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Ruff

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[45] **July 10, 1973**

[54] **ELECTROSTATIC DISCHARGE DEVICE**

[76] Inventor: **John Denis Ruff,** 206 Birch St., Alexandria, Va.

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[52] **U.S. Cl.** ..... **317/2 R,** 317/2 B

[51] **Int. Cl.** **H05f 3/00**

[58] **Field of Search** ..... 317/2 R, 2 B, 2 D

[56] **References Cited**

UNITED STATES PATENTS

3,099,774 7/1963 Crane ..... 317/2 D

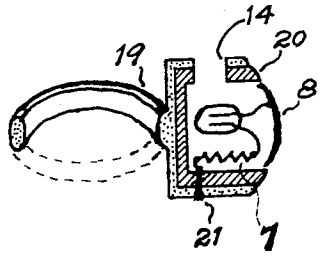
390,115 9/1888 Delany ..... 174/5 R

Primary Examiner—L. T. Hix

[57] **ABSTRACT**

A device which enables the user to dissipate an electrostatic charge, such as is picked up from walking on a rug, by controlling the rate of discharge through a resistor which is mounted within the device, and the device is worn on the user's finger as a ring and which is thus kept conveniently available, and the device incorporates an indicator lamp which gives a visual indication of the charge dissipation.

1 Claim, 6 Drawing Figures



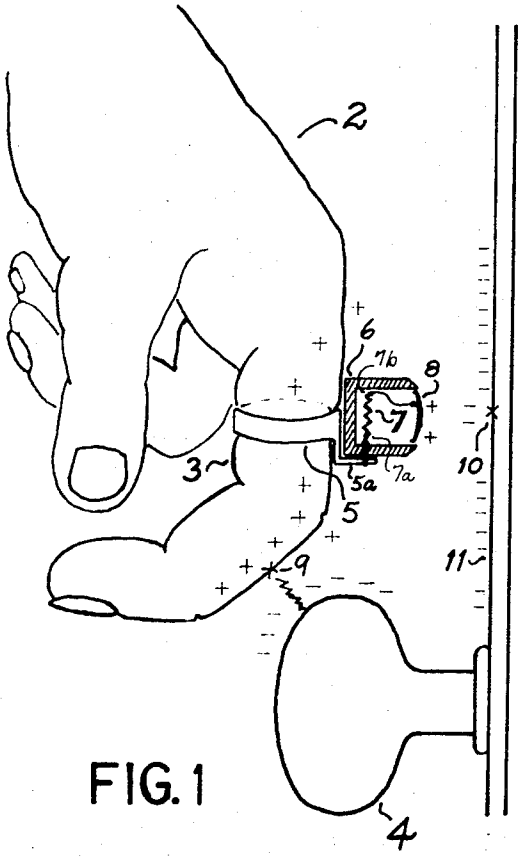


FIG. 1

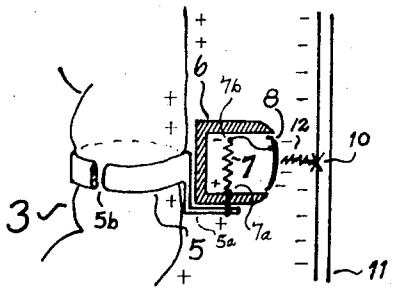


FIG. 2

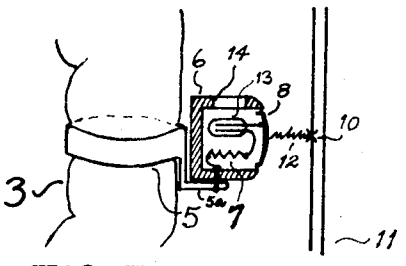


FIG. 3

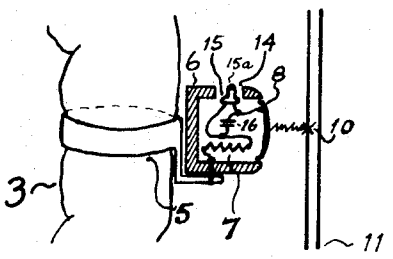


FIG. 4

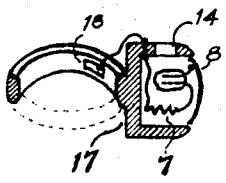


FIG. 5

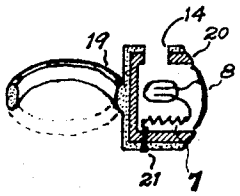


FIG. 6

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ELECTROSTATIC DISCHARGE DEVICE

Often during winter months, when the air is very dry, many people have problems with static electricity. People walking on rugs, sliding on fabric furniture, sliding on vinyl seats in cars (and on vinyl furniture) tend to generate substantial static charges. Then when they touch their hands on a conductor surface this charge is conducted away with a momentary electrical current of high intensity. The result is a painful shock. My invention uses a resistor to control the discharge current flow so that while the same electrical charge is dissipated, the rate of discharge (that is, the current level) is reduced to a level which is not painful. This is possible because the pain of electric shock depends on the current level flowing through the body tissues. If the current level is reduced enough, no pain is felt. In my invention the resistor is mounted in a ring to be worn on the user's finger. This places the device in a convenient position so that the user can reach out and touch the device to a conductor surface and thus be rid of the bothersome charge with the minimum of trouble.

In use, a person walking on a rug would know that he had accumulated a static charge. Then as he approached a door he would expect that if he touched the doorknob he would get a shock. But with my invention he would only have to touch the ring to the doorknob first to discharge his static charge and then go ahead and open the door. He would not get a shock at any time. An insulated electrode surface faces outwards from the ring so that a contact can be made easily by this surface with the conducting surface. The electrode surface is connected electrically to one side of the resistor, while the other side of the resistor makes electrical contact with the wearer's finger.

An additional feature is the use of a small glow lamp which is built into the ring and which is wired in series with the resistor. While the static charge is being discharged through the resistor this lamp lights and provides a visual indication that discharge is taking place. The user then knows that he has made proper contact with the conducting surface.

In the drawings:

FIG. 1 gives a general descriptive view of the device.

FIG. 2 shows the operation during discharge.

FIG. 3 shows the device incorporating an indicator lamp.

FIG. 4 shows an alternate type of indicator lamp.

FIG. 5 shows an alternate construction of the device using a one-piece plastic body.

FIG. 6 shows an alternate construction of the device using an all metal construction with an insulating liner.

DESCRIPTION

FIG. 1 shows the user's hand 2 and assuming that the user has been engaged in activity causing him to be charged with static electricity, and that hand 2 (and finger 3) then carries a positive static charge. The doorknob 4 is then negatively charged (relative to the positive charge of the user). A metal band 5 fits on finger 3. Attached to band 5 is an insulating plastic housing 6. Mounted within this housing is resistor 7 with its electrical connection points 7*a* and 7*b*. Point 7*a* is connected electrically to band 5 at lug 5*a* which is a protruding part of band 5. On the side of housing 6 that is facing outward from finger 3 is mounted an electrode 8. Resistor connection point 7b is connected electrically to this electrode.

OPERATION

Without the benefit of my invention if finger 3 (FIG. 1) were moved close to doorknob 4, at point 9, a spark would occur and the user would experience a painful shock as a momentary intense current flow discharges his body's static charge through the spark at point 9. The static potential involved is generally some thousands of volts, and when point 9 is close enough to the doorknob, dielectric breakdown of the separating air occurs and an arc is established. This arc offers very little resistance to the flow of current between the finger and the doorknob, and so with the high voltage involved, a very high current then flows. And since the painful effect of electric current relates primarily to the intensity of the current, the current flow through point 9 is quite painful. Fortunately, however, the body's static charge (though high in voltage) is limited in capacity; so that when the arc is established, the charge is dissipated instantaneously, and the current flow (through the arc) ceases. But to prevent the arc at point 9, finger 3 must not be placed close enough to the doorknob 4 to allow an arc, until the user' s body charge has been dissipated.

CHARGE DISSIPATION

With the user's body carrying a static charge (as shown in FIG.1) and assuming a potential of 3,000 volts; then this voltage drop will be present across the air space between electrode 8 and point 10 on the metal door-plate 11, with electrode 8 being positive and door-plate 11 negative (relatively). Then, as shown in FIG.2, when electrode 8 is moved close enough to point 10, an arc 12 is established. Electrode 8 and resistor connection 7*b* then become negative, relative to finger 3 (and to resistor connection 7*a* which is connected electrically to finger 3). This places the voltage drop across resistor 7, and assuming a value of 3 meg-ohm for resistor 7 the current flow can not be greater than 1 milliampere, which is not painful to the user. Arc 12 does have some resistance to current flow but it is not significant when compared to resistor 7. Arc 12 may collapse before all of the user's body charge is dissipated, but the user continues to close the gap between electrode 8 and plate 11 until direct contact is made and then all of the charge will be dissipated. The time taken for total dissipation through resistor 7 is much greater than when the charge is dissipated through the arc at point 9 (FIG.1) and variations in conditions cause some variations in this time. Never the less tests have shown that acceptable discharge can generally be achieved in less than one tenth of a second. The size of 3 meg-ohm for resistor 7 can be reduced considerably, and satisfactory results still maintained, particularly when static charges of lower potential are encountered. However resistances less than 20,000 ohm have been found to be generally unsatisfactory. Band 5 can be a solid band as shown in FIG.1, or, it can be split as shown at 5*b* (FIG.2) to allow adjustments for various finger sizes to be made by bending of the metal band.

INDICATOR LAMP

FIG.3 shows an arrangement using indicator lamp 13 to indicate discharge current. This lamp is of the type generally called a glow lamp and which consists of two separated electrodes mounted in a transparent envelope filled with a gas having a low dielectric strength

(such as neon, argon, etc.). This lamp **13** is shown connected in series with electrode **8** and resistor **7.** Alternately the lamp could be connected (electrically) between resistor **7** and metal lug **5***a*. A characteristic of these glow lamps is a 90 volt (approx.) starting voltage so that with the high static voltages involved, the lamp will always start. Their resistance to current flow is small compared to resistor **7,** so that the resulting current flow when lamp **13** is connected in series with resistor 7 to a 3,000 volt static charge will still be about 1 milliampere. Typical small types of glow lamps are rated at one twenty-fifth watt and require less than 1 milliampere to light them; so that these types give a good indication of current flow during charge dissipation. In use the indicator lamp enables the user to be sure that he has properly dissipated the static charge before making solid contact between his hand and the conductor surface (doorknob etc.). When an indicator lamp is used, housing **6** should be made of transparent material or, alternately, an opaque material used, but with an opening **14** in the housing (FIG.3) so that the lamp **13** can be seen.

An alternate type of lamp known as a Light Emitting Diode (LED) has low current requirements and fast response, and can be used in place of the glow lamp **13.** FIG.4 shows LED **15** used in a similar manner to that already described for glow lamp **13.** LED **15** can be placed so that it is visible through opening **14** in a similar manner shown with lamp **13** in FIG.3, or it can be mounted so that its light emitting surface **15***a* (FIG.4) protrudes outside housing **6** through opening **14.** With some LED applications a small capacitor **16** can be used (as shown in FIG.4) to protect the LED from high voltage breakdown.

FIG.5 shows an alternate method of constructing the device. The band **5** and housing **6** as shown in FIGS.**1,2,3,4** are now replaced by a single piece of plastic **17** and electrical contact is made with the finger by an inserted metal piece **18** which is connected electrically to resistor **7.** The operation is otherwise as already described. This type of construction can be used with the arrangement using resistor **7** only, as shown in FIGS.**1,2.** Or, it can be used with the combined resistor and either type of lamp as shown in FIGS.**3,4,5.**

FIG. **6** shows another alternate method of constructing the device. Band **5** and housing **6** are replaced by a single metal piece **19** which has an insulating liner **20** which prevents any unwanted electrical contact (or arcing) between the housing portion of metal piece **19** and electrode **8,** or other electrical components. Contact is made between metal piece **19** and resistor 7 at point **21.** The operation is otherwise as already described. This type of construction can be used with the arrangement using resistor **7** only, as shown in FIGS.**1,2.** Or, it can be used with the combined resistor and either type of lamp as shown in FIGS.**3,4,6.**

I claim:

1. A static electricity discharge device combining an electrical resistor which has two points of electrical connection to it and means of mechanically attaching the said resistor to a persons finger so that the said resistor and the said means of attaching form a unit which can be worn in the manner of a jewellery ring and the said means of attaching including an insulated plastic housing in which the said resistor is secured and means of making an electrical connection between one of the said two points of electrical connection and the said finger, and an electrode which is electrically connected to the other of the said two points of electrical connection, and the said electrode is insulated electrically from the said means of making an electrical connection, and the said electrode is mounted on the said plastic housing and facing away from the said finger and positioned so that the said person can extend the said finger toward an electrical conductor surface and cause the said electrode to make electrical contact with this surface thus discharging the said persons electrostatic charge through the said resistor at a controlled rate, and also mounted within the said plastic housing a lamp means of indicating flow of electrical current through the said resistor and the said lamp means being connected electrically in series with the said resistor.

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