Dec. 5, 1961 L. J. GAUDET 3,012,120

CIRCUIT BREAKER FOR ELECTRIC CIGAR LIGHTER

Filed Nov. 18, 1958

Fig. 2.

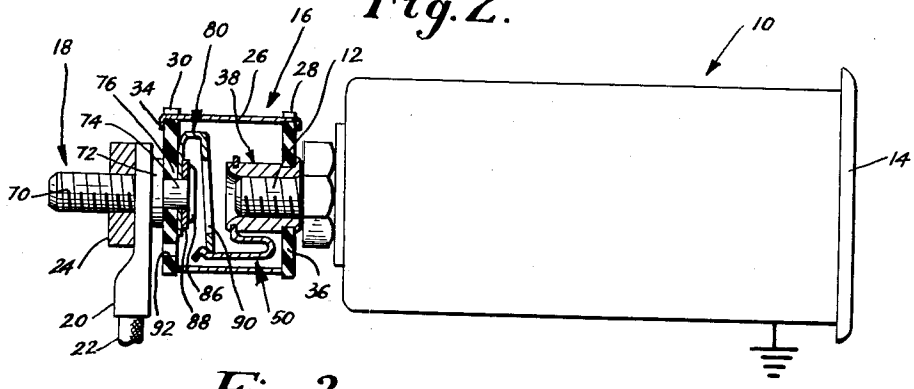


Fig. 3.

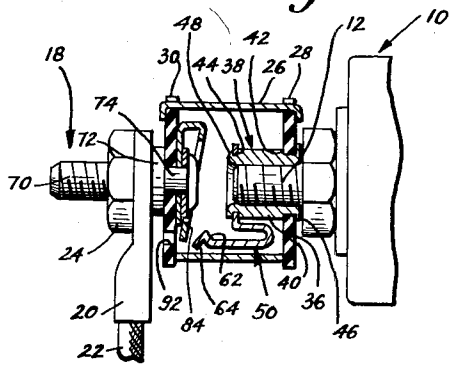


Fig. 1.

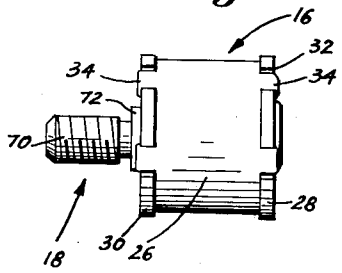


Fig. 4.

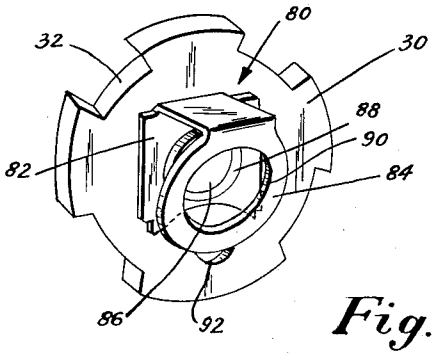


Fig. 5.

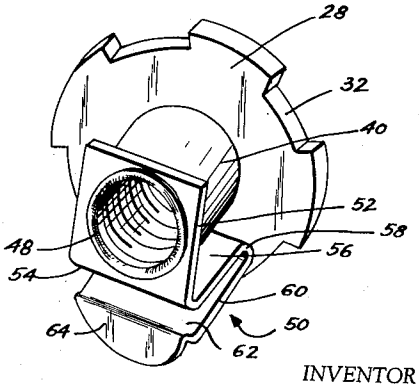
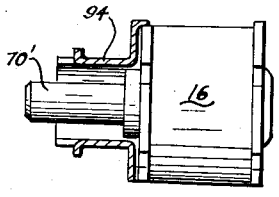


Fig. 6.



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CIRCUIT BREAKER FOR ELECTRIC CIGAR LIGHTER

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This invention relates to circuit breakers, and in particular to disposable circuit breakers adapted for use in combination with electric cigar lighters of the type commonly used in motor vehicles. The device of the present invention is particularly adapted for use in combination with a cigar lighter socket of the type illustrated in U.S. Patent 2,495,657, but is not limited to such combination.

A principal object of the present invention is to provide a simple and reliable low cost circuit breaker which may be readily applied to conventional electric cigar lighter sockets, and which may be readily removed and replaced by a new device when it has served its purpose of protecting the lighter against excessive heating, or of protecting the wire against electrical overload in the case of a short circuit in the lighter. Further objects will be in part evident and in part pointed out hereinafter.

The invention and the novel features thereof may best be made clear from the following description and the accompanying drawings, in which:

FIGURE 1 is a side elevational view of a preferred embodiment of the invention;

FIGURE 2 is a sectional view of the device, illustrated in circuit with a conventional cigar lighter socket, and showing the device in closed circuit condition;

FIGURE 3 is a sectional view of the device corresponding to FIGURE 2, but showing the device in open circuit position;

FIGURE 4 is a perspective view, on enlarged scale, of the contact spring element of the device in association with one of the insulating disc closures;

FIGURE 5 is a perspective view, also on enlarged scale, of the bimetallic thermostatic latch element of the device, in association with the other insulating disc closure; and

FIGURE 6 is an elevational view, partly in section, of a modified construction adapted for use with a bayonet catch connector.

Referring to the drawings, in FIGURE 2 is shown the outline of a conventional cigar lighter socket **10**, provided with the usual rearwardly extending stud **12** for electrical connection. As is well known, the forward end of the socket **10** is provided with a flange **14**, adapted to abut the front surface of the instrument board (not shown) of an automobile, in which the socket may be mounted in conventional fashion. Detachably mounted on the socket stud **12** is a preferred embodiment of the disposable circuit breaker of the present invention, indicated generally as **16**. The circuit breaker **16** carries a rearwardly extending stud **18**, preferably corresponding in size and form to the socket stud **12**, and similarly adapted for electrical connection. As shown, the terminal **20** of wire **22** may be positioned over the stud **18**, and secured in place by the nut **24**.

The circuit breaker **16** comprises a generally cylindrical metallic housing **26**, closed at both ends by insulating discs **28** and **30**. As shown in FIGURES 1, 4 and 5, each of the discs **28** and **30** is provided with a plurality of spaced peripheral notches **32**, and the housing **26** at either end is provided with a plurality of corresponding fingers or tabs **34**, adapted to fit within the respective disc notches. The tabs and notches serve to align the elements for assembly, which may be completed

by bending the tab ends inwardly over the outer faces of the associated discs.

The forward disc closure **28**, as shown in FIGURES 2 and 3, is centrally apertured at **36**, and in said aperture is mounted an internally threaded bushing **38**. The bushing **38** comprises a central section **40** terminating in shoulders **42** and **44**, and end skirts **46** and **48** of reduced external diameter. The bushing is secured in the disc closure **28** by positioning it within the aperture **36** thereof, the aperture fitting closely about the end skirt **46** and against shoulder **42**, and the end skirt may be rolled over the outer surface of the disc closure to permanently engage the elements. On the rearward end of the bushing **38** is mounted a bimetallic thermostatic latch element indicated generally as **50**. As shown, the latch element **50** comprises a base end **52** which fits over the bushing skirt **48** and against the bushing shoulder **44**, and is fixedly mounted on the bushing by rolling over the end skirt, in the manner previously described.

As illustrated in FIGURES 2, 3 and 5, the latch element **50** is sharply bent at **54**, whereby the base end **52** is joined to a forwardly extending section **56**, and reversely bent at **58**, whereby the section **56** is joined to a free leg **60** which extends rearwardly a short distance beyond the base end **52**. Adjacent its outer end, the leg **60** is sharply offset in radially inward direction to form a detent **62**, from which extends the inclined guide lip **64**.

The stud **18** comprises a threaded portion **70** at one end, a flange **72**, and an extension **74** of reduced diameter. The rearward disc closure **30** is centrally apertured at **76**, whereby it is adapted to fit over the stud extension **74** and against the flange **72**. Mounted on the stud extension **74**, immediately inside the disc closure **30**, is a contact spring element indicated generally as **80**. The contact spring **80** is generally U-shaped, being formed into a base leg **82** and free leg **84**. The stud **18**, disc closure **30** and contact spring **80** may be assembled by positioning the disc closure and contact spring on the stud extension **74**, the base leg **82** of the contact spring being appropriately apertured for such purpose, and then upsetting the outer end of the extension to form a head **86**. Preferably, a contact washer **88** is interposed between the stud head **86** and the contact spring. The free leg **84** of the contact spring may be substantially annular, as illustrated in FIGURE 4, and centrally apertured at **90**. The aperture **90** desirably is relatively large with respect to the stud head **86**, to permit passage of a tool to form head **86** and to allow the leg **84** to fit over the stud head when in open circuit position.

The device is normally assembled in the open circuit position or relationship illustrated in FIGURE 3 of the drawings. As will be evident, the contact spring **80** and the latch element **50** must be operatively aligned, and this relationship may be readily attained in assembly by appropriate disposition of the disc closure notches **32** and the housing tabs **34**. The rearward disc closure **30** is provided with a relatively small opening or passage **92**, in alignment with the outer end of the free leg **84** of the contact spring element **80**. The passage **92** permits the insertion of a small tool, by means of which the free leg **84** of the contact spring may be biased toward and into contact with the latch element **50**. As will be understood, movement of the contact spring leg **84** in such direction causes its outer end to engage the inclined guide lip **64** of the latch element, whereby the latch element leg **60** is displaced outwardly, permitting the spring leg **84** to pass over and engage behind the detent **62** of the latch element. In such simple fashion, the device is placed in closed circuit position, illustrated in FIGURE 2, whereby current may flow from the terminal **20** through stud **18**, contact spring **80**, latch element **50**, and bushing **38** to the socket stud **12**.

The bimetallic thermostatic latch element **50** is adapted, when heated, to warp outwardly toward the wall of the housing **26**. Accordingly, if the latch element is sufficiently heated by heat conducted from the socket stud **12** or by excessive current passing therethrough, the leg **60** of the latch element will warp outwardly and disengage the contact spring **80** from its detent **62**, permitting the contact spring to return to its unbiased position illustrated in FIGURE 3, thereby breaking the circuit through the device. It will be recognized that upon subsequent cooling of the latch element, its leg will return to normal position, but will not contact nor engage the contact spring, so that in the event of malfunction, the circuit is permanently broken. Desirably, the circuit breaker is designed to open in from 40 to 55 seconds due to excessive heating, if a normally operating 12-volt lighter drawing in the neighborhood of 7 amperes is held continuously in circuit. In the event of malfunction of the associated cigar lighter, resulting in the passage of excessive current, the circuit breaker will function in about 7 seconds when passing 15 amperes, and substantially instantaneously when passing 40 amperes. In such event, the latch element is heated primarily by its inherent electrical resistance.

As previously indicated, the circuit breaker device is readily applied to conventional electric cigar lighter sockets. For example, instead of applying the terminal **20** to the socket stud **12**, the circuit breaker **16** may be engaged to the socket stud **12**, and the terminal **20** applied to the circuit breaker stud **18**. In the event the circuit breaker performs its protective function, upon the determination and correction of the cause of the lighter malfunction, the circuit breaker may be readily removed and replaced by a new device. This requires only removal of the terminal **20** from the circuit breaker stud **18**, removal of the circuit breaker from the socket stud **12**, replacement of a new circuit breaker on the socket stud **12**, and application of the terminal **20** to the new circuit breaker stud. The replacement operation is obviously quick and simple. Alternatively, it will be recognized that the circuit breaker may be restored to operative closed circuit condition, by removing the terminal **20** therefrom and inserting a small tool, nail, or the like, through the passage **92** in the rear disc closure **30**, to engage the contact spring **80** and the latch element **50** in the manner previously described.

As illustrated in FIGURE 6, the portion **70'** of the stud **18** may be unthreaded, and enclosed by a connector sleeve **94**, to provide a bayonet type electrical connection. Obviously, if the socket stud **12** is other than threaded, the bushing **38** of the circuit breaker may be appropriately altered for electrical connection therewith.

It will thus be seen that there has been provided by this invention a device in which the various objects hereinbefore set forth, together with many practical advantages, are successfully achieved. As various possible embodiments may be made of the mechanical features of this invention, all without departing from the scope thereof, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawings is to be interpreted as illustrative, and not in a limiting sense.

I claim:

1. A circuit breaker including: a housing; insulating disc closures mounted in opposite ends of said housing; a stud mounted in one of said closures and extending outwardly therefrom, the outer end of said stud being adapted for electrical connection; a contact spring element disposed inside said housing and secured to the inner end of said stud, the inner end of said stud being provided with a head, said contact spring being substantially U-shaped with one leg of said spring being apertured and retained under said stud head; the other leg of said spring being apertured in general alignment with the stud axis; an internally threaded bushing mounted in the other of said closures and extending therethrough; and a bimetallic thermostatic latch element disposed inside said housing and mounted on said bushing, said latch element being adapted to normally engage and retain said spring element in closed circuit relationship and to release said spring element when displaced by elevated temperature.

2. A circuit breaker as defined in claim 1, wherein the disc closure mounting said stud is apertured in general alignment with the outer end of the free leg of said contact spring.

3. A readily detachable circuit breaker element for electric cigar lighters comprising: a housing; insulating disc closures mounted in opposite ends of said housing; a stud mounted in one of said closures and extending outwardly therefrom, the outer end of said stud being adapted for electrical connection; a substantially U-shaped contact spring element disposed inside said housing and secured by one leg thereof to the inner end of said stud; means to detachably connect said circuit breaker in electrical contact with an electric cigar lighter assembly, said means including a bushing mounted in the other of said closures and extending therethrough; a through bore in said bushing to receive a portion of an electric cigar lighter; and a bimetallic latch element disposed in said housing and mounted on said bushing, said latch element including a free leg extending toward and aligned with the free leg of said contact spring and adapted to normally engage and retain said spring element leg in closed circuit relationship and to release said spring element leg when displaced by elevated temperature.

4. The device as defined in claim 3 wherein the disc closure mounting said stud is apertured in general alignment with the outer end of the free leg of said contact spring.

5. The device as defined in claim 3 wherein the inner end of said stud is provided with a head, one leg of said spring being apertured and retained under said stud head, the other leg of said spring being apertured in general alignment with the stud axis.

6. The device as defined in claim 5 wherein the disc closure mounting said stud is apertured in general alignment with the outer end of the free leg of said contact spring.

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