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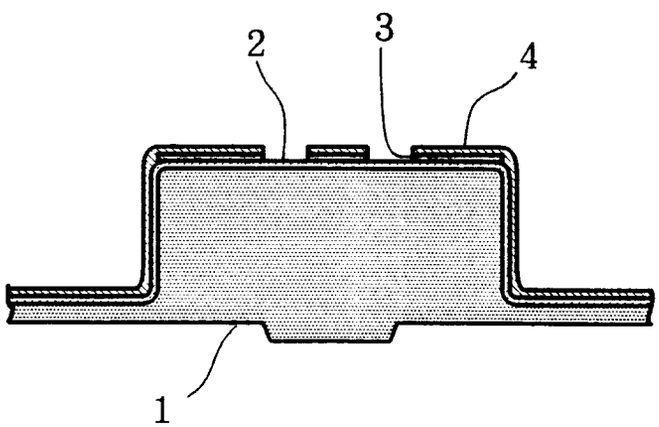
(54) Manufacturing method of color keypad for a contact of character illumination rubber switch

(57) A manufacturing method of a keypad for a contact character illumination rubber switch composed of a surface enriched in color design variation, comprising the steps of forming a black or gray intermediate layer (3) on a surface portion of a color keypad member (1) for a contact character illumination switch of a mobile communication system, electric equipment for car loading or the like, forming a colored surface layer (4) thereon with any color, and applying a laser beam from the upside thereon for burning up and removing the intermediate layer (3) and the colored surface layer (4).

Fig. 1



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Description

The present invention relates to a manufacturing method of color keypad for a contact of character illumination rubber switch in a mobile communication system and electrical equipments for car loading.

The manufacturing method of the keypad for a contact of character illumination rubber switch made by rubber which illuminates only either characters or figures is already well known through the Japan Patent Publication No. HEISEI 5-32850. In this method, laser beam is irradiated so that the laser beam energy is absorbed into a colored surface layer in the shapes of characters and burns off it.

In order to remove the colored surface layer by means of the laser beam, it is necessary to arrange materials such as carbon black on the surface so that the laser beam is readily absorbed into the colored layer. Therefore the available keypads manufactured by irradiating laser beam currently have only dark colors such as black or gray or the like as the colored surface layer. It is possible to emit the laser beam on the colored surface layer of any colors of which are not black or gray and to burns off it, on the contrary, the incomplete removal thereof is readily caused within the colored surface layer because the colored surface layer do not completely absorb the laser beam. Moreover, if by increasing the irradiation dose of the laser beam the colored surface layer is removed, removal or burning thereof is caused on the lower colored light permeable layer, thus by using the recent laser beam unit, it is difficult to obtain high quality products and the marketing can not be realized.

It is the purpose of the present invention to manufacture a keypad having color variation much needed, especially by women and young people, for the color keypad for illuminated character contact is the mobile communication system and the electrical equipments for car loading.

The present invention relates to a manufacturing method of a keypad for a contact of character illumination rubber switch composed of a surface enriched in color design variation, comprising the steps of forming a black or gray intermediate layer 3 over a surface section of a color keypad member 1 for a contact of character illumination switch of the mobile communication system, electric equipments or the like, forming a colored surface layer thereon with any colors, and applying laser beam from the upside thereof for burning up and removing the intermediate layer and the colored surface layer.

FIG 1 is a cross section view of a keypad according to the present invention.

FIG 2 is a cross section view of a conventional keypad,

Now the present invention will be described more in detail referring to the embodiment as shown in Fig. 2. A body of keypad 1 is formed with transparent or semi-transparent elastic material. Such elastic material includes natural rubber (polyisoprene rubber), butadiene rubber, styrene butadiene rubber, chloroprene rubber, nitryl rubber, butyl rubber, ethylene propylene rubber, acrylic rubber, silicone rubber, fluoric rubber, urethane rubber, other synthetic rubber, or styrene base, olefin base, ester base, urethane base thermoplastic elastomer. Over the face thereof, a colored translucent layer 2, a black or gray dark colored intermediate layer 3 and a colored surface layer 4 are formed by painting or printing with polyester base, silicone base or various liquid rubber (urethane base, diene base, polybutene base). For painting method, reciprocation, air, rotary or other well-known methods are employed, while for printing, screen, offset, PAD or other well-known methods are employed.

Thereafter, laser beam is applied to the intermediate lay from the upper side of this colored surface layer 2, to remove characters or graphic pattern shape portion. When this intermediate layer is removed, the colored surface layer will be also removed at the same time. Thus, a keypad is realized with its colored surface with any colors.

Example

A transparent or semi-transparent silicone rubber is molded by a metal die of keypad shape and a colored translucent layer 2 is coated using silicone ink white (made by Toshiba Silicone Ltd.) in order to form a colored translucent layer base. At that time, 20 parts by weight of hardener is added to 100 parts by weight of silicone ink.

Next, as an intermediate layer 3, silicone ink black (made by Toshiba Silicone Ltd.) is formed thereon in the shape of key top by silk screen printing. At this time, the key top printing may also be applied with gray silicone ink mixing conveniently white ink and blackink (made by Toshiba Silicone Ltd.) as the intermediate layer 3.

Finally, 30 parts by weight of Color Master Red (made by Toshiba Silicone Ltd.) are added to 100 parts by weight of Silicone Ink Clear (made by Toshiba Silicone Ltd.) as an ink used for the colored surface layer 4, the liquid obtained as the result is mixed enough, diluted with solvent and coated on the key top surface. More, on this occasion, 20 parts by weight of the hardening are added to 100 parts by weight of silicone ink.

About the silicone rubber keypad coated as mentioned above, the intermediate layer 3 and the colored surface layer 4 at the same time are removed by a laser marker (made by Fuji Electric Ltd.). As the result, the colored surface layer and the intermediate layer can be removed in the same shape of the given character and/or symbol as the keypad for conventional black, gray or other character illuminating rubber switch contacts.

Same results are obtained, using blue, green and brown as the colored surface layer 4 and, with a same arrangement as (3). Moreover, a wide variety of color

variation can be realized by preparing color masters of the colored surface layer.

The thickness of the colored surface layer 4 is set within the range of 50 μm or less depending on the laser output energy conditions of the laser machine, however, preferably 20 to 30 μm is appropriate. At 15 μm or less, in some cases, the color of the intermediate layer 3 becomes visible through the colored surface layer and the color is not distinct in respect of the outside appearance. At 50 μm or more, the energy efficiency of the intermediate layer is deteriorated, the increase of the processing time and the removal of some colored surface layer become easy to occur.

By using this method of manufacturing, any colors other than black can be selected for the colored surface layer having the widest area in respect of the outside appearance, permitting to enrich the variation of key top color design.

Additionally, at that time, products presenting desired qualities, and strongly demanded especially by women and young people, can be manufactured without suffering deterioration of any characters or figures such as discoloration due to the fading of the colored transparent or translucent layer.

Claims

1. A method of manufacturing a keypad for a contact character illumination rubber switch made of rubber or other elastic material, in which a colored transparent or translucent layer of any color is expressed and formed, comprising the steps of:

   forming, as the need arises, a colored transparent or translucent layer (2), over the surface portion of a keypad member (1) for contact made of rubber molded by using transparent or semi-transparent elastic material;
   applying a black, gray or other dark color layer thereon as an intermediate layer (3) for enhancing optical energy absorption;
   additionally forming thereon a colored surface layer (4) with any color(s) other than black and gray;
   thereafter irradiating with a laser beam said colored surface layer in the shapes of characters or figures;
   burning up said intermediate layer (3) by absorption of laser beam energy; and
   at the same time, burning up and removing said colored surface layer (4) by said burning heat.

Fig. 1

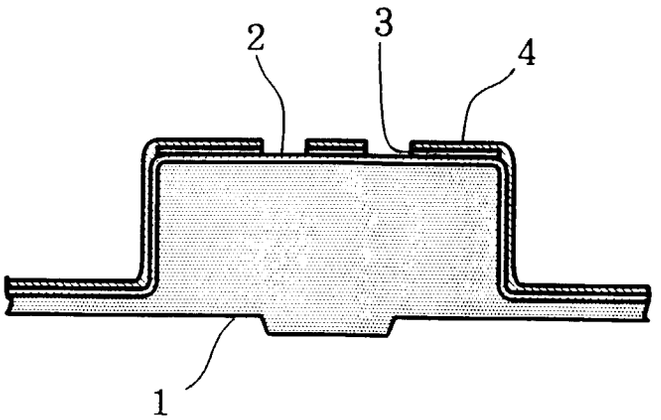
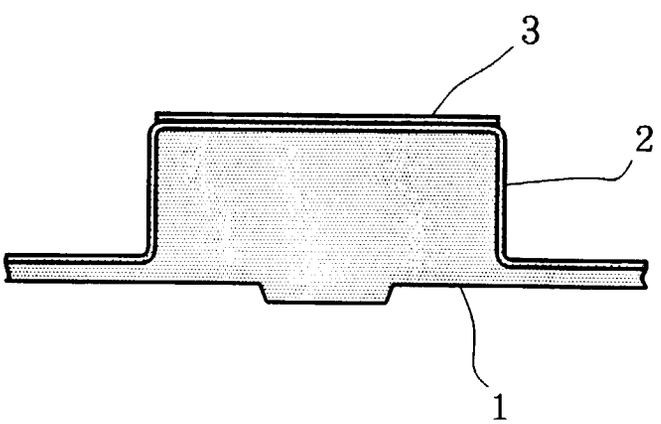


Fig. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 97 30 9838

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	DE 35 09 519 A (RICHARD HEINZE KUNSTSTOFF SPRI) * page 7, line 35 - page 8, line 32; figures 1-3 *	1	H01H13/70
A	US 5 510 782 A (NORRIS JEFFREY J ET AL) * abstract; figures 2,3 *	1	
A	DE 43 24 625 A (SHINETSU POLYMER CO) * claim 1; figures 1A-1F *	1	
A	GB 2 246 099 A (SILITEK CORP) * abstract; figures 1-3 *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	6 March 1998	Mausser, T

CATEGORY OF CITED DOCUMENTS

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