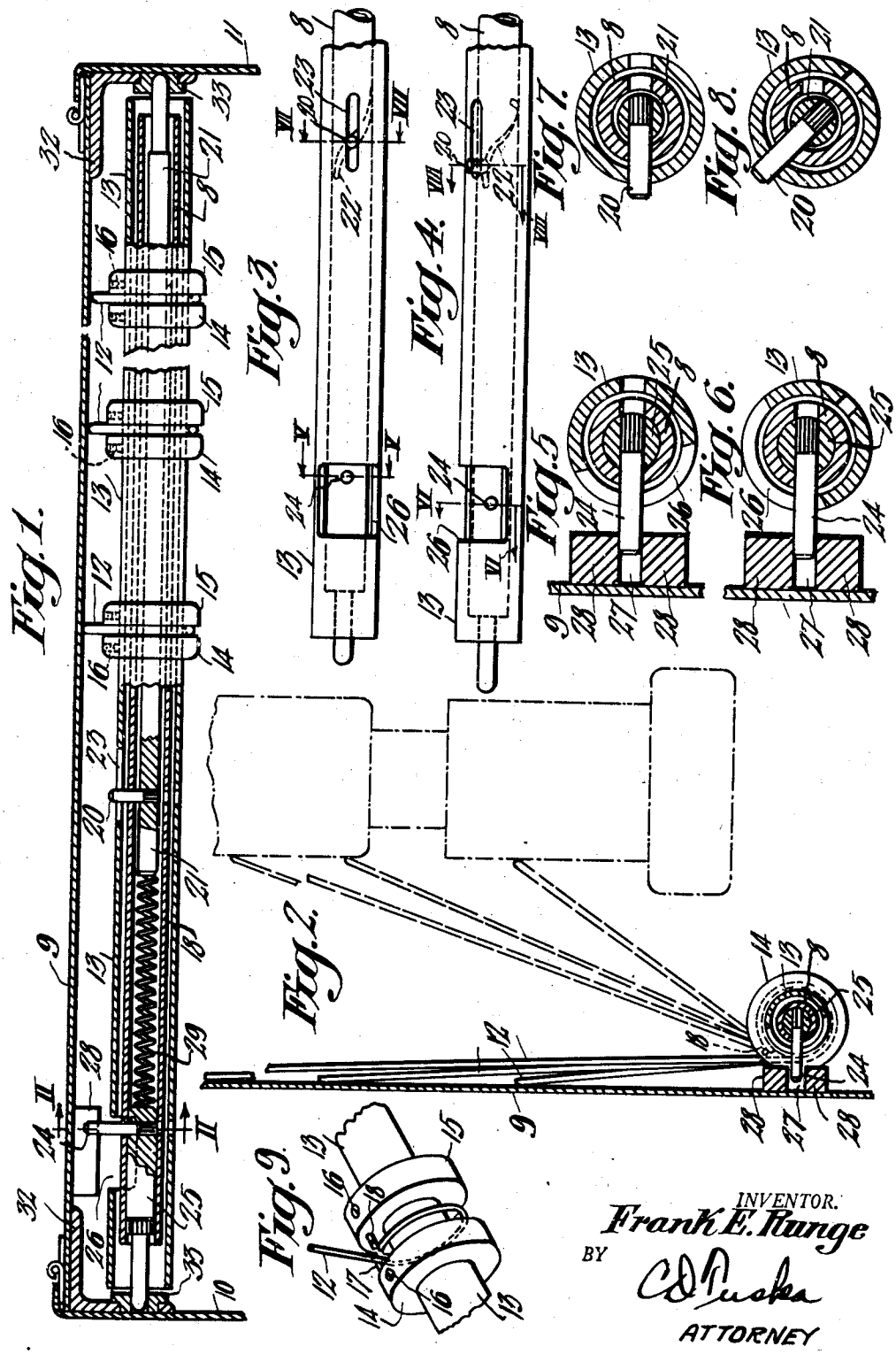
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HIGH VOLTAGE SAFETY SWITCH

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HIGH VOLTAGE SAFETY SWITCH

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The present invention relates to electron microscopes and other high voltage electrical apparatus, and more particularly to an assembly operated by the opening of a door or doors of the housing for the high voltage units.

Some of the objects of the present invention are: to provide a safety grounding means for high voltage units; to provide a grounding means for an electron microscope which is automatically caused to function when a door of the microscope housing is opened; to provide a grounding means for an electron microscope which is automatically caused to function when one or more doors of the microscope housing is or are opened; to provide means for breaking a ground connection when a door housing high voltage units is closed provided no other door is open; to provide a positive and certain means for operating a grounding assembly in response to the opening of a door or doors; to provide a compact, positive and foolproof mechanism for grounding housed high voltage units when a door or doors of the housing is opened; and to provide other improvements as will hereinafter appear.

In the accompanying drawing,

Figure 1 represents a longitudinal section, in part, of one form of grounding mechanism embodying the present invention;

Figure 2 represents a section on line II—II of Fig. 1;

Figure 3 represents a fragmentary plan of the plunger parts in position as restrained by the closed doors;

Figure 4 represents the plan of Fig. 3 showing the position of the parts when released by the opening of the left door;

Figure 5 represents a section on line V—V of Fig. 3;

Figure 6 represents a section on line VI—VI of Fig. 4;

Figure 7 represents a section on line VII—VII of Fig. 3;

Figure 8 represents a section on line VIII—VIII of Fig. 4; and

Figure 9 represents a detail perspective of one set of the ground rod actuating means.

Referring to the drawing, one form of the present invention is shown mounted on the rear wall 9 of the housing for the high voltage units of an electron microscope, and in position to be controlled by the two opposite doors 10 and 11 which serve to gain access to the interior of the housing.

For contacting conductors, condensers or other high voltage parts, there is provided a plurality of grounding rods 12, usually of different lengths in order to reach parts at different distances from the wall 9. Each rod 12 has one end looped about an actuating sleeve 13, at spaced intervals for free turning movement thereon, and is held against lengthwise movement on the sleeve 13 by a pair of collars 14 and 15 which are fixed to the sleeve 13 by set screws 16 or the like. The collar 14 is provided with a pick-up pin 17 projecting laterally and parallel to the sleeve 13 to engage one side of the adjacent rod 12, and the collar 15 has a like pick-up pin 18 projecting laterally and parallel to the sleeve 13 to engage the opposite side of the same rod 12. Thus turning of the sleeve 13 in a clockwise direction, as seen in Fig. 9, will cause the pins 14 to flip the rods 12 clockwise considerably to shift them past the dead center of the sleeve so that each rod is forced against, or finally falls by gravity against, its adjacent conductor. To return the rods 12, the sleeve 13 is turned counter-clockwise and the pins 18 then pick up the respective rods 12 and return them to contact with the wall 9. On this return movement the pins 18 remain in contact with the rods 12 to hold them against the wall 9.

It is important that the collars 14 and 15 be rotationally adjusted and fixed upon the sleeve 13, so that the pick-up pins 17 and 18 have a predetermined arc of travel to pick up the rods 12 in the required manner.

For imparting rotary movement to the sleeve 13, it is supported by and is freely rotatable on a tube 8, and receives its motion by means of a cam follower or pin 20 fixed to a plunger 21 and projecting radially therefrom to traverse a cam slot 22 in the tube 8 and enter a linear slot 23 in the sleeve 13. The slot 23 is parallel to the axis of the sleeve 13 and has a uniform width to slidably receive the cam follower or pin 20. The cam slot 22 is in the form of a spiral across the juxtaposed face of the tube 8. It will thus be seen that relative movement between the pin 20 and the tube 8 will shift the pin 20 against one or the other side of the slot 23, depending upon its direction of travel, and thus turn the sleeve 13 as required to shift the rods 12 to grounding position or opposite thereto.

For actuating the pin 20, the plunger 21 is of a length to project from one end of the tube 8 into the path of the door 11, so that as the latter is closed it will contact the end of the plunger 21 and shift it axially of the tube 8 (to the left as seen in Fig. 1 thereby to cause the pin 20 to turn the sleeve 13). Rotation of the sleeve 13 from the opposite end of the mechanism is accomplished by the axial movement of a thrust-pin 24

fixed to and projecting radially from a plunger 25 to pass with a snug fit through a hole in the tube 8 and traverse an opening 26 in the sleeve 13. This opening 26 is of such dimensions as to allow unrestricted linear and rotary motion of the pin 24 with respect to the sleeve 13. The free end of the thrust-pin 24 is arranged to ride in a slot 27 formed between two superposed lugs 28 fixed to the wall 9. The slot 27 is longer than the maximum stroke of the thrust-pin 24 and its function is to prevent turning of the tube 8 while permitting endwise movement thereof. The plunger 25, firmly fixed in the tube 8, projects from the end of the sleeve 13 into the path of the door 10, so that as the latter is closed it will contact the end of the plunger 25 and shift it axially of the sleeve 13.

For maintaining the plungers 21 and 25 projected for contact with the respective doors 10 and 11, a compression spring 29 is interposed between the opposed ends of the two plungers and functions to propel one or the other, or both outwardly when either or both doors are opened.

In order to support the assembly on the wall 9, brackets 30, in the form of apertured angle irons 32, carrying bushings 33 to receive guide the respective plungers 25 are provided. These bushings 31 allow free turning movement of the sleeve 13 as will be understood.

The operation of the device is as follows: Assuming both doors are closed, the parts will be in the position shown in Figs. 1, 2, 3, 5 and 7. When the door 10 is opened the spring 29 using the plunger 21 as a fixed abutment propels the plunger 25 outwardly, thereby shifting the thrust pin 24 to the left (as seen in Fig. 4) and causing the tube 8 to follow its movement. In so moving the tube 8 pulls the cam slot 22 along with it and thereby moves the cam follower pin 20 in the direction to turn the sleeve 13 in a clockwise direction (Fig. 9), thereby causing the collar pick-up pins 17 to engage the respective rods 12 and flip each over to its grounding position. When the door 10 is swung back to closed position the reverse action of the parts takes place and the pick-up pins 18 are caused to engage the respective rods 12 to return them in a positive manner to inoperative position. With both doors now closed again, it will be assumed that the door 11 is opened. The spring 28 now uses the plunger 25 as a fixed abutment and propels the plunger 21 outwardly. This movement is transmitted to the rock-pin 20, which cams the sleeve 13 in a clockwise direction to flip the rods 12 to grounding position through the action of the pick-up pins 17. When the door 11 is closed the plunger 21 is pressed back against the tension of the spring 29 and the pin 20 now cams the sleeve 13 counter-clockwise so that the pick-up pins 18 return the respective rods 12.

In case both doors 10 and 11 are open, the closing of one door merely results in the whole internal assembly within sleeve 13 sliding as an articulated unit, and no rotary motion of the sleeve 13 can take place because there is no fixed abutment against which the spring 29 can react.

I claim as my invention:

1. A device for grounding electrical conductors, comprising a tube, two plungers in said tube, a spring normally compressed between said plungers to cause said plungers to project at opposite ends of said tube for respectively contacting two doors, said plungers and spring having a minimum length when said doors are closed and an expanded length when either door is opened, a grounding rod, and means operated by the expanding motion of said plungers, as one or the other of said doors is opened, for moving said rod from an inoperative position to a grounding position.

2. A device for grounding electrical conductors, comprising a tube, two plungers in said tube, a spring normally compressed between said plungers to cause said plungers to project at opposite ends of said tube for respectively contacting two doors, said plungers and spring having a minimum length when said doors are closed and an expanded length when either door is opened, a grounding rod, and means operated by the retracting motion of said plungers as one or the other of said doors is closed, for moving said rod from a grounding position to an inoperative position.

3. A device for grounding electrical conductors, comprising a tube, two plungers in said tube, a spring normally compressed between said plungers to cause said plungers to project at opposite ends of said tube for respectively contacting two doors, said plungers and spring having a minimum length when said doors are closed and an expanded length when either door is open, a grounding rod, and means operating as a function of the length of said spring and plungers for moving said rod from one position to another.

4. A device for grounding electrical conductors, comprising a tube, two plungers in said tube, a spring normally compressed between said plungers to cause said plungers to project at opposite ends of said tube for respectively contacting two doors, said plungers and spring having a minimum length when said doors are closed and an expanded length when either door is open, a grounding rod, means operated by the retracting motion of said plungers as one or the other of said doors is closed for moving said rod from a grounding position to an inoperative position, and means rendering said last means ineffective if one door is closed while the other is open.

5. A device for grounding electrical conductors, comprising a sleeve, a tube in said sleeve and relatively slidable, means between said sleeve and tube for translating linear motion of said tube into rotary motion of said sleeve, a grounding rod, means actuated by said sleeve for swinging said rod from one position to another and means arranged to be actuated by the opening or closing of an associated door to move said rod from an ungrounded position to a grounded position during a door opening movement and from a grounded position to an ungrounded position during a door closing movement.

6. A device for grounding electrical conductors, comprising a sleeve, a tube in said sleeve and relatively slidable, means including a cam slot in said tube and a pin, for imparting rotary motion to said sleeve, a grounding rod, means actuated by said sleeve for swinging said rod from one position to another, and means arranged to be actuated by the movement of an associated door for causing said pin to move in a direction to cause said rod to swing to a predetermined position.

7. In an electron microscope, the combination of a wall forming a portion of a housing, oppositely disposed doors for said housing, a grounding rod, means mounting said rod for movement towards and away from said wall, a current conductor in the path of movement of said rod, and

means actuated by the opening of either door for causing said mounting means to move said rod away from said wall and into contact with said conductor whereby said conductor is grounded.

8. In an electron microscope, the combination of a wall forming a portion of a housing, oppositely disposed doors for said housing, a grounding rod, means mounting said rod for movement towards and away from said wall, a current conductor in the path of movement of said rod, and means actuated by the closing of one door after the other door is closed for causing said mounting means to move said rod out of contact with said conductor and into contact with said wall.

9. A device for grounding electrical conductors, comprising a sleeve, a tube relatively slidable in said sleeve and having a cam slot, means including a pin traversing said slot for turning said sleeve, a grounding rod, means actuated by said sleeve for swinging said rod from one position to another, means arranged to be actuated by the opening of an associated door at one end of said sleeve for operating said turning means to cause said rod to move to a grounding position, and means arranged to be actuated by the opening of a door at the other end of said sleeve for operating said turning means to cause said rod to move to the same grounding position, said last actuating means being rendered ineffective when the first actuating means has functioned.

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