

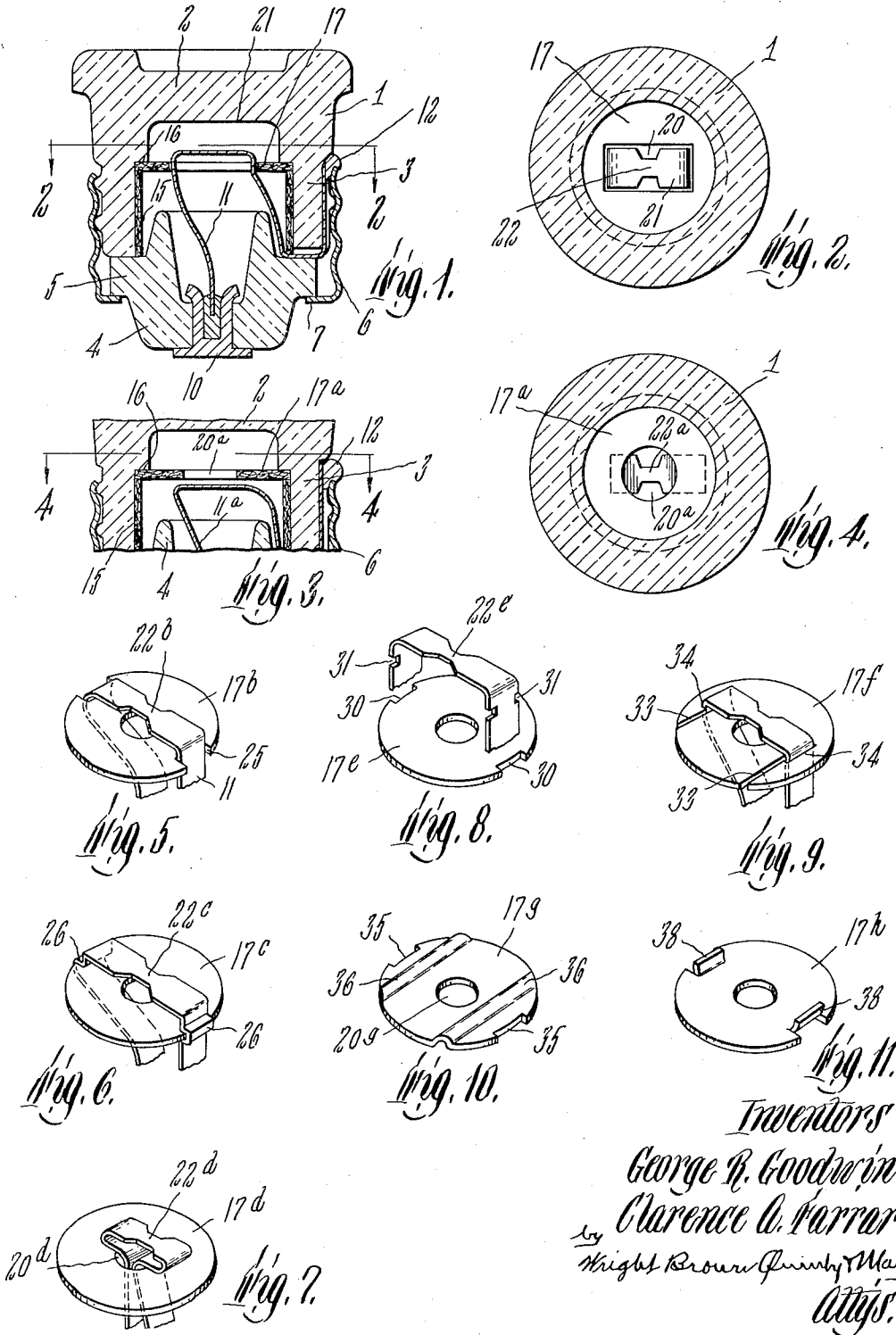
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FUSE

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FUSE

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This invention relates to electric fuses and more particularly, though not necessarily limited thereto, to fuses of the plug type.

A primary object of this invention is to facilitate the detection of blown fuses. To this end it has been proposed to provide a tell-tale surface against which the fuse strip or link lies and of normally contrasting color therewith, both the fuse link and this surface being visible through a window portion of the fuse casing. One of the difficulties heretofore experienced with such constructions is due to the fact that under service conditions the fuse element or link may reach a temperature sufficiently elevated, but short of actual blowing, so that the surface material, after a time, becomes discolored and may even present substantially the appearance which would have been produced had the fuse link actually blown, but while the link is still intact and the fuse is in serviceable condition. Thus a false indication of the condition of the fuse may be presented. This is particularly liable to occur where the surface material has been especially treated as by chemicals so as to undergo marked color change when heated, the temperature at which such change takes place being commonly lower than that which may be reached by the fuse under a load which it is capable of carrying for some time without blowing and which may differ but little from actual blowing temperature.

According to this invention, this difficulty is overcome by spacing the hottest part of the fuse link where blowing will occur from the surface material sufficiently so that the latter will not become sufficiently heated, as long as the fuse continues to carry current, to give a blown-fuse indication. The hot part of the fuse link is sufficiently close to the surface material, however, so that when blowing does occur the arc produced thereby will so project the hot gas or fused metal or both against the indicating surface as to heat it sufficiently to give a blown-fuse indication. This indication shown through or adjacent to the space where the fuse link has been ruptured, or adjacent to the remaining portions of the fuse link after rupture, and presenting a color contrast to the appearance of the unblown fuse will provide the desired blown-fuse indication to the observer.

This application is a division of our application Serial No. 668,700, filed May 1, 1933, for Fuses.

For a more complete understanding of this invention, reference may be made to the accompanying drawing in which,—

Figure 1 is a central longitudinal section through a fuse of the plug type illustrating a preferred embodiment of this invention.

Figure 2 is a transverse section on line 2—2 of Figure 1.

Figure 3 is a section similar to a portion of Figure 1 but showing a modification.

Figure 4 is a section on line 4—4 of Figure 3.

Figures 5 to 9 inclusive are fragmentary perspectives showing further modifications.

Figures 10 and 11 are perspectives showing still further modifications in the tell-tale surface materials.

Referring first to Figures 1 and 2, at 1 is indicated the top member of a fuse plug having a window portion 2 in its closed end and having an annular wall 3 defining a tubular casing. This top member is preferably formed of glass in one integral piece. At 4 is shown a base member of insulating material having an annular flange 5 on which is seated the end of the tubular portion 3 of the top member. As shown, these two parts are held assembled by a conductive sleeve 6 presenting a threaded exterior for insertion in a mating threaded socket in the manner well known in connection with fuse plugs. This shell 6 is shown as provided with a flange 7 which engages under the flange 5 of the base member, and the engagement of this shell with a threaded exterior of the portion 3 acts to hold the base and top member in assembled relation.

The base member is provided with a central terminal 10 extended therethrough to which is secured one end of a fuse link 11. The other end portion of this fuse link passes out between the top and base members, preferably a groove being formed in one or both of these to permit its free passage, and is secured to the shell as by a drop of solder at 12. Within the tubular portion 3 is shown a sleeve 15 of fiber or paper, or other suitable non-conductive material, which acts as a protector for the portion 3 and prevents the hot metal or gases within the fuse plug from impinging on the portion 3 in such a manner as would be liable to cause it to break. Surrounding the window 2 on the inside of the top member 1 is an annular shoulder or ledge 16 spaced from one end of the sleeve 15 so as to permit the edges of a paper or fiber disk 17 to extend therebetween, the sleeve 15 holding the disk substantially against the shoulder 16. This disk may present on its upper surface a color contrasting with that of the adjacent fuse part and is of a character which becomes modified by sufficient heat so as to present a discolored

or different colored surface than that presented before such heating has occurred. A colored paper may be used for this purpose, the paper being somewhat blackened when subjected to sufficient heat, or, if desired, this member may be treated with various chemicals which may in themselves undergo change in appearance when subjected to sufficient heat, such changes being permanent in character. As examples of such chemicals may be mentioned easily oxidizable agents, such as sodium or potassium chlorate, either with or without manganese dioxide, organic dyes, including vegetable dyes, which undergo color changes or become blackened when heated, and inorganic pigments which may decompose or discolor when heated. In the latter group may be mentioned metallic iodine, mercurous carbonate and hydrated chromium chloride.

In the section shown in Figures 1 and 2 the disk 17 is provided with a central elongated aperture 20, and a portion 21 of the fuse link intermediate to its ends is extended through this aperture, so that both this intermediate portion of the fuse link and the upper surface of the disk 17 are visible through the window 2 and preferably present contrasting color. This portion 21 of the fuse link also is provided with a reduced cross section portion 22 which is thus heated to a higher temperature than the remaining portion of the fuse link and is that part of the fuse link which ruptures when the fuse blows. It is found, however, that in service the fuse links become heated and in many cases may be heated almost to the point where rupture, or blowing of the link occurs, without actually causing such blowing to take place, and it is desirable that the appearance of the disk 17 be not materially altered by this fairly high temperature of the fuse link prior to actual blowing. For this reason the portion 21 of the fuse link is spaced from the face of the disk 17, as by being spaced from the plane thereof, sufficiently so that until actual blowing of the fuse occurs with its consequent explosive effect due to the arc produced, which tends to throw hot gases and molten metal from the blown portion in all directions, the disk will not be sufficiently heated for this change in appearance to occur. However, the portion 21 is so close to the disk 17 that when blowing actually occurs the hot products of the arc formed by the blowing impinge against the disk 17 sufficiently to cause the desired change of appearance thereof, which indicates a blown fuse. Not only does the surface appearance of the disk 17 change by the blowing of the fuse, but also this blowing removes a part of the fuse link which shows a dark space through into the lower portion of the interior of the fuse, which further accentuates the changed appearance of the fuse when viewed from the window end, from its non-blown condition.

In Figures 3 and 4 a modified construction is shown in which the disk 17a is provided with a central round perforation 20a, and the fuse element 11a is provided with its reduced cross section portion 22a opposite to the perforation but on the opposite side of the disk 17a from the window 2. It is spaced from the disk 17a sufficiently so that the heating of the fuse link which occurs during service is not effective to substantially change the appearance of the disk 17a. As viewed through the window, however, in both the forms thus far described, the portion of the

fuse link visible appears to be in proximity to the tell-tale surface but actually these two are spaced apart sufficiently to prevent the heat from the fuse, as long as it does not blow, from producing substantial change of appearance in the tell-tale surface member, while at the same time it is sufficiently close thereto so that when blowing actually occurs the surface appearance does change to blown-fuse indication.

Where a central opening opposite to the weakened portion of the fuse link and of a size greater than the width of the link is employed, as in the constructions shown in Figures 3 and 4, the nearest surface of the disk is further removed from the hottest part of the link for the same spacing of the link from the face of the disk than when the opening is of a width substantially only that of the link as in the construction shown in Figures 1 and 2. An advantage incident to the separation of these parts axially of the fuse, however, rather than by increasing the size of the disk opening lies in the fact that as viewed through the window more of the disk surface is visible and it appears to be closer to the sides of the link, though as a matter of fact the spacing of the nearest edge of the opening may be no nearer.

Figures 5 to 9 illustrate various constructions of fuse link and disk for insuring the support of the reduced cross section portion of the fuse link in the desired spaced relation from the tell-tale surface. For example, as shown in Figure 5, the disk 17b may be provided with notched portions 25 through which the fuse link passes and about which it is so bent as to support the reduced cross section portion 22b in the desired position. In Figure 6 the fuse link is provided with bent portions 26 which are formed to embrace the edges of the tell-tale disk 17c to support the reduced cross section portion 22c in the desired position. In Figure 7 the disk 17d is provided with a central aperture 20d through which the fuse element passes in looped formation presenting the reduced diameter portion 22d properly spaced from the face of the disk 17d. In Figure 8 both disk and fuse link are provided with mating notches 30 and 31 so related as to retain the reduced cross section portion 22e in proper spaced relation to the tell-tale disk. In Figure 9 the disk 17f is provided with the slots 33 through which the side portions of the fuse link may be inserted into the perforations 34. The construction shown in Figure 9 is not specifically claimed herein, but forms subject matter of the parent application, of which this is a division.

In Figure 10 the disk 17g is shown as provided with edge notches 35 and corrugations 36, these corrugations being spaced apart and on either side of the central perforation 20g of the disk to support the intermediate portion of the fuse link elevated from the surface of the disk.

In Figure 11 a still different construction is shown in which the disk 17h is provided with cut and upwardly bent tongues 38 which act as supports across which the intermediate portion of the fuse link may extend.

In all the constructions illustrated it will be noted that the top face of the disk which is visible through the window is exposed to the action of the hot combustion products when the fuse link blows.

From the foregoing description of certain embodiments of this invention it will be evident to those skilled in the art that various changes and

modifications may be made without departing from the spirit and scope of this invention as defined by the appended claims.

We claim:

- 5 1. A fuse comprising a casing having a window, a sheet material piece within said casing back of said window modifiable in appearance when subjected to heat and having an aperture there-through, and a fuse link within said casing having an intermediate portion spaced from each face of said piece, said intermediate portion having a part of reduced cross section opposite to said aperture.
- 10 2. A fuse of the plug type, comprising a tubular casing having a window at one end, a disk of sheet material within said casing back from said window and having an aperture there-through, and a fuse link within said casing having an intermediate portion projecting through said aperture and having a portion of reduced cross section located between said window and the adjacent face of said disk and spaced from said disk.
- 15 3. A fuse of the plug type, comprising a tubular casing having a window at one end, a disk of sheet material within said casing back from said window, and a fuse link within said casing having an intermediate portion positioned between said disk and window and extending through said disk, said intermediate portion having a part of reduced cross section, and said disk and link being formed complementally to space said reduced cross section portion from the plane of the adjacent face of said disk.
- 20 4. A fuse of the plug type, comprising a tubular casing having a window at one end, a disk of sheet material within said casing back from said window and having an aperture there-through, and a fuse link within said casing having an intermediate portion positioned between the said disk and window and extending through said disk, said intermediate portion having a part of reduced cross section spaced from the adjacent face of said disk and opposite to said aperture.
- 25 5. A fuse comprising a casing having a window, a sheet material piece within said casing back of said window and substantially parallel thereto, and a fuse link within said casing having a reduced cross section portion, said link and piece being formed complementally to support said portion spaced from the plane of each face of said piece and between said piece and window.
- 30 6. A fuse comprising a casing having a window, a sheet material piece within said casing back of said window, and a fuse link within said casing having a reduced cross section portion, said piece having portions cut to receive said link and cooperating therewith to support said portion spaced from the plane of each face of said piece.
- 35 7. A fuse of the plug type comprising a tubular casing having a window at one end, a tell-tale disk of sheet material within said casing back from said window, and a fuse link within said casing having a reduced cross section portion positioned between said window and disk and spaced from the face of said disk and a portion positioned on the opposite side of said disk.
- 40 8. A fuse of the plug type comprising a tubular casing having a window at one end, a tell-tale disk of sheet material within said casing back from said window and having an aperture there-through, and a fuse link within said casing having an intermediate portion spaced from one face
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of said disk, said intermediate portion having a part of reduced cross section opposite to said aperture.

9. A fuse of the plug type having a top member provided with a window in one end and an annular shoulder surrounding said window, a base member for closing off the opposite end of said top member, an apertured disk seated on said shoulder, means for holding said disk thereto, and a fuse link within said fuse having an intermediate portion extended through said aperture and visible through said window and end portions positioned back of said disk.

10. A fuse of the plug type having a top member provided with a window in one end and an annular shoulder surrounding said window, a base member for closing off the opposite end of said top member, an apertured disk seated on said shoulder, means for holding said disk thereto, and a fuse link within said fuse having a portion opposite to said aperture visible through said window.

11. A fuse of the plug type having a top member provided with a window in one end and an annular shoulder surrounding said window, a base member for closing off the opposite end of said top member, an apertured disk seated on said shoulder, means for holding said disk thereto, and a fuse link within said fuse having an intermediate portion spaced from a face of said disk and provided with a part of reduced cross section opposite to said aperture and visible through said window.

12. A fuse of the plug type having a tubular top member provided with a closed end having a window and an annular internal ledge about said window, a base member having a central terminal extending therethrough, a conductive shell surrounding and securing said top and base members together, a fuse link having its ends secured respectively to said terminal and shell and having an intermediate portion visible through said window, a sleeve lining the tubular portion of said top member and spaced from said ledge, and a disk of sheet material having its margin positioned in said space.

13. A fuse of the plug type having a tubular top member provided with a closed end having a window and an annular internal ledge about said window, a base member having a central terminal extending therethrough, a conductive shell surrounding and securing said top and base members together, a fuse link having its ends secured respectively to said terminal and shell and having an intermediate portion visible through said window, a sleeve lining the tubular portion of said top member and spaced from said ledge, and a disk of sheet material having its margin positioned in said space, said disk having a central aperture and said link having a part of reduced cross section opposite to said aperture.

14. A fuse of the plug type having a top member provided with a window in one end and an annular shoulder surrounding said window, a base member closing off the opposite end of said top member, a tell-tale disk seated on said shoulder, means for holding said disk to said shoulder, and a fuse link within said fuse having an intermediate portion back of said window and spaced from the top face of said disk sufficiently to prevent heating of said link from load current less than sufficient to rupture said link from damaging said tell-tale disk, said link having its end portions extending back of said disk.

15. A fuse comprising a casing having a window therein, a fuse link within said casing and having a reduced cross section portion visible through said window, and a sheet material piece having an opening therethrough opposite to said portion, the edge of said opening being spaced from said portion sufficiently to prevent heat from said fuse portion short of blowing temperature from giving blown-fuse indication on said disk and being sufficiently close to cause actual blowing of said fuse at such portion to give such blown indication.
16. A fuse comprising a casing having a window therein, a fuse link within said casing and having a portion back of said window, and a sheet material piece positioned between said window and said link and having an opening therethrough opposite to said portion and through which said portion is visible through said window, the top face of said piece being exposed to the hot gases when said link blows.
17. A fuse comprising a casing having a window therein and an annular shoulder spaced back from said window, a fuse link within said casing and having a reduced cross section portion back

of said window, and a sheet material piece positioned between said window and said shoulder and having an opening therethrough opposite to said reduced cross section portion and through which said portion is visible through said window, the top face of said piece being exposed to the hot gases when said link blows.

18. A fuse of the plug type, comprising a casing having a top portion provided with a window in its upper end, a base portion, a central terminal extending through the lower end of said base portion, a conductive threaded shell surrounding said casing and securing said top and base portions together, and spaced from said central terminal, a fuse link within said casing having its ends secured respectively to said terminal and shell and having an intermediate portion provided with a reduced cross section part visible through said window, and a sheet material piece within said casing and substantially parallel thereto and having a hole therethrough positioned opposite to said reduced cross section portion.

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