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NEUTRALIZING APPARATUS AND MANUFACTURE OF SAME

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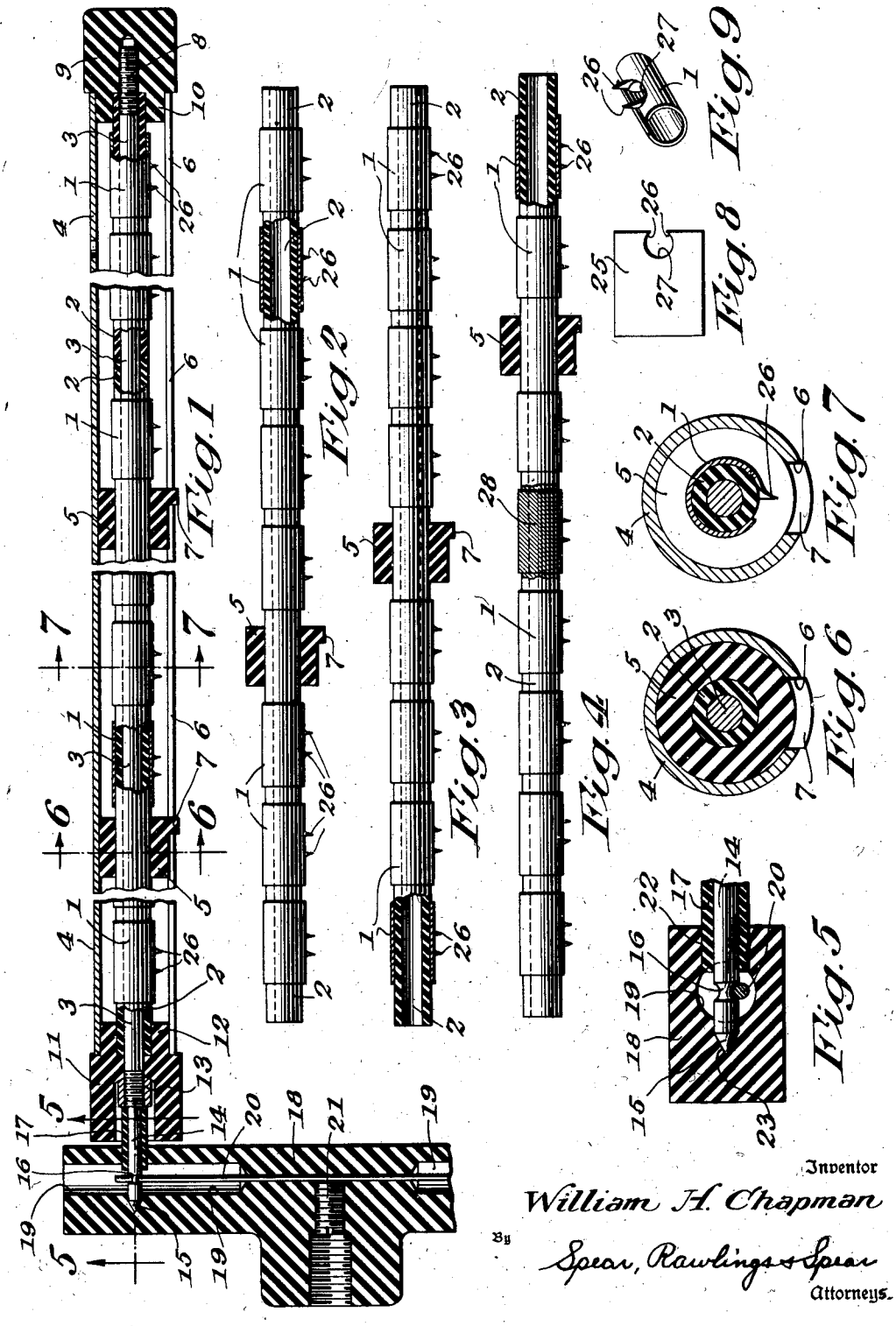


Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

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NEUTRALIZING APPARATUS AND MANUFACTURE OF SAME

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7 Claims. (Cl. 175—264)

My present invention relates to apparatus for use in neutralizing static electric charges and to the manufacture of such apparatus.

As illustrative of the type of apparatus with which my present invention is concerned, I refer to certain of my earlier patents. These are Letters Patent Nos. 940,431, of Nov. 16, 1909, 1,653,599, of Dec. 20, 1927, and 1,841,323, of Jan. 12, 1932, and in general they disclose neutralizing apparatus comprising an insulated conductor to which metal discharge devices are capacitatively coupled. The discharge points in such apparatus are each supported in position by porcelain blocks held in place by a grounded metal casing having a longitudinally disposed slot with which the discharge points are in alinement.

This type of neutralizing bar presented one serious problem because surface leakage in humid atmosphere made it necessary to employ casings of considerable diameter in order to permit the use of insulators large enough to prevent a substantial insulating surface between the sleeve with which the discharge points were in contact and the grounded casing. While this expedient rendered the bars operable under favorable atmospheric conditions, the size of the bars limited their applicability to machines having considerable space for their installation.

One object of my present invention is, accordingly, to provide neutralizing apparatus in which the leakage factor is virtually obviated so that the neutralizing bars may be made in any desired size in order that they may be attached to machines where limited space hitherto has precluded the neutralization of static electric charges developed by their operation, while at the same time securing safety against fire hazard or shock by the use of shorter induction sleeves.

I accomplish this important objective by providing a stiff insulating tube of considerable length on which I mount all of the sleeves, each of which includes one or more discharge points. The tube is held in desired relation to the metal casing by supports carried by the tube at long intervals and spaced from the sleeves. In addition, I provide a stiff metal conductor rod within the tube to complete the inducing element and to contribute to the rigidity of the combination with the sleeves axially of the metal casing and with the discharge points positively alined with its slot.

The production of the discharge devices is an important phase of my present invention in accordance with which I provide inexpensive and efficient discharge points integral with the sleeves. I accomplish this result by forming from a thin metallic strip blanks with one or more portions bendable into discharge after the blank has been shaped into a sleeve adapted to resiliently engage the insulating sheath. The discharge devices are spaced on the insulating sheath as desired and cemented thereto with a non-conductive adhesive applied over the whole surface after assembly.

In the accompanying drawing I have shown an embodiment of my invention from which these and other novel features will be readily apparent.

In the drawing:

Fig. 1 is a partly sectioned view of neutralizing apparatus in accordance with my invention.

Figs. 2, 3 and 4 are partly sectioned views of the sections of the inducing element shown assembled in Fig. 1.

Fig. 5 is a fragmentary section along the lines 5—5, of Fig. 1.

Figs. 6 and 7 are views in cross section along the lines 6—6, and 7—7, respectively, of Fig. 1.

Fig. 8 shows the blank from which discharge devices are formed, and

Fig. 9 shows the completed discharge device.

In accordance with my invention I mount a plurality of discharge devices generally indicated at 1, on a tube 2 of insulating material so that they are capacitatively coupled with the conductor 3 sheathed in the tube 2. The conductor 3 is adapted to be connected to a source, not shown, of alternating current suitable to induce a charge in the devices 1 capable of neutralizing the static electricity developed by the operation of the machine in which the neutralizing apparatus is to be attached.

To insure that the inducing element, consisting of the sheathed conductor and the discharge devices, is sufficiently rigid even when of small diameter, both the tube 2 and the conductor 3 are of stiff material in order that they may each contribute to the desired strength.

The inducing element is supported axially in a tubular grounded metal casing 4 by hard rubber insulators 5 shaped to fit tightly on the tube 2 and to fit relatively loosely in the casing 4. The casing 4 has a longitudinal slot 6 with which the discharge devices must be in alinement. The insulators 5 include key portions 7 entrant of the slot 6 to prevent the mis-alinement of the discharge devices therewith.

The insulators 5 are spaced from the discharge devices 1 and relatively few of these are employed.

The conductor 3 of the neutralizing apparatus shown in the drawings protrudes from each end of the inducing element and is threaded at one end as at 8 to receive the hard rubber end cap 9 formed with an annular flange 10 to receive the end of the tube 2 and to support the casing 4. An end cap 11 having an annular flange 12 fits over the other exposed end of the conductor 3 to

receive the tube 2 and to support the casing 4 and is locked in place by a nut 13. The exposed portion 14 of the conductor 3 is of reduced diameter and is formed with a pointed end 15 and an annular contact groove 16 between which and the nut 13 it is protected by an insulating sleeve 17.

In Fig. 1 I have shown fragmentarily a yoke 18 having a pair of alined chambers 19 interconnected by a passage in which I mount a piece of relatively stiff wire 20 held in place by a set screw 21 adapted to be connected to the line from the source of alternating current. As shown in Fig. 5, each of the chambers 19 has an aperture 22 to receive the sheathed end of the conductor and a recess 23 to receive the pointed end 15. This structure makes a very satisfactory and convenient connection where the installation requires two neutralizing bars.

In accordance with my invention, I form these discharge devices 1 from a strip of metal for which stainless steel in the order of .005 inch is very suitable. The strip is cut into blanks 25 and one edge of each is then provided with one or more tab portions 26 bendable outwardly into a discharge point. As shown in Figs. 8 and 9, the tab portions 26 may be conveniently formed by punching the blank 25 with a hole 27 tangent to one edge.

The blanks 25 are then shaped into induction sleeves adapted to engage resiliently the tube 2 and the portions 26 are then bent outwardly to present discharge points. In practice, the discharge devices are formed with the edge having the tab portions 26 in parallel with the axis of the induction sleeve in order not to disturb the lay of the tab portions and to ensure the alinement of the discharge devices.

The discharge devices are positioned on the tube 2 as desired with the discharge points in alinement. I then coat the tube 2 and the sleeves of the discharge devices with a suitable non-conductive adhesive firmly anchoring the discharge devices in place. The adhesive coating is shown only at 28 in Fig. 4.

In accordance with my invention, I am able to provide neutralizing apparatus that is simple and inexpensive to manufacture and service. Because of the absence of direct support between the induction sleeves and the grounded casing, my apparatus functions favorably in spite of unfavorable atmospheric conditions and may be made in small sizes for installation in machines where limited space has hitherto precluded the neutralization of static charges developed by their operation.

What I therefore claim and desire to secure by Letters Patent is:

1. Apparatus for use in neutralizing static electric charges, said apparatus comprising a conductive casing to be grounded and having a longitudinal slot, a relatively stiff inducing element, said element consisting of a conductor, a non-conductive sheath for said conductor, and a plurality of discharge devices mounted on said sheath to be capacitatively coupled to said conductor, said discharge devices including discharge points disposed in alinement and insulators mounted on said sheath out of contact with said discharge devices, said insulators fitting within said casing and positively supporting said element in desired relation to said casing.

2. Apparatus for use in neutralizing static electric charges, said apparatus comprising a metal casing to be grounded and having a longitudinal slot, an inducing element, said element consisting of a conductor, a non-conductive sheath for said conductor and a plurality of discharge devices mounted on said sheath to be capacitatively coupled to said conductor, said discharge devices including discharge points disposed in alinement, and insulators mounted on said sheath out of contact with said discharge devices, said insulators fitting within said casing and positively supporting said element in desired relation to said casing, said inducing element being sufficiently stiff to permit said insulators to be separated by a plurality of discharge devices.

3. Apparatus for use in neutralizing static electric charges, said apparatus comprising a metal casing to be grounded and having a longitudinal slot, a relatively stiff tube of insulating material, a relatively stiff metal conductor in said tube, and a plurality of discharge devices mounted on said tube to be capacitatively coupled to said conductor, said discharge devices including a sleeve resiliently engaging said tube and integral discharge points each in alinement with the others, and insulators mounted on said insulated conductor out of contact with said discharge devices, said insulators fitting within said casing and positively supporting said element in desired relation to said casing.

4. Apparatus for use in neutralizing static electric charges, said apparatus comprising a metal casing to be grounded and having a longitudinal slot, a stiff conductor, a non-conductive sheath for said conductor, a plurality of discharge devices mounted on said sheath, said discharge devices including a sleeve portion resiliently engaging said sheath and an integral discharge point, said discharge points being disposed in alinement and insulators mounted on said sheath in spaced relation to said discharge devices, said insulators fitting within said casing to support said sheathed conductor in desired relation thereto.

5. Apparatus for use in neutralizing static electric charges, said apparatus comprising a metal casing having a longitudinal slot, a relatively stiff inducing element within said casing consisting of a conductor, a non-conductive sheath for said conductor, and a plurality of discharge devices mounted on and supported solely by said sheath to be capacitatively coupled to said conductor, said discharge devices being spaced from each other and including a plurality of discharge points, each of said points being in alinement with said slot and being located wholly within said casing.

6. Apparatus for use in neutralizing static electric charges, said apparatus comprising a metal casing having a longitudinal slot, a relatively stiff inducing element within said casing consisting of a conductor, a non-conductive sheath for said conductor, and a plurality of discharge devices mounted on and supported solely by said sheath to be capacitatively coupled to said conductor, and insulators mounted on said sheath and fitted within said casing to positively support said element in desired relation to said casing, said discharge devices each including at least one discharge point with the discharge points all being in alinement with said slot and being located wholly within said casing, and said discharge devices being spaced from each other and from said insulators.

7. The device of claim 6 in which there are a plurality of discharge devices between each of the insulators.

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