United States Patent

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[54] **HIGHWAY DIVIDER BUTTON**
10 Claims, 2 Drawing Figs.

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[50] **Field of Search** 94/1.5; 260/88.1; 161/167, 406

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ABSTRACT: For use along divider strips on highways, a button which is attached to the pavement to remind drivers to stay in divided lanes, the button preferably being comprised of an ionomer base which provides desirable abrasion-resistant and impact-resistant characteristics, the base having added thereto a suitable filler such as titanium oxide to impart a desired color thereto and being joined to the pavement through a preferably integral adhesive which is dry and nontacky at most temperatures, but which becomes adhesive at elevated temperatures to join the button to the pavement. The button, when joined to the pavement, is particularly advantageous in the absorption of impact or shock and does not transmit pavement-damaging shock to the pavement.

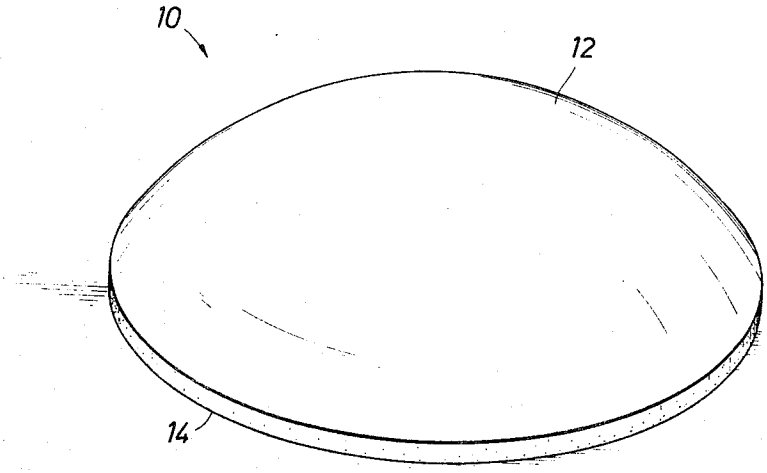


FIG. 1

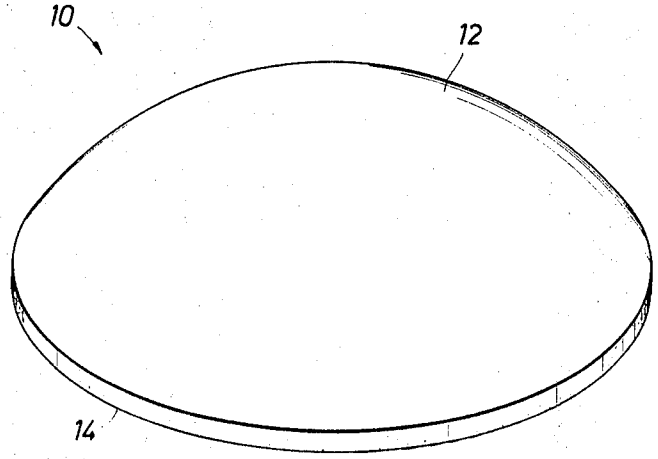
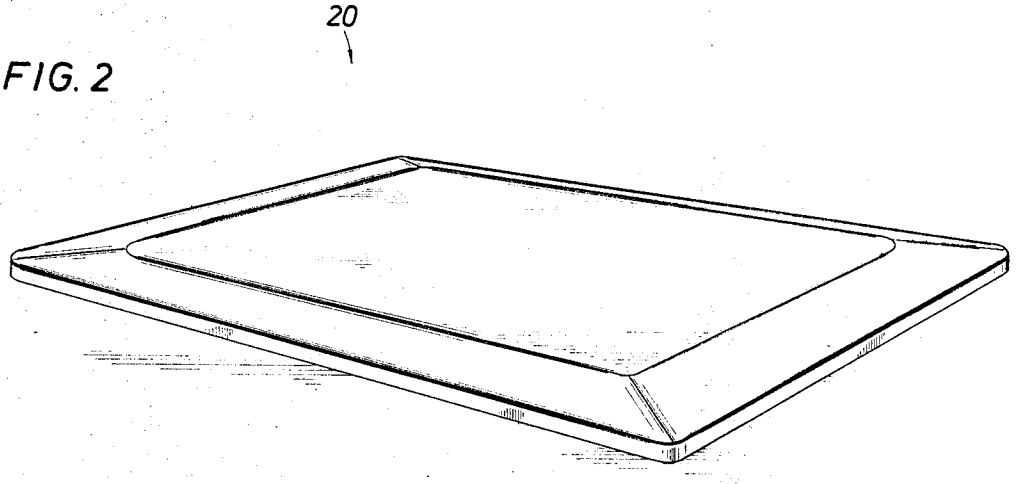


FIG. 2



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HIGHWAY DIVIDER BUTTON

SUMMARY OF PROBLEM AND SOLUTION

In multiple-lane highways, the lanes are typically separated by a painted stripe. The painted strip is a visual reminder to a driver to stay in his lane. However, drivers invariably stray into adjacent lanes. This problem has been corrected somewhat by the utilization of ceramic highway buttons which are glued or otherwise joined to the pavement along the painted stripe. The buttons stand up sufficiently to be felt through the tires of the vehicle, but are sufficiently smooth and rounded to prevent damage to vehicle tires. When the vehicle runs over the buttons, a steady thump-thump-thump is felt in the car and the driver is quickly reminded to return his car to the proper lane.

The ceramic buttons currently in use have been found wanting in several regards. While their attachment is difficult at best, their service and life is considerably inferior to that which is essential. There is a tendency for entire ceramic buttons, including the adhesive, to break free of the pavement and to be thrown along the roadway with a high degree of danger. Additionally, there is a tendency of ceramic highway buttons to fracture inasmuch as they are not particularly resilient to the shock loading which occurs when a tire strikes the button. It will be understood that the buttons are subjected to shock loads which have a duration of only a few milliseconds, and hence, the shock loading causes cracks and fissures in the buttons, which often leads to disintegration of the unitary structure.

One of the most common modes of failure of the ceramic highway buttons is for the entire button, adhesive, and a thin layer of concrete pavement to be jarred free by a sudden shock loading on the button. While the layer of concrete may be thin, this is, nevertheless, destructive to the roadway and vehicle tires. Once damage is initiated at the surface of the concrete pavement, hairline cracks and the like may radiate from the point at which a ceramic roadway button was installed and broken away. Quite often an entire highway button is broken free from the pavement. While there is some danger of the button being thrown as a projectile by a passing vehicle, a common occurrence is the fracturing of the button by passing vehicles or wheels of the said vehicle into a number of dangerous chunks of the material which are likely to be propelled in a dangerous manner randomly about the highway and right-of-way. This is particularly true in multiple-wheel vehicles and trucks inasmuch as they typically have paired axles with wheels following immediately one behind the other.

While the foregoing points out the difficiencies and infirmities of devices known in the prior art, the economics of installation, service, replacement and upkeep militate against the continued use of the apparatus presently used in view of the fact that it fails in its general application. Consequently, the apparatus of the present invention is summarized as including a new and improved highway button which is preferably formed of an ionomer base, a suitable filler to provide appropriate bulk, color and cost reduction, which is then joined to the pavement through an integrally formed adhesive normally found on the button and inert and solid at most temperatures. The apparatus is readily heated, at which time the adhesive becomes tacky and will join the button to the highway pavement. Particularly, the summary of the present invention directs great emphasis at the absence of shock transmittal to the pavement. The completed highway button of the present invention is particularly shock absorbing and will not deliver the sharp impact to the pavement, typically concrete, also very tough, to prolong and extend the life of the present invention when installed.

While the foregoing merely summarizes the present invention, the following specification describes the preferred embodiment thereof and many objects and advantages of the present invention will be noted from a consideration of the included specification and the drawings which include:

FIG. 1 is a view of a highway button, exaggerated in vertical dimension, to show the adhesive layer included therewith; and

FIG. 2 is a semirectangular highway button.

Considering the invention first generally speaking, attention is directed to the drawing which illustrates a highway button which is denoted by the numeral **10**. The highway button includes a generally rounded portion **12** which is preferably a portion of a sphere. A lower adhesive portion **14** is indicated in the drawings although the thickness has been exaggerated for sake of clarity of drawing. A typical highway button finding use today is perhaps 4 inches in diameter and the maximum height is on the order of ½ to 1 inch. As will be appreciated, the dimensions may vary and the geometry of the curvature of the highway button **10** is likewise subject to variation. The preferred form incorporates a portion of a sphere cut by a chord through the sphere to provide a very regular structure having rounded surfaces or edges. While this is the preferred embodiment, clearly other embodiments will be described hereinafter and are incorporated within the scope of the present disclosure.

The preferred embodiment incorporates a body having rounded edges or faces somewhat as shown in the drawings which is preferably formed of an ionomer chemical base. Briefly, various fillers and additives are included in the chemical base to impart colors and to reduce the cost of the manufactured product.

The ionomer base of the present invention is particularly desirable, and as a matter of fact, is the difference between success and failure in the ability to absorb impact without transferring a measurable shock wave to the pavement and causing the fractures which have plagued products relating to the present invention heretofore, and to absorb impact without damaging the button surface. The preferred mixture of filler to base is approximately 40 to 60 percent. The upper limit on the percentage of ionomer base is principally governed by economics, and in the case of a 100 percent ionomer highway button, there is an absence of coloration which is considered a desirable factor for highway buttons. Hence, the upper limit of 60 percent is dictated principally by the economics of manufacture. When the ionomer percentage is reduced, the lower percentage article is associated with an increasing tendency toward imbrittlement, and should the base be reduced too low, the very characteristics which have plagued devices of the prior art will be encountered. That is, with too small a percentage of ionomer resin, the completed product too nearly resembles the brittle, nonyielding ceramic materials which have failed heretofore.

The preferred ionomer for use with the present invention is based on a sodium or zinc-neutralized ethylene/methacrylic acid copolymer. Of course, other ions may be used in the neutralization, such as lithium or potassium. Considering the copolymer only, the ethylene predominates with the methacrylic acid ranging from about 5 to about 20 percent. These limits are not critical, but represent examples of commercially available products which can be readily obtained. The neutralization of the acid in the copolymer is never carried to total completion, but is only partial to leave unreacted acid groups in the copolymer.

Without the metal ions added in the process, the characteristics required for the function of the present invention are difficult, if not impossible, to achieve. The metal ions impart several characteristics of significance to the present invention. For one, the metal ions create a grease-resistant product. That is to say, the product is impervious to greases and oils which inevitably reach highway surfaces, and will not absorb them, become softened by them, or otherwise deteriorate in their presence. The metal ions in the completed copolymer particularly impart the toughness, abrasion-resistant characteristic, and impact-resistant characteristic which are necessary for the functions described herein. Of particular interest is the tendency of the completed product to absorb high impact without imparting damaging shock to the surface to which it is attached. Thus, as viewed in FIG. 1, impact on the upper surface of the highway button **10** is not transmitted in the usual damaging fashion to the pavement to which it is joined.

The foregoing described the preferred ionomer as being an ethylene/methacrylic acid copolymer. However, other ionomers may be adapted in accord with the teachings described above for the preferred ionomer. The preferred filler for the preferred invention is titanium dioxide, although barium sulfate, calcium carbonate, and other fillers are known. The titanium dioxide particularly imparts whiteness to the completed product, it being kept in mind that the pure ionomer chemical base provides an essentially clear highway button. Since noticeability of the button is of importance, the titanium dioxide is preferably added in some portion to obtain the desired whiteness. Of course, other colors can be achieved through the use of other fillers, an example being the addition of reflective fillers to achieve a product which has reflectivity after dark, and other color pigments for special applications.

The filler may range from 100 percent titanium oxide for a totally white product, to much lesser percentages in conjunction with less expensive fillers to reduce cost while still obtaining a white product.

The adhesive **14** shown in FIG. **1** should be considered next. The adhesive is exaggerated in thickness but preferably covers the entire bottom face of the product and is used to join the highway button **10** to the pavement. The preferred adhesive is a hydralized copolymer. Such a product is available under the trade name Elvon. The adhesive is applied to the molded or cast highway button and is firm at room temperatures and at most temperatures at the point of installation. The preferred integral adhesive described herein preferably is activated by the application of heat immediately prior to installation. For installation by hand methods, the highway button **10** may be hand held and an open flame briefly applied to the adhesive **14** to raise its temperature to a tacky or flowable consistency. At this juncture, the button **10** is simply pressed to the pavement and the bonding is completed. More automated installation techniques are suggested.

FIG. **1** illustrates the common circular highway button normally used. FIG. **2** discloses a highway button indicated by the numeral **20** which is one of the variations of the present invention. It is generally rectangular, although again, the edges, as presented to the tires of vehicles using the highway, are defined for purposes of this disclosure, as being rounded. Again, the lower side may be covered with the integral adhesive or an epoxy to join the button to the pavement. It will be noted that the button **20** incorporates several facets. One use of the several facets is the implementation of reflective materials, colors, and the like. For instance, to warn drivers that they are proceeding the wrong way, one face may be treated to form a red reflective surface. The opposite face is treated with a white reflective surface. Of course, other variations in coloration, structure and shape may be adapted without departing from the scope of the present invention.

While the foregoing is directed to the preferred embodiments of the present invention, numerous variations and alterations may be adapted without departing from the scope of this disclosure; the claims appended hereto adopt the language of this specification and determine the scope thereof.

I claim:

1. A highway button comprising a curved rounded surface having an absence of sharp corners or edges and a lower face adapted to be contacted against the surface of a highway, the body of said highway button being comprised of a metal ion-neutralized copolymer which consists of ethylene and an acid selected from the group consisting of acrylic acid or methacrylic acid.

2. The invention of claim **1** wherein said copolymer includes from about 5 to 20 percent of the acid.

3. The invention of claim **1** wherein the metal ions are selected from the group consisting of sodium, zinc, lithium, or potassium.

4. The invention of claim **1** including an adhesive on the lower face of said button which is inert and nontacky at room temperature, and becomes adhesive at elevated temperatures sufficient to make said adhesive tacky.

5. The invention of claim **4** wherein said adhesive is a hydralized copolymer.

6. The invention of claim **1** including a filler material comprising a portion of the body of said highway button.

7. The invention of claim **6** wherein said filler comprises about 40 percent to 60 percent by weight of said highway button.

8. The invention of claim **6** wherein said filler is titanium dioxide.

9. The invention of claim **6** wherein said filler is selected from the group consisting of titanium dioxide, barium sulfate, or calcium carbonate.

10. The invention of claim **1** including a reflective surface on the exterior of the body of said highway button.