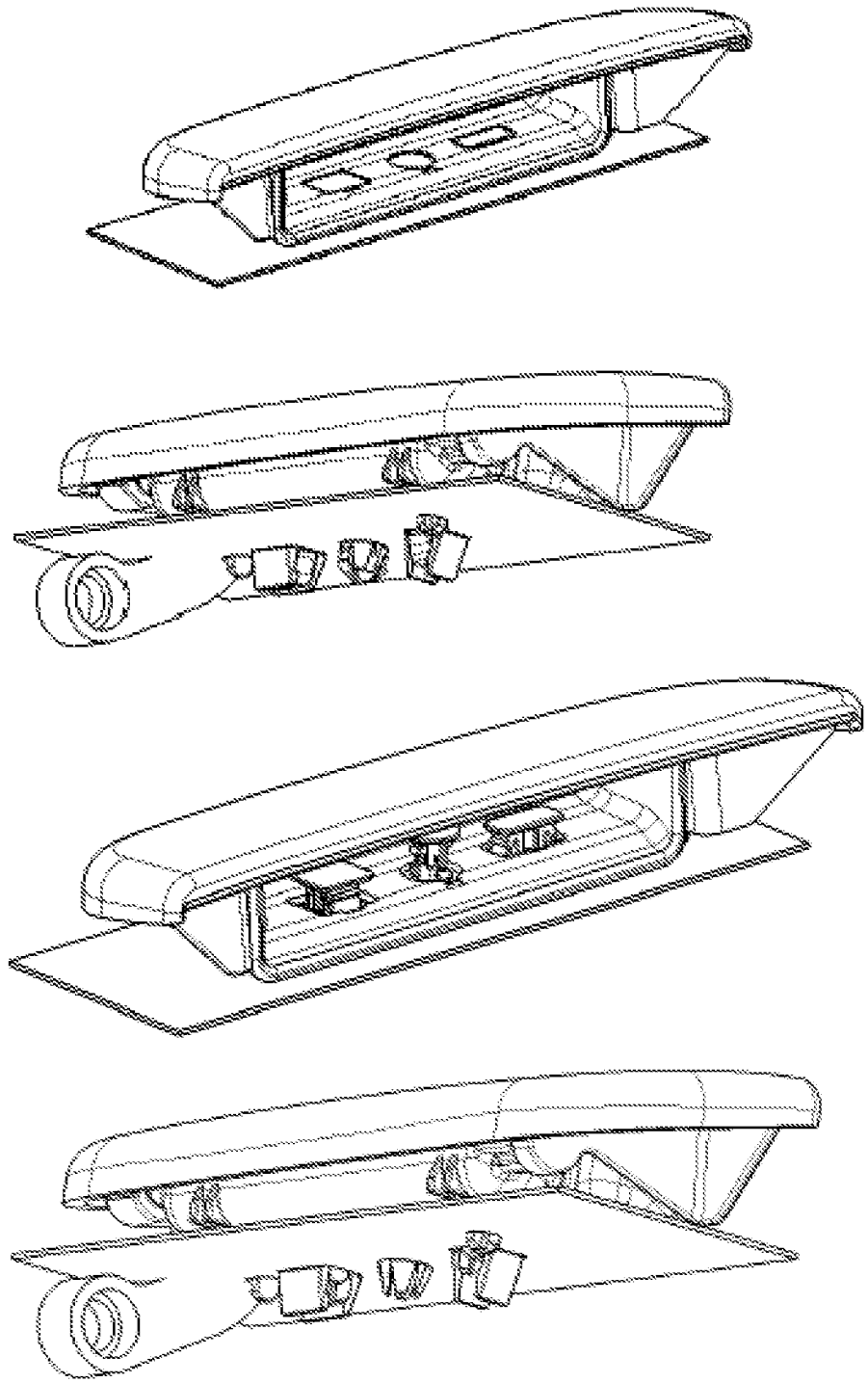


FIG. 7

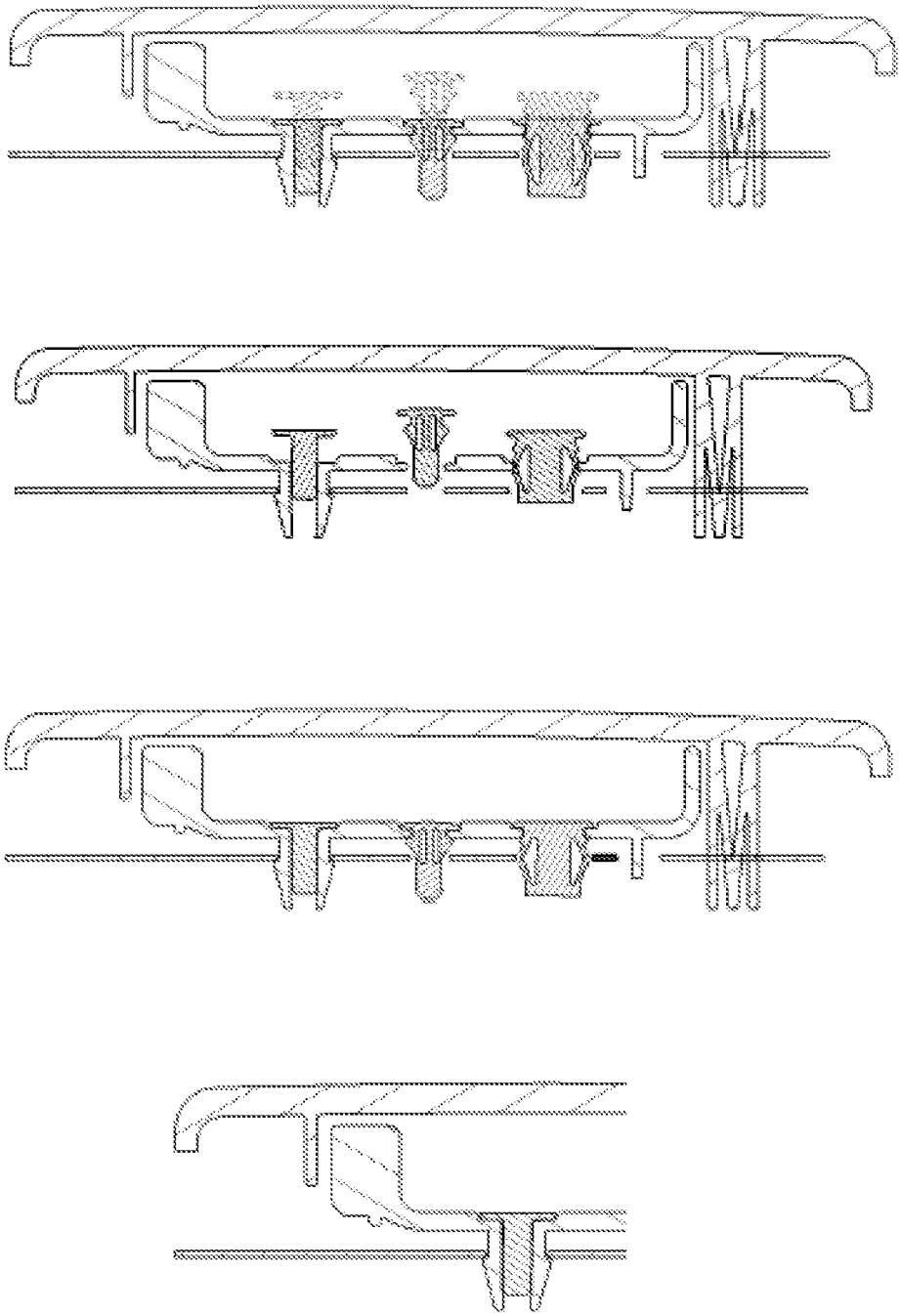
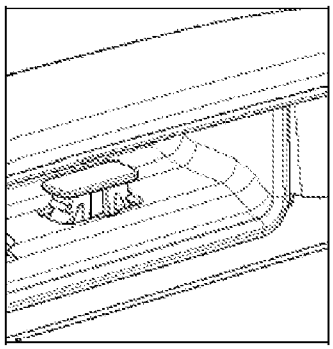


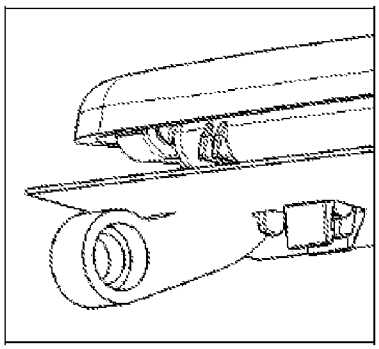
FIG. 8

Prepositioned Condition

Front view

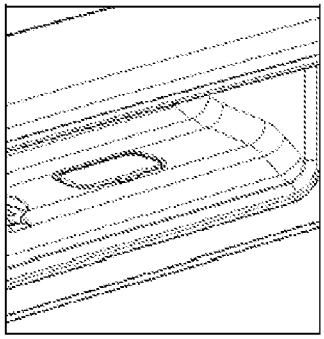


Back view

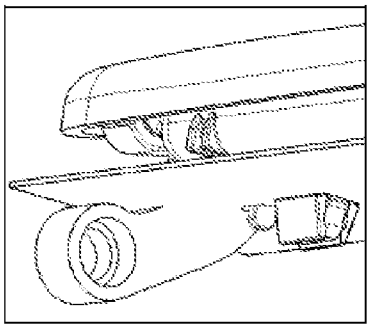


Assembled Condition

Front view



Back view



Section view

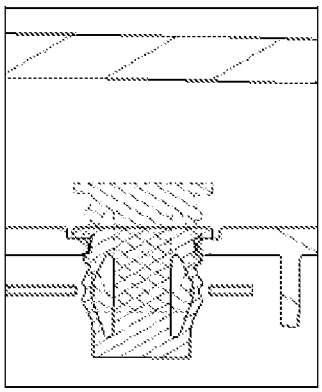
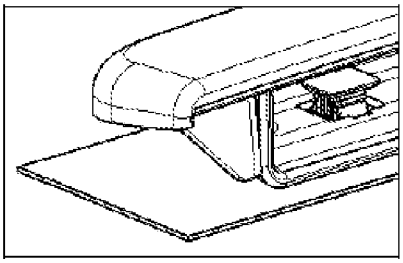


FIG. 9

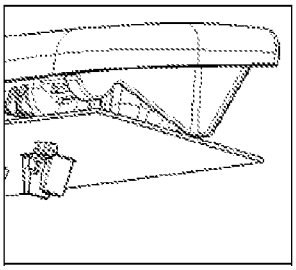
SQUARE TYPE PLUG

Prepositioned Condition

Front view

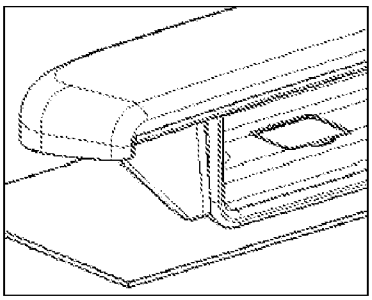


Back view

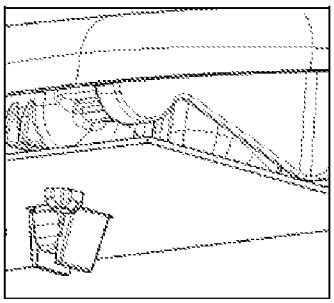


Assembled Condition

Front view



Back view



Section view

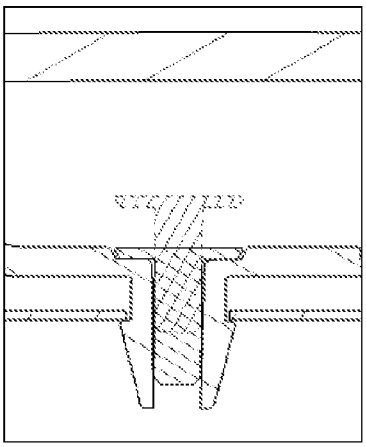
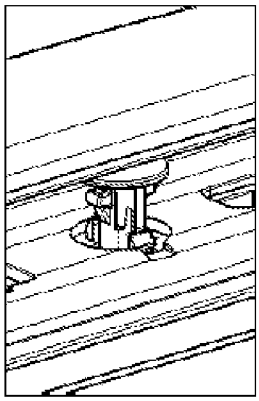


FIG. 10

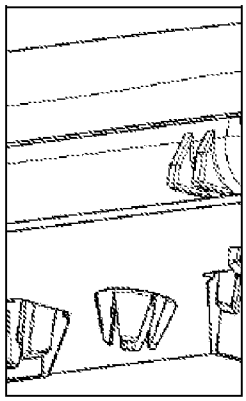
ROUND TYPE PLUG

Prepositioned Condition

Front view

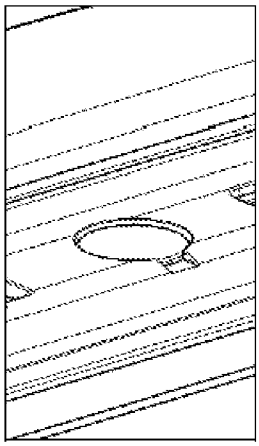


Back view

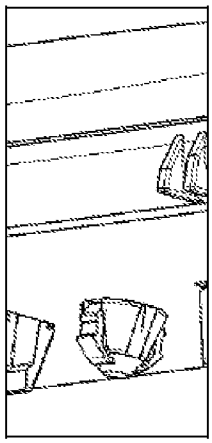


Assembled Condition

Front view



Back view



Section view

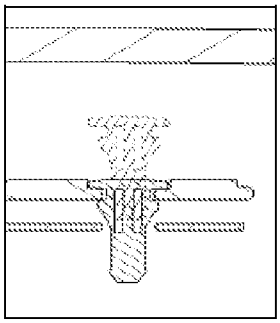


FIG. 11

HOOK & ROUND TYPE COMBINATION

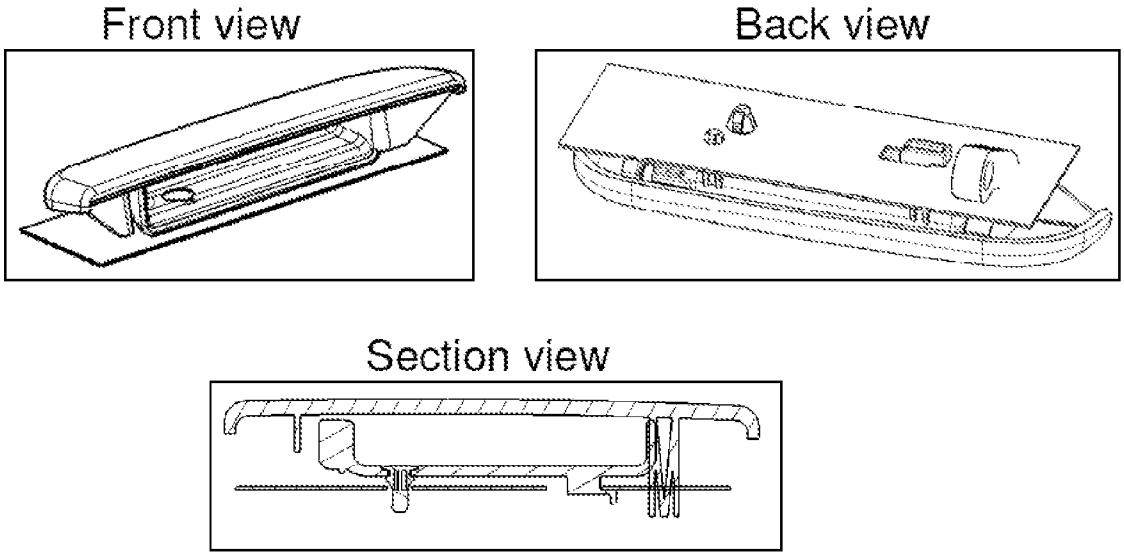


FIG. 12

HOOK & SQUARE TYPE COMBINATION

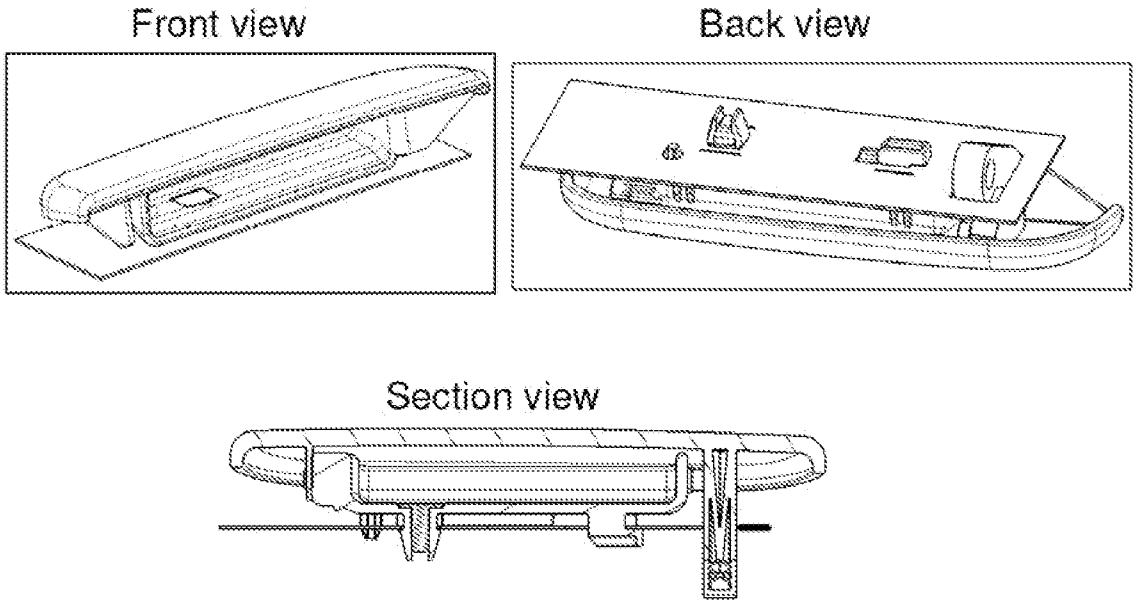


FIG. 13

HOOK & RECTANGLE TYPE COMBINATION

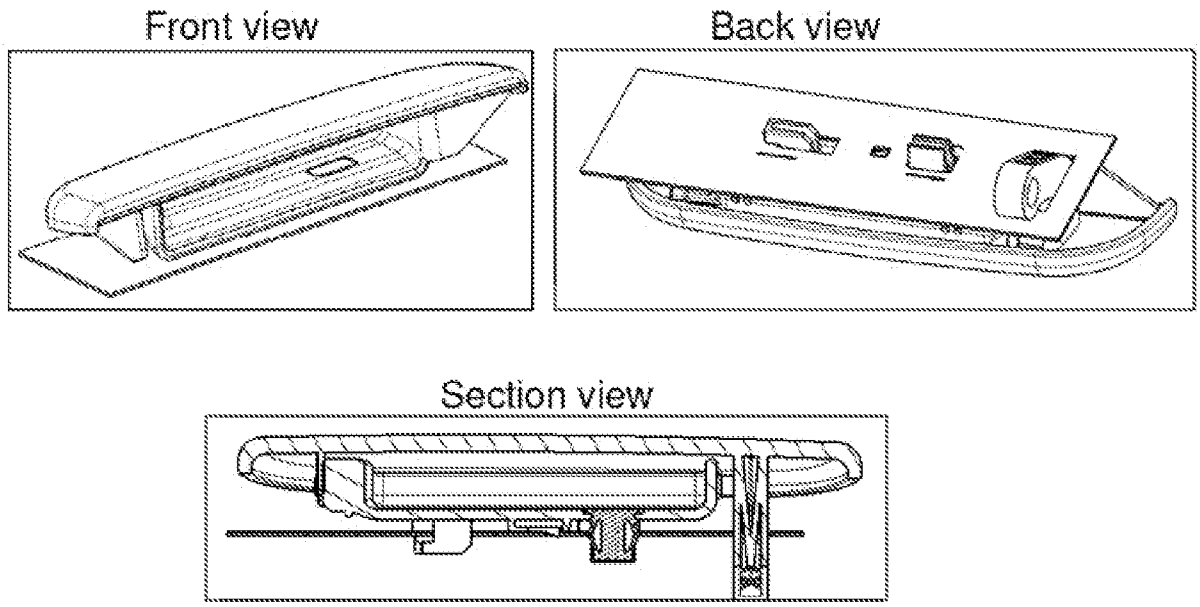


FIG. 14

SQUARE & RECTANGLE TYPE COMBINATION

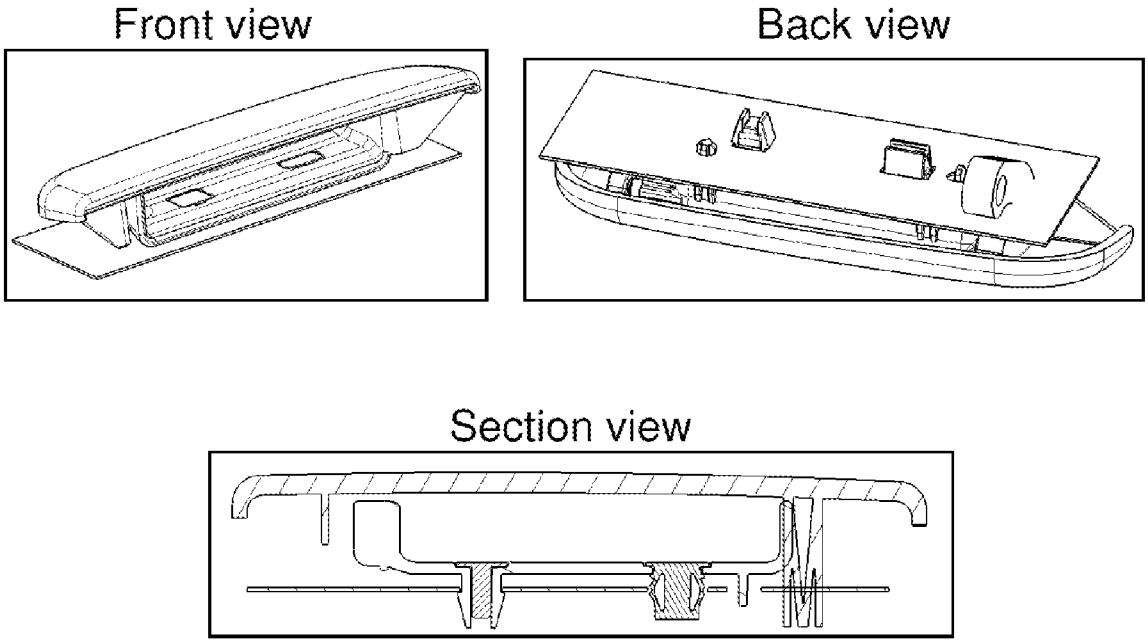


FIG. 15

ROUND & SQUARE TYPE COMBINATION

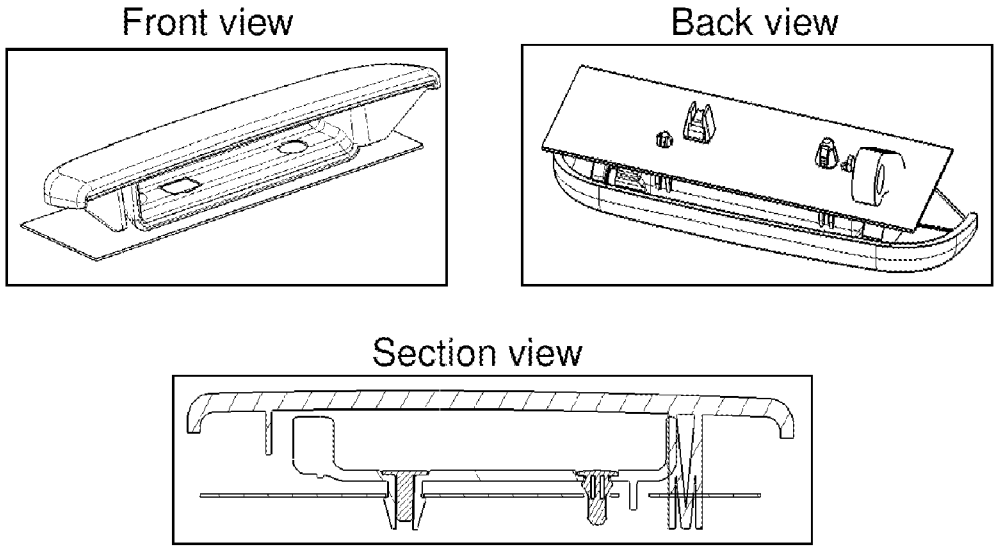


FIG. 16

ROUND & RECTANGLE TYPE

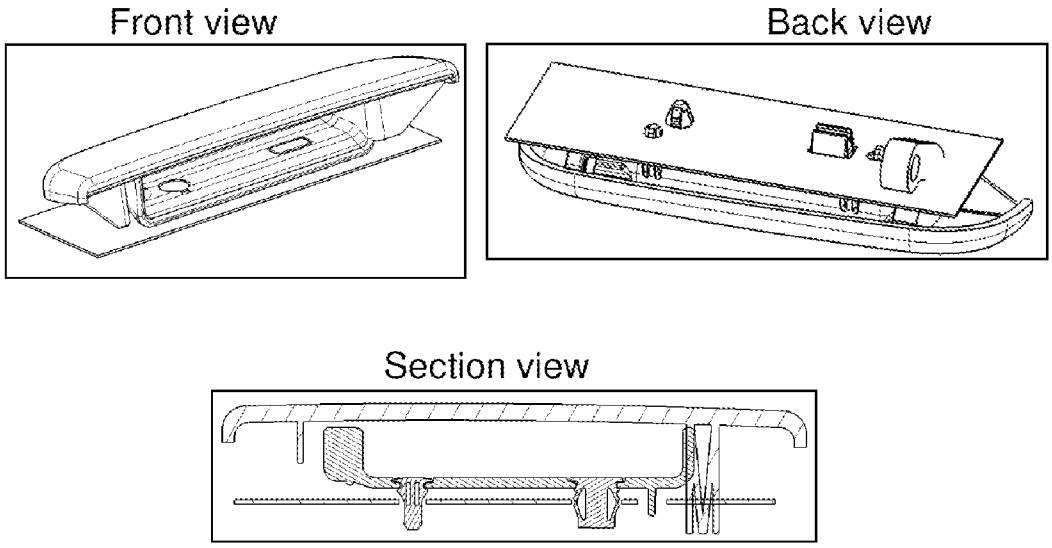


FIG. 17

ROUND & ROUND TYPE

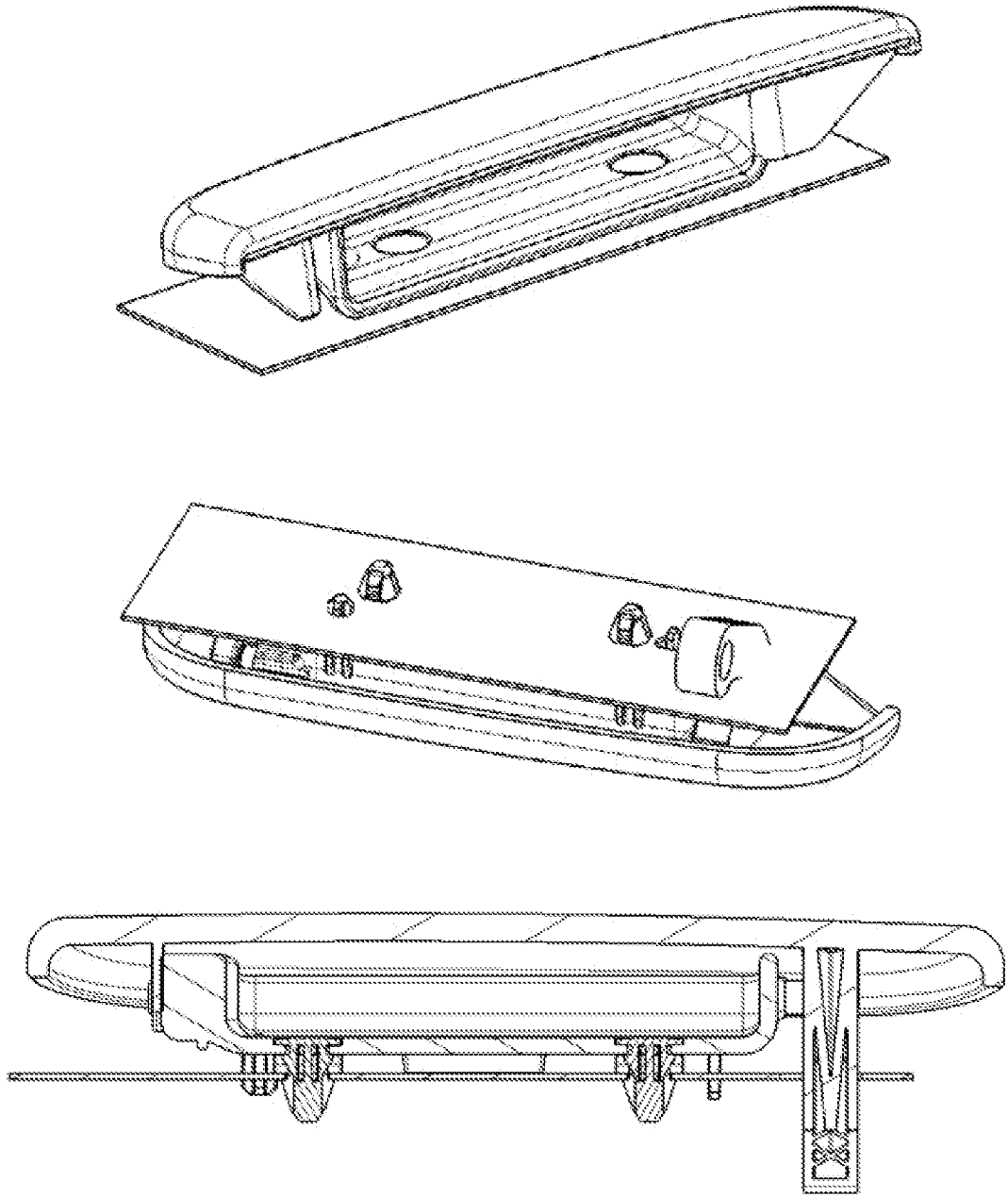


FIG. 18

SQUARE & SQUARE TYPE

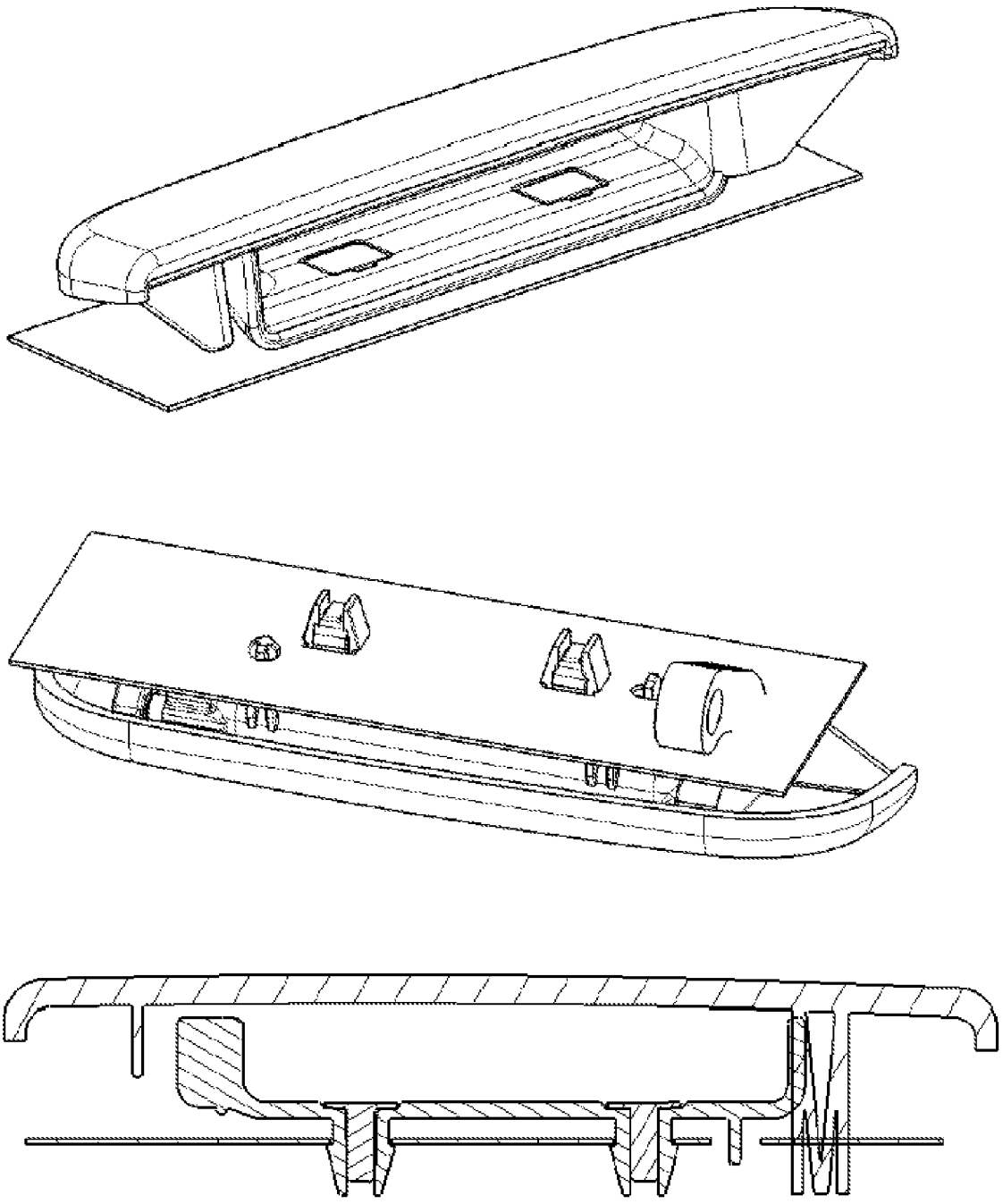


FIG. 19

RECTANGLE & RECTANGLE TYPE

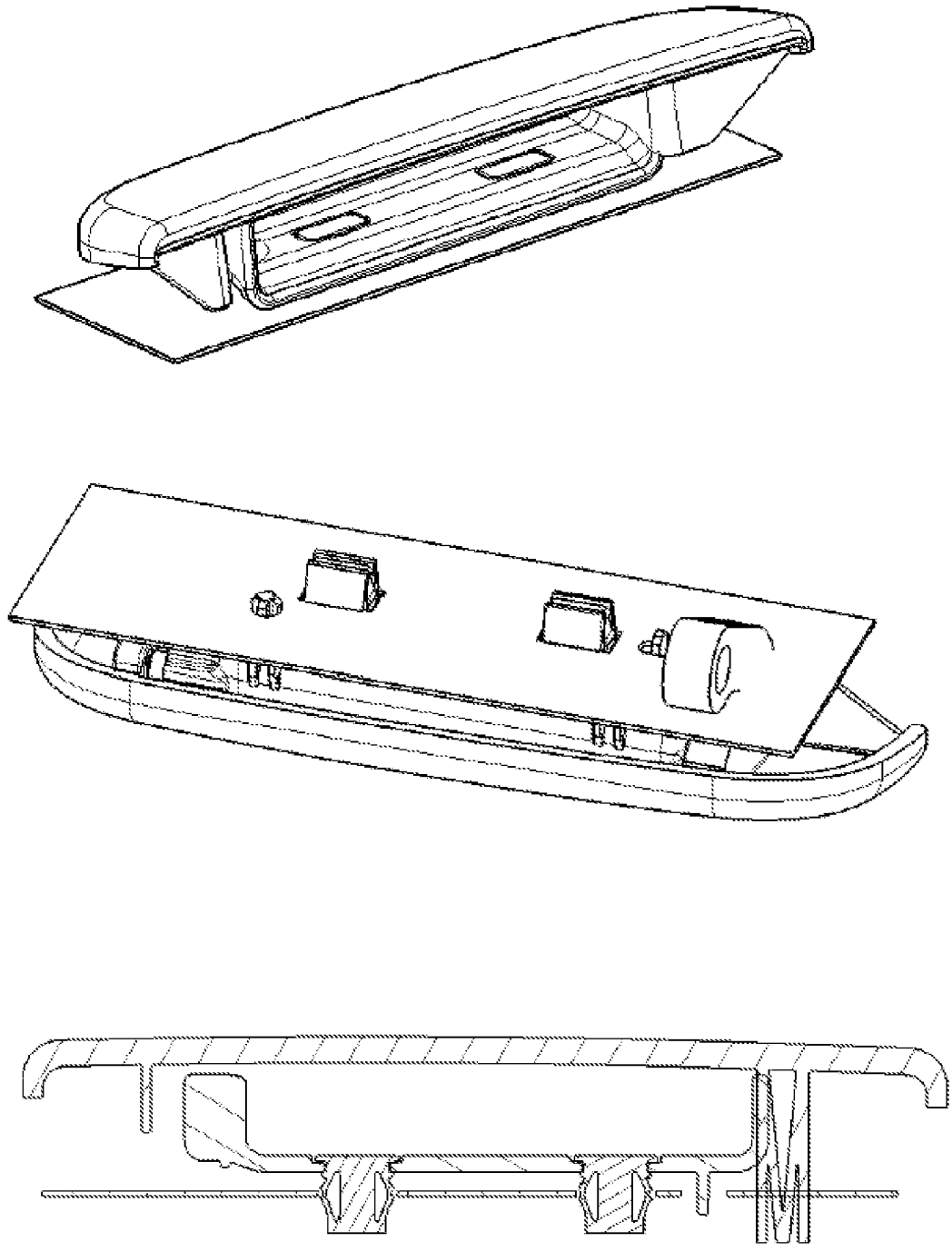


FIG. 20

HOOK & RECTANGLE TYPE WITH NON RETURN SNAP

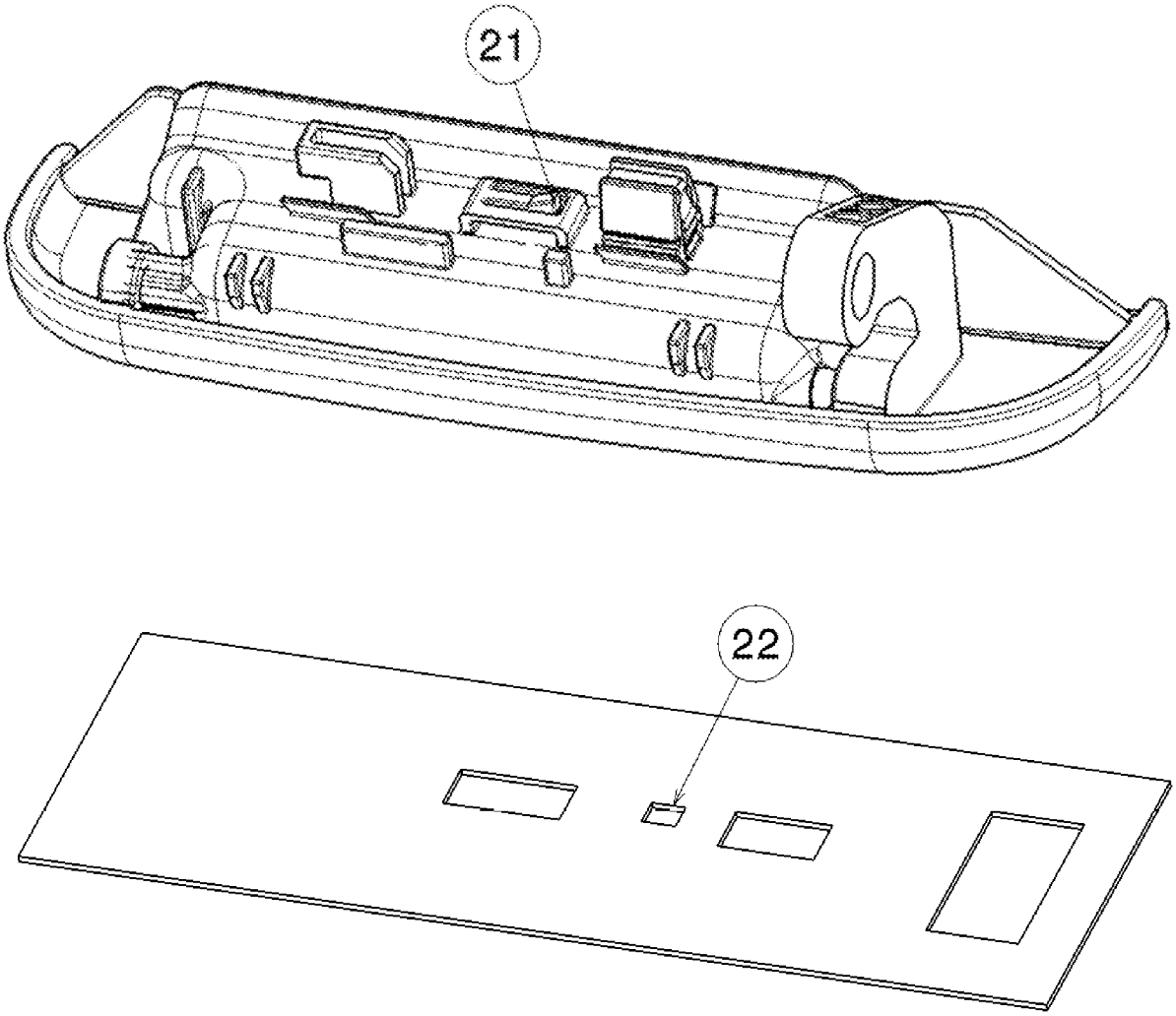
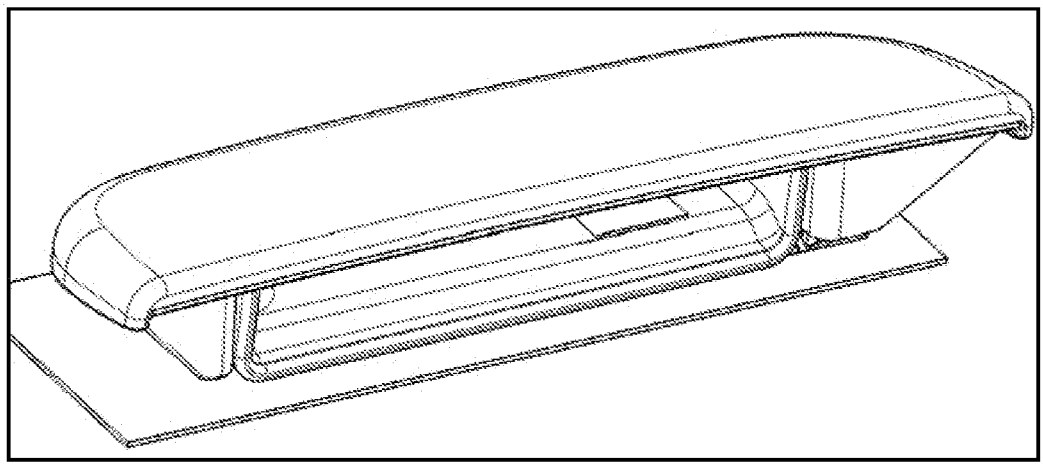
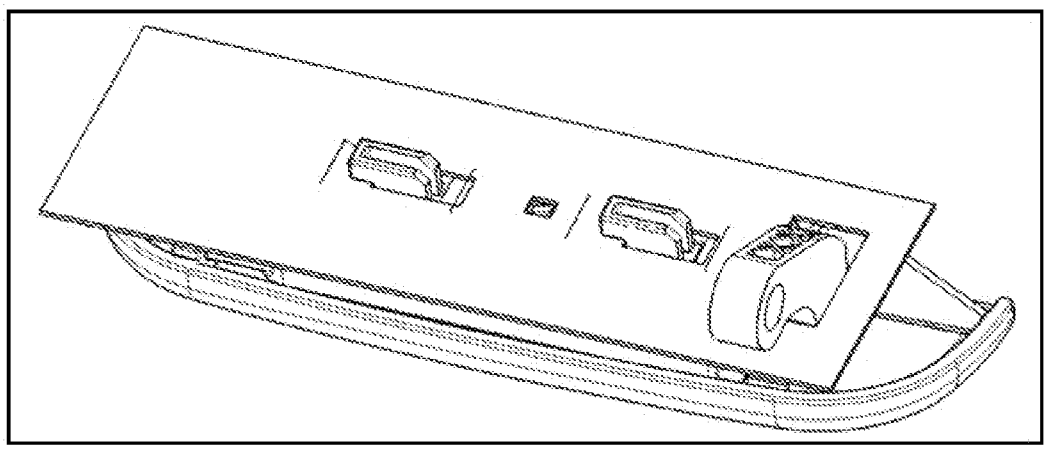


FIG. 21

HOOK & HOOK TYPE WITH NON RETURN SNAP





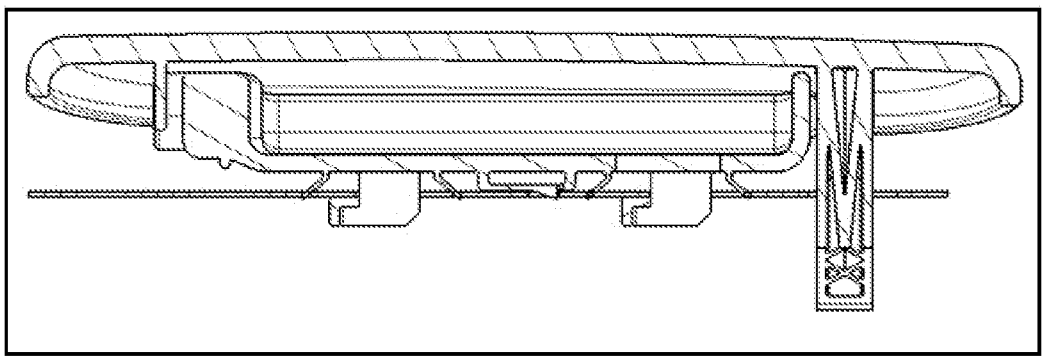


FIG. 22

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/036324

A. CLASSIFICATION OF SUBJECT MATTER
INV. E05B5/00 E05B65/20
ADD.

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)
E05B

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)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 03/008743 A2 (STRATTEC SECURITY CORP [US]; DIMIG STEVEN J [US]; FEUERSTEIN JOHN K [U) 30 January 2003 (2003-01-30) page 5, line 26 - page 8, line 20 page 10, line 30 - page 11, line 25 page 13, line 13 - page 15, line 16 page 16, line 13 - line 25 page 17, line 12 - page 18, line 4 figures 1-11, 17	1-5,7-9, 14
X	DE 28 24 216 A1 (VOLKSWAGENWERK AG) 6 December 1979 (1979-12-06) page 5, line 21 - page 7, line 29 figure 1	1-3,5,7, 9,14,15

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"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)

"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

"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

"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 October 2012	17/10/2012

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Antonov, Ventseslav

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/036324

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 183 302 A (PELACHYK RICHARD [US] ET AL) 2 February 1993 (1993-02-02) column 2, line 16 - column 3, line 2 figures 1-4 -----	1-3,5,7, 9,14,15
X	US 6 052 948 A (SPITZLEY LARRY W [US]) 25 April 2000 (2000-04-25) column 2, line 63 - column 4, line 16 figures 1-7 -----	1,4,5,9, 14,15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2012/036324

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 03008743 A2	30-01-2003	CA 2454628 A1	30-01-2003
		EP 1417389 A2	12-05-2004
		MX PA04000822 A	17-05-2004
		US 2003014835 A1	23-01-2003
		WO 03008743 A2	30-01-2003
DE 2824216 A1	06-12-1979	NONE	
US 5183302 A	02-02-1993	NONE	
US 6052948 A	25-04-2000	NONE	