March 26, 1963 F. E. HANSCOM 3,083,318

BRUSHES WITH MEANS FOR NEUTRALIZING STATIC CHARGES

Filed April 27, 1959 2 Sheets-Sheet 1

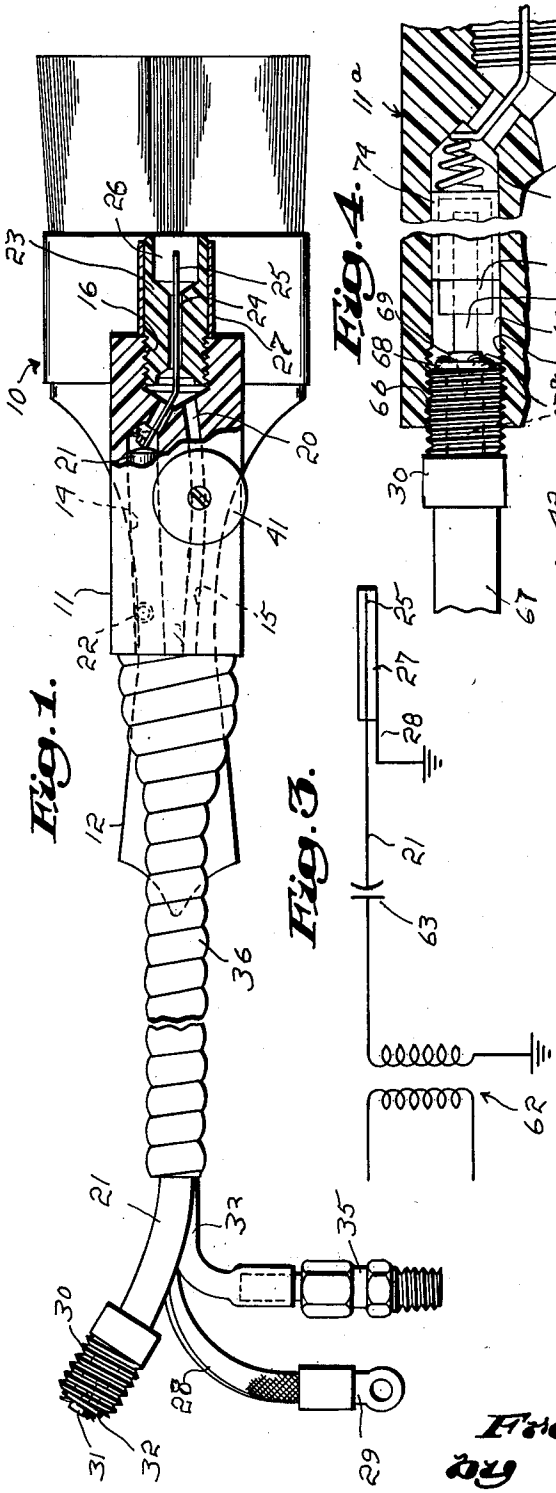

Fig. 1.

Fig. 4.

Fig. 3.

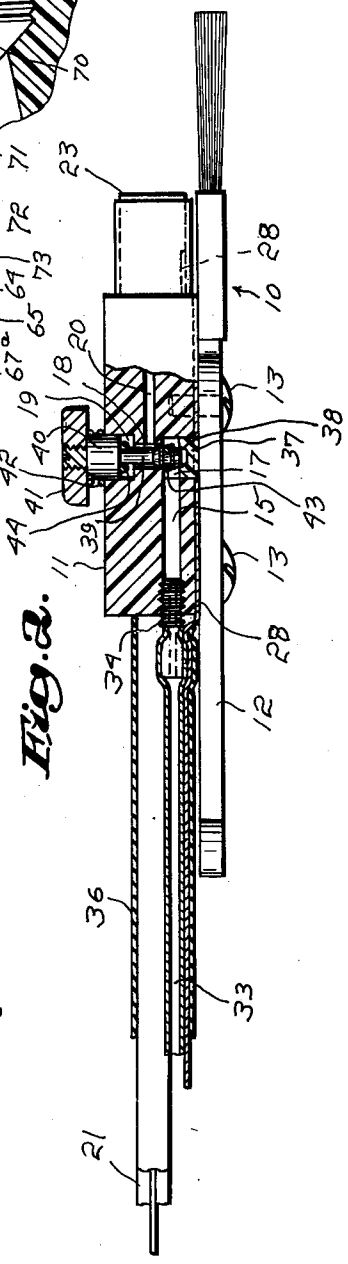

Fig. 2.

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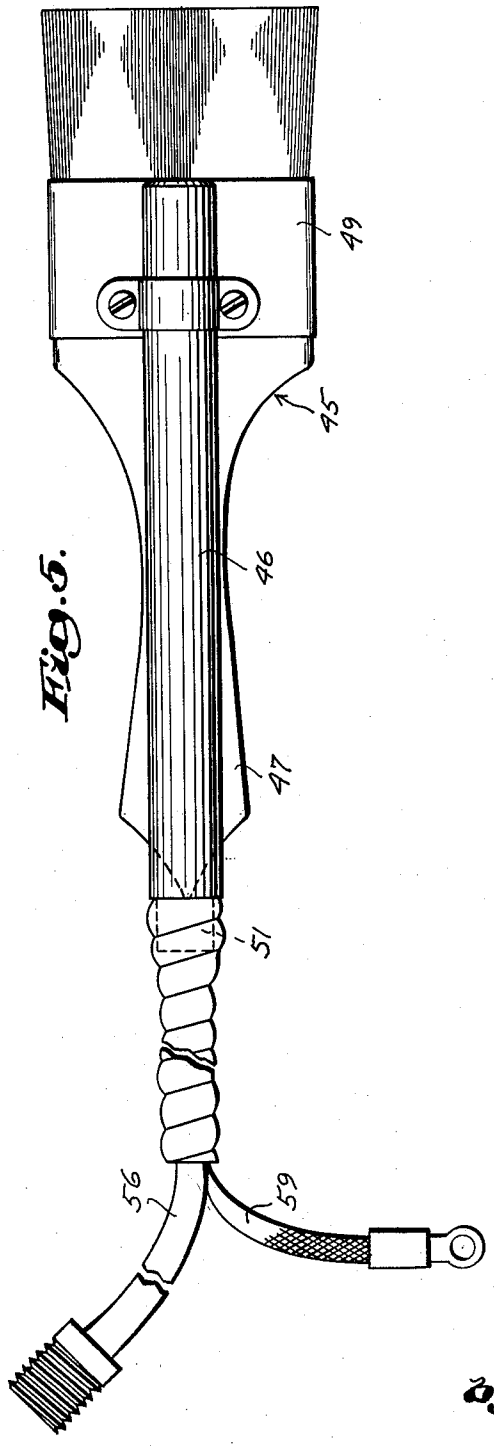

Fig. 5.

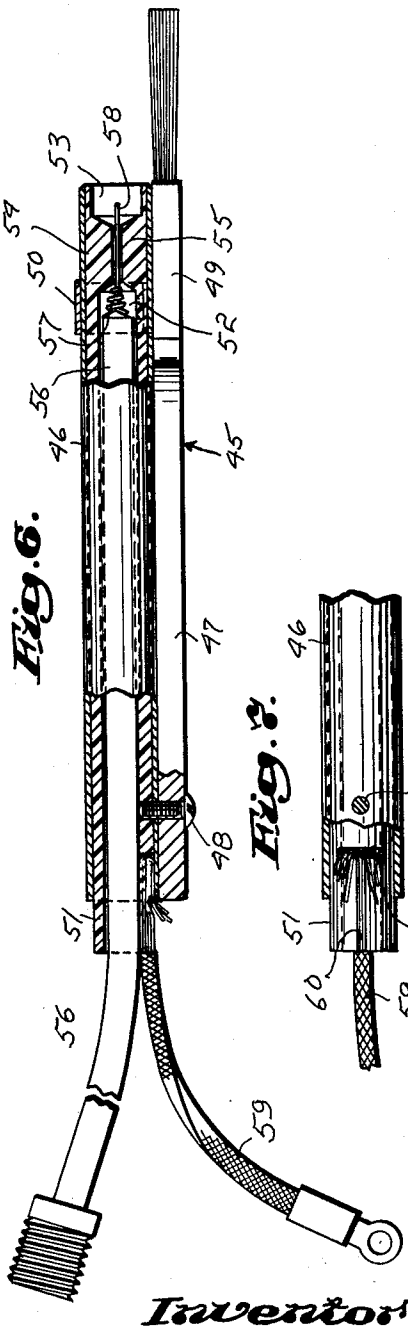

Fig. 6.

Fig. 7.

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3,083,318
BRUSHES WITH MEANS FOR NEUTRALIZING STATIC CHARGES

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10 Claims. (Cl. 317—2)

The present invention relates to brushes provided with means for neutralizing the static charge adhering dust particles to the surface to be cleaned.

While there are many examples of production of maintenance difficulties caused by static electricity, the cleaning of photographic film is the problem with which the present invention is primarily concerned. Unless, for example, such film is free of dust particles prior to printing, the finished pictures may be blemished. The practice of brushing the film is rendered only partly effective due to static electric charges causing the dust particles to cling tenaciously to the film.

The principal objective of the present invention is to provide brushes provided with means for so neutralizing static electric charges that brushing is effective with or without an associated air stream in removing dust from photographic film lenses or other surfaces which must be cleaned but require considerable care in so doing.

In accordance with the invention this objective is attained by providing a brush with a discharge point disposed towards the sweeping end thereof and coupled either directly or capacitatively, to a cable for connection to a source of high electric potential and insulated from a grounded sleeve housing the discharge point. The insulation between the sleeve and the discharge point is preferably a body fitted into said sleeve and having a chamber in its end proximate to the sweeping end of the brush in which the chamber the point is exposed. The body may have a passage therethrough through which the discharge point freely extends and which is placed in communication with a valve controlled source of air under pressure so that not only is there no air stream available to blow away freed dust particles, but also the air stream is ionized to an extent making the invention singularly effective in cleaning photographic film and other surfaces from which static electric charges will make dust otherwise difficult to remove.

In the accompanying drawings, there are shown illustrative embodiments of the invention from which these and other of its objectives, novel features, and advantages will be readily apparent.

In the drawings:

FIG. 1 is a partly sectioned elevation of the upper face of a brush in accordance with one embodiment of the invention;

FIG. 2 is a partly sectioned edge view thereof;

FIG. 3 is a somewhat schematic view of a typical operating circuit;

FIG. 4 is a fragmentary, longitudinal section through a capacitative coupling between the cable and the discharge point;

FIG. 5 is an elevation of the upper face of a brush in accordance with another embodiment of the invention;

FIG. 6 is a partly sectioned side view thereof; and

FIG. 7 is a fragmentary view of the rear part of the undersurface of the holding sleeve and cable receiving insulator body.

In the embodiment of the invention illustrated by FIGS. 1 and 2, a generally indicated brush 10 is shown as having a mount 11 attached to its handle 12 as by screws 13. The brush 10 is illustrative of any conventional brush such, for example, as a camel's hair brush for use in cleaning photographic film.

The mount 11 has parallel bores 14 and 15 extending towards the sweeping end of the brush 10 from the other

end thereof. The bore 14 is in communication with a centrally located bore 16 extending rearwardly towards the handle end of the brush. The bore 15 opens into a counterbore 17 in the undersurface of the mount 11 at one end of a passage 18 which opens into a counterbore 19 in the opposite mount face. The passage 18 is placed in communication with the bore 16 by a bore 20.

One end of an electric cable 21 extends into the bore 14 and is anchored therein as by a set screw 22. A body 23 of stock that is a non-conductor of electricity is threaded into the bore 16 and it has an axial passage 24 freely receiving the discharge point 25 which is connected to and in contact with the cable 21 and which opens into an axial end chamber 26 in which the discharge point 25 is exposed. The body 23 has a sleeve 27 of electrically conductive stock. A flat, ground cable 28 is clamped between the mount 11 and the handle 12 with one end securely caught between the body 23 and the sleeve 27 and its other end provided with a connector 29. The other end of the cable 21 is shown as extending into a threaded connector 30 to which it is shown as locked by a copper tack 31 driven through a washer 32 after the conductor 21a of the cable 21 has been passed through and into the end of the cable's conductor splayed against the exposed face of the washer. The washer 32 is dimensioned to seat against the threaded end of the connector 30.

One end of a flexible tube 33 is attached to a fitting 34 threaded into the exposed end of the bore 15 and its other end has a fitting 35 enabling it to be detachably coupled to a suitable source of air under pressure, preferably in the range of from 12–20 p.s.i. Proximate to the mount 11, the cables 21 and 28 and the tube 33 are held together as by a spiral wrapping 36. The counterbore 17 is closed by a plug 37 defining a chamber for the valve head 38 whose stem 39 passes freely through the passage 18 and is connected to the hub 40 of a valve operating button 41. The hub 40 is a free fit in the counterbore 19 and it holds in place a spring 42 with one end seated against the proximate face of the mount 11 and its other end engaging the undersurface of the button 41 to yieldably maintain the valve head 38 in a position in which its annular seal 43 blocks the flow of air into the passage 18. When the button 41 is manually depressed, the seal 43 is unseated and the annular stem seal 44, backed by the face of the hub 40, is seated against the proximate end of the passage 18 placing the passage 20 in communication with the source of air under pressure. An air stream is thus established through the axial passage 24 and about the discharge point 25 and against the surface to be cleaned by the sweeping end of the brush 10.

In the embodiment of the invention illustrated by FIGS. 5–7, a generally indicated brush 45, which may be identical to the brush 10, has a sleeve 46 of stock that is electrically conductive attached to the brush handle 47 as by a screw 48 with its front end connected to the bristle holder 49 by a clip 50.

A body 51, of stock that is not a conductor of electricity, is locked in the sleeve 46 as by the screw 48 and is dimensioned to protrude from the rear end thereof. The body 51 has an axial chamber 52 extending forwardly from its rear end and terminating short of a relatively shallow axial chamber 53 in the front end thereof to establish an intermediate seat 54 having an axial passage 55 extending therethrough. A cable 56, otherwise similar to the cable 21, extends into the chamber 52 and has the tapering coil 57 of the discharge point 58 soldered to its conductor. The cable 56 is also anchored by the screw 48 with the discharge point 58 extending through the seat passage 55 and exposed in the chamber 53.

A ground cable 59, otherwise similar to the ground 28, extends along a slot 60 in the body 51 and has its end

frayed and caught in a transverse slot 61 thus to be securely anchored between the body 51 and the sleeve 46 when the sleeve 46 is slid over it. While the embodiment of the invention illustrated by FIGS. 5–7 does not have the advantages afforded by an ionized air stream, it is effective in use and economical to manufacture.

Suitable ionization of the air about the discharge points is effected by means of a transformer 62, for example, a 115 volt A.C. transformer, see FIG. 3, capable of delivering potential in the order of 5000 volts to the appropriate cable, such as the cable 21. The cables 21 and 56 each have a capacitor with that in the cable 21 being indicated at 63 in FIG. 3 and adapted to yield approximately 3600 volts to the discharge point 21 which is coupled directly thereto.

If it is desired to lessen the spark hazard and to reduce the voltage, the discharge points may be capacitatively coupled to the cables. In FIG. 4, there is shown a mount 11[a] identical to the mount 11 except that the entrance of its bore 64 is threaded as at 65 to receive the threaded connector 66 which is similar to the connector 30. The cable 67 extends into the connector 66 and its conductor 67[a] passes through and is splayed against the outer face of a washer 68 dimensioned to seat on the threaded end of the connector 66. A tack 69, preferably of copper, is driven into the splayed end of the conductor 67[a] and through the washer 68.

The discharge point 70 is arranged and disposed in a manner similar to the discharge point 25 but it, like the discharge point 58, terminates in a spiral resilient coil 71 seated in the extremity of the bore 64. A sleeve 72, of stock that is a non-conductor of electricity, receives within it a part of a conductor element 73 and the front part of the sleeve 72 fits into an outer sleeve 74 of electrically conductive stock. The sleeve 74 is dimensioned to be a sliding fit within the bore 64 and it is brought into contact making engagement with the resilient point coil 71 when the connector is threaded into the bore 64 to bring the head of the tack 69 into good contact with the proximate end of the conductor element 73. While this arrangement is particularly satisfactory, capacitative couplings may be otherwise effected and readily adapted for use in other embodiments of the invention, including that illustrated by FIGS. 5–7.

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

1. In a device for neutralizing static charges, a cable, a first connector in the form of a sleeve through one end of which one end of said cable extends, an annular member seated against the other end of said connector through which the conductor of the cable extends and against the exposed surface of which said conductor is splayed, a tack-like anchor of conductive stock extending through said member and into said conductor, and a second connector attached to said first connector and including a conductor seated against said anchor.

2. In a device for neutralizing static charges, a cable, a first connector in the form of a sleeve through one end of which one end of said cable extends, an annular member seated against the other end of said connector through which the conductor of the cable extends and against the exposed surface of which said conductor is splayed, a tack-like anchor of conductive stock extending through said member and into said conductor, a second connector attached to said first connector and including a conductor seated against said anchor, and a sleeve of electrically conductive stock carried by said second connector and including a discharge point.

3. In a device for neutralizing static charges, a cable including a threaded connector part, a body having a passage extending therethrough, one end portion of said passage being of greater diameter than the other to establish an intermediate seat at its inner end, the other end of said larger portion being threaded to receive said part, a discharge point in said other portion provided with a resilient coil at one end dimensioned for insertion through said larger portion and into engagement with said seat and when thus seated to position its other end in an operative position, and a conductor member slidable within said larger portion and dimensioned for engagement with said coil and by said connector part when said connector part is threaded into the threaded end of said larger portion.

4. In a device for neutralizing static charges, a cable including a threaded connector part, a body having a passage extending therethrough, one end portion of said passage being of greater diameter than the other to establish an intermediate seat at its inner end, the other end of said larger portion being threaded to receive said part, a discharge point in said other portion provided with a resilient coil at one end dimensioned for insertion through said larger portion and into engagement with said seat and when thus seated to position its other end in an operative position, and a unit slidable within said larger portion and dimensioned for engagement with said coil and by said connector part when said connector part is threaded into the threaded end of said larger coupling, said unit including a sleeve closed at one end and of electrically conductive stock disposed with its closed end engaging said coil, a conductor engaged by said connector part, and a non-conductive sleeve supporting said conductor within said first named sleeve.

5. In a device for neutralizing static charges, a cable, a discharge point including a resilient coil at one end, a capacitative coupling between the end of said cable and said coil, and means housing said coupling, said coil and said cable end and holding them in end-to-end contact.

6. In a device for neutralizing static charges, a cable, a discharge point including a contact end, means holding said contact end and a cable end in alinement, and a capacitative coupling including an outer sleeve provided with a closed end in contact with said contact end, an inner sleeve of stock that is a non-conductor of electricity within said outer sleeve and having an open end disposed towards said cable end, and a conductor seated in said inner sleeve and of sufficient length so that one end protrudes therefrom, said protruding end and said cable end being in contact.

7. In a device for neutralizing static charges, a cable, a discharge point including a resilient coil at one end, a body having a chamber in which said coil is exposed and to which an end of said cable is attached with its end in alinement with the axis of said coil, and a capacitative coupling including an outer sleeve provided with a closed end in contact with said coil, an inner sleeve of stock that is a non-conductor of electricity within said outer sleeve and having an open end disposed towards said cable end, and a conductor seated in said inner sleeve and of sufficient length so that one end protrudes therefrom, said protruding end and said cable being in contact, said conductor and said outer sleeve being of stock that is a conductor of electricity, said coil being at least partly compressed.

8. In combination, first supporting structure, a brush at one end of said structure, and a device for neutralizing static charges including a cable, a discharge point, one end of which is connected to one end of said cable, second supporting structure for said cable end and said point in one end of which said point is exposed, said first and second supporting structure being of stock that is a non-conductor of electricity, and at least the point exposing end of said second supporting structure including a sleeve of stock that is a conductor of electricity, means connecting said first and second structures with said point disposed towards the sweeping end of said brush, and a ground clamped between said structures and connected to said sleeve.

9. In combination, a device for neutralizing static charges including a cable, a discharge point, supporting

structure having a first passage extending from end-to-end thereof and including first and second sections, a cable end being connected to the first section, said discharge point extending from the first to the second section with one end of the point being exposed, the other end of the point being connected to said cable end, said supporting structure having a second passage extending from end-to-end thereof for connection to a suitable air source, said second passage including first and second sections, said second section opening into the second section of the first passage, and a valve operable to interconnect the first and second sections and normally blocking them, said supporting structure being of stock that is a non-conductor of electricity, a sleeve of stock that is a conductor of electricity surrounding said point, and a ground connected to said sleeve.

10. The device of claim 9 in which the supporting

structure includes a sleeve portion threaded in the second section of the first passage and having an axial passage freely receiving the point, and the grounded sleeve is carried by the sleeve portion.

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