

Oct. 28, 1958

W. E. NUTTER

2,858,482

STATIC ELECTRICITY GROUNDING DEVICE

Filed April 26, 1954

2 Sheets-Sheet 1

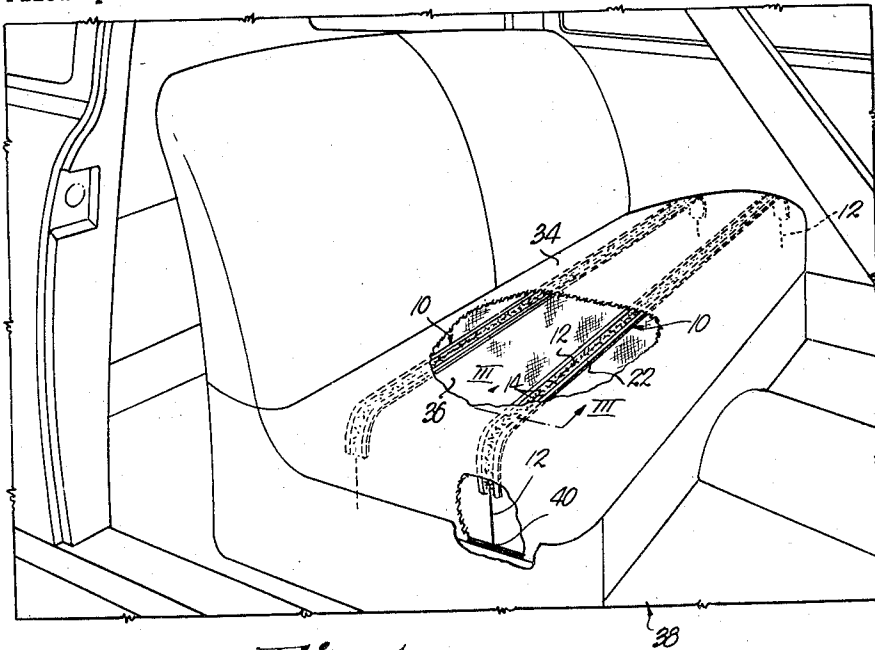


Fig. 1.

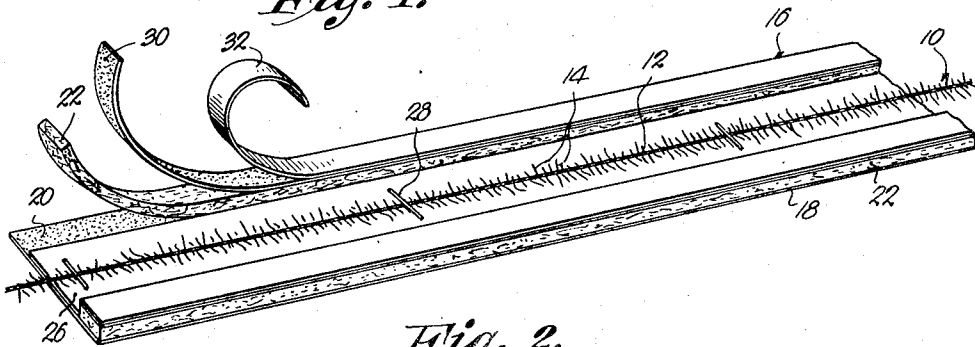


Fig. 2.

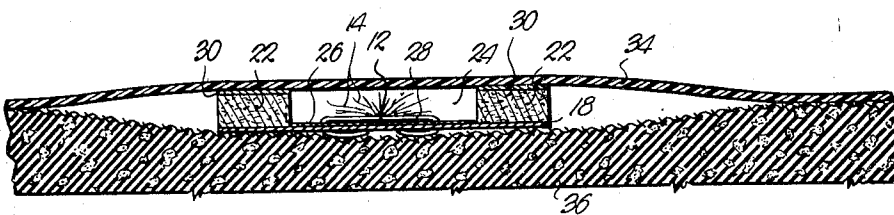


Fig. 3.

INVENTOR

BY *Waldo E. Nutter*
Chas. H. Hovine
ATTORNEY.

Oct. 28, 1958

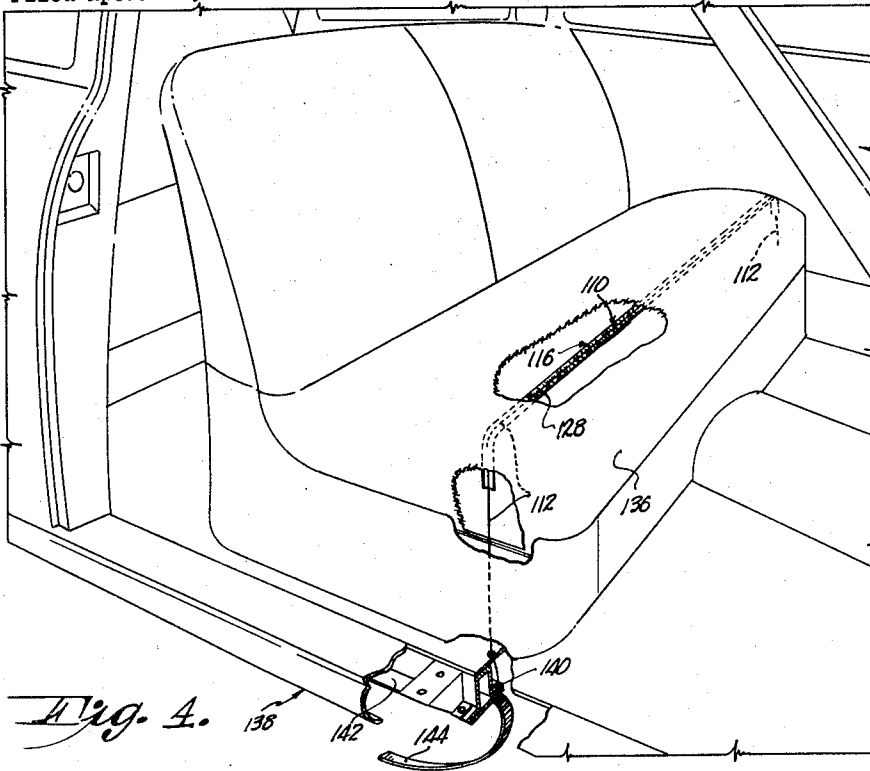
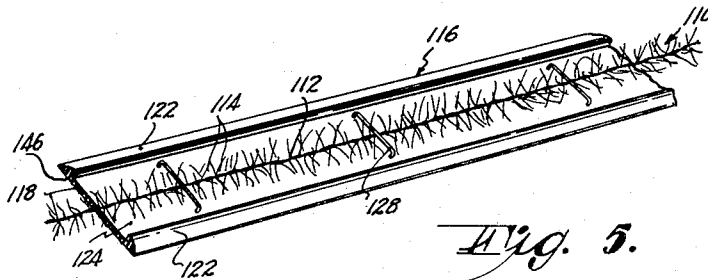
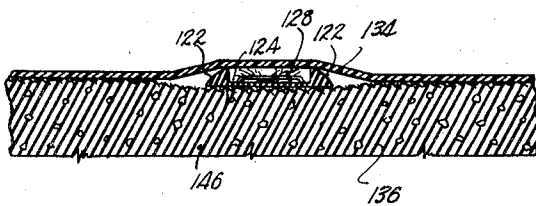
W. E. NUTTER

2,858,482

STATIC ELECTRICITY GROUNDING DEVICE

Filed April 26, 1954

2 Sheets-Sheet 2



INVENTOR

BY *Waldo E. Nutter*
W. E. Nutter
ATTORNEY.

1

2,858,482

STATIC ELECTRICITY GROUNDING DEVICE

Waldo Edward Nutter, Kirkwood, Mo.

Application April 26, 1954, Serial No. 427,747

8 Claims. (Cl. 317—2)

This invention relates to an article in the nature of an elongated, flexible member for collecting and discharging static electricity charges, the primary object being to improve upon the disclosure of a copending application, Serial No. 349,505, filed April 17, 1953, in the name of George Morris Alder, now Patent No. 2,802,148, and relating to an automobile seat cover having electrical grounding properties and grounding tape.

In the said co-pending application there is provided a grounding tape having many uses, so far as grounding static electricity is concerned, but particularly adapted for use with automobile seat covers. The articles forming the subject matter of the present invention is likewise particularly adapted for use with automobile seat covers but is obviously adapted for many other applications.

The principles of said application, relative to the provision of conductive elements arranged throughout the length of an elongated core and provided with a plurality of terminal ends, are carried forth in the present invention and the primary improvement hereof relates to the novel manner of supporting the conductive core and its elements so that the article may be properly disposed upon the normally lowermost face of a seat cover connected therewith and with the conductive components in close proximity to the seat cover itself.

It is the most important object of the present invention therefore, to provide an article for grounding static electricity charges that includes an elongated support that is U-shaped in cross-section to present a cavity within which the conductive core and its elements are mounted so that the elements are maintained in proper relationship to the seat cover even after long and continued use.

Another object hereof is to provide in an article of the aforementioned character, a support that includes an elongated tape having marginal strips extending longitudinally thereof and made from resilient material to normally prevent smashing and flattening of the conductive component of the article, yet permit the seat cover to move into engagement with the conductive elements when the seat of the automobile is occupied.

Other objects of the instant invention include the way in which a liner is mounted within the groove aforementioned to protect the conductive elements from contact with adhesive on the tape that is utilized to mount the resilient strips; the way in which bands are provided on the strips having adhesive on both sides thereof to mount the bands on the strips and to in turn mount the entire article on the lowermost face of a seat cover; the way in which a pull-off tape is provided for each band respectively; the way in which the conductive member includes an elongated core twisted to secure the short, laterally extending conductor elements thereto; the manner of mounting the conductor means to the tape and therefore, to the liner through the medium of clips or the like; and the manner of operably connecting the conductive core of the device to a conductive drag strap mounted on the automobile.

2

In the drawings:

Figure 1 is a perspective view showing the interior of an automobile provided with a seat cover having electrical grounding properties by virtue of the use of the static electricity grounding device of one embodiment of the present invention, the seat cover being partially broken away for clearness.

Fig. 2 is an enlarged, fragmentary, perspective view of one of the grounding devices of Fig. 1 with one of the pull-off tabs, bands and resilient strips turned back to clearly illustrate the construction of the device.

Fig. 3 is a fragmentary, detailed, cross-sectional view still further enlarged and taken on line III—III of Fig. 1.

Fig. 4 is a view similar to Fig. 1 showing a modified form of the present invention.

Fig. 5 is a view similar to Fig. 2 showing the embodiment of Fig. 4; and

Fig. 6 is a view similar to Fig. 3 illustrating the modification.

The electricity of stationary charges produced by rubbing unlike bodies together, is well known, for few have failed to experience the startling effect of sudden, disruptive discharges of such electrical forces when approaching or touching objects having a different potential. Such equalization of the differences in electrical potentials is especially aggravating when one touches metallic parts of automobiles, and while many attempts have been proposed to obviate the difficulty, no satisfactory solution had been developed prior to the invention disclosed in said co-pending application.

Static electricity appears to be more prevalent in cold weather, probably because of the humidity factor. In moist air, bodies discharge rapidly and the accumulation of charges upon their surfaces is less noticeable. Thus, in cold weather, when perspiration is at a minimum, and the absolute humidity much less than in warm weather, complaints of "shocks," as the electrified body discharges its surface charge, are quite frequent.

Automobile seat covers seem to present one of the greatest problems in this regard, more especially in recent years, as the result of development of new materials, such as the synthetics, including nylon and plastics. The frictional contact between the clothing of automobile passengers and such covers quickly produces a difference of potential between the passengers and the remainder of the automobile. As the statically charged passenger approaches another body of different potential, such as the metal body of the automobile, the potential gradient or electrical pressure increases until ionization takes place, producing an undesirable sensation of shock.

It is recognized that devices have been provided, with varying degrees of success, to "ground" the automobile itself in order to lessen the shock as one approaches the body thereof and grasps a door handle or contacts other metallic parts of the vehicle while standing on the ground. This discharging of static electricity from the electrified automobile is to be distinguished, however, from the aforementioned seat and seat cover problems concerning charges within the automobile body, for none of such devices has been effective in elimination of the development of a difference in potential between the automobile and the occupant as he slides across the seat or its cover.

It is generally agreed that the character of the discharge of static electricity, or the equalization of a difference in electrical potential between two points, is determined primarily by the nature of the medium through which the discharge takes place, the amount of such difference in potential, and the form of the terminal conductors on which the difference exists. The spark that is produced across the air gap between the tips of the fingers and the ignition key for instance, through which the discharge passes, can oftentimes be seen and heard, as well as felt,

and is evidence of the relatively high difference in potential that has developed between these two terminals as the result of the sliding, frictional engagement by wearing apparel with the seat or seat cover.

When two differently charged, smooth surface bodies are brought into proximity in air, the voltage gradient, and therefore, the field intensity, increase as the distance diminishes. At a predetermined distance of separation between these bodies the field intensity is sufficiently strong to rupture the air dielectric, causing the air to ionize, thereby becoming a good conductor and allowing a current to flow between the bodies until their potential difference approaches zero.

If the surface area of one of the charged bodies is pointed, the field intensity required to produce ionization occurs at a greater distance of separation between the bodies than the predetermined distance above mentioned. If the predetermined separation distance is kept the same, then ionization can be made to occur at a much lower difference in potential between the two bodies, since making the surface of one body sharply pointed, greatly increases the field intensity in the air between the two bodies. By the use of many sharply pointed tips on one body, the field intensity required to produce ionization of air occurs at a much lower difference in potential between the two bodies.

The article for collecting and discharging static electricity charges illustrated in Figs. 1-3 of the drawings corresponds to the disclosure of the said copending application in the provision of an elongated conductive device broadly designated by the numeral 10 and having the same principle of operation as the conductive device therein set forth.

Device 10 includes an elongated core 12 made up of two or more strands of conductive material such as copper wire twisted upon themselves throughout the lengths thereof to mount a plurality of laterally extending elements 14. In other words, the elements 14 are twisted within the strands of the core 12 and project in all directions transversely of the core 12 throughout the length thereof. Elements 14 may be made of any suitable conductive material or be rendered conductive in well known manners, and to this end, elongated strips of metallic foil may be utilized, provided only that they terminate in relatively small ends remote from the core 12, and while it is not absolutely essential that such ends be pointed, the efficiency of the device is increased whenever the size of such ends is maintained at a minimum.

A support for the device 10, is broadly designated by the numeral 16, and includes an elongated tape 18 of flexible material such as relatively strong paper or cloth-like backing tape having adhesive 20 coating one face thereof. The coating 20 serves to mount a pair of elongated strips 22 upon the said one face of tape 18, strips 22 being in spaced, parallelism and disposed along corresponding marginal edges of the tape 18 to present a longitudinally extending groove 24 in the support 16.

The strips 22 are preferably made from a suitable resilient material such as felt, and the coating 20 serves to mount an elongated liner 26 upon the tape 18 within the groove 24 and between the strips 22. The liner 26 may consist of any suitable flexible material such as paper, and it is upon this liner 26 that the device 10 is disposed within the cavity 24 as is clear in the drawing.

An inexpensive and satisfactory means of mounting the device 10 on the support 16, consists of a plurality of spaced fasteners 28 that extend through the liner 26 and the tape 18 are rebent on the normally lowermost face of the tape 18, as shown in Fig. 3.

An elongated band 30 is provided for each strip 22 respectively and mounted on the normally uppermost faces thereof, each band 30 being provided with adhesive on both sides thereof as is clear in Fig. 2. The adhesive on one side of the bands 30, serves to secure the same to the corresponding strips 22 and the adhesive on the oppo-

site side thereof mounts a pull-off tab 32 which serves to protect the uppermost adhesive coatings of the bands 30 prior to placing the article in use in the manner illustrated by Fig. 1 of the drawing. It is to be noted that there is provided a band 30 and a pull-off tab 32 for each strip 22 respectively, and that the strips, the bands and the tabs are coextensive in width and extend throughout the length of the tape 18.

The article may be cut to lengths suitable for mounting on the lowermost face of a seat cover 34, and when so mounted, the article is disposed between the seat cover 34 and the seat 36 of automobile 38. It is to be preferred that a pair of the grounding devices be disposed in parallelism and extend longitudinally of the seat 36 as shown in Fig. 1. Prior to so disposing the strips, the tabs 32 are removed and the adhesive on the uppermost faces of the bands 30 will thereby serve to attach the bands 30 and therefore, the entire article to the lowermost face of the seat cover 34.

The seat cover 34 therefore, closes the cavity 24 by bridging the distance across the strips 22 and the device 10 is housed within the groove 24 with the elements 14 in close proximity to the lower face of cover 34, as shown in Fig. 3. Elements 14 are, therefore, protected against contact with any adhesive that might otherwise tend to lower the efficiency of the device 10 in discharging static electricity charges.

The resilient nature of the strips 22 permits cover 34 to move downwardly into engagement with the elements 14 when the automobile 38 is occupied, and therefore, any static electricity charge will be quickly dissipated by the device 10 since the core 12 thereof is preferably connected with a suitable ground such as the seat springs or seat frame as shown at 40 in Fig. 1.

The material from which the covers 34 are made and the material of the clothing worn by the passengers are so unlike that a relatively high difference in potential is created when such wearing apparel comes into frictional sliding engagement with the seat covers 34. The small difference in potential that results by use of the techniques herein described is of too low a magnitude to cause a perceptible shock to a passenger when he touches a metallic part of the automobile body because the charges on the passenger and on the seat cover 34 are discharged as they are produced, or immediately thereafter by the element hereof. This effect can only be accomplished when the grounding means is composed of a conductor that has the plurality of terminal ends as hereinabove described.

The provision of ordinary conductors mounted on the seat cover and disposed in engagement therewith, or even interwoven therein have not been successful for the very reason that the mediums used to produce the discharge do not cause rupture of the air dielectric, and resulting ionization, at a potential sufficiently low to be imperceptible to a passenger in the automobile, as in the present invention. Furthermore, elongated conductors, either in the form of a single wire, a flat metallic strip, or a plurality of fine wires grouped together and extending throughout the seat cover, do not discharge themselves quickly at a low potential, and for that reason, the discharge that takes place across the air gap between the passenger and the automobile body is of sufficient intensity to be perceptible and sometimes painful to the passenger.

In Figs. 4-6 there is shown a modification wherein is included an elongated conductive device 110 having a core 112 mounting elements 114 as above explained.

A support 116 is preferably made from plastic, rubber or similar flexible material. Support 116 is U-shaped in cross-section, presenting a bight 118 and a pair of integral strips 122, presenting a groove 124.

Device 110 is disposed in groove 124 and held in place by direct mounting to bight 118 through use of fasteners 128. As seen in Figs. 4 and 6, the device is interposed between cover 134 and seat 136, with groove 124 facing

the lowermost surface of cover 134, and with elements 114 engaging cover 134. Core 112 is extended to a point of connection 140 with frame 142 of automobile 138, which also mounts a drag strap 144 of flexible material such as conductive rubber, thereby connecting device 110 directly with strap 144. It is to be preferred that strap 144 be bowed as shown, so as to maintain a constant yieldable bias against the ground. By ribbing the extruded support 116 as at 146, it will be less likely to slip with respect to seat 136.

Strap 144 may, of course, be used also in the same manner with the device 10 of Figs. 1-3 to bleed off static charges as they are developed. Extensive tests have shown that static charged bleed off through strap 144 most rapidly upon the occupant leaving the automobile 138 and moving out of contact therewith or as he approaches the automobile and reaches for the door handle or other metallic part. By virtue of such immediate action, the occupant is not shocked as he moves his hands toward or away from metallic parts of the vehicle, and to this extent therefore, the addition of ground-engaging strap 144 adds to the beneficial results emanating from the use of the present invention.

Manifestly, when the ground or pavement is damp, there is a still more definite and continuous discharge through strap 144 even while the occupant is seated in the automobile.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A flexible article for collecting and discharging static electricity charges from a flexible body, said article comprising a support including an elongated tape having a pair of spaced, longitudinally-extending, resilient strips mounted on one face thereof, presenting a groove therebetween, said support being adapted to engage said body with said one face of the tape in spaced, facing relationship to the body; and a conductive device mounted on the support within the groove and extending longitudinally thereof, said device including an elongated, flexible core and a plurality of flexible elements secured to the core throughout the length thereof, each element being provided with a terminal end, whereby when the same are disposed in proximity to said body and the latter charged, the body will lose its charge and the device will discharge itself immediately.

2. A flexible article for collecting and discharging static electricity charges from a flexible body, said article comprising a support including an elongated, flexible tape having a pair of spaced, flexible, longitudinally extending, resilient strips mounted on one face thereof, presenting a groove therebetween, and a flexible liner disposed within the groove and mounted on said one face of the tape throughout the length thereof between the strips, said support being adapted to engage said body with said one face of the tape in spaced, facing relationship to the body; and a conductive device mounted on the support within the groove, on said liner, and extending longitudinally thereof, said device including an elongated, flexible core and a plurality of flexible elements secured to the core throughout the length thereof, each element being provided with a terminal end, whereby when the same are disposed in proximity to said body and the latter charged, the body will lose its charge and the device will discharge itself immediately.

3. A flexible article for collecting and discharging static electricity charges from a flexible body, said article comprising a support including an elongated, flexible tape having a pair of spaced, flexible, longitudinally-extending, resilient strips mounted on one face thereof, presenting a groove therebetween, and a flexible band secured to each strip respectively and extending throughout the lengths thereof, each band being provided with an outermost face having a coating of adhesive thereon, said outermost face of the bands being adapted for adhesive attachment to said body; and a conductive device mounted on the support within the groove and extending longitudinally there-

of, and device including an elongated, flexible core and a plurality of flexible elements secured to the core throughout the length thereof, each element being provided with a terminal end, whereby when the same are disposed in proximity to said body and the latter charged, the body will lose its charge and the device will discharge itself immediately.

4. A flexible article for collecting and discharging static electricity charges from a flexible body, said article comprising a support including an elongated, flexible tape having a pair of spaced, flexible, longitudinally-extending, resilient strips mounted on one face thereof, presenting a groove therebetween, a flexible liner disposed within the groove and mounted on said one face of the tape throughout the length thereof between the strips, and a flexible band secured to each strip respectively and extending throughout the lengths thereof, each band being provided with an outermost face having a coating of adhesive thereon, said outermost face of the bands being adapted for adhesive attachment to said body; and a conductive device mounted on the support within the groove, on said liner, and extending longitudinally thereof, said device including an elongated, flexible core and a plurality of flexible elements secured to the core throughout the length thereof, each element being provided with a terminal end, whereby when the same are disposed in proximity to said body and the latter charged, the body will lose its charge and the device will discharge itself immediately.

5. A flexible article for collecting and discharging static electricity charges from a flexible body, said article comprising a support including an elongated, flexible tape having a pair of spaced, flexible, longitudinally-extending, resilient strips mounted on one face thereof, presenting a groove therebetween, a flexible band secured to each strip respectively and extending throughout the lengths thereof, each band being provided with an outermost face having a coating of adhesive thereon, and a flexible, pull-off tab covering said outermost face of each band respectively, the adhesive coatings releasably securing the tabs to the bands, said coatings being adapted for securing the bands to said body after removal of said tabs; and a conductive device mounted on the support within the groove and extending longitudinally thereof, said device including an elongated, flexible core and a plurality of flexible elements secured to the core throughout the length thereof, each element being provided with a terminal end, whereby when the same are disposed in proximity to said body and the latter charged, the body will lose its charge and the device will discharge itself immediately.

6. A flexible article for collecting and discharging static electricity charges from a flexible body, said article comprising a support including an elongated, flexible tape having a pair of spaced, flexible, longitudinally-extending resilient strips mounted on one face thereof, presenting a groove therebetween, a flexible liner disposed within the groove and mounted on said one face of the tape throughout the length thereof between the strips, a flexible band secured to each strip respectively and extending throughout the lengths thereof, each band being provided with an outermost face having a coating of adhesive thereon, and a flexible, pull-off tab covering said outermost face of each band respectively, the adhesive coatings releasably securing the tabs to the bands, said coatings being adapted for securing the bands to said body after removal of said tabs; and a conductive device mounted on the support within the groove, on said liner, and extending longitudinally thereof, said device including an elongated, flexible core and a plurality of flexible elements secured to the core throughout the length thereof, each element being provided with a terminal end, whereby when the same are disposed in proximity to said body and the latter charged, the body will lose its charge and the device will discharge itself immediately.

7. In combination with a flexible seat cover, a flexible article for collecting and discharging static electricity

7

charges therefrom comprising a support including an elongated, flexible tape having a pair of spaced, flexible, longitudinally-extending, parallel, resilient strips mounted on one face thereof, presenting a groove therebetween, and a flexible band secured to each strip respectively and extending throughout the lengths thereof, each band being provided with an outermost face having a coating of adhesive thereon securing the bands to the normally lowermost face of said seat cover with the groove between the seat cover and the strip; and a conductive device mounted on the support within the groove and extending longitudinally thereof, said device including an elongated, flexible core and a plurality of flexible elements secured to the core throughout the length thereof, each element being provided with a terminal end, whereby when the seat cover is charged, it will lose its charge and the device will discharge itself immediately.

8. For an automobile having a seat provided with a flexible cover, a ground-engaging drag strap of conductive material; means mounting the drag strap on the automobile; a flexible article for collecting and discharging

8

static electricity charges comprising an elongated, flexible support having a longitudinal groove, and a conductive device mounted on the support within the groove and extending longitudinally thereof, said device including an elongated flexible core, and a plurality of flexible elements secured to the core throughout the length thereof, each element being provided with a terminal end, whereby when the same are disposed in proximity to said cover and the latter charged, the cover will lose its charge and the device will discharge itself immediately; and means connecting said core to the drag strap, said article being between the seat and the cover with the groove facing the cover and the elements engaging the latter.

References Cited in the file of this patent

UNITED STATES PATENTS

1,396,318	Bunger	Nov. 8, 1921
1,680,310	Wehrle	Aug. 14, 1928
2,023,321	Gutman	Dec. 3, 1935
2,449,972	Beach	Sept. 28, 1948