(54) Title: STRUCTURE PREVENTING OVERHEATING OF AUDIBLE WARNING DEVICES FOR VEHICLES

(57) Abstract: The present invention relates to a housing group (A) for the audible warning device (horn) used in the vehicles comprising the following: a housing (10); a contact (1) forming an electrical current; a steel spring (3) with springiness feature and for mounting the contact (1) thereon; a chassis (6) for mounting the contact (1) thereon; a coil plastic (8) wound with the wire forming a magnetic field and additionally for mounting the chassis (6), terminal group comprising terminal plastic (17) and terminal (18) and lower pin (15) thereon; an adjustment screw (11) for adjusting the inter-contact points of the contacts (1).
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Structure preventing overheating of audible warning devices for vehicles

Technical Field

The present invention relates to the audible warning devices (horns) used in the vehicles.

The present invention particularly relates to the improvements and design changes made on the housing group of the audible warning device for the successful completion of horn testing.

Prior Art

Currently, the horn, when subjected to long term intermittent horn blowing testing conditions provided in the customer specifications and intended for simulating continuous operation of the horn under all severe weather conditions and voltage changes of the vehicle that might be encountered by means of applying high voltage under high temperatures and high humidity cannot successfully complete these tests.

In addition, they cannot complete the life tests, having a much longer cycle and where readjustment of the horn during and after the testing is prohibited, with a maximum loudness level variation of 2 dB(A) according to the international specifications created by the customer to simulate long term operation of the horn on the vehicle. The loudness drop at the end of testing is greater than the value of 2 dB(A).

During these tests, high heat is generated in the contact group. Following problems listed below are encountered due to the effect of the high heat generated. These problems lead to function loss of the horn or inability to meet customer's expectations due the decalibration thereof.

The problems resulting from high heat are the followings:

- Due to the contacts being very close to the plastic of the coil and coil plastic provided just below the contacts, the high heat generated in this region causes deformation of the plastic by significant impact of said high heat on the plastic and thereby causes loss of horn's functionality by the pressure of the plastic on the contact group (spring, chassis, contacts).

- High heat transfer is another problem due to the integral structure of the surface of coil plastic. Thus, the heat rapidly affects the whole surface of the coil and causes the coil
plastic to expand by undergoing deformation, thus, leads to accumulation of plastic material between the upper pin and the lower pin and results in the function loss of the horn by preventing the diaphragm group from advancing towards the lower pin.

The spring and chassis provided in the contact group are both riveted to the flap of the coil plastic. The generated high heat is transferred to both the chassis and spring, then, entirely to the flap of the coil plastic. However, due to the high heat generated, the coil plastic flap undergoes plastic deformation and calibration of the horn performed during manufacturing is disrupted by loosening of the riveting area. Thus, the horn undergoes a greater drop in sound level compared to the initial values or lose its function completely.

Although a similar patent application disclosing the housing group of the audible warning device according to the present invention is not encountered during the patent search, patent applications filed in the similar technical fields are available.

**Objects of the Invention**

The main object of the present invention is to provide improvements and design changes made on the housing group of the audible warning device for the successful completion of horn testing.

Another object of the present invention is to ensure successful completion of the long term intermittent horn blowing testing of the horn under high temperature and high humidity created by the customer to simulate severe operating conditions by the application of high voltage and to provide a maximum sound pressure level change of 2 dB(A) for the horn between the start and end of testing.

Another object of the present invention is to ensure successful completion of the life tests, having a much longer cycle and where readjustment of the horn during and after the testing is prohibited, in accordance with the international specifications created by the customer to simulate long term operation of the horn on the vehicle and to provide a maximum sound pressure level change of 2 dB(A) for the horn between the start and end of testing.

The horn will become a very durable and long lasting product capable of maintaining the initial production performance thereof even when being exposed to the most severe conditions thanks to the housing group of the horn according to the present invention.

Following improvements and design changes are made during the design of the housing group of the horn.
a) In the coil plastic, voiding is carried out in the area remaining just below the region where the contact group is mounted. Thus, the high heat generated in the contacts does not affect the coil plastic and thereby, the pressure on contacts resulting from the melting or permanent deformation of the coil plastic is prevented. The horn is able to operate without any functional failure.

b) Direct influence of heat on the entire surface is avoided by forming heat dissipation voids on the surface of the coil plastic and heat transfer is reduced. Thus, expansion of coil is prevented and maintaining the functionality of the horn intact is ensured by providing easy movement of the diaphragm group towards the lower pin.

c) Riveting of the spring and chassis forming the contact group to different regions is carried out instead of riveting said elements together as in the current technology. The spring is separated from the coil plastic and mounted to the housing group. Thus, split of the heat is provided by dividing the high heat region into two regions and the heat reaching the coil plastic from the spring is completely prevented. Thus, the effect of the high heat generated in the contacts on the coil plastic and loosening of the riveting area by formation of plastic deformation on the flap of the coil plastic is prevented by simultaneous transfer of said high heat generated in the contacts to the spring as well as the chassis. Thus, maintaining the calibration of the horn made during the manufacturing thereof intact is provided.

d) The spring having a loosening rivet in the mounting region thereof due to high temperatures and causing the horn not to meet the conditions expected by the customer is separated from the chassis. Unlike the current technology, the spring is riveted in the housing on a metal quite resistant to high temperatures instead of being riveted on the coil plastic. This metal connection piece is not affected by the high heat generated inside the horn and does not undergo deformation like the plastic used in the current technology. Thus, the deformation formed upon exposure of the mounting location of the spring to high temperatures and loosening problem encountered in the riveting thereof are completely eliminated. Thus, calibration of the horn made during the manufacturing thereof to remain intact and maintaining the function thereof is provided by ensuring that the riveting of the horn remains intact at all times despite the effect of high heat generated under heavy loads and long term operating conditions.

To achieve the mentioned objects, a housing group for the audible warning device (horn) used in the vehicles comprising a housing; a contact forming an electrical current; a steel spring with springiness feature and for mounting the contact thereon; a chassis for mounting the contact thereon; a coil plastic wound with the wire forming a magnetic field and additionally for mounting
the chassis, terminal group comprising terminal plastic and terminal and lower pin thereon; an adjustment screw for adjusting the inter-contact points of the contacts is developed, wherein it comprises a high heat resistant metal connection piece for mounting said spring thereon and an insulating piece used on the connection piece for preventing short circuit of the circuit and having electrical insulation and high heat resistance.

In a preferred embodiment of the present invention, a metal washer is used for riveting the spring on the housing of the housing group by means of riveting.

In a preferred embodiment of the present invention, a contact void is formed on the coil plastic in the region below the contacts to prevent the high heat generated in the contacts from affecting the coil plastic and thereby, the pressure thereof on contacts resulting from the melting or permanent deformation of the coil plastic.

In a preferred embodiment of the present invention, heat dissipation voids in the form of voided regions are formed on the coil plastic in order to reduce the heat transfer and to interrupt surface integrity on the coil plastic.

In a preferred embodiment of the present invention, the spring is separated from the chassis and riveted on a metal connection piece resistant to quite high temperatures in another region of the housing.

In a preferred embodiment of the present invention, an insulation plastic with insulating feature is used in order to prevent the short circuit of the horn during the riveting of the chassis to the housing with rivets.

**Description of the Figures**

Figure 1 is an exploded perspective view of housing group of the audible warning device (horn) according to the present invention.

Figure 2 is a view of housing group of the audible warning device (horn) according to the present invention.

Figure 3 is a view showing the coil plastic which chassis and contact are riveted on.

Figure 4 is a perspective view showing the coil plastic which chassis and contact are riveted on.

Figure 5 is a view of the coil plastic.

**Reference Numbers**
A. Housing group
1. Contact
2. Washer
3. Spring
4. Connection piece
5. Insulating piece (thermally and electrically insulating)
6. Chassis
7. Washer
8. Coil plastic
9. Air discharge filter
10. Housing
11. Adjustment screw
12. Adjustment screw cap
13. Insulation plastic
14. First rivet
15. Lower pin
16. Second rivet
17. Terminal plastic
18. Terminal
19. Third rivet
20. Terminal

Detailed Description of the Invention

The present invention relates to the improvements and design changes made on the housing group (A) of the audible warning device for the successful completion of horn testing.

In Figure 1, an exploded perspective view of the housing group (A) is given. The housing group (A) according to the present invention comprises a contact (1) forming an electrical current and a steel spring (3) with springiness feature for mounting the contact (1) thereon. A metal washer (2) is used for riveting the spring (3) on the housing (10) of the housing group (A) by means of a third rivet (19). The spring (3) is mounted on a high heat resistant metal connection piece (4). An insulating piece (5) with electrical insulation and high heat resistance is used on the connection piece (4). The insulating piece (5) is used for preventing the short circuit of the circuit.
The contact (1) is mounted on a metal chassis (6). A metal washer (7) is used for riveting the terminal group comprising terminal plastic (17) and terminal (18) on the housing (10) by means of a second rivet (16). A coil plastic (8) for winding the wire forming a magnetic field thereon and additionally for mounting the chassis (6), terminal group comprising the terminal plastic (17) and terminal (18) and the lower pin (15) thereon is used.

Unlike the current technique, a contact void (8.1) is formed on the coil plastic (8) in the portion below the contacts (1). Thus, the high heat generated in the contacts (1) does not affect the coil plastic (8) and thereby, the pressure on contacts (1) resulting from the melting or permanent deformation of the coil plastic (8) is prevented. The horn is able to operate for long time without any functional failure.

Again, unlike the current technique, heat dissipation voids (8.2, 8.3) in the form of voided regions are formed on the coil plastic (8) in order to reduce the heat transfer and to interrupt surface integrity thereon. Direct influence of heat on the entire surface is avoided thanks to the heat dissipation voids (8.2, 8.3) formed on the surface of the coil plastic (8) and heat transfer is reduced. Thus, expansion of coil is prevented and maintaining the functionality of the horn intact is ensured by providing easy movement of the upper pin towards the lower pin.

An adjustment screw (11) is used for adjusting the inter-contact points of the contacts (1). A plastic adjustment screw cap (12) attached on the adjustment screw (11) and forming an area for application of silicone on said area is used.

Unlike the current technique, an insulation plastic (13) with insulating feature is used in order to prevent short circuit of the horn during the riveting of the chassis (6) to the housing (10) by means of the first rivet (14).

In the system, a lower pin (15) providing downward movement of the diaphragm group by means of the magnetization through the magnetic field generated in the coil (8) is also used. A special air discharge filter (9) for balancing the external and internal environmental conditions during the operation of the horn is used.

The rivets (14,19) are connection elements used for mounting the chassis (6) and spring (3) to the housing (10). The other rivet (16) is another connection element providing the mounting of the terminal group (17, 18) to the housing (10).

Terminals (18) are used for transmitting the voltage from the vehicle to the coil plastic (8). Terminal plastic (17) is the plastic piece for mounting the terminals (18) thereon.
When voltage is provided to the horn, the contacts (1), one of which is mounted to the spring (3) and the other one to the chassis (6), generate a current by contacting each other. As a result, the wire wound onto the coil plastic (8) generates a magnetic field and pulls the upper pin towards the lower pin (15). Thus, the cap provided on the upper pin contacts the spring (3), causes said spring (3) to move downwards and as a result of this movement the current is cut by the separation of contacts (1) from each other. Eventually, magnetic field disappears and the upper pin goes back to the initial position thereof. During the operation of the horn, this cycle is repeated at least 300 times per second depending on the type of the horn. When the horn is subjected to long term intermittent horn blowing testing conditions provided in the customer specifications and intended for simulating continuous operation of the horn under all severe weather conditions and voltage changes of the vehicle that might be encountered by means of applying high voltage under high temperatures and high humidity as well as subjected to the long cycle life test requested by the customer without making any adjustment, the contacts come into contact numerous times since the horn will be operated for longer periods of time and thus, excessive heat is generated in said contacts (1). In the coil plastic (8), a contact void (8.1) is formed in the area remaining just below the region where the contact group (1, 3, 6) is mounted. Thus, the high heat generated in the contacts (1) does not affect the coil plastic (8) and thereby, the pressure on contacts (1) resulting from the melting or permanent deformation of the coil plastic (8) is prevented. The horn is able to operate for long time without any functional failure.

Direct influence of heat on the entire surface is avoided thanks to the heat dissipation voids (8.2, 8.3) formed on the surface of the coil plastic (8) and heat transfer is reduced. Thus, expansion of coil is prevented and maintaining the functionality of the horn intact is ensured by providing easy movement of the diaphragm group towards the lower pin (15).

Riveting of the spring (3) and chassis (6) forming the contact group to different regions is carried out instead of riveting said elements together as in the current technology (Figure 2, Figure 3). The spring (3) is separated from the coil plastic (8) and mounted to the housing (10). Thus, split of the heat is provided by dividing the high heat region into two regions and the heat reaching the coil plastic (8) from the spring (3) is completely prevented. Thus, the effect of the high heat generated in the contacts (1) on the coil plastic (8) and loosening of the riveting area by formation of plastic deformation on the flap of the coil plastic (8) is prevented by simultaneous transfer of the spring (3) as well as the chassis (6). Thus, maintaining the calibration of the horn made during the manufacturing thereof intact is provided.
The spring (3) having a loosening rivet in the mounting region thereof due to high temperatures and causing the horn not to meet the conditions expected by the customer is separated from the chassis (6). Unlike the current technology, the spring (3) is riveted in the housing (10) on a metal (4) quite resistant to high temperatures instead of being riveted on the coil plastic (8). This metal connection piece (4) is not affected by the high heat generated inside the horn and does not undergo deformation like the plastic used in the current technology. Thus, the deformation formed upon exposure of the mounting location of the spring (3) to high temperatures and loosening problem encountered in the riveting thereof is completely eliminated. Thus, calibration of the horn made during the manufacturing thereof to remain intact and maintaining the function thereof is provided by ensuring that the riveting of the horn remains intact at all times despite the effect of high heat generated under heavy loads and long term operating conditions.

All these inventive attempts ensure successful completion of the long term intermittent horn blowing testing of the horn under high temperature and high humidity created by the customer to simulate severe operating conditions by the application of high voltage and the sound pressure level change for the horn between the start and end of testing has a maximum value of 2 dB(A).

In addition, it successfully completes the life tests, having a much longer cycle and where readjustment of the horn during and after the testing is prohibited, in accordance with the international specifications created by the customer to simulate long term operation of the horn on the vehicle and the sound pressure level change for the horn between the start and end of testing has a maximum value of 2dB(A).

The horn is made a very durable and long lasting product capable of maintaining the initial production performance thereof even when being exposed to the most severe conditions thanks to the present invention.
CLAIMS

1. A housing group (A) for the audible warning device (horn) used in the vehicles comprising
   - a housing (10);
   - a contact (1) generating electrical current;
   - a steel spring (3) with springiness feature for mounting said contact (1) thereon;
   - a chassis (6) for mounting said contact (1) thereon;
   - a lower pin (15) providing the downward movement of the diaphragm group;
   - a terminal (18) transmitting the voltage from the vehicle to the coil plastic (8);
   - a coil plastic (8) for winding the wire forming a magnetic field thereon and additionally for mounting said chassis (6), terminal group comprising the terminal plastic (17) and terminal (18) and the lower pin (15) thereon; and
   - an adjustment screw (11) used for adjusting the inter-contact points of the said contacts (1), characterized in comprising
     - a high heat resistant metal connection piece (4) for mounting said spring (3) thereon and
     - an insulating piece (5) positioned between said connection piece (4) and said housing (10) in order to prevent short circuit of the circuit and having electrical insulation and high heat resistance.

2. The housing group (A) according to Claim 1, characterized in comprising a metal washer (2) used for riveting said spring (3) on the housing (10) of the housing group (A) by means of at least one third rivet (19).

3. The housing group (A) according to Claim 1, characterized in comprising a contact void (8.1) formed on said coil plastic (8) in the region where said contacts (1) are in contact with said coil plastic (8), in order to prevent the high heat generated in said contacts (1) from affecting said coil plastic (8) and thereby, the pressure on contacts (1) resulting from the melting or permanent deformation of the coil plastic (8).

4. The housing group (A) according to Claim 1, characterized in comprising heat dissipation voids (8.2, 8.3) reducing the heat transfer and interrupting the surface integrity on said coil plastic (8), formed on said coil plastic (8) in the form of voided regions.

5. The housing group (A) according to Claim 1, characterized in that said spring (3) is located on the metal connection piece (4) significantly resistant to high heat in a separate
region of said housing (10) such that said spring (3) and said chassis (6) are positioned so as not to be completely on top of each other.

6. The housing group (A) according to Claim 1, characterized in comprising an insulation plastic (13) with insulating feature preventing the short circuit of the horn during the connection of said chassis (6) to said housing (10) by means of said first rivet (14).
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. G10K9/15  G10K9/22

**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)

G10K

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**

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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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