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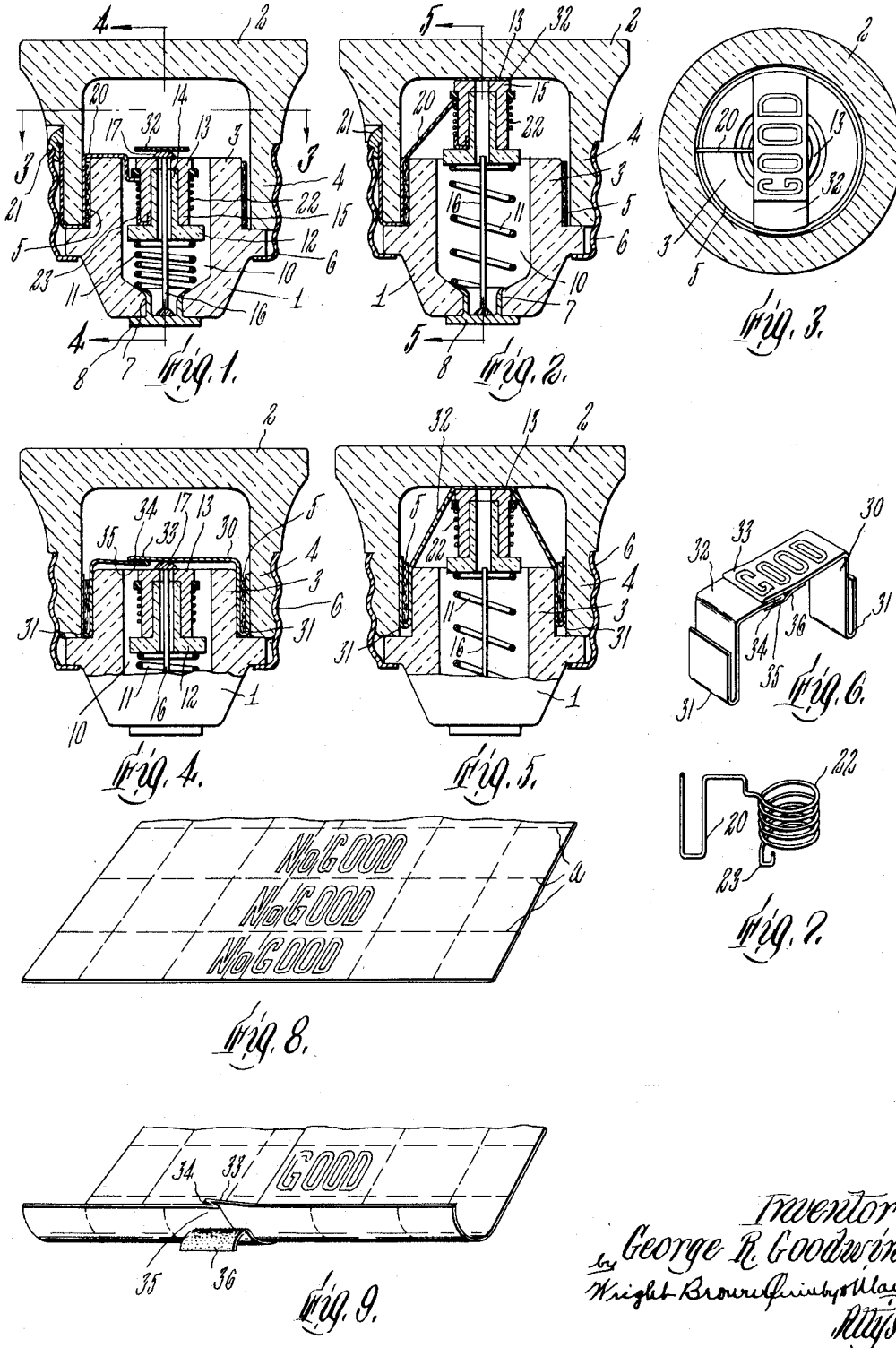
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2,274,059

DELAYED ACTION AND INDICATING ELECTRIC FUSE

Filed Feb. 27, 1940

2 Sheets-Sheet 1



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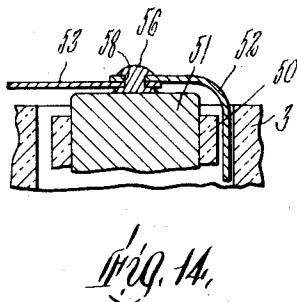
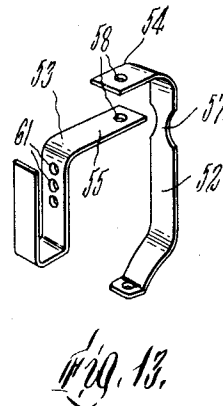
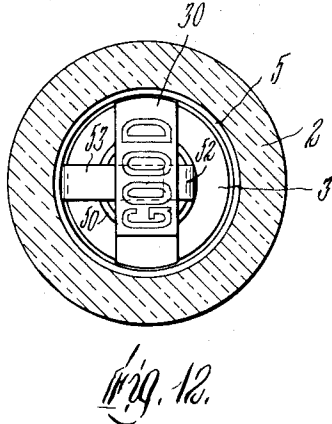
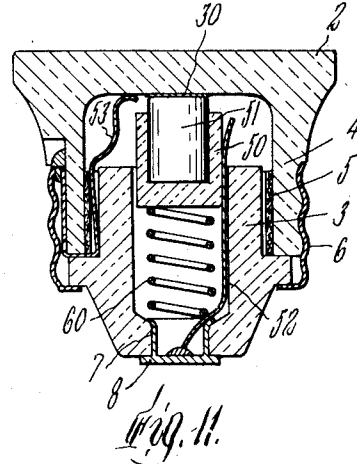
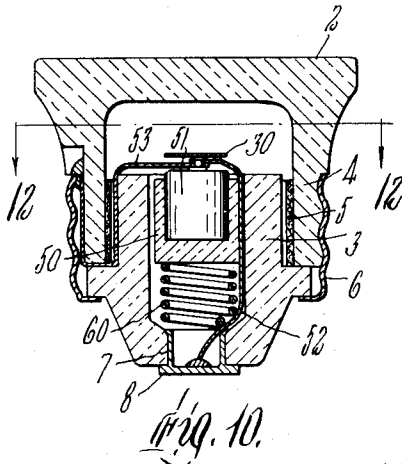
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DELAYED ACTION AND INDICATING ELECTRIC FUSE

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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DELAYED ACTION AND INDICATING
ELECTRIC FUSEGeorge R. Goodwin, Pawtucket, R. I., assignor to
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6 Claims. (Cl. 200—130)

This invention relates to electric fuses and has for an object to provide a fuse which will not blow on transient relatively low overloads such as would be effective to blow the usual fuse, but which will blow should the overload be of such duration as to indicate defective line conditions from which overload protection is desirable.

A further object is to provide such a fuse which will blow promptly should the overload be unduly heavy.

By the use of this invention, the interruption of service with its consequent annoyance will be avoided where the overload condition is so transient or small that no harm will result, there being actually no defective condition in the line which requires attention.

A further object of this invention is to provide signalling means for indicating at a glance whether the fuse is operative or has blown.

For a more complete understanding of this invention, reference may be had to the accompanying drawings in which

Figures 1 and 2 are central longitudinal sectional views through a plug fuse embodying the invention, the parts being shown in normal and blown conditions, respectively.

Figure 3 is a sectional view on line 3—3 of Figure 1.

Figures 4 and 5 are sectional views on lines 4—4 and 5—5 of Figures 1 and 2, respectively.

Figure 6 is a perspective view of a signal element in good-fuse indicating condition.

Figure 7 is a detail in perspective.

Figures 8 and 9 are perspective views of a plurality of signalling elements in sheet form, Figure 9 showing the sheet folded to present good-fuse indication.

Figures 10, 11 and 12 are views similar to Figures 1, 2 and 3, respectively, but showing a modified construction.

Figure 13 is a perspective view of the fuse link part for the construction of Figures 10 to 12, inclusive.

Figure 14 is a view similar to a portion of Figure 10 but to a larger scale.

Referring first to the construction shown in Figures 1 to 9, the fuse illustrated is of the plug type, though in its broadest aspects this invention is not limited to any particular type of fuse. As shown, it comprises a base portion 1 of any suitable insulating material, porcelain being commonly used, and a top 2 of insulating material which may be of glass. Glass is desirable for this top member since its central portion, being transparent, serves as a window through

which the condition of the fuse may be readily inspected and through which may be viewed an indicator of fuse condition as will be further described. The base portion 1 as shown, is provided with an upstanding circular flange 3 loosely entering within a downwardly turned flange 4 of the top member 2. Preferably between these flanges is positioned a collar 5 of paper or other suitable material which may be used to protect the glass flange 4 from the heat of the fuse. This, however, is not essential where glass having high heat resistance is employed or where it is not likely to be contacted by hot metal or gases from the blowing of the fuse.

The base and upper portions 1 and 2 may be secured together as by the usual threaded metallic sleeve 6 which forms the side terminal for the fuse, and the base portion 1 may be provided with a central perforation 7 to receive the usual center terminal 8. This opening 7 is shown as at one end of a chamber 10 within the body of the fuse and within which is housed a coil spring 11. This spring bears against the base portion of the chamber 10 and against a flanged end 12 of a plunger 13. As shown this plunger comprises two parts, one part 14 including the flange 12 being of insulating material and the other part 15 of metal, as for example, brass. The flange itself is shown as centrally perforated, and extending through the perforation is a fuse link portion 16 provided at its upper end with a head 17 overlying the top face of the plunger and in contact with the metallic portion 15. This link 16 is so short that when the head 17 is in position the plunger is held retracted into the chamber toward the central terminal 8 and holds the spring 11 in compressed condition as shown in Figure 1. The head 17 is of a low fusing composition such as solder and when the fuse blows this portion fuses and releases the plunger which is thereupon projected by the spring 11 into the position shown in Figure 2. The side terminal 6 has secured thereto another fuse link portion 20 which passes between the flanges 3 and 4 and is secured at its outer end to the terminal 6 as by the soldered connection 21.

The particular fuse here shown is intended for a low capacity, such, for example, as 5 amperes or less, and in order that the parts may not be too delicate and yet maintain the fuse of low capacity, the link part 20 is provided with a heating element in the form of a coil 22 as shown best in Figure 7. This coil 22 may be provided with an insulating covering such, for example, as enamel, and its lower end at 23 may be bent

up into U form where its insulation is removed so that it may make good electrical connection with the lower end portion of the metallic plunger part 15. Through this metallic plunger part it is in electrical connection with the head 17. The metallic part 15 which contacts directly with the fusible head 17 acts to conduct the heat away from this head during normal fuse operation so that a reasonable overload will not act to heat the head 17 sufficiently to fuse it for a considerable time, since it must heat up not only the mass of the head 17 but also the metallic plunger part 15. Thus this acts to delay the fusing of the head 17 until such time as the overload conditions have been able to heat up the metallic part 15 sufficiently for the head 17 to reach its fusion temperature. The heating coil 22, however, acts normally to maintain the metallic portion 15 at a temperature somewhat below the fusing temperature of the head 17 so that the parts may be of sufficient size to be readily handled and incorporated in the fuse without producing an undesirable amount of lag in the blowing of the fuse under overload conditions. The release of the plunger by the fusing of the head 17 allows the spring 11 to project the plunger so as to substantially separate the fuse link 16 from electrical connection with the fuse link 20. This substantially reduces the extent of arcing when the fuse blows. This motion of the plunger 13 may also be employed to produce a clear indication of the blowing of the fuse as will now appear.

The indicator is shown in "good fuse" indicating condition detached from other parts in Figure 6. It comprises a strip 30 of sheet material, such, for example, as paper, the end portions 31 of which are secured as by folding to engage about the opposite sides of the collar 5 with the intermediate portion 32 extending across the top of the plunger 13. This portion 32 has a part folded on itself to form three superposed layers 33, 34 and 35 and these layers are normally held in such folded condition in a temporarily and easily separated manner as by a piece of weak material such as tissue paper or the like at 36 which overlaps the folded portions on their under faces and is secured in position. The top face of the portion 32, including the lapped layer 33, may have printed thereon a good fuse indicating legend such as the word "Good." The underlying layers 34, 35 may have printed thereon the legend "No" in such relation to the good indication that when the strip is unfolded the "No" appears before "Good," this indicating that the fuse has blown.

The parts are so arranged that when the plunger is depressed in the condition shown in Figures 1 and 4, the central portion 32 extends across the fuse beneath the window with the parts folded and presenting to view the word "Good" through the window portion of the upper body member 2. The release of the plunger by fusing of the head 17, however, acting on the strip, breaks the holding element 36 and unfolds the indicator strip so that the "No Good" indication is projected toward or against the back of the window portion and indicates to the observer that the fuse has blown.

The indicator strips may be made from a sheet of paper or other material in the manner shown in Figure 8, this piece being arranged for cutting into strips as along the lines *a*. The piece may be folded on itself to form the three overlying layers 33, 34 and 35 transverse to the length

of the strips and secured in position as by the tissue paper 36. The word "Good" is printed on each of these strips adjacent to the line of fold and the word "No" is printed on the same face of each strip at the folded portion so that it is out of view until the strip has been unfolded. The piece of paper having been printed, folded, and temporarily secured may be then severed into the individual strips and its end portions folded up as shown in Figure 6 for securement within the fuse body.

For fuses of greater capacity no heating means for the metallic member of the plunger may be desirable, and a fuse intended for such heavier service has been illustrated in Figures 10 to 14. In these figures the plunger is shown as comprising a cup-shaped insulating portion 50 within which is seated a metallic plug 51. The fuse link may comprise two parts 52 and 53. The part 52 is shown as secured at one end to the central fuse terminal 8 and its upper end as at 54 is bent over the adjacent end portion 55 of the link portion 53. The overlapping portions of these link parts are shown as perforated as at 58 and they are joined as by the solder 56 flowed through these holes 58 as shown best in Figure 14. This solder joint 56 engages the top face of the metallic plunger part 51 which receives heat therefrom and acts to delay the raising of the temperature of this soldered portion 56 when it is heated by the passage of current. One of the link portions, as shown the portion 52, is provided with a reduced cross sectional part 57, this being for the purpose of providing for a quick blowing of the fuse on very heavy overload conditions, as, for example, say five hundred or more times the normal. This results in immediate blowing of the fuse on a complete short circuit or on such heavy overloads that immediate breakage of the circuit is desirable. Under smaller overloads the fuse will blow by fusing of the solder connection 56, if this overload condition continues for a sufficient time to heat up the plug 51 to the necessary extent. Interruption of the circuit either at the part 57 or at the soldered connection 56 releases the plunger 50 for projection by the spring 60, so that the conductive parts of the fuse link are quickly separated thus to reduce the arcing. This fuse construction may also embody the indicator means shown in connection with the fuse of Figures 1 to 5, the indicating strip 30 being extended over the upper face of the plug 51 in a manner similar to its mounting in the fuse of Figures 1 to 5. The capacity of the fuse link may be determined as by perforating the link as at 61 to the desired extent, the more or the larger these perforations the less being the fuse capacity.

From the foregoing description of certain embodiments of this invention, it should be evident to those skilled in the art that various changes and modifications might be made without departing from the spirit or scope of this invention as defined by the appended claims.

I claim:

1. A fuse comprising an insulating body, electric terminals in said body, said body having a chamber, a plunger comprising a metallic member, a spring within said chamber and engaging said plunger for pressing said plunger away from said one terminal, a fuse link portion secured at one end to said one terminal and having a fusible head portion engaging said metallic member and normally holding said plunger retracted against the pressure of said spring, and a fuse link por-

tion electrically connected to the other of said terminals and to said fusible head and having a heating element arranged in heating relation to said metallic member.

2. A plug fuse comprising an insulating body, central and side terminals in said body, said body having a chamber adjacent to said central terminal, a centrally perforated plunger having a lower portion of insulating material and an upper metallic portion, a coil spring within said chamber and engaging said insulating plunger portion and pressing said plunger away from said central terminal, a fuse link portion secured to said central terminal and extending through the perforation in said plunger and having a fusible head portion overlying said metallic plunger portion and normally holding said plunger toward said central terminal against the pressure of said spring, and a fuse link portion secured to said side terminal and including an insulated heating coil surrounding said metallic plunger portion and at its end remote from said side terminal in electrical connection with said fusible head portion.

3. A fuse comprising an insulating body having a window, a pair of fuse terminals, a fuse link connecting said terminals, a spring pressed plunger engaging said link and held thereby against such spring pressure, a signal strip normally presenting a good fuse indication visible through said window, said strip having a portion folded back and carrying a blown fuse indication on said folded back portion, said plunger being positioned to unfold said strip and present said

blown fuse indication visible through said window upon release of said plunger as by the blowing of said link.

4. A fuse indicator comprising a strip of sheet material having a portion folded back on itself and temporarily secured in folded condition, said folded back portion concealing a blown fuse indication revealed by unfolding of said strip on release of said securement.

5. An article of manufacture comprising a piece of sheet material for cutting along parallel lines into a series of strips, said piece being folded on itself to form three superposed layers transversely of said strips and intermediate to the ends thereof, readily breakable means for securing said layers folded together, said pieces presenting on each strip adjacent to said fold a good indication and on the same side of the piece on the said folded portion a modifying indication visible with said good indication when said folded portion is unfolded and showing therewith a "No good" indication.

6. A fuse comprising an insulating body having a pair of fuse terminals, a conductive fuse link connecting said terminals and provided with a fusing portion intermediate to its ends, and a spring pressed heat absorbing plunger bearing against one side of said fuse link and against and in direct contact with said fusing portion in position to delay the heating of said fusing portion to fusing temperature and to separate said link at said fusing portion when fusing occurs.

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