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(54) **OLEFIN-BASED THERMOPLASTIC ELASTOMER AND MOLDED PRODUCT PRODUCED THEREFROM**

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(57) **ABSTRACT**

An olefin-based thermoplastic elastomer comprises a propylene-based resin (A) and an olefin-based copolymer rubber (B), and has a ratio ( $N_1/SS$ ) of first normal stress difference ( $N_1$ ) to shear stress (SS) of 0.6:1 to 1.4:1 said first normal stress difference ( $N_1$ ) and shear stress (SS) being determined by subjecting said elastomer to step shear test at a temperature of 200° C. and a shear rate of 25.1 sec<sup>-1</sup>. Such olefin-based thermoplastic elastomer shows excellent moldability, transferability of embossed patterns and mechanical strength.

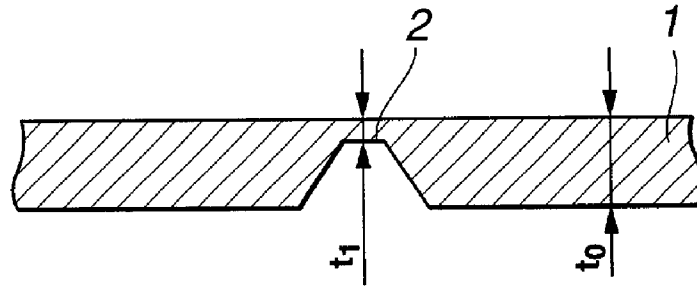
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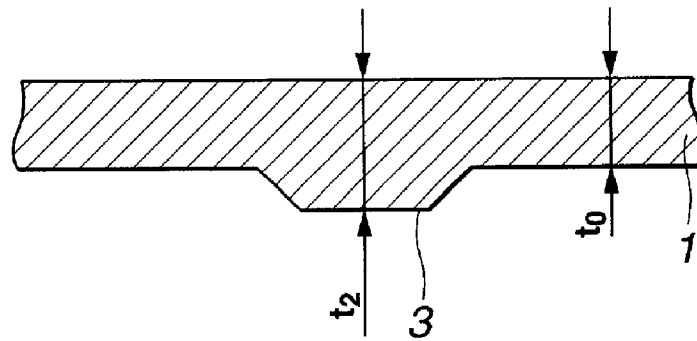
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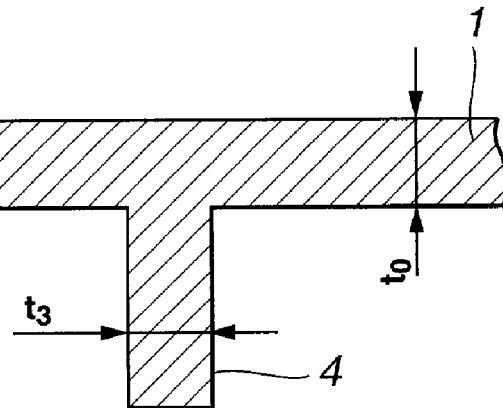
**FIG.1(a)**



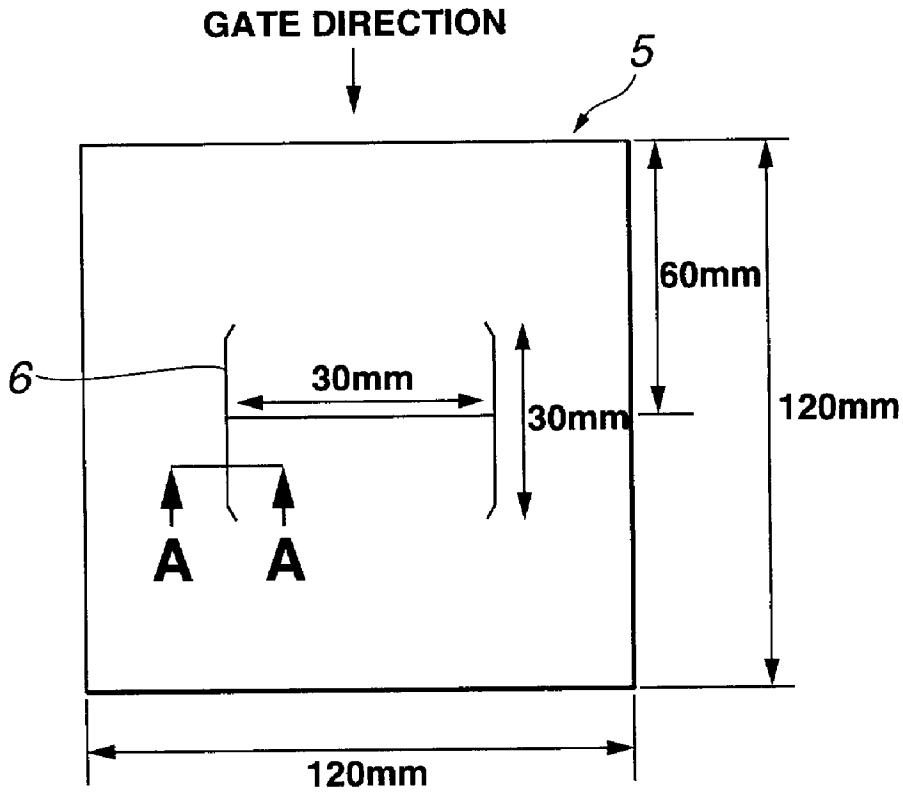
**FIG.1(b)**



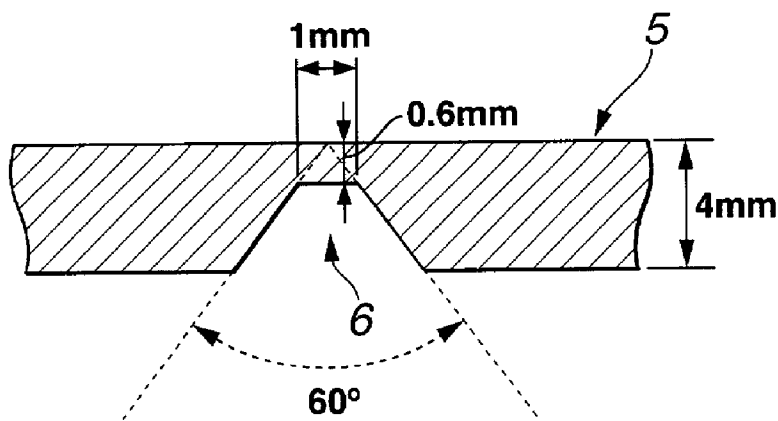
**FIG.1(c)**



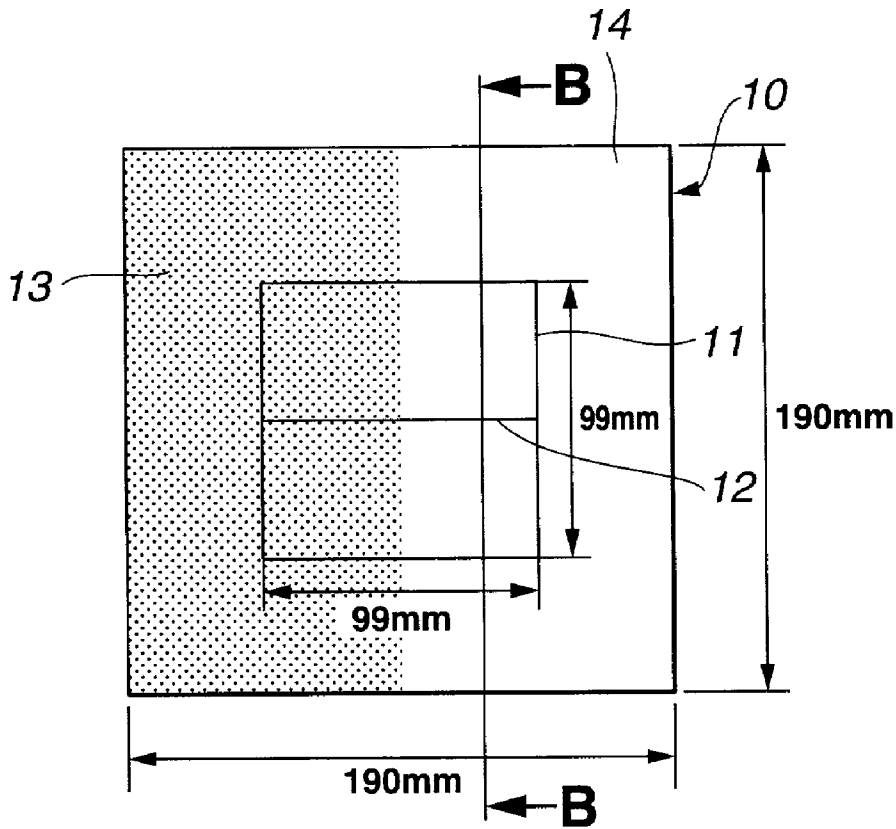
# FIG.2(a)



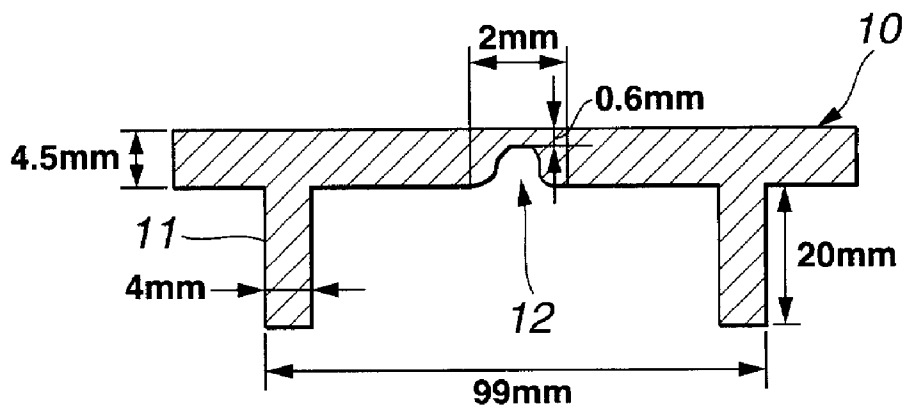
# FIG.2(b)



# FIG.3(a)



# FIG.3(b)



## OLEFIN-BASED THERMOPLASTIC ELASTOMER AND MOLDED PRODUCT PRODUCED THEREFROM

### BACKGROUND OF THE INVENTION

[0001] The present invention relates to an olefin-based thermoplastic elastomer comprising a composition containing a propylene-based resin and an olefin-based copolymer rubber, and more particularly, to an olefin-based thermoplastic elastomer which is excellent in moldability, transferability of embossed patterns and mechanical strength, is capable of providing a molded product being free from appearance defects such as an uneven luster, weld marks and flow marks even when the thickness thereof is varied over a wide range, and is suitable for forming automobile interior trims or parts, especially a cover for accommodating an air bag.

[0002] In recent years, thermoplastic elastomers such as styrene-based elastomers, olefins-based elastomers, polyesters-based elastomers, polyamides-based elastomers, polyurethane-based elastomers, etc., which are rubber-like soft materials and exhibit a good moldability compatible with that of thermoplastic resins without vulcanization process, have been noticed from the standpoints of productivity, recyclability or the like, and have been extensively used in various applications such as automobile parts, electrical appliances, medical apparatuses or components thereof, electric wires and sundries. Among these elastomers, compositions composed of a propylene-based resin and an olefin-based copolymer rubber such as an ethylene-propylene copolymer rubber or an ethylene-propylene-non-conjugated diene copolymer rubber, or olefin-based thermoplastic elastomers obtained by kinematically heat-treating the above compositions in the presence of an organic peroxide so as to allow the olefin-based copolymer rubber to be cross-linked and form a partially cross-linked product, have been especially noticed as economically useful materials because of inexpensiveness thereof. In addition, since the elastomers show an appropriate flexibility and are prevented from eliminating embossed patterns thereon even when subjected to thermoforming process, positive studies have been made to apply these elastomers to automobile interior trims or parts as alternative materials for conventional soft vinyl chloride resins.

[0003] Molded products such as typically automobile interior trims or parts generally include ribs for ensuring a mechanical strength thereof, or other components or fitting members for attachment to a base structure and, therefore, has both thin-wall and thick-wall portions therein, resulting in large change in thickness. Such a thickness change tends to cause appearance defects such as uneven luster, weld marks and flow marks on the surface of the molded product. In particular, since the olefin-based thermoplastic elastomers are in the form of not only a mixture but also a partially cross-linked product, non-uniform dispersion or coarse dispersion of cross-linked rubbers tends to be caused. Therefore, molded products produced from such olefin-based thermoplastic elastomers are more likely to suffer from the above-described appearance defects.

[0004] To solve problems concerning the above-described appearance defects, for example, Japanese Patent Application Laid-Open (KOKAI) No. 8-176394(1996) describes a

thermoplastic elastomer composition exhibiting a die swell ratio of not less than 1.8 at a shear rate of  $6.8 \times 10^3 \text{ sec}^{-1}$  and comprising a propylene-based block copolymer resin, a specific hydrogenated aromatic vinyl-conjugated diene block copolymer, an ethylene- $\alpha$ -olefin copolymer rubber and paraffin-based process oils. Also, Japanese Patent Application Laid-Open (KOKAI) No. 10-259281(1998) describes a thermoplastic elastomer composition comprising a propylene-based resin, a specific hydrogenated aromatic vinyl-conjugated diene block copolymer and an ethylene- $\alpha$ -olefin copolymer rubber.

[0005] However, as a result of the present inventors' earnest studies, it has been found that these conventional thermoplastic elastomer compositions fail to fully satisfy requirements such as reduction in thickness of molded products due to recent tendency toward light-weight automobile parts, or enlargement in size of molded products due to recent tendency toward reduced number of parts, especially such a requirement that molded products having a large change in thickness, e.g., an air bag cover having a thin wall portion with a thickness as small as not more than 1 mm for inflation or deployment of an air bag received therein, should be free from appearance defects such as uneven luster, weld marks, flow marks or the like.

[0006] Under the circumstances, it has been found that the specified olefin-based thermoplastic elastomer obtained by mixing a propylene-based resin and an olefin-based copolymer rubber and having a specific ratio ( $N_1/SS$ ) of first normal stress difference ( $N_1$ ) to shear stress ( $SS$ ), shows excellent moldability, transferability of embossed patterns and mechanical strength. The present invention has been attained based on the finding.

### SUMMARY OF THE INVENTION

[0007] An object of the present invention is to provide an olefin-based thermoplastic elastomer comprising a composition containing a propylene-based resin and an olefin-based copolymer rubber, which is not only excellent in moldability, transferability of embossed patterns and mechanical strength, but also capable of providing a molded product being free from appearance defects such as uneven luster, weld marks and flow marks.

[0008] To accomplish the aim, in a first aspect of the present invention, there is provided an olefin-based thermoplastic elastomer comprising a propylene-based resin (A) and an olefin-based copolymer rubber (B), and exhibiting a ratio ( $N_1/SS$ ) of first normal stress difference ( $N_1$ ) to shear stress ( $SS$ ) of 0.6:1 to 1.4:1 wherein the first normal stress difference ( $N_1$ ) and shear stress ( $SS$ ) are determined by subjecting the elastomer to step shear test at a temperature of 200° C. and a shear rate of  $25.1 \text{ sec}^{-1}$ .

[0009] In a second aspect of the present invention, there is provided a molded product formed from said olefin-based thermoplastic elastomer as defined in the above-mentioned first aspect, having an opening and/or a flat base plate comprising:

[0010] a thin-wall portion having a thickness in the range of from 5 to 50% of a thickness of said flat base plate, a thick-wall portion having a thickness in the range of from 110 to 200% of the thickness of said flat base plate, and/or

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