A housing (10) for a vehicle instrument cluster comprises a front sheet cover (20) and a back sheet cover (30) connected by at least one arm portion (40), with the front sheet cover (20), the back sheet cover (30) and the at least one arm portion (40) being integrally formed. A method of forming a housing (10) for a vehicle instrument cluster comprises providing a sheet, providing a plurality of dielines (140, 160, 180, 200) on the sheet in order to define a front sheet cover (20), a back sheet cover (20) and at least one arm portion (40), and folding the front sheet cover (20) and the back sheet cover (30) along the a plurality of dielines (140, 160, 180, 200) to surround the vehicle instrument cluster with the front sheet cover (20), the back sheet cover (30) and the at least one arm portion (40). A blank (100) for preparing a housing (10) for a vehicle instrument cluster is also provided.
A Housing of A Vehicle Instrument Cluster and A Method of Manufacturing Thereof

FIELD OF THE INVENTION

The invention relates to a housing of an instrument cluster for vehicles. The invention also relates to a method of manufacturing a housing of an instrument cluster for vehicles.

BACKGROUND

An instrument cluster assembly, also known as instrument panel, for vehicles is typically used for displaying operation information such as vehicle speed, engine rotation speed (RPM), engine temperature, fuel level, distance travelled or other information of the vehicle components during operation. An vehicle instrument cluster assembly usually consists of a display panel for displaying information, a raised top cover or maybe also side covers for easy viewing of the information regardless of the lighting condition of the operating environment, a printed circuit board (PCB) with various components assembled thereon (i.e. a printed circuit board assembly (PCBA)) connects to the vehicle computer to control the displayed information, a housing or a frame for adapting the instrument cluster to the vehicle dash board, which is usually by means of fasteners to secure the housing to the vehicle. In addition, an instrument cluster assembly usually consists of a rear cover for protecting the backside of the PCB. The rear cover, which is typically made with non-conducting materials such as polypropylene. The rear cover is usually fixed to cover the back of the instrument cluster, to protect the PCB and thus the instrument
cluster from electrostatic discharge. The rear cover may also carry additional fastening means such as screws, clips or the like to secure the instrument cluster to the vehicle.

The display panel of the instrument cluster may display information in analog or digital readings. An analog display panel usually comprises a faceplate having gauges with numbers and graduations as indicia, and pointers caused to sweep angularly across the indicia by electromechanical movements. The faceplate is usually made with white or reflective materials such as acrylonitrile butadiene styrene (ABS). Alternatively, a digital display panel usually comprises a electronic screen, such as a liquid crystal display (LCD), showing a digital readout of the parameters of the operating vehicle. The display panel may also be provided with light-emitting diode (LED) as indicating lights or to serve other optical functions.

It is known that conventional instrument cluster assemblies are usually heavy and bulky, with the assembling of the faceplate and/or the rare cover usually involves handling of a number of parts and installation steps which could be difficult, troublesome, time consuming and also labour intensive. It is therefore an object of the present invention to provide a housing for vehicle instrument cluster, in which the aforesaid shortcoming is mitigated, or at least to provide a useful alternative to the public.

**SUMMARY OF THE INVENTION**

In accordance with a first aspect of the present invention, there is provided a housing for a vehicle instrument cluster, said housing comprises a front sheet
cover and a back sheet cover connected by at least one arm portion, wherein said front sheet cover, said back sheet cover and said at least one arm portion are integrally formed.

In an embodiment of the first aspect, said front sheet cover and said back sheet cover are arranged substantially parallel to each other so as to sandwich the vehicle instrument cluster.

In an embodiment of the first aspect, said at least one arm portion is substantially perpendicular to said front sheet cover and said back sheet cover.

In an embodiment of the first aspect, said front sheet cover, said back sheet cover and said at least one arm portion are prepared by a thin sheet of flexible material.

In an embodiment of the first aspect, said front sheet cover is provided with at least one indication means.

In an embodiment of the first aspect, said at least one indication means is integrally formed with said front sheet cover.

In an embodiment of the first aspect, said at least one indication means is printed on said front sheet cover.

In an embodiment of the first aspect, said indication means is a gauge.
In an embodiment of the first aspect, said housing is provided with at least one opening.

In an embodiment of the first aspect, said at least one opening engages with at least one fixing means of the instrument cluster to hold together the housing and the vehicle instrument cluster.

In an embodiment of the first aspect, said housing is provided with at least one fastening means adapted to fasten said housing with the vehicle instrument cluster or a vehicle dash board.

In an embodiment of the first aspect, said fastening means is integrally formed with the housing.

In an embodiment of the first aspect, said fastening means is connectable to the housing.

In accordance with a second aspect of the present invention, there is provided method of forming a housing for a vehicle instrument cluster, the housing comprises a front sheet cover and a back sheet cover covering the vehicle instrument cluster, an at least one arm portion connecting the front sheet cover and the back sheet cover, the method comprising steps of providing a sheet material, providing a plurality of dielines on the sheet material in order to define said front sheet cover, said back sheet cover and said at least one arm portion, and folding said front sheet cover and said back sheet cover along the plurality of dielines to
surround the vehicle instrument cluster with said front sheet cover, said back sheet cover and said at least one arm portion.

In an embodiment of the second aspect, said dielines are provided by folding, creasing, perforating, compressing or scoring said sheet material.

In an embodiment of the second aspect, further comprising a step of providing at least one indication means on said front sheet cover.

In an embodiment of the second aspect, further comprising a step of providing at least one opening on said front sheet cover and/or said back sheet cover.

In an embodiment of the second aspect, further comprising a step of providing at least one fixing means at said front sheet cover and/or said back sheet cover for fixing said housing with the vehicle instrument cluster or an vehicle dash board.

In accordance with a third aspect of the present invention, there is provided a blank for preparing a housing for a vehicle instrument cluster, the blank comprising a plurality of dielines defining a front sheet cover, a back sheet cover and at least one arm portion of the housing, said dielines further comprise a plurality of foldlines in between the front and the back sheet covers and the arm portion, wherein said front sheet portion, said back sheet portion and said at least one arm portion are integrally connected.
Figure 1 shows a prospective view of the housing of a vehicle instrument cluster in accordance with an embodiment of the present invention.

Figure 2 shows a sketch (not in scale) of blank of the housing or an unfolded housing in accordance with an embodiment of the present invention.

Figure 3 shows a prospective view of the housing of a vehicle instrument cluster in accordance with an embodiment of the present invention in its in use condition, i.e. with the housing encasing an instrument cluster showing a front sheet cover of the housing.

Figure 4 shows a prospective view of the housing of a vehicle instrument cluster in accordance with an embodiment of the present invention in its in use condition, i.e. with the housing encasing an instrument cluster showing a back sheet cover of the housing.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 shows a preferred embodiment of the present invention. Figure 1 embodies a housing 10 of a vehicle instrument cluster. The housing having a front sheet cover 20 and a back sheet cover 30. The front sheet cover 20 and the back sheet cover 30 are connected by and are integrally formed with at least one arm portion 40. When in use the front sheet cover 20 and the back sheet cover 30 is arranged to be
substantially parallel to each other to sandwich the vehicle instrument cluster. The at least one arm portion 40 connects the front sheet cover 20 and the back sheet cover 30 which is arranged to be substantially perpendicular to the two covers.

The housing is prepared by simply folding a thin sheet of a blank provided with a plurality of dielines defining the front sheet cover 20, back sheet cover 30 and the at least one arm portions 40. The thin sheet can be made of any flexible and light-weighted material, for example low density polymers which are non-expensive, extremely light weight, flexible and are relatively easy and cheap to process. The low density polymers can be thermoplastic or thermosetting polymers. The sheet can be prepared by die stamping or molding. The sheet can be prepared by optical grade polymers adaptable to tailor light transmission for decorative and functional purposes. Alternatively, they can also be opaque or reflective to allow light reflection. They can be non-conductive for insulating purpose, which reduces the risk of electrostatic discharge of the instrument cluster, especially from the back portion of the instrument cluster where the printed circuit board (PCB) is usually exposed. This also helps improving the electromagnetic compatibility performance of the instrument cluster.

Figure 2 shows a sketch of a blank 100 of the housing 10 or an unfolded housing. In Figure 2, the solid dielines 120 represent cutlines while the broken dielines 140, 160, 180 and 200 represent foldlines. The foldlines 140 and/or 160 delineates the front sheet cover 20 and the at least one arm portion 40, while the foldlines 200 and/or 180 delineates the back sheet cover 30 and the at least one arm portion 40. The foldlines can be marked by folding, creasing, perforating, compressing or scoring of the sheet.
depending on the type of the marking machines available. The foldlines are located at the junctions between the sheet covers 20, 30 and the at least one arm portions 40.

To assemble the blank 100 into a housing 10 for use, the front sheet cover 20 and the back sheet cover 30 are folded about the foldlines at the junctions to surround an instrument cluster, with the front sheet cover 20 covering a front portion of the instrument cluster, and the back sheet cover 30 covering a back portion of the instrument cluster. More specifically, the front sheet cover 20 is folded about the broken dielines 140 and/or 160 so that the front sheet cover 20 lies at a plane being substantially perpendicular to the at least one arm portion 40; and the back sheet cover 30 is folded about the broken dielines 200 and/or 180 so that the back sheet cover 30 lies at a plane being substantially perpendicular to the at least one arm portion 40 and being substantially parallel to the front sheet cover 20.

The at least one arm portion 40 of the housing may further comprise at least one shoulder portion 220 defined by the broken dielines 140 and 160, and/or the broken dielines 200 and 180. The shoulder portion 220 serves as a transition region when the at least one arm portion 40 join at the front sheet cover 20 and/or the back sheet cover 40. The shoulder portion 220 can be a beveled surface or a round surface with curved radius. Alternatively, the shoulder portion 220 can be a single edge joining the front sheet cover 20 and the arm portion 40, and/or the back sheet cover 30 and the arm portion 40.

Figures 3 and 4 show the housing 10 in its in use condition, i.e. with the housing 10 surrounding and encasing the instrument cluster showing the top sheet cover 20
This allows a very simple and user-friendly assembly of the instrument cluster with the housing, with significantly less tools or instruments required, and the number of steps and procedure of assembly can be much reduced and simplified.

The front sheet cover 20 consists of at least one indication means 60, for example, a gauge, an electronic device or a signalling device. The gauges can be in the form of a speedometer, tachometer, or meter indicating fuel-level, oil pressure, oil temperature or tire pressure etc. The gauges are marked with numbers and/or graduations as indicia, which can be printed onto the front sheet cover 20. The gauges can also be illuminated by a lighting device of the instrument cluster. The numbers and/or graduations can also be provided in the form of recesses or protrusions which are integrally molded with the housing 10. Alternatively, the gauge can be a digital device comprising a digital display such as a liquid crystal display integrally molded into the front sheet cover 20 of the housing 10. Similarly, the signally device can be any translucent screens integrally molded into the front sheet cover 20, and consequently illuminated by an illuminating means such as a laser light source, a focused light-emitting diode (LED) light source, or other kind of light sources provided on the instrument cluster. The front sheet cover 20 may also consists of at least one opening 80 adapted to connecting at least one pointer 90 to the instrument cluster for an electromechanical movement. The pointer 90 is connectable to, for example, a motor controller, such as a stepper motor, of the instrument cluster by means of a shaft. The pointer 90 is rotatable to sweep angularly across the gauge. The pointer 90 can also be virtually formed such as by electrical means in the form of an illuminated pointer provided by the digital device, provided that the digital
device is integrally molded into the front sheet cover 20. The at least one opening 80 may also allow adaption of a lighting device, for example, a LED light source from the instrument cluster for illuminating or signalling purpose. Furthermore, the at least one opening 80 may also adapted to allow operation of other components of the instrument cluster by the driver such as a reset knob or switches or buttons to serve other functions.

The back sheet cover 30 also consists of at least one opening 80 adaptable to electrically connect the instrument cluster to a vehicle. As shown in Figure 4, the openings 80 can also be provided to adapt to at least one fixing means of the instrument cluster to hold together the housing and the encased instrument cluster. Alternatively, the back sheet cover 30 can also be provided with at least one fastening means (not shown). The at least one fastening means can be integrally formed with the housing. In another embodiment, the at least one fastening means can also be formed separately, and is releasably engageable to the housing. The at least one fastening means is adaptable to fasten said housing with the vehicle instrument cluster or the vehicle dash board. The same arrangement can also be provided on the front sheet cover 20 instead of the back sheet cover 30 to serve similar purpose. The fastening means can be in the form of clips, snap-fit couplings or any fasteners available in this field that a skilled person would consider suitable. In addition, molding or printing of brand name or company label of the instrument cluster can also be arranged on the back sheet cover 30 of the housing 10.

The housing 10 can also be molded to provide additional indentations or recesses, or protrusions to allow adaption of the encased instrument cluster to other components
of the vehicle dash board. The at least one opening 80 of the housing 10 can also be provided to allow adaption to other components of the vehicle dash board.

It should be understood that the present invention should not be limited to the application in vehicle instrument cluster. A person skilled in the art should understand that the present invention can be arranged in any kind of instruments or instrument clusters.

It should also be understood that the above only illustrates and describes examples whereby the present invention may be carried out, and that modifications and/or alterations may be made thereto without departing from the spirit of the invention. Certain features of the invention, which are, for clarity, described in the context of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features of the invention which are, for brevity, described in the context of a single embodiment, may also be provided or separately or in any suitable subcombination.
1. A housing for a vehicle instrument cluster, said housing comprises a front sheet cover and a back sheet cover connected by at least one arm portion, wherein said front sheet cover, said back sheet cover and said at least one arm portion are integrally formed.

2. The housing for a vehicle instrument cluster of claim 1, wherein said front sheet cover and said back sheet cover are arranged substantially parallel to each other so as to sandwich the vehicle instrument cluster.

3. The housing for a vehicle instrument cluster of claim 1, wherein said at least one arm portion is substantially perpendicular to said front sheet cover and said back sheet cover.

4. The housing for a vehicle instrument cluster of claim 1, wherein said front sheet cover, said back sheet cover and said at least one arm portion are prepared by a thin sheet of flexible material.

5. The housing for a vehicle instrument cluster of claim 1, wherein said front sheet cover is provided with at least one indication means.

6. The housing for a vehicle instrument cluster of claim 5, wherein said at least one indication means is integrally formed with said front sheet cover.
7. The housing for a vehicle instrument cluster of claim 5, wherein said at least one indication means is printed on said front sheet cover.

8. The housing for a vehicle instrument cluster of claim 5, wherein said indication means is a gauge.

9. The housing for a vehicle instrument cluster of claim 1, wherein said housing is provided with at least one opening.

10. The housing for a vehicle instrument cluster of claim 9, wherein said at least one opening engages with at least one fixing means of the instrument cluster to hold together the housing and the vehicle instrument cluster.

11. The housing for a vehicle instrument cluster of claim 1, wherein said housing is provided with at least one fastening means adapted to fasten said housing with the vehicle instrument cluster or a vehicle dash board.

12. The housing for a vehicle instrument cluster of claim 11, wherein said fastening means is integrally formed with the housing.

13. The housing for a vehicle instrument cluster of claim 11, wherein said fastening means is connectable to the housing.
14. A method of forming a housing for a vehicle instrument cluster, the housing comprises a front sheet cover and a back sheet cover covering the vehicle instrument cluster, an at least one arm portion connecting the front sheet cover and the back sheet cover, the method comprising steps of providing a sheet material, providing a plurality of dielines on the sheet material in order to define said front sheet cover, said back sheet cover and said at least one arm portion, and folding said front sheet cover and said back sheet cover along the plurality of dielines to surround the vehicle instrument cluster with said front sheet cover, said back sheet cover and said at least one arm portion.

15. The method of forming a housing for a vehicle instrument cluster of claim 14, wherein said dielines are provided by folding, creasing, perforating, compressing or scoring said sheet material.

16. The method of forming a housing for a vehicle instrument cluster of claim 14, further comprising a step of providing at least one indication means on said front sheet cover.

17. The method of forming a housing for a vehicle instrument cluster of claim 14, further comprising a step of providing at least one opening on said front sheet cover and/or said back sheet cover.

18. The method of forming a housing for a vehicle instrument cluster of claim 14, further comprising a step of providing at least one fixing means at said front
sheet cover and/or said back sheet cover for fixing said housing with the
vehicle instrument cluster or an vehicle dash board.

19. A blank for preparing a housing for a vehicle instrument cluster, the blank
comprising a plurality of dielines defining a front sheet cover, a back sheet
cover and at least one arm portion of the housing, said dielines further
comprise a plurality of foldlines in between the front and the back sheet covers
and the arm portion, wherein said front sheet portion, said back sheet portion
and said at least one arm portion are integrally connected.
INTERNATIONAL SEARCH REPORT

PCT/CN2013/080168

A. CLASSIFICATION OF SUBJECT MATTER
G12B 9/02(2006.01)i; G01D 11/24(2006.01)i; B60K 37/00(2006.01)i

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)
B60K37/--; B60K35/--; G12B9/--; G01D1/--;

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)
EPIDOC, WPLCNPAT: COVER, SHELL, CASE, CASESIG, CAGE, HOUSE, HOUSING, SHIELD, VEHICLE?, CAR?, AUTOMOBILE, GAUGE, INSTRUMENT, DASHBOARD, PLATE, BOARD, BLANK, SHEET, FOLD+, BEND+, BENT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>1-19</td>
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<td>A</td>
<td>CN 2819389 Y ((LUOYANG TRACTOR INST. CO., LTD.)) 20 September 2006 (2006-09-20) the whole document</td>
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Further documents are listed in the continuation of Box C.

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
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Date of the actual completion of the international search: 17 March 2014
Date of mailing of the international search report: 30 April 2014

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