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ELECTRICAL DEMONSTRATION APPARATUS

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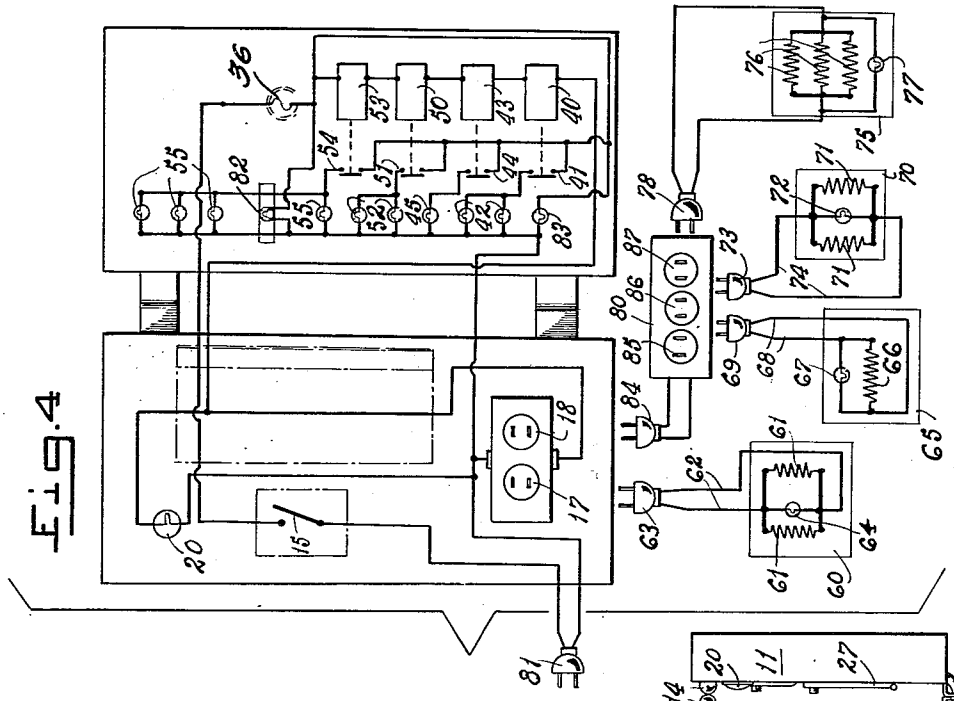


Fig. 4

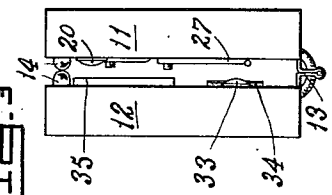


Fig. 3

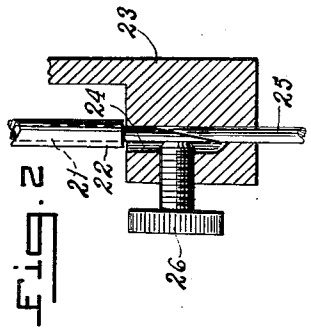


Fig. 2

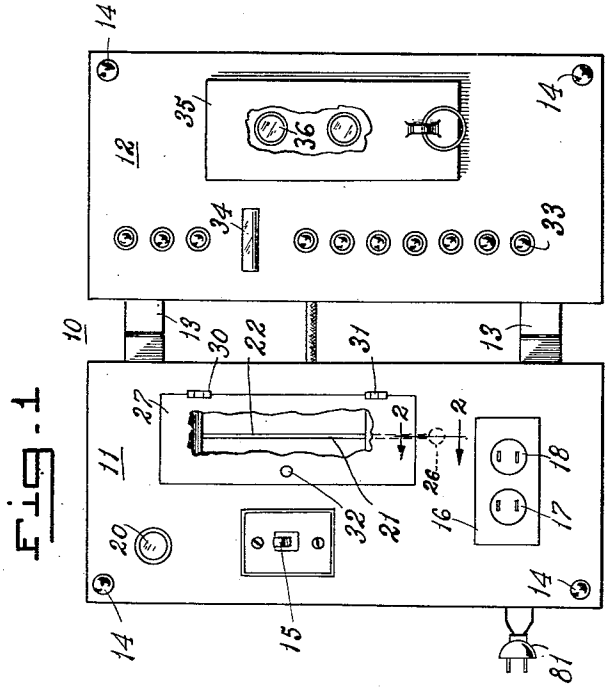


Fig. 1

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ELECTRICAL DEMONSTRATION APPARATUS

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7 Claims. (Cl. 35—19)

This invention relates to an electrical demonstration apparatus and more particularly to an apparatus for teaching the hazards and dangers stemming from the improper use of electrical apparatus of the home appliance type.

At the present time when inherently dangerous equipment is used daily by persons, many of whom do not understand the principles underlying the use of such equipment, it is especially important to instill in such persons safe habits for using that equipment. This is particularly true of electrical equipment which finds many applications in the modern home. It is well known and conceded that people think of home electrical appliances simply as devices which can be connected or "plugged" into the convenient electric wall outlet and a switch turned on to enjoy the benefits of such appliances.

In a great many cases, no thought is given to the number of appliances being used at one time, nor to the house circuits to which the appliances are connected, nor to whether or not the electrical circuits are being overloaded, indeed if it is even realized that the circuits can be overloaded and the significance of such overload. Thus if the use of electric appliances is such that a fuse burns out or "blows" many persons have adopted the dangerous habit of replacing the fuse with an oversized fuse having a burn out capacity too great to protect the circuit so fused or to retain the burned out fuse and insert a copper penny in the fuse socket. Again no thought is given to the possible consequences of such acts and the imminent danger to which such persons expose themselves.

In instances such as those above related it is not generally possible to teach persons the scientific principles involved in the use of household electrical equipment and thus warn them of the dangers they face in engaging in such practices. In fact, most persons are not interested in such a teaching. Thus it is incumbent on persons concerned with public safety to teach the home dwellers safe habits to follow when using electrical appliances around the home. This task becomes of vital importance when one considers the increasing number of types of electrical appliances being made available to householders and the corresponding inadequacy of the electric wiring in many existing homes.

One of the groups vitally interested in instilling in persons safe habits relating to the use of home electrical appliances and thereby minimizing the dire consequences of improper use of such appliances is the New York Board of Fire Underwriters. It is the practice of this group to lecture before various audiences and particularly among children of school age, about common practices followed by many homeowners when using electrical appliances and the dangers resulting from such improper use of the electrical appliances. Furthermore, in carrying out this work it is desirable to have demonstration equipment whereby the lessons of the lecture can be visually observed and the consequences of improper use of the appliances graphically impressed on the audience.

The object of the present invention is to provide a compact, portable apparatus for graphically and trenchantly

teaching the consequence of improper use of the common household electrical appliances.

In carrying out the invention there is provided a portable unit, preferably in two sections in order that one section may be folded over the other to make a compact unit, one section having a wall type toggle switch, a double outlet whereby the conventional prong type electric plug can be connected to the unit, a pilot lamp and a readily accessible and visible wire which carries the entire current used by the demonstration unit, the wire in turn having a sheath capable of bursting into flame when subjected to extraordinary heat, and the other section having a plurality of pilot lamps which are successively illuminated when increasing electrical load is connected to the unit, a warning indicator to show when safe conditions are observed or exceeded and a fuse box. There are also provided several units which are used to place an electrical load on the demonstration unit and which simulate various home electrical appliances.

Features and advantages of the invention may be gained from the foregoing and the description which follows.

In the drawings:

Figure 1 is an elevational view with parts broken away showing schematically the demonstration unit as it appears in use;

Figure 2 is an enlarged sectional view taken along line 2—2 of Figure 1 and showing the means whereby the main current carrying wire is detachably connected in the circuit;

Figure 3 is a plan view showing the demonstration unit in folded position for easy portability; and

Figure 4 is a wiring diagram showing the electrical connections and circuits employed in the demonstration unit.

Reference will now be made to the drawings to describe a preferred embodiment of my invention.

The demonstration unit **10** comprises two sections **11** and **12** connected one to the other by a pair of hinges **13** which permits the sections to be compactly folded as shown in Figure 3 for portability or opened (Figure 1) in which latter instance the unit may be presented for observation and demonstration purposes. Section **11** may be termed the "appliance" section and section **12** the "indicator" section. A number of rubber bumpers **14** are provided, one in each outermost corner of the sections, so that when the unit is in folded condition the front panels of the sections will be spaced apart to prevent interference between the elements mounted on the respective front panels.

Each section is made of a metallic box, the front of which is provided with the elements to be referred to hereinafter. The rear panel of each of the boxes is a metal sheet maintained in place by a plurality of wing nuts (not shown) whereby the panels are removable for access to the equipment mounted within the boxes.

Considering in the first instance, section **11**, there is provided a wall type toggle switch **15** and a conventional double outlet **16** having a pair of prong type sockets **17** and **18**, both elements being readily recognizable as the type found in the home.

In addition, a pilot lamp **20** is provided preferably to give white light and thereby simulate a room lamp such as a ceiling light. Internal to the box of section **11** is a bare wire **21** which will hereinafter be seen to carry the entire current drawn by the demonstration unit. Covering the wire is a replaceable paper sheath **22** which is chemically treated with either potassium nitrate or sodium nitrate to render it flammable, when subjected to extraordinary heat. The upper end of the wire may be fixedly secured to a stud for connection to the remainder of the electric circuits. However, the lower end of the wire is connected to the circuits by means which permit the ready freeing of the

wire. See Figure 2. The means may be a block 23 of insulation material having an opening 24 wherein the tip of the wire 21 may be inserted. The wire 25 leading to the remainder of the electric circuits is shown immovably mounted in the block. A thumb screw 26 is provided to maintain the free end of wire 21 in close electrical contact with wire 25. By loosening thumb screw 26 wire 21 may be removed from block 23 and a used paper sheath 22 removed from the wire and a new sheath placed over the wire after which the wire 21 is returned to opening 24 and thumb screw 26 tightened. The removal of a used sheath and its replacement by a new coated paper sheath is accomplished from the rear of the box and hence the rear panel is removable to provide access to the thumb screw 26 and block 23. The front panel of the box has a swinging panel 27 therein which is hingedly mounted at 30 and 31 whereby wire 21 can be exposed to the view of the audience observing the demonstration. A knob 32 is provided to facilitate opening of the panel.

The remaining section 12 of the unit is provided on its front panel with a plurality of small pilot lamps. The lower lamp 33 shows white when illuminated, the next six lamps above lamp 33 show green when illuminated, and the remaining three lamps show red when illuminated. A small clear plastic member 34, illuminable by a lamp located therebehind, serves as a safety marker in a manner hereinafter described. Also accessible from the front panel is a fuse box 35 which utilizes screw type fuse 36 of the kind generally found in private homes.

In the interior of the box forming section 12 of the demonstration unit are mounted several relays for controlling illumination of the pilot lamps referred to above. These relays are Guardiam relays arranged for serial connection in an electric circuit. Relay 40 is set to operate when a current of two amperes passes through its winding. Operation of the relay engages its contacts 41 to complete a circuit for two parallel connected pilot lamps 42. Relay 43 is set to operate when a current of three amperes passes through its winding at which time relay contacts 44 engage to complete a circuit for the single pilot lamp 45. Relay 50 is set to operate when a current of five amperes passes through its winding at which time relay contacts 51 engage to complete a circuit for the two parallel connected pilot lamps 52. Relay 53 is set to operate when a current of eight amperes passes through its winding. Operation of the relay engages its contacts 54 to complete a circuit for four parallel connected pilot lamps 55. In accordance with the previous discussion, pilot lamps 42, 45 and 52 glow green when illuminated as does the lowermost lamp 55. The remaining three lamps 55 glow red when illuminated.

The means whereby an electric load is placed on the unit and the illumination of the pilot lamps thereby controlled include a device 60 which in its demonstrated form is shown as a model refrigerator. Internally, the device includes a pair of parallel connected resistors 61 to which a pair of conductors 62 are connected. The conductors lead from the resistors to a prong type plug 63 to facilitate connection of the simulated refrigerator to the circuits of the demonstrator unit through outlet 17. A pilot lamp 64 is connected in parallel with the resistors and is mounted external to the model in order that the audience may be informed that the model refrigerator is operatively connected to the demonstrator unit.

This is a similar device 65 which simulates a reading lamp and it includes a single resistor 66 connected in parallel with the lamp bulb 67. A pair of conductors 68 lead from the device to a prong type plug 69 in order that this device can also be connected into the circuits of the demonstrator unit.

A model television set 70 comprises a pair of resistors 71 and a pilot lamp 72 which are connected to a prong type plug 73 by wire conductors 74. There is further provided a model infra red broiler 75 which comprises three resistors 76 and lamp 77. Plug 78 is connected to the components of the model broiler and thereby it can also be electrically connected to the demonstrator unit. In each model appliance, the lamp provided serves as a visual indication that the device is operatively connected to the demonstrator unit.

A multi-outlet unit 80 is also used to demonstrate a too prevailing practice which is resorted to in many instances when the number of household appliances sought to be used at one time exceeds the number of outlets provided for a normal and safe load on the electrical circuits of a house.

The operative connection of the various elements heretofore described and the use of the demonstration unit can best be explained by an outline description of the manner of using the apparatus when lecturing on the safe use of electrical appliances in the home.

The lecturer first explains to his audience the purpose of the demonstration in accordance with the preamble portion of this specification after which he displays the demonstration unit as herein provided and connects it to an electrical outlet (not a part of this unit) by means of electric plug 81.

Upon actuation of wall toggle switch 15 a circuit is completed through the switch contacts, fuse 36 and the parallel circuits of safety mark pilot lamp 82, first indicator lamp 83, and the four serially connected relays 40, 43, 50, and 53 and pilot lamp 20. The outlet 16 to which the variable electric load is connected is in parallel with pilot lamp 20. The current taken by lamp 20, which simulates a room lighting fixture such as a ceiling light, although passing through the serially connected relays is not of sufficient value to cause any of the relays to be operated. The illumination of lamp 82 simply establishes a reference level above which the illumination of any pilot lamps indicates an unsafe or dangerous condition. It is for this reason that the lamps located above safety mark lamp 82 glow red when illuminated. Lighting of lamp 83 simply indicates that even the "room light" 20 places an electric load on the circuits.

At this stage of the demonstration, the lecturer proceeds to plug the various "appliances" into the double outlet 16. A certain sequence of adding appliances to the circuit will generally be followed for purposes of simplification and adequately demonstrating the principles sought to be illustrated, although other sequences may be used for connecting the appliances to the circuit.

Plug 63 will be inserted in outlet socket 17 to connect the refrigerator unit 60 to the circuit. This unit comprises the two resistors connected in parallel and will draw a current through the relay circuit sufficient to operate relay 40 thereby engaging contacts 41 to complete a circuit for pilot lamps 42. Next, the lecturer inserts plug 69 into outlet socket 18 to connect the reading lamp unit 65 to the circuit. As heretofore noted this unit includes a single resistor 66 which when connected in the circuit increases the current through the relay circuit to a value whereby relay 43 is operated and contacts 44 engaged to complete circuit for lamp 45 which is therefore illuminated. It will be noted that these appliances cause the illumination of indicator pilot lamps well below the safe reference level indicated by safety mark lamp 82.

Now if a person desires to add additional appliances to the circuit he will observe that this cannot conveniently be accomplished inasmuch as there is no available outlet into which the additional appliances can be plugged. To illustrate a prevailing practice, reading lamp plug 69 is removed from outlet socket 18 and in its place is inserted multioutlet plug 84. Now instead of only two electric outlets available for use there are four outlets, thus permitting more appliances to be simultaneously connected to the circuit than heretofore possible. The consequences of the use of such multi outlets can now be illustrated with their possible dire results.

Reading lamp plug 69 is now inserted in socket 85 and the condition above described is restored, namely, pilot lamps 83, 42 and 45 are illuminated. However, due to the availability of additional outlets, it is now possible to insert television set plug 73 into socket 86. Immediately the two parallel connected resistors 71 of the television set draw a sufficient additional current through the relay circuit to operate relay 50 and engage contacts 51. Consequently, additional indicator lamps 52 become illuminated and inasmuch as they are below safety mark lamp 82 a safe condition still prevails.

However, an additional socket 87 is still available for use. Therefore broiler unit plug 78 is inserted into this remaining plug and the three resistors making up the broiler unit draw additional current to operate relay 53 and engage contacts 54. Engagement of the contacts complete a circuit for pilot lamps 55. Three of these lamps are located above safety mark lamp 82 and indicate an unsafe condition. Therefore these lamps glow red when illuminated as previously noted.

The fuse 36 is a standard fuse and consequently will blow out when an overload condition persists for a short time. Therefore, the unsafe condition can be explained and visualized by the three uppermost pilot lamps 55 glowing red prior to the circuits being disconnected from the power source as by the fuse blowing. Although the fuse is termed a standard fuse it should be understood that it is a low amperage fuse. In this manner, an overload can be placed on the fuse as hereinafter indicated without blowing out the fuses protecting the circuits feeding the auditorium where the demonstration is being carried out.

After the fuse blows, the "appliances" are left in the circuit and the fuse is replaced, not by a similarly rated standard fuse, but by a higher current fuse. This will be explained as replacing the standard 15 ampere house fuse by a 25 ampere fuse. These indicate relative values and not the true values of the fuses used.

Whereas with a standard fuse the connected appliances caused the fuse to burn out, the higher current fuse can carry the overload provided by the appliances seemingly without ill effect. However, the lecturer opens swinging panel 27 to expose wire 21 covered by sheath 22 which represents the electric wires ordinarily not exposed to view but rather extending behind the walls of the house. Due to the current overload this wire generates an extraordinary heat which causes the chemically treated paper sheath 22 to burst into flame. Inasmuch as this wire corresponds to or represents the normal wiring in a house, it is readily explainable that the use of higher than normal rated fuses in the fuse box of a house can result in dangerous overloading of the house wiring which in turn can give rise to an electric fire starting behind the house walls where it may remain undetected until it reaches proportions which render it uncontrollable.

After this demonstration, thumb screw 26 is loosened and wire 21 freed so that the burned sheath 22 may be removed and a new chemically treated paper sheath slid over the wire. The wire is then returned to opening 24 and thumb screw 26 tightened whereupon the demonstration can be repeated.

During the second demonstration, instead of replacing the burned out fuse with a higher rated fuse, a copper penny is inserted in the fuse socket and the burned out fuse reinserted. Here again, all the appliances are reconnected to the electric outlets. As before all of the pilot lamps are illuminated, including the ones which glow red, when their circuit is completed thus indicating an unsafe condition. Now with the penny inserted in the fuse socket there is no protection given to the circuits and abnormally high currents may be carried by the circuits. The swinging panel 27 is again opened and the sheath covered wire 21 is exposed to the view of the audience. In a short while the overloaded wire generates

the heat sufficient to cause sheath 22 to again burst into flame.

Having thus completed the demonstration the lecturer summarizes the improper practices which should be avoided when using electrical appliances in the home, to wit, do not use multi outlets which increase the number of outlets in the house, do not replace burned out fuses with higher rated fuses or insert a copper penny in the fuse socket with the burned out fuse. Rather, the audience is advised that they should determine the cause of burning out fuses and remedy the abnormal condition.

Having thus described my invention, and realizing that many apparent changes can be made from the disclosure without departing from the scope of my invention, it is intended that the foregoing description and the drawings should be interpreted in an illustrative rather than a limiting sense.

What is claimed is:

1. An apparatus of the type described comprising means for placing a variable load on an electric circuit, an electric circuit to which said variable load means is connected, and a sheath for a section of said circuit which is flammable under certain load conditions, said sheath being chemically treated in order to be rendered flammable.

2. An apparatus according to claim 1 including means for detachably connecting the section of the circuit for which said sheath is provided to the remainder of the circuit in order that the sheath may be readily placed on the section of the circuit.

3. An apparatus of the type described comprising an electric circuit, an outlet whereby an electric load can be connected to said circuit, variable load means adapted for connection to said circuit through said outlet, indicator means for indicating the extent of the electric load connected to said circuit, and means flammably responsive to the load on said circuit exceeding a predetermined value, said last named means being chemically treated to render it flammable under the load conditions encountered in the apparatus.

4. An apparatus of the type described comprising an electric circuit, an outlet whereby an electric load can be connected to said circuit, variable load means adapted for connection to said circuit through said outlet, indicator means for indicating the extent of the electric load connected to said circuit, flammable means responsive to the load on said circuit exceeding a predetermined value, and means for indicating the predetermined electric load value above which the flammable means responds to the excessive load.

5. An apparatus of the type described comprising an electric circuit, an outlet whereby an electric load can be connected to said circuit, variable load means adapted for connection to said circuit through said outlet, flammable means responsive to the load on said circuit exceeding a predetermined value, a plurality of pilot lamps, relay means responsive to the load carried by the electric circuit for controlling illumination of said lamps whereby said lamps indicate the extent of the load carried by the electric circuit, and means for indicating the predetermined electric load value above which the flammable means responds to the excessive load, the pilot lamps being disposed on both sides of said last named means with those for indicating a load value higher than said predetermined value being of a distinctive color.

6. An apparatus according to claim 3 wherein said flammable means is a sheath of paper disposed on a section of the electric load carrying circuit.

7. An apparatus according to claim 5 including circuit interrupting means for opening the electric circuit when the electric load exceeds the predetermined value.

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