

# PATENT SPECIFICATION

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## (54) DECORATIVE LIGHTS

(71) We, GENERAL ELECTRIC COMPANY, a corporation organized and existing under the Laws of the State of New York, United States of America, of 1 River Road, Schenectady 12305 State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates generally to string sets of series-connected, decorative, incandescent lamp. More particularly, the invention relates to a string set construction wherein two unshunted lamps act as a fuse for the string set.

In the past, most string sets of series-connected decorative incandescent lamps have been made of either 18-gauge wire for outdoor use or 20-gauge wire for indoor use. Unfused string sets made of smaller conductor wires would not be protected by the conventional 15- and 20-amp branch circuit fuses and circuit breakers. In other words, if an unfused indoor string set with a wire size smaller than 20 mils encountered an electrical problem, the 15 or 20 fuse or breaker would not open the circuit. This is so because the current flowing through the smaller diameter conductor would not be sufficient to trip the circuit breaker or blow the fuse even when there is a problem in the set. Accordingly, the heat buildup in the string set of the smaller gauge wire would continue to a point where it might ignite the string set insulation or anything in the surrounding area before any fuse would blow or breaker trip.

Although the economies of using string sets of smaller gauge wire are great, they should not be used without short circuit protection. Any short circuit protection designed into a string set should have the qualities of being able to utilize standard parts such as lamp sockets, wires and in-

sulation which are presently used in the string set industry. Furthermore, any short circuit protective device should also have the quality of being able to blend in with all the other lamps and sockets of the string set inasmuch as these sets are primarily used for decorative purposes.

Accordingly, the present invention provides a string set of series-connected incandescent lamps comprising a plurality of lamps positioned in a plurality of lamp sockets, the lamp sockets being connected to each other by a conductor and at least two of said lamp sockets being connected to means for making electrical contact with a power supply, the two incandescent lamps in said two lamp sockets being of the unshunted type, and the wire conductors connecting said two lamp sockets to said source of power being of a gauge greater than the gauge of the wire conductors connecting the remainder of the plurality of lamp sockets to each other.

The invention thus provides a string set having all but two lamp sockets connected by a smaller gauge wire, such as 24-gauge insulated wire. The two lamp sockets nearest the plug end of the string set are connected to the plug by a heavier gauge wire, such as 20-gauge wire. The lamps fitting the last two sockets are unshunted incandescent filament lamps which, unlike the shunted variety in the remainder of the string set, will form an open circuit upon filament failure. Adequate protection for the series string set is provided by positioning the two unshunted incandescent lamps as the first and last lamps in the set and by connecting them to the plug with a heavier gauge wire. In the event of any electrical problems within the string set, either or both of the unshunted lamps would pass a current through the filament which would be sufficiently high to burn out the filament and accordingly open the circuit and prevent any further difficulties from

arising due to over heating and possible fire.

Additionally, the two sockets are made such that they will accept only the special unshunted lamps. This can be accomplished in several ways. One is that the base portions of the shunted lamps can have a smaller diameter which will not fit the two sockets; and another is that their base portions can have a curved keyed surface which will not mate with the larger flat keyed surfaces of the two sockets. Since the fuse device is two unshunted lamps visually similar to the remainder of the lamps, and these two lamps are associated with nothing more than, for example, two slightly larger sockets, and two pieces of wire of somewhat larger diameter, the string set's decorative appearance is not marred because these items blend in with the remainder of the string set.

The present invention will be further described, by way of example only, with reference to the accompanying drawings, in which:—

FIG. 1 is a perspective view showing a string set of the invention;

FIG. 2 is a front elevation view in section of one of the special sockets of the string set;

FIG. 3 is a plan view of the socket shown in FIG. 2;

FIG. 4 is a front elevation section view of one of the regular sockets used throughout the remainder of the string set;

FIG. 5 is a top elevation view of the socket shown in FIG. 4;

FIG. 6 is a front elevation view of a special lamp; and

FIG. 7 is a front elevation view of a regular lamp used in the string set of the invention.

Referring now to FIG. 1 of the drawings, a string set 10 is therein illustrated and is comprised of shunted lamps 11 which fit in regular sockets 12 and unshunted lamps 13 which fit in special sockets 14. Plug 15 is connected to special sockets 14 through heavier gauge wire indicated by the number 16. The remaining regular sockets 12 are connected by a wire of slightly smaller diameter indicated by the number 17. This smaller diameter wire can be seen coming out of one side of each of the special sockets 14 and into the other side of the adjacent regular lamp sockets 12. The set 10 is shown with the conductors twisted together to form a line. They may also be unwound to form the conventional loop or circle.

Shunted lamps 11 (FIGS. 1 and 7) are comprised of an envelope 18 and a filament 19 connected to lead wires 20 which are held together by a bead 21. Just above the bead 21 is a piece of aluminium wire 22 which is wound around the lead wires 20 and is known as a shunt wire. Typically, this shunt wire, 22, serves the purpose of maintaining

the string set in a closed circuit condition upon the failure of filament 19. Shunt wire 22 is of a thickness sufficiently large such that it will not glow like a filament; however, it will continue to conduct and maintain the string set circuit in an operative condition. As shown in FIG. 7, lamp 11 has a base 35 which contains a pair of diametrically opposite grooves 36 and fits socket 12 mating snugly with extensions 30. FIG. 5.

Unshunted lamp 13 (FIGS. 1 and 6) is similarly comprised of envelope 23 and a filament 24 connected to lead wires 25 and held together by a bead 26. However, unlike lamp 11, lamp 13 does not contain a shunt wire so that when the filament of lamp 13 fails the circuit will break and be in an open circuit condition. Unshunted lamp 13 has a base 37 with a pair of diametrically opposite flats 38 to fit socket 14 by mating with extensions 28 shown in FIG. 3.

FIGS. 2 and 3 are a front elevation section view and a plan view, respectively, of a special socket 14. Heavier gauge conductor 16 enters on side of the socket and lighter gauge conductor 17 makes contact on the other side of the socket. If shunted lamp 11 were placed in special socket 14, it would not accomplish the purpose of serving as a fuse for one side of the string set in that when filament 19 of lamp 11 failed shunt wire 22 would continue to conduct current to the string set in spite of any electrical problems existing in the set. It is therefore important to make the lamp and socket combination such that shunted lamp 11 will not be usable in special socket 14. Accordingly, socket 14 has been designed to accept only a special lamp 13. Special socket 14 has extensions 28 which match flats 38 on unshunted lamps 13. By comparison, socket 12 has smaller diameter contact openings 29 and has somewhat circular extensions 30 to mate with grooves 36 both of which are of a different shape and are smaller than the extensions 28 and flats 38 of socket 14 and lamp 13.

Another aid in placing the proper lamp in the special socket is by color coding unshunted lamps 13 with a green safety color as illustrated at 31. Not all of these precautions are necessary in combination in that one or more may work by themselves to prevent incorrect insertion of a shunted lamp 11 into the special socket.

One particular example of a string set which will utilize the invention is one using a 20-gauge diameter conductor inside the wire illustrated by 16 and a 24-gauge conductor similarly illustrated by the wire marked at 17. These conductors have a PVC thermoplastic insulation which is generally between 16 and 23 mils in thickness. In the set of this example, each of the unshunted lamps 13 is painted green such as indicated

at 31 and also has in its base portion a pair of slots which fit snugly with extensions 28 in socket 14. This embodiment does not utilize the third alternative of making lamp 13 with contacts which would fit in receptacles 27 in socket 14 but would be too large to fit openings 29 in socket 12. In other words, unshunted lamp 13 may fit in socket 12; however, because of extensions 28, the shunted lamp 11 would not be accepted by special socket 14.

It will be seen from the above that in the event of electrical problems the string set of the invention can work in either of two ways. First, larger size conductor 16 can conduct a higher current than smaller conductor 17 when there is a problem in the circuit thereby conducting a current which would trip a conventional 15- or 20-amp circuit breaker or blow a 15- or 20-amp fuse. Secondly, the unshunted lamps and heavier gauge wire protect the string set circuit in that filament 24 is designed such that any excess in current above a safe level will burn out or break the filament. Since the lamp 13 is unshunted, the circuit will then be in an open circuit condition and will not be conducting electricity to any trouble spot in the series set.

#### WHAT WE CLAIM IS:—

1. A string set of series-connected incandescent lamps comprising a plurality of lamps positioned in a plurality of lamp sockets, the lamp sockets being connected to each other by a conductor and at least two of said lamp sockets being connected to means for making electrical contact with a power supply, the two incandescent lamps in said

two lamp sockets being of the unshunted type, and the wire conductors connecting said two lamp sockets to said source of power being of a gauge greater than the gauge of the wire conductors connecting the remainder of the plurality of lamps sockets to each other.

2. A string set as claimed in claim 1 wherein said wire connecting said two lamp sockets to the means for making electrical contact with a power supply is 20-gauge wire and the wire size of the wire connecting the remainder of the plurality of lamp sockets is 24-gauge wire.

3. A string set as claimed in claim 1 or claim 2 wherein said connecting wires are twisted such that said string set forms a line.

4. A string set as claimed in any one of claims 1 to 3 wherein said remainder of the plurality of lamps are shunted lamps.

5. A string set as claimed in any one of claims 1 to 4 wherein said two unshunted lamps and their respective sockets have male and female contacts which are larger than said male and female contacts of the remainder of said lamps and sockets.

6. A string set as claimed in any one of claims 1 to 4 wherein said two unshunted lamps each have a base which contains a flat, said flat being bigger than a groove in each of the bases of the remainder of said plurality of lamps.

7. A string set of series-connected incandescent lamps substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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3  
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two lamp sockets being of the unshunted type, and the wire conductors connecting said two lamp sockets to said source of power being of a gauge greater than the gauge of the wire conductors connecting the remainder of the plurality of lamps sockets to each other.

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