Oct. 12, 1937. G. B. HIGGINS 2,095,439

ATTACHMENT PLUG

Filed June 21, 1934

Fig. 1.

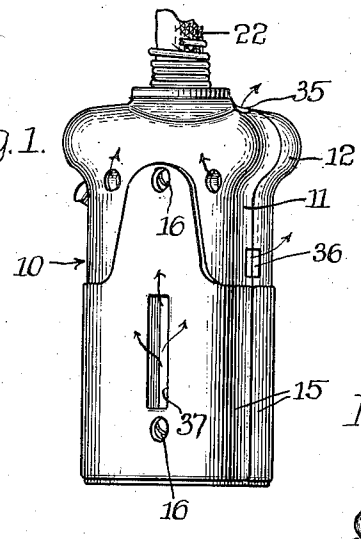


Fig. 2.

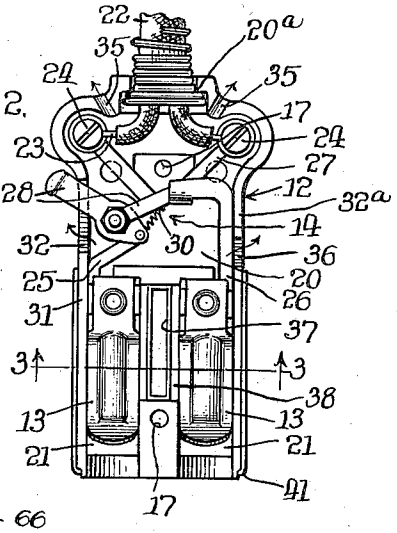


Fig. 8

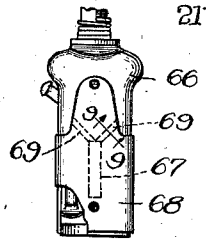


Fig. 5.

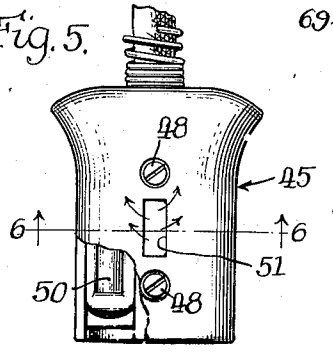


Fig. 3.

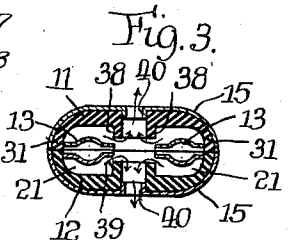


Fig. 9

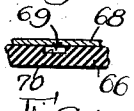


Fig. 10

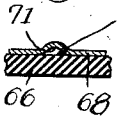


Fig. 4.

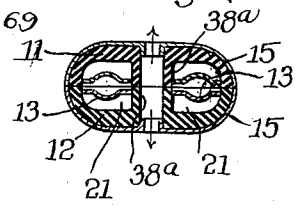


Fig. 7.

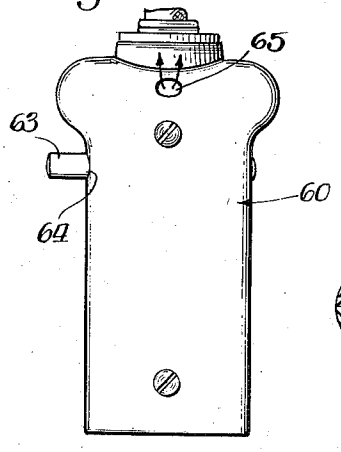
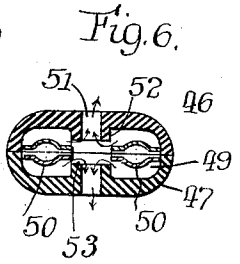


Fig. 6.



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ATTACHMENT PLUG

Grover B. Higgins, Chicago, Ill.

Application June 21, 1934, Serial No. 731,697

4 Claims. (Cl. 200—51)

The invention relates generally to electrical attachment plugs, and more particularly to such plugs which are adapted for use in connection with electric irons, electric cooking devices and various household appliances.

In the use of plugs of this character it is found that considerable heat is generated within the plug, due generally to the looseness of the connections between the stationary terminals and the terminals of the plug, or due to similar looseness in the contacts of the switch mechanism which is provided in many plugs of this type. As a result the exterior surface of the plug attains a relatively high temperature so that it is difficult for the user to handle and manipulate the plug. Such heat within the plug body also causes undue deterioration of the terminals and the switch mechanism.

With this situation in mind, an important object of the invention is to provide a plug of this character wherein high interior and exterior temperatures are avoided so as to facilitate handling of the plug and increase the life of the mechanism housed in the plug body.

Another object of the invention is to provide a plug wherein a relatively inexpensive molded insulating housing and a reinforcing and protecting metallic armor are so constructed and arranged that objectionable high temperatures of the plug are avoided.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawing in which:

Fig. 1 is a perspective view of an armored attachment plug embodying the features of the invention, the plug being of the type which has switch mechanism housed therein.

Fig. 2 is an elevational view of the plug of Fig. 1 with one section of the housing and armor removed to show the switch and the terminals mounted within the other section of the housing.

Fig. 3 is a transverse sectional view taken along the line 3—3 of Fig. 2.

Fig. 4 is a view similar to Fig. 3 showing an alternative form of construction.

Fig. 5 is an elevational view of another form of plug embodying the invention.

Fig. 6 is a transverse sectional view taken along the line 6—6 of Fig. 5.

Fig. 7 is a view showing an alternative form of plug embodying the invention.

Fig. 8 illustrates, in elevation, another alternative form of the invention.

Figs. 9 and 10 are fragmental sectional views taken along the line 9—9 of Fig. 8 and showing two methods of forming the heat conducting channels.

While I have shown in the accompanying drawing and will herein describe in detail the preferred embodiment of the invention together with several alternative embodiments thereof, it is to be understood that this disclosure is given for the purpose of illustrating the invention and is not intended as a limitation of the invention to the construction disclosed. In the appended claims, I am to cover all modifications and alternative constructions falling within the scope of the invention.

In the form illustrated in Figs. 1 to 3 of the drawing the invention is embodied in a switch-type attachment plug having a separable two-part casing or housing 10 composed of sections 11 and 12 of molded insulating material, and within which friction terminals 13 and a switch mechanism 14 are mounted. About a substantial portion of the housing 10 a two-part reinforcing and protecting armor 15 is provided to prevent injury to the relatively brittle housing 10 in case the plug is dropped or subjected to other unusual impact. Bolts 16 extending through suitable apertures (not shown) in the armor and through bores 17 (Fig. 2) molded in the sections 11 and 12 serve to hold the sections of the armor 15 as well as the housing sections 11 and 12 in assembled relation.

As shown in Figs. 2 and 3 the housing sections 11 and 12 are recessed to form a switch chamber 20 adjacent the upper end of the plug and spaced parallel channels 21 extending longitudinally of the plug and opening through the lower end thereof to receive the spring terminals 13. At its upper end the housing provides an opening 20a through which a cord 22 may extend for connection of its wires 23 to screw terminals 24, the terminals 24 being mounted on the section 11 adjacent the upper limit of the switch chamber 20. A conductor strip 25 connects one terminal 24 with one of the spring terminals 13, while spring strips 26 and 27 extend toward each other from the other terminals 13 and 24 to form the spaced stationary contacts of the switch mechanism 14. A switch arm 28, pivoted on the section 12 and actuated by a pivoted operating lever 29 in conjunction with a compression spring 30 in a conventional manner, is shifted with a conventional snap-action to and from its closed position wherein the arm 28 bridges the contacts formed by the spring strips 26 and 27. The switch operating lever 29 extends from the housing through a slot

31 in one side wall 32 of the switch chamber 20.

As an incident to the transmission of electricity through the switch mechanism 14 and the spring terminals 13 considerable heat is ordinarily generated so that the temperature of the plug as a whole gradually rises during continued use of the plug. This high temperature is objectionable in all types of plugs, but is particularly so when the armor 15 is employed, since the metal of the armor retains the heat and makes it difficult to handle and manipulate the plug. It also causes undue deterioration of the terminals 13 and switch 14 and produces a sticking tendency in the switch.

The present plug, however, is constructed so as to avoid such a building up of high temperatures, with the result that use of the armor 15 is rendered practical. The armor 15, in turn, by its action in reinforcing and protecting the cast housing sections 11 and 12, makes it possible to form these sections from a moldable insulating substance which is less expensive than the material which must be used in an unarmored plug.

To avoid the building up of high temperatures in the plug, the sections 11 and 12 and the armor sections 15 are so formed as to provide for a continuous circulation of air through the hollow interior of the plug, whereby to dissipate and carry off the heat as it is generated. Thus a plurality of openings 35, 36 and 37 are formed in the various housing and armor sections through which cooling currents of air may pass continuously as indicated by the arrows in the various figures of the drawing.

The openings 35 are, in the present instance, formed in the top wall of the switch chamber 20 to permit upward travel of the air which is heated by the warm elements of the switch mechanism 14. The opening 36 also communicates with the switch chamber 21 and is formed in the side wall 32a of the switch chamber opposite the wall 32.

Cooling of the spring contacts 13 and of the lower portions of the housing sections 11 and 12 is obtained by locating the opening 37 in space between the two channels 21 in which the terminals 13 are housed. As shown in Figs. 2 and 3, the opening 37 preferably takes the form of an elongated slot positioned longitudinally of the plug and extending entirely through the sections 11 and 12 and the two sections of the armor 15. Flanges or ledges 38 formed on the sections 11 and 12 define the opening 37 and the inner sides of the channels 21, and in the preferred form illustrated in Fig. 3 of the drawing, the ledges 38, throughout the length of the slot 37, terminate short of each other so as to define passages 39 opening laterally from the slot 37 into the channels 21. Thus the air which is heated within the channels 21 may move from the channels 21 through the passages 39 and outwardly through the slot 37 as indicated by the arrows in Fig. 3.

The direction of movement of the air currents may vary, of course, in accordance with changes in the relative temperatures of the various parts of the plug assembly, or in accordance with the position of the plug when in use, but it will be noted that circulatory paths are provided which permit a cooling air circulation under all conditions.

In Figs. 2 and 3 it will be clear that the armor sections 15 are formed to give the maximum strengthening and protecting effect. Thus it will be seen that the side edges of the sections 15 are proportioned so as to be in firm abutment with each other in their assembled relation, while inturned flanges 40 and 41 are formed about the opening 37 and the lower edge respectively to protect the adjacent edges of the housing and properly distribute any shock to which the armor may be subjected.

The embodiment illustrated in Fig. 4 of the drawing is in most respects similar to that of Fig. 4, but is provided with ledges 38a on the sections 11 and 12 which extend toward each other into abutment so that the slot 37 is in the form of a closed passage entirely through the plug body. In this form the cooling effect is obtained by contact of the air with the inner surfaces of the ledges 38a.

In Figs. 5 and 6 of the drawing the invention is embodied in an unarmored attachment plug which is of a smaller size than the form shown in Fig. 1 due to the fact that the switch mechanism has been omitted. This plug has a housing 45 formed from molded insulating material in two separable sections 46 and 47 which are held together by bolts 48 extending through suitable apertures in the sections. In the lower end of the housing 45 spaced parallel channels 49 are formed to house spring terminals 50, and the heat generated about these terminals is dissipated by the provision of a ventilating slot 51 formed between the channels 49 and extending entirely through the plug housing 45. The slot 51 is defined in a measure by ledges 52 which terminate short of each other so as to provide openings 53 through which heated air may pass from the channels 49 into the slot 51 as indicated by the arrows in Fig. 6. Thus a continuous circulation of cooling air prevents the building up of high temperatures in the plug housing.

Fig. 7 of the drawing illustrates a plug having a sectional body 60 similar to the form shown in Figs. 1 to 3, but embodying a conventional switch mechanism (not shown) arranged for actuation by a reciprocable transverse slide bar 63 which projects at its opposite ends through sliding bearings 64 (only one shown) formed in the body 60. In this form the upper portion of the plug body which houses the switch mechanism is cooled through the provision means whereby the air heated within the plug may escape from the interior of the plug.

This means as herein shown comprises a single relatively large ventilating opening 65 formed in the upper portion of the plug body 60, from which the heated air may pass as indicated by the arrows in Fig. 7. Additional openings may, of course, be provided as determined by the heat generating characteristics of any particular plug design.

Figs. 8 to 10 illustrate an embodiment of the invention wherein the ventilating opening or openings in the plug body 66 are covered or protected so as to avoid all question as to danger due to accessibility of the conductors within the plug body. Thus the body has a transverse passage or opening 67 similar to the passage 38a of Fig. 4 or passage 37 of Fig. 3, and as protecting means to prevent insertion of a conductor into the opening, a guard or sheath is arranged in overlying relation to the opening 67 in such a manner as to permit lateral escape of the heated air between the body 66 and the sheath. This sheath may be of any desired material or form and in the present instance is constructed as a sectional metallic armor 68 similar to that employed in the embodiment of Fig. 1. To provide for the escape of the heated air one or more

passages 69 may be formed by appropriate shaping of the body 66, the armor 68, or both, to extend from the opening 67 to the edge of the armor 68. These passages 69 preferably extend upwardly from the opening 67, and may be provided by inward channels 70 formed in the body 10, as shown in Fig. 9, or by outward channels 71 formed in the armor 68 as shown in Fig. 10.

From the foregoing it will be evident that the present invention, by simple means, attains a continuous cooling action in the attachment plug which prevents undue heating of the plug and renders the same more readily usable. This cooling action also prevents damage to the various metallic parts of the device.

Due to the cooling of the plug, the use of a protective armor is rendered feasible, with the result that the insulating housing may be manufactured from less expensive material, and hence the plug as a whole may be more economically manufactured.

I claim as my invention:

1. An attachment plug comprising an insulating body having a pair of laterally spaced channels formed therein opening through one end of the body, terminals mounted in said channels with the major portion of the outer surfaces of said terminals spaced from the walls of said channels, said body having a passage therethrough located between said channels and transversely related thereto, and said body also being formed to provide openings from said channels into said passage.

2. A plug of the character described comprising, in combination, a hollow insulating body, terminals in said body, openings in said body through which cooling currents of air may move into and out of said hollow body, a metallic armor surrounding and protecting a portion of said body, said armor being formed in a plurality of sections and having openings therein registering with certain of said openings in the body, said openings in the armor sections having inturned marginal flanges extending into the corresponding body openings in firm engagement with the sides thereof, and means clamping said armor sections in position.

3. An attachment plug comprising a hollow insulating body having an open end, a pair of terminals mounted therein adjacent said end, said body having a plurality of openings therein through which cooling air may circulate into and out of said hollow body, reinforcing and protecting means for said body comprising two armor sections adapted to embrace a substantial portion of said body, said armor sections being formed so that its edges abut each other when the armor is in firm engagement with the outer surface of said body, inturned flanges on the armor sections protecting the end edges of said body at said end thereof, said armor having openings therein registering with certain of said openings in said body, inturned flanges on said armor about said openings in the armor to extend into the corresponding openings in the body, and means for holding the armor sections in position on said body.

4. An attachment plug comprising in combination, a hollow insulating body providing a switch chamber in its upper end and a pair of laterally spaced longitudinal channels adjacent to and opening endwise through the lower end of said body, terminals in said channels, switch mechanism in said switch chamber electrically connected to said terminals, said body having a plurality of openings therein through which cooling air may circulate into and out of said switch chamber to cool said switch, and said body also having an opening in its lower side portion through which heated air may pass from said channels.

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