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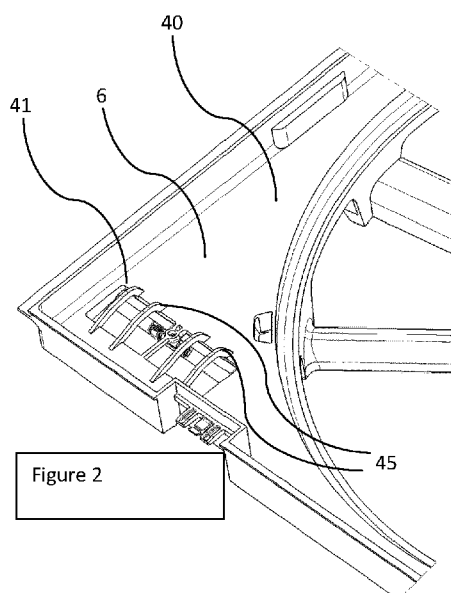
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(54) Title: FLAP WINDOW REINFORCEMENT FOR FAN SYSTEM SHROUDS

(57) Abstract: The invention related to a fan shroud (6) for a vehicle comprising:
· a main wall (40),
· at least one window (41) arranged for an air passage, this window being formed on the main wall,
· a flap (42) associated with this window arranged to close or open this window,
· at least one reinforcing rib (45) arranged to mechanically reinforce an area of the main wall adjacent to the window.



FLAP WINDOW REINFORCEMENT FOR FAN SYSTEM SHROUDS

The present disclosure relates to a fan shroud for a vehicle.

A motor vehicle is commonly equipped with cooling systems arranged in its engine
5 compartment. The heat engine is thus cooled by a supply of outside air. This outside air makes it possible to cool, via heat exchangers, a fluid circulating elsewhere in a thermal loop of the vehicle. These cooling systems, also called "cooling units" most often include at least one external air inlet generally disposed on the vehicle body, and for example at the front of the vehicle, one or several heat exchangers arranged on the path of the incoming air and a
10 motor-fan unit for forcing the air supply for example when the vehicle is stopped.

The design of shroud in fan system often need the use the flaps to ensure proper air flow through cooling module.

Unfortunately using flaps impacts the stiffness of the shroud due to several holes called windows to allow air to flow.

15 The risk is to have weaken fan systems so that the displacement during the vibrations is out of the requirements or/and deformation or breaks occurs.

Patent application EP1855903 discloses a shroud with windows and flaps that are cutted out of a flexible film.

The present invention aims to enhance shrouds with air flow windows.

20 The present invention relates to a fan shroud for a vehicle comprising:

- a main wall,
- at least one window arranged for an air passage, this window being formed on the main wall,
- a flap associated with this window arranged to close or open this window,
- 25 • at least one reinforcing rib arranged to mechanically reinforce an area of the main wall adjacent to the window.

The invention makes whole shroud more robust, and enables to reduce softening and allows the forces to be smoothly transferred through whole surface of a shroud with no discontinuity in the surface.

The amount of ribs, their direction and shape has to be can be selected in function of
5 the application.

An advantage is also that material used for shroud design could be reduced and in the same time improved stiffness would be reachable.

According to one aspect of the invention, the rib extends over the window and
10 connects to two sides of the window.

According to one aspect of the invention, the two sides between which the reinforcing rib extends are two opposite sides of the window.

According to one aspect of the invention, the window has a polygonal shape, in particular rectangular, and the two sides between which the reinforcement rib extends are
15 two opposite sides of this rectangle.

According to one aspect of the invention, the rib is perpendicular to both edges of the window.

According to one aspect of the invention, the rib has legs each connected to one edge side of the window. Thus the rib has an extent substantially similar to a window dimension,
20 so that this rib has no dimension that goes substantially beyond this dimension of the window.

For example, the rib does not have junction points with the main wall that are remote from the window.

Alternatively, these junction points are remote from the window, so that the rib has
25 a greater span than the window.

According to one aspect of the invention, the rib has an arcuate shape so that the distance between the plane of the window and the rib is variable.

According to one aspect of the invention, the point of the rib furthest from the plane of the window, which point may be considered as a top of the rib, is closer to one side of the window than to the other side on which the rib connects.

According to one aspect of the invention, the top of the rib is rounded.

5 According to one aspect of the invention, the rib has two parallel flanks.

According to one aspect of the invention, these flanks are in particular perpendicular to the plane of the window.

According to one aspect of the invention, the rib extends parallel to a side edge of the window.

10 According to one aspect of the invention, the shroud has several ribs for each window.

According to one aspect of the invention, these ribs are parallel to each other. These ribs are for example four in number.

According to one aspect of the invention, the ribs of one of the windows are identical.

15 According to one aspect of the invention, the ribs of one of the windows have ribs that intersect with each other.

According to one aspect of the invention, the ribs intersect at right angles.

According to one aspect of the invention, the ribs comprise for example two parallel ribs which intersect with four other parallel ribs.

20 According to one aspect of the invention, some ribs may have a rectilinear central region, and not rounded.

According to one aspect of the invention, the rib or ribs are made in one piece with the main wall, in particular being molded together.

25 According to one aspect of the invention, the material of the main wall and the ribs is in particular a plastic material.

The invention also relates to a cooling unit having a fan shroud as claimed in one of the preceding claims, a fan motor unit.

Other characteristics, details and advantages of the invention can be inferred from the description of the invention hereunder. A more complete appreciation of the invention and many of the attendant advantages thereof will be readily obtained as the same becomes
5 better understood by reference to the following detailed description when considered in connection with the accompanying figures, wherein:

FIGURE 1 illustrates a schematic representation of a cooling unit;

FIGURES 2 to 6 illustrate a shroud according to a first embodiment of the invention,

10 **FIGURE 7** illustrates a shroud according to a second embodiment of the invention.

In Figure 1 are illustrated various elements that can be included in a cooling unit 1 to be integrated in a motor compartment of a vehicle according to the present invention. Such a cooling unit 1 may in particular comprise at least one device 2 for regulating the supply of
15 air into the cooling unit 1, one or more stacked heat exchangers, among which, by way of non-limiting example, a condenser 3 and a radiator 4, and at least one motor-fan unit 5.

The device 2 for regulating the air intake can for example be made by a shell 2s, 2i with adjustable flaps as shown in FIG. 1. This shell 2s, 2i comprises an upper part 2s and a lower part 2i fixed on one another and stalled relative to each other. This stall can in
20 particular allow to have an additional heat exchanger.

The cooling unit 1 may comprise a first heat exchanger formed by a condenser 3 and a second heat exchanger formed by a radiator 4. The radiator 4 allows the cooling of the heat engine via an exchange between the outside air and a coolant circulating in the radiator 4 while the condenser 3 is an element of an air conditioning circuit with an exchange network
25 between the incoming fresh air and a refrigerant.

The motor-fan unit 5 can be integrated in a shroud 6 and makes it possible to force the air inlet into the cooling unit 1 when this air supply is no longer sufficient, for example in certain situations. in which the vehicle is at a standstill or at least idle. This shroud 6 may

have two lateral elements 8, a lower edge 9 and a bottom wall 10 in which the motor-fan unit 5 is integrated. A housing has at least one closure wall 11 which covers or closes a volume in which the heat exchangers are housed and which is defined by the arrangement of four peripheral walls, namely: a front transverse wall 12, a rear transverse wall 13, these transverse front and rear walls 12, 13 being arranged across a flow of air entering the vehicle, and two longitudinal walls left and right not shown here. The flow of air entering the vehicle thus passes successively through the front transverse wall 12 of the housing, one or more heat exchangers 3, 4 stacked and finally the rear transverse wall 13 of the housing. The transverse front wall 12 of the housing corresponds to the shell 2s, 2i in which can be integrated the device 2 for regulating the air inlet and the rear transverse wall 13 of the housing carries the motor-fan unit 5. A ventilation device 20 comprises the rear transverse wall 13 and the motor-fan unit 5.

The shroud 6 has an opening 33 of substantially circular shape for the passage of air 21 and the housing for the motor-fan unit is disposed substantially in the center of this opening.

As illustrated in Figures 2 to 6, the fan shroud 6 comprises:

- a main wall 40,
- at least one window 41 arranged for an air passage, this window being formed on the main wall 40,
- a flap 42 associated with this window 41 arranged to close or open this window 41,
- reinforcing ribs 45 arranged to mechanically reinforce an area 46 of the main wall adjacent to the window.

The ribs 45 extend over the window 41 and each connect to two sides 47 of the window.

The two sides 47 between which the reinforcing rib extends are two opposite sides of the window 41.

The window 41 has a rectangular shape and the two sides 47 between which the reinforcement ribs 45 extends are two opposite sides of this rectangle.

The ribs 45 are perpendicular to both edges 47 of the window.

The ribs 45 each have legs 48 each connected to one edge 47 side of the window. Thus the ribs 45 have an extent substantially similar to a window dimension.

For example, the rib does not have junction points with the main wall that are remote from the window.

5 Alternatively, these junction points are remote from the window, so that the rib has a greater span than the window.

Each rib 45 has an arcuate shape so that the distance between the plane of the window 41 and the rib 45 is variable.

10 The point 49 of the rib 45 furthest from the plane of the window, which point may be considered as a top of the rib, is closer to one side of the window than to the other side 47 on which the rib 45 connects.

The top 49 of the rib is rounded.

Each rib 45 has two parallel flanks 50 which are in particular perpendicular to the plane of the window 41.

15 Ribs 45 extends parallel to a side edge of the window.

The shroud 6 has several ribs 45 for each window 41.

These ribs in a number of 4 are parallel to each other.

The ribs of one of the windows are identical.

20 The flap 42 is hinged to main wall 40, via spring effort effect of a spring 55 to close the window 41 if air pressure is under a certain value.

In figure 3, the flap 42 is closed.

In figure 4, the flap 42 is open.

In another embodiment of the invention illustrated in Figure 7, the ribs 45 of each window 41 have ribs 45 that intersect with each other.

25 The ribs 45 intersect at right angles.

The ribs 45 comprise for example two parallel ribs which intersect with four other parallel ribs.

Some ribs 45 may have a rectilinear central region, and not rounded.

The ribs 45 are made in one piece with the main wall 40, in particular being molded together.

According to one aspect of the invention, the material of the main wall and the ribs
5 is in particular a plastic material.

CLAIMS

5

1. A fan shroud (6) for a vehicle comprising:

- a main wall (40),
- at least one window (41) arranged for an air passage, this window being formed on the main wall,

10

- a flap (42) associated with this window arranged to close or open this window,
- at least one reinforcing rib (45) arranged to mechanically reinforce an area of the main wall adjacent to the window.

2. A fan according to claim 1, wherein the rib (45) extends over the window and connects to two sides of the window.

15

3. A fan according to claim 2, wherein the window has a polygonal shape, in particular rectangular, and the two sides between which the reinforcement rib extends are two opposite sides of this rectangle.

20

4. A fan according to any preceding claims, wherein the rib has legs (48) each connected to one edge side of the window. Thus the rib has an extent substantially similar to a window dimension, so that this rib has no dimension that goes substantially beyond this dimension of the window.

25

5. A fan according to any preceding claims, wherein the rib does not have junction points with the main wall that are remote from the window.

6. A fan according to any preceding claims, wherein the rib has an arcuate shape so that the distance between the plane of the window and the rib is variable.

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7. A fan according to any preceding claims, wherein the shroud has several ribs for each window.

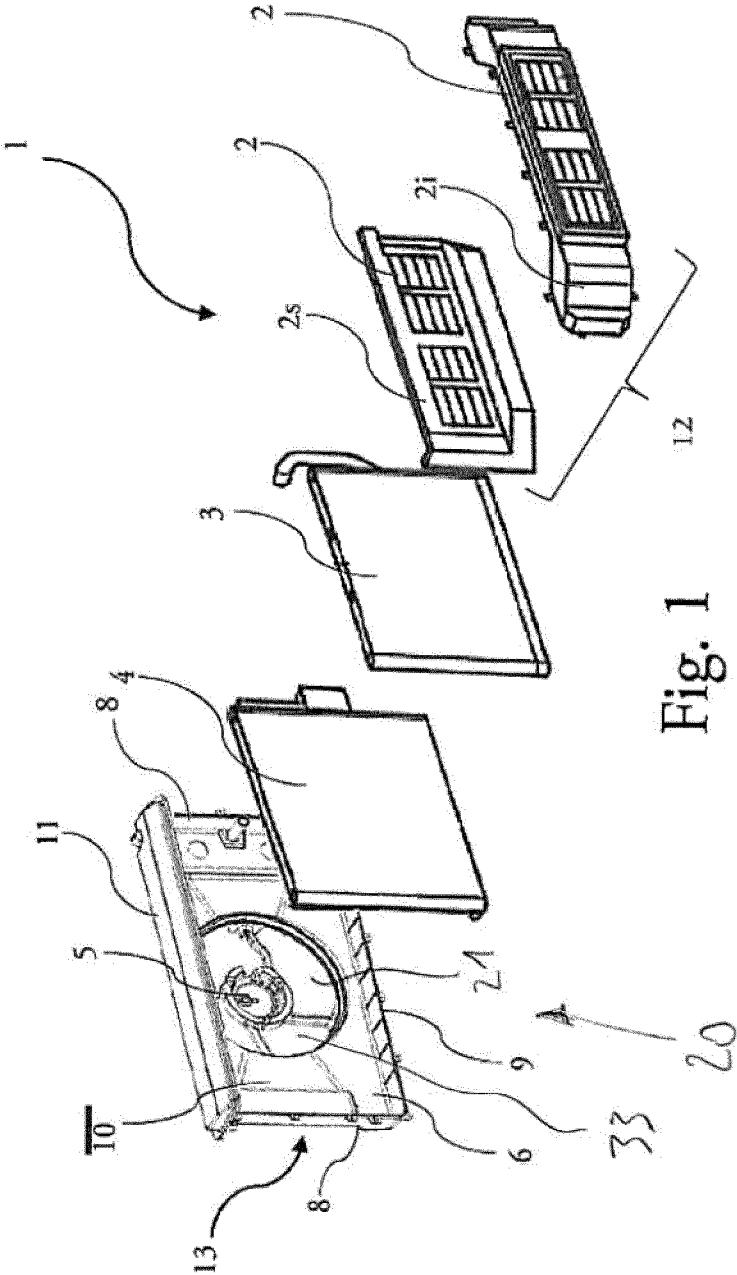
8. A fan according to any preceding claims, wherein the ribs of one of the windows have ribs
5 that intersect with each other.

9. A fan according to any preceding claims, wherein the rib or ribs are made in one piece with the main wall, in particular being molded together.

10

10. A cooling unit having a fan shroud as claimed in one of the preceding claims, a fan motor unit.

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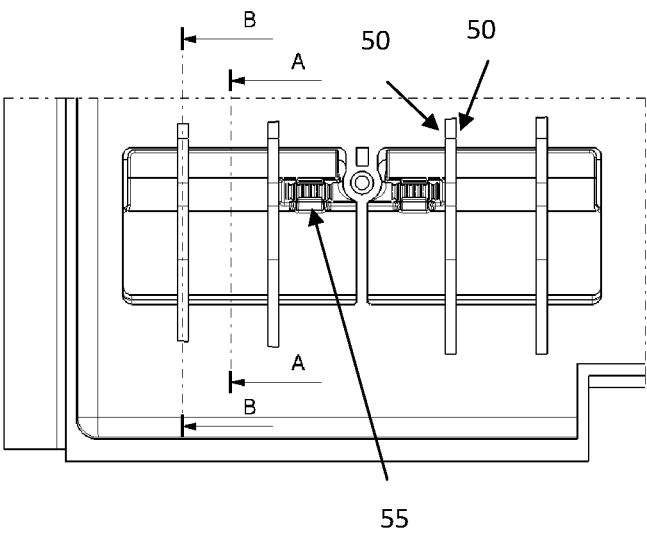
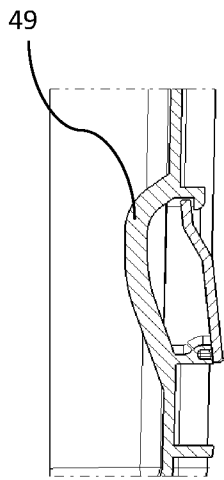
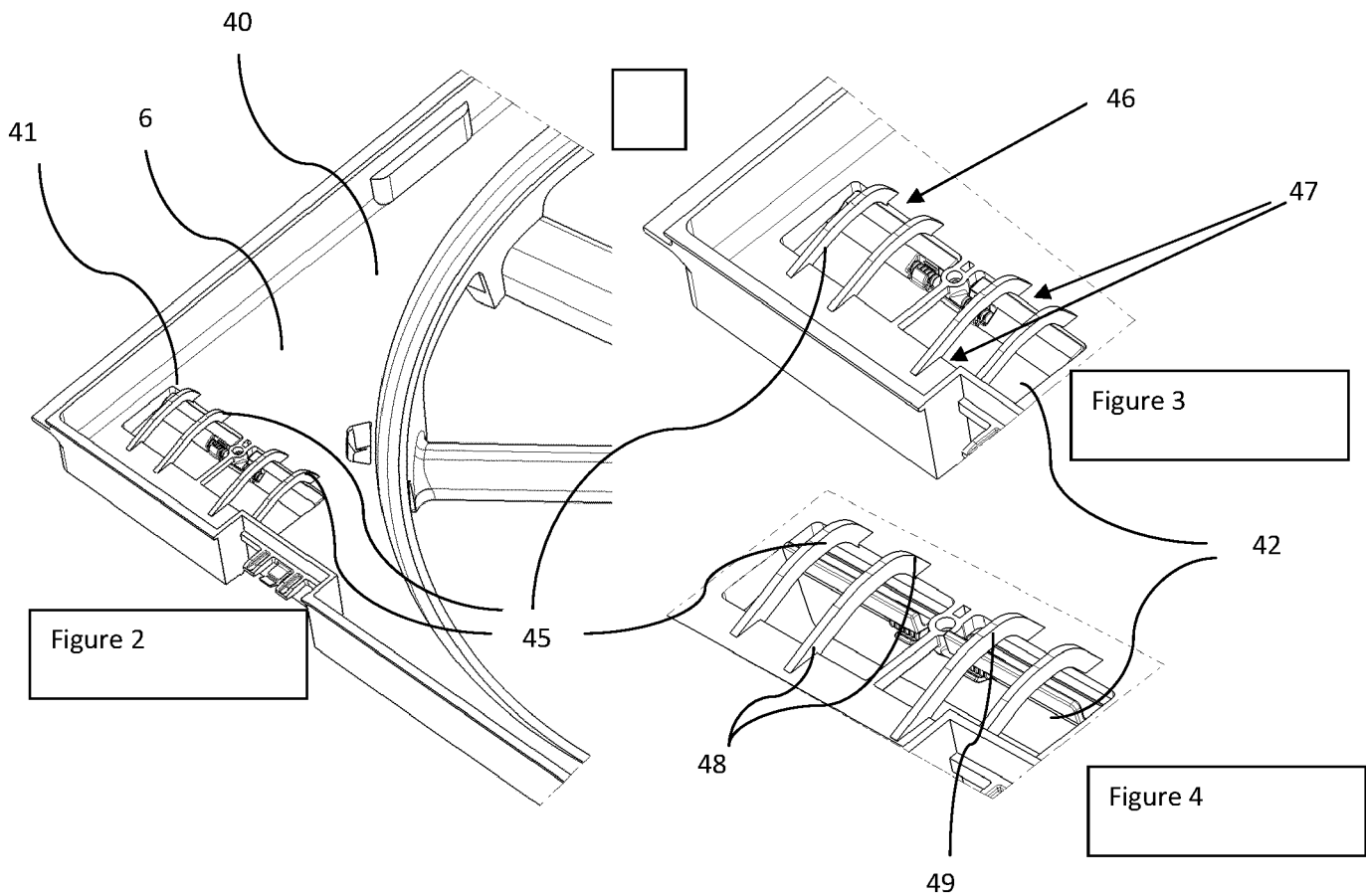


Figure 5

Figure 6

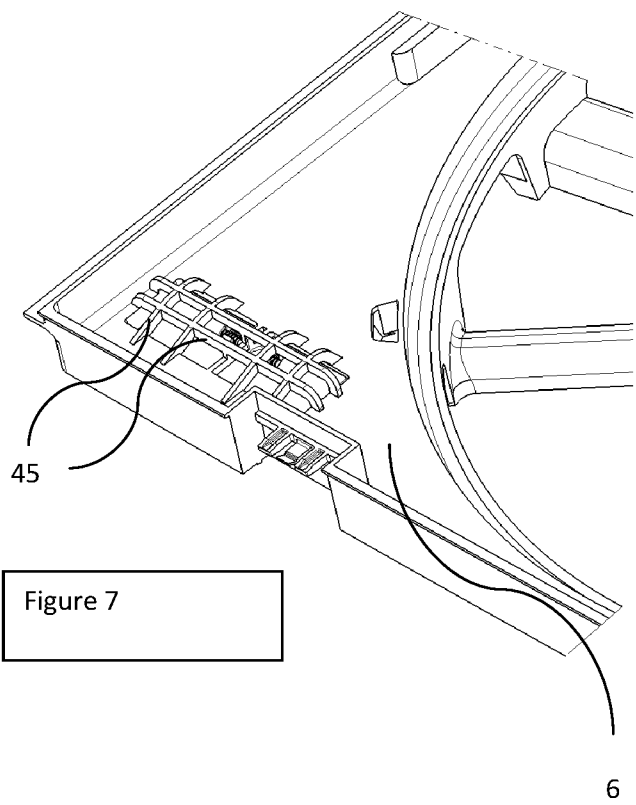


Figure 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/086816

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60K11/00 B60K11/02
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)
B60K

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2007/141981 A1 (CALSONIC KANSEI CORP [JP]; NAKAJIMA HIROSHI [JP]) 13 December 2007 (2007-12-13) figures 1, 2 paragraphs [0004], [0055] - [0059], [0064], [0075] -----	1-5,7-10
X	KR 2018 0093624 A (HANON SYSTEMS [KR]) 22 August 2018 (2018-08-22) figures 3, 5, 7 paragraphs [0008], [0028], [0034], [0040] -----	1,5,6,9, 10



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2007141981 A1	13-12-2007	JP 2007327360 A WO 2007141981 A1	20-12-2007 13-12-2007

KR 20180093624 A	22-08-2018	NONE	
