United States Patent [19]

Nasu

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[54] **LENS STRUCTURE FOR A COMBINATION SIGNAL LAMP**

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[73] Assignee: **Ichiko Industries Limited,** Tokyo, Japan

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[30] **Foreign Application Priority Data**

Jan. 20, 1972 Japan 47-9005

[52] **U.S. Cl.** **240/106.1,** 240/8.3, 240/41.55

[51] **Int. Cl.** **F21v 5/04**

[58] **Field of Search** 240/8.3, 106, 106.1, 41.55, 240/41.5; 46/25

[56] **References Cited**

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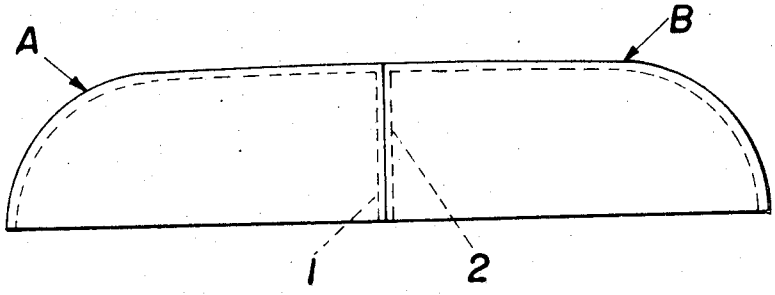
Assistant Examiner—Russell E. Adams, Jr.
Attorney, Agent, or Firm—Wenderoth, Lind & Ponack

[57] **ABSTRACT**

A lens structure for a combination signal lamp for automobiles is comprised of at least two lens pieces connected to each other. Each of the lens pieces has a side wall at which they can be connected together. The side wall of one of the two lens pieces is provided with spaced, exposed vertical dovetail grooves each having a closed top and an open bottom and this side wall also has a notch which runs horizontally at the bottom thereof and includes the open lower end portions of the grooves. The side wall of the other lens piece is provided with spaced dovetail projections which fit in said dovetail grooves and with an elongated horizontal flange which fits in said notch. This lens structure is made by placing the dovetail grooves and the dovetail projections together and also by putting the flange in place in the notch, and then by welding together the abutting walls of the flange and the notch integrally relying on known welding techniques utilizing, for example, supersonic waves.

4 Claims, 10 Drawing Figures



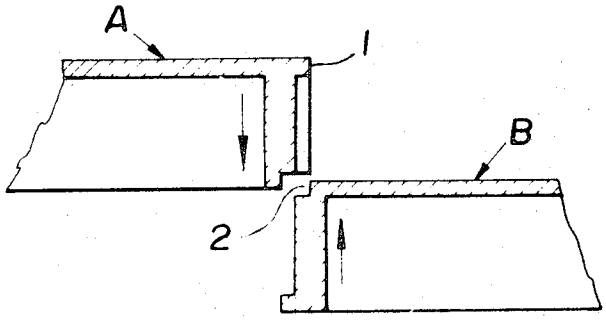


FIG.1

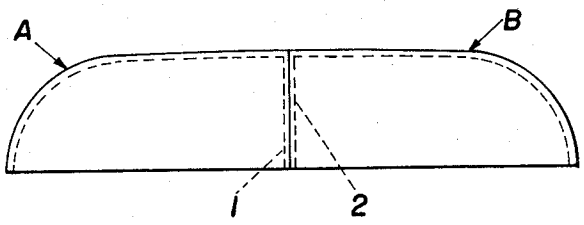


FIG.2

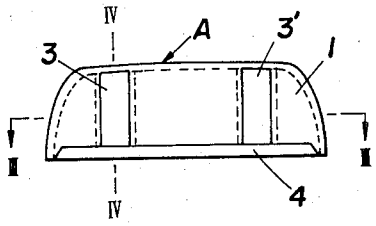


FIG.5

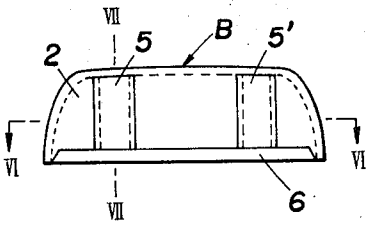


FIG.3

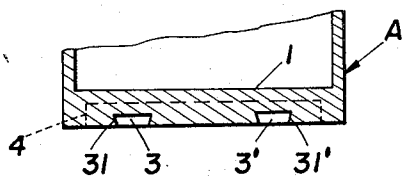


FIG.6

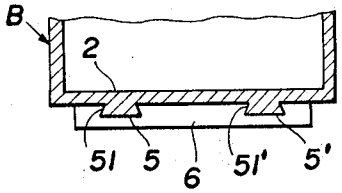


FIG.4

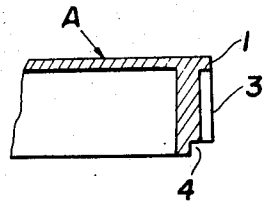


FIG.7

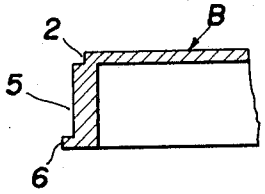


FIG.8

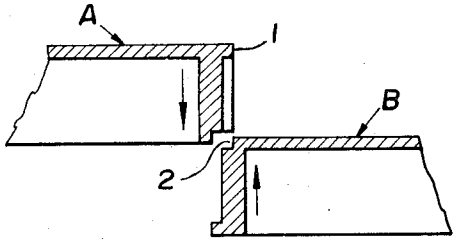


FIG.9

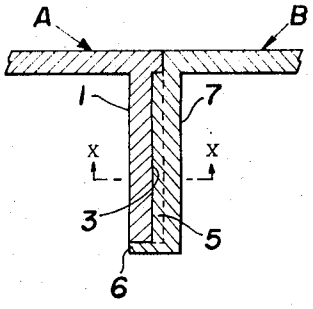
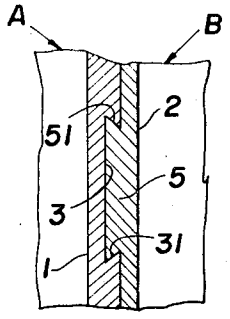


FIG.10



LENS STRUCTURE FOR A COMBINATION SIGNAL LAMP

BACKGROUND OF THE INVENTION

1. Field of the Invention:

The present invention is concerned with a structure of a combination signal lamp, and more particularly, it relates to a lens structure of the type described such as the combination of a tail lamp and a turn signal lamp for automobiles.

2. Description of the Prior Art:

Lens structures for combination signal lamps for automobiles are usually made with molded plastic lens pieces. It is, however, technically impossible to mold a plurality of plastic pieces simultaneously into an integral combination lens structure, because of the fact that these lens pieces are of different colors. Therefore, the conventional lens structures of this kind have been produced by the following complicated steps.

One of the conventional production methods comprises separately molding the required lens pieces of different colors, forming rough surfaces of those walls of the lens pieces which are to be connected together, and then bonding them together by the use of an adhesive.

Another conventional production method uses a metal mold provided with at least one space for accommodating a pre-fabricated lens piece of a first color. In use one places this pre-fabricated first lens piece in place in said space and then molds a fresh lens piece of a second color integrally with said first lens piece in the metal mold, thus welding these at least two pieces together. In this case also, said first lens piece is given a roughening treatment at the connecting surface to increase the welding force of the surface.

However, these conventional producing methods have the following drawbacks. In the first-mentioned method, the adhesive used requires 1–2 hours to harden. Therefore, the bonded pieces have to be left at rest for this time until a firm bond is established.

The other method described above, on the other hand, requires the use of a large mold having a size sufficient for accommodating the pre-fabricated lens piece or pieces, and will have the troublesome steps of mounting these pre-fabricated lens pieces in the space within the metal mold for each manufacturing process, thus lowering the production efficiency. Furthermore, there may arise the inconvenience that the mounted pre-fabricated lens pieces may break at the time of final molding.

SUMMARY OF THE INVENTION

It is, therefore, a primary object of the present invention to provide a lens structure for a combination signal lamp of the type described, which is free from the aforesaid drawbacks and which can be produced with an improved efficiency.

Another object of the present invention is to provide a lens structure for a combination signal lamp of the type described, in which the respective lens pieces are connected together firmly and wherein the resulting structure can withstand the externally applied bending forces.

These and other objects as well as the features and advantages of the present invention will become apparent by reading the following detailed description of an embodiment thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagrammatic side view of an example of a combination signal lamp with two lens pieces firmly joined together.

FIG. 2 through FIG. 4 show one of the two lens pieces to be joined together, in which: FIG. 2 is a view of that wall of the lens piece to be connected; FIG. 3 is a sectional view of the same, taken along the line III — III in FIG. 2; and FIG. 4 is a sectional view of the same, taken along the line IV — IV in FIG. 2.

FIG. 5 through FIG. 7 show the other of the two lens pieces, in which: FIG. 5 is a view of the wall of said other lens pieces to be joined; FIG. 6 is a sectional view of the same, taken along the line VI — VI in FIG. 5; and FIG. 7 is a sectional view of the same, taken along the line VII — VII in FIG. 5.

FIG. 8 is an explanatory illustration, showing the manner in which two mating lens pieces are placed together.

FIG. 9 is a sectional view, showing the connecting walls of the lens pieces as they are fastened together.

FIG. 10 is a sectional view, taken along the line X — X in FIG. 9.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawings, A represents generally a first lens piece and B represents generally a second lens piece. The first lens piece A has a side wall **1**, and the second lens piece B has a side wall **2**. These lens pieces A and B unite integrally together at the surfaces of these side walls **1** and **2**.

Description will hereunder be made of an example of such lens structure.

The side wall **1** of the first lens piece A is provided, on its outer surface, with exposed vertical dovetail grooves **3**, and **3'** which are open at their lower ends. In addition, at its lower end face piece A is provided with a horizontally extending elongated notch **4** which includes said dovetail grooves **3** and **3'**. More specifically, said vertical dovetail grooves **3** and **3'** are, as shown in FIG. **3**, so formed that they are widened progressively as they go toward the inner face of the side wall **1** forming generally a V-shape so that these grooves have inclined inner side faces **31, 31'**. Said vertical grooves **3** and **3'** are such that their upper ends are lower in level than the top of this lens piece A and that the lower ends thereof which are open join the horizontal notch **4** formed at the bottom of said side wall **1**.

The second lens piece B has, at its side wall **2**, vertical dovetail projections **5** and **5'** which are complementary in configuration to said dovetail grooves **3** and **3'** of the first lens piece A so as to be able to fit therein when the two lens pieces A and B are assembled together. This second lens piece B also has an elongated horizontal flange **6** extending from the lower end of the side wall **2** and is complementary in configuration to said notch **4** of the first lens piece A so as to be fittingly received in said notch **4**. Said dovetail projections **5** and **5'** are provided on the side wall **2** at the sites corresponding to those of said dovetail grooves **3** and **3'** on the side wall **1**, respectively. From the foregoing description, it

should be understood that the outer side faces **51** and **51'** of said dovetail projections **5** and **5'** extend in progressive widening fashion from the surface of the side wall **2**, forming substantially a V-shape as shown in FIG. **6**, and that said bottom flange **6** extends beyond the outermost edges of the dovetail projections **5** and **5'**. Needless to say, said vertical dovetail grooves **3** and **3'** and said complementary dovetail projections **5** and **5'** are formed to be parallel to each other.

The following is a description of the manner in which the first and the second lens pieces A and B are assembled together. These first and second lens pieces A and B having the aforesaid configurations are first brought to such positions as shown in FIG. **8** in which the lens piece A is positioned closely above the lens piece B so that the side wall **1** is located directly above the side wall **2**. Then, said vertical dovetail projections **5** and **5'** of the second lens piece A are slid into said vertical dovetail grooves **3** and **3'** beginning at the open lower ends of said grooves so that said inclined inner side faces **31** and **31'** of said grooves are progressively slidably engaged with their mating outer side faces **51** and **51'** of said projections to establish dovetail joints and so that said bottom horizontal flange **6** of the second lens piece B is fitted progressively into said notch **4** of the first lens piece A. The first and second lens pieces are thus firmly united together. Thereafter, the bottom flange **6** is welded firmly to the walls of the notch **4** by relying on a known supersonic or high-frequency welding technique.

It should be noted that an opaque light-shield paint may be applied to the outer surface of either one of the two side walls **1** and **2** before uniting the first and second lens pieces A and B together to keep the colored light rays of one lamp A from mingling into the lens piece material of the other lamp B when these two lamps are lighted.

An advantage of the present invention is that it takes only 3–5 seconds to establish the firm fastening of the two lens pieces A and B because of the complementary lower end structures of the side walls of these two pieces. More specifically, after these two pieces are put together, it is only necessary to weld the bottom ends of these two pieces A and B together in 3 to 5 seconds by the use of, for example, supersonic waves. The invention does not use the conventionally employed adhesives which require a lot of time to harden.

Another advantage of the present invention is that the aforesaid "dovetail joint" portion plus the fusion-welding at the bottom portions of the two pieces A and B cooperatively exhibit a resistance which is sufficiently powerful to cope with any external forces such as a bending force or a pulling force in spite of the small area of the fusion-welded portion of the lens structure.

A further advantage of the present invention is found in that, unlike the conventional manufacturing processes — i.e., the process using an adhesive and the integral molding process which uses a large-size metal mold for housing a pre-molded lens piece or pieces and which molds the final lens piece together with the pre-molded lens pieces in said mold to produce an integrally fused lamp assembly — there can be obtained a much improved productivity and what is more, the products of the present invention are substantially free from any breakage, thus eliminating the occurrences of rejected lamps which are frequently encountered in the prior art. Besides, this simple structure of the lamps and the simplified manufacturing method significantly lower the number of manufacturing steps and time and as a result, the manutacturing time and costs are accordingly lowered.

The foregoing description in conjunction with the accompanying drawings illustrates an embodiment in which only two lens pieces are joined. It should be understood, however, that the present invention is not limited to said one embodiment. It should be also understood that the present invention can be applied to a combination lamp comprised of three lamps, for example, a tail-lamp, a turn signal lamp, and a stop lamp without departing from the spirit and scope of this invention. It should be understood also that an embodiment has been described where each of the side walls of these two lens pieces has two vertical dovetail grooves and complementary vertical dovetail projections, but that only one or more than two of these grooves and projections may be formed. Therefore, needless to say, other variations and modifications can be made also within the spirit and scope of the present invention.

I claim:

1. A lens structure for a combination signal lamp, comprising at least two lens pieces each having a side wall to be joined together, each side wall having upper and lower edges and vertical side edges,

the side wall of one of said two lens pieces having at least one exposed, vertical dovetail groove having first and second ends, said first end being opened and a horizontal notch joining said open first end,

the side wall of the other one of said two lens pieces having at least one vertical dovetail projection, having first and second end surfaces, located at a site corresponding to that of said groove and provided with a configuration complementary to that of said groove, this latter side wall further having a horizontal flange extending from said first surface and being of a configuration complementary to that of said notch,

said dovetail projection being received in said dovetail groove,

said flange being received in said notch, and said flange and walls of said notch being fusion-welded together.

2. A lens structure for a combination signal lamp according to claim **1**, in which the side wall of one of the two lens pieces has two of said dovetail grooves in parallel relation with each other and the side wall of the other of the two lens pieces has two of said dovetail projections in parallel relation with each other at sites corresponding to those of said dovetail grooves.

3. A lens structure for a combination signal lamp according to claim **1**, in which said flange and walls of said notch are fusion-welded together by a supersonic welding technique.

4. A lens structure for a combination signal lamp according to claim **1**, in which the outer surface of said side wall of either one of said two lens pieces is coated with a light-shielding opaque material.

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