Nov. 7, 1950 S. J. STONE 2,529,195

CIRCUIT BREAKER

Filed June 6, 1949 2 Sheets-Sheet 1

Fig. 1.

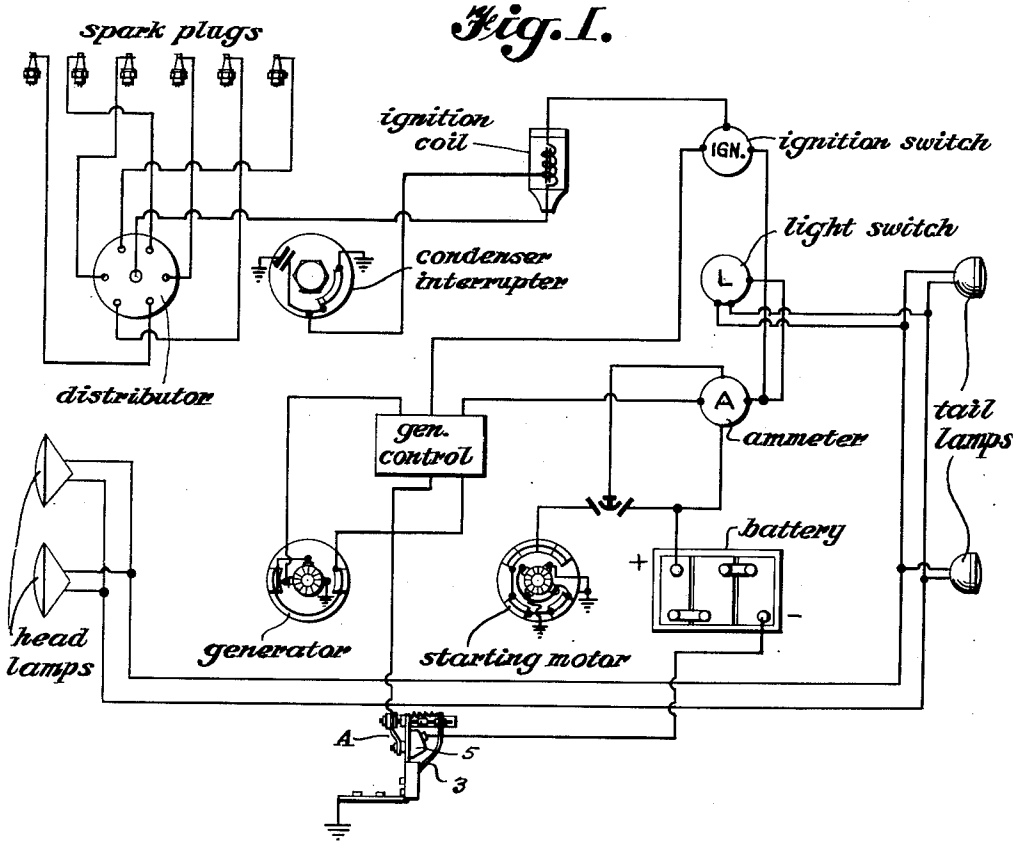
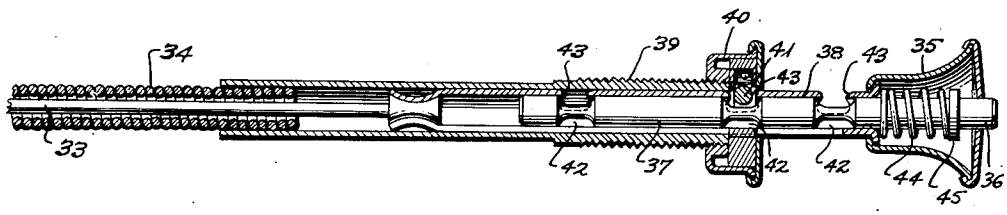


Fig. 4.



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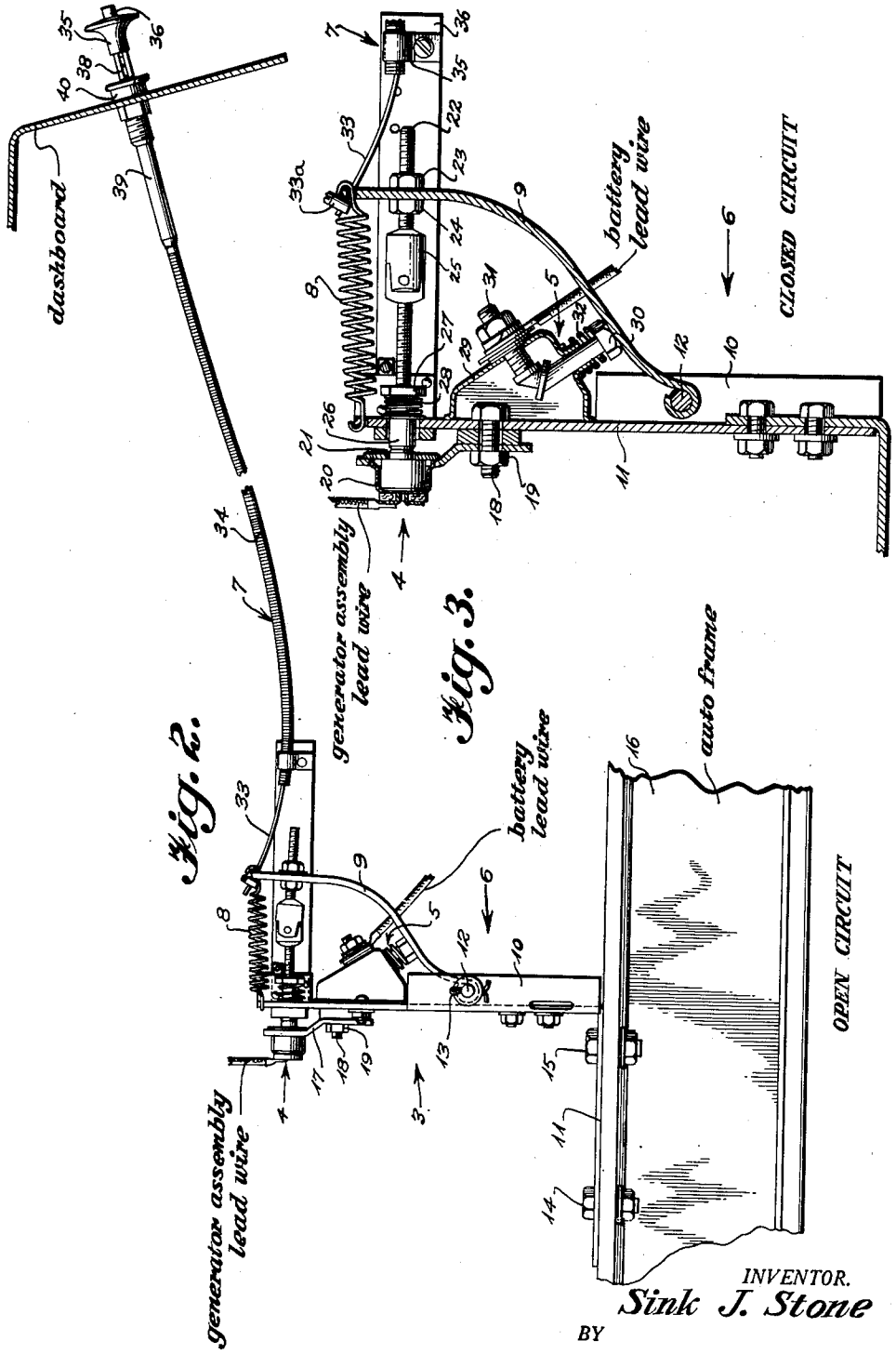


Fig. 2.

Fig. 3.

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Patented Nov. 7, 1950

2,529,195

UNITED STATES PATENT OFFICE

2,529,195

CIRCUIT BREAKER

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Application June 6, 1949, Serial No. 97,475

6 Claims. (Cl. 171—97)

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This invention relates to circuit breakers and more particularly to a manually operated circuit breaker for energizing or de-energizing the electrical circuits of powered vehicles.

While the danger of fires due to short circuits in the electrical circuits of automobiles, airplanes, or the like, is an ever-present hazard, it is one which attains its greatest proportions as an aftermath of accidents and during periods of storage when the condition of the equipment is incident to damage, operator injury or operator absence least likely to be subjected to emergency corrective repair. The two common sources of electrical energy in powered vehicles are the battery and the generator. Accidents causing violent disruption of the load circuits of these sources frequently cause them to be short-circuited to elements within the vehicle not capable of adequately dissipating the heat energy therefrom, with the result that fires are started. In some cases, the natural deterioration of these load elements, particularly during protracted storage, leads to the same results.

In attempts to minimize the fire hazards incident to accidents and protracted storage of vehicles powered by engines employing inflammable fuels, various devices have been developed to either disconnect the electrical supply sources in response to the shock of a collision or manually when the operator anticipates a collision. These devices have lacked, primarily, the capability of maintaining the safe condition which they establish when they are themselves subjected to accident damage and have, secondarily, lacked reliability when required to function under emergency conditions after long periods of inactivity. Furthermore the prior art safety devices of the circuit-breaking type have been rather overspecialized with respect to adaptability either to accident operation or operation under conditions of storage.

It is therefore an object of this invention to overcome the foregoing deficiencies of the prior art and to provide a vehicle circuit breaker which will maintain a safe or open circuit condition when subjected to severe shock and damage and which is equally reliable for accident fire protection or storage fire protection regardless of how long it may have been inactive before being placed in protective or operating position.

It is likewise an object of this invention to provide a manually operated power vehicle safety circuit breaker easily accessible to the operator of the vehicle which will de-energize the battery and the generator simultaneously.

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It is another object of this invention to incorporate into the circuit breaker a means of actuation which is easily operated and can be placed in a position either to energize or de-energize the electrical circuit and to afford means of maintaining the circuit breaker in either of these desired positions.

Broadly, this invention relates to a manually operated circuit breaker for energizing or de-energizing electrical circuits of powered vehicles which is actuated at a point distant from the points in the electrical circuit which are to be broken and which can be rigidly held in a position of make or break as may be desired.

Other objects and advantages of this invention will be apparent upon consideration of the following description of a preferred embodiment thereof in conjunction with the annexed drawings wherein:

Figure 1 is a circuit diagram illustrating a typical automobile electrical circuit including all the usual load elements and showing the position of the circuit breaker of the present invention in a typical position of use.

Figure 2 shows the circuit breaker, including the switch assembly and actuating means therefor, in association with parts of an automobile, the circuit breaker being in an open-circuit position.

Figure 3 is a view partially in section and partially in elevation illustrating the switch assembly of the circuit breaker in its circuit closing position.

Figure 4 is a longitudinal sectional view of the actuating means for the switch assembly of Figure 3.

Referring in greater detail to Figure 1, the circuit breaker of the present invention designated by reference numeral 3, is shown in the ground line of the battery and generator assembly. The load circuits of the battery and generator are of the conventional type, such as headlights, taillights, light switch, ignition switch, ignition coil, spark plugs, distributor, generator, starting switch, starting motor, distributor and condenser interrupter and generator control. These elements are identified in Figure 1 by appropriate legends. The generator control is part of the generator assembly and is one of such nature that a dangerous current may be generated by the generator even under conditions when the battery ground line is interrupted but when the generator ground line is not. This is a common type of generator control and not per se part of this invention. Consequently

it is shown diagrammatically. The entire electrical circuit, including the load elements, is a conventional type and this figure merely illustrates a typical environment of the circuit breaker of the present invention. The circuit breaker 3 includes two switches 4 and 5. Switch 4 is in the ground line of the generator assembly and switch 5 is in the ground line of the battery circuit. These switches will be explained in greater detail as to their construction and relation to the entire switch assembly in Figures 2 and 3.

As can be appreciated upon reference to Figure 2, the circuit breaker 3 is comprised of two basic sub-assemblies, a switch sub-assembly 6 and an operating sub-assembly 7. Switches 4 and 5 are normally held in circuit closing position. They are held in this position due to the action of coil spring 8 on the free end of the pivoted lever arm 9. The lever arm is pivoted at one end to the channel section 10 of the supporting frame 11 for the switch circuit breaker. The lever arm is pivotably mounted to the channel section by means of bolt 12 and cotter pin 13. The supporting frame is rigidly mounted by any means such as bolt and nut assemblies 14 and 15 to the auto frame 16. The auto frame constitutes the common ground for the battery and generator assembly. The coil spring 8 is connected between the supporting frame 11 and the free end of the lever arm 9. In the absence of any applied force to the spring, as through the operating assembly 7, the spring holds the lever arm in a position to cause the contacts of switches 4 and 5 to be closed and consequently to form a continuous circuit between the generator assembly and ground and the battery circuit and ground. When switch 4 is in closed circuit position, the path from the generator assembly to ground (which is the automobile frame) consists of the generator assembly lead wire, switch 4, a metal strip member 17 which supports the switch 4 and is mounted to the supporting frame 11 by any suitable means such as bolt 18 and nut 19, and the auto frame 16. When switch 5 is in closed circuit position, the path from the battery to ground consists of the battery lead wire, switch 5, lever arm 9, supporting frame 11 and the automobile frame 16. When force is applied to the lever arm contra to the force of the spring, as by the operating assembly 7, the lever arm is rotated about its pivot point in the direction opposing the force placed upon it by the spring, and the switches 4 and 5 are moved into circuit-opening position, thus ungrounding both the battery and the generator. The details of the operation of the switch assembly are more clearly illustrated with reference to Figure 3.

Referring to Figure 3, the switch assembly is shown in closed circuit position. No force is being applied in opposition to the coil spring 8 by the operating assembly 7. Therefore switches 4 and 5 are in closed circuit position. Switch 4 is the type normally used in doorbell circuits and its construction conforms to prior art practices. It consists of a substantially weather-proof housing 20 and a slidable button 21. This button is normally urged in an outward direction by a spring or other means within the housing 20, not shown. In its normal position, the switch within the housing is in circuit-opening position. When the button is depressed inwardly, the switch is in circuit-closing position.

The force necessary to depress the contact point 21 into the housing and keep switch 4 in circuit-closing position is applied through rod 22. This rod is threaded at one end and is connected to the lever arm by nuts 23 and 24. Due to the force of the coil spring 8 acting upon the lever arm, rod 22 acts against the force of the spring or other means within the housing of switch 4 which normally urges contact point 21 in an outward direction, this force being applied through a toggle 25 in the rod 22 providing lost motion in the direction of motion of the button and a contact point 26. Since the lever arm is pivoted, any motion thereof will describe a slight arc. To translate this angular displacement into straight-line motion, a lost-motion connection is necessary. Mounted on the rod 22, adjacent the contact point 26, is a flange 27. Between this flange and the supporting frame 11, through which the contact arm 22 passes, is a spring 28 which maintains a resilient driving contact with the contact point 26.

Switch 5, as shown in Figure 3, is in circuit-closing position. Contact is made within a switch housing 29. This housing is substantially weather-proof and is mounted to the supporting frame by bolt 18 and nut 19. The switch is maintained in circuit-closing position when the force of the coil spring 8 is acting alone upon the lever arm 9. Frictionally mounted on the lever arm 9 is a sliding bolt 30. This bolt is maintained in abutting relation to the lever arm 9 by the spring 31. The spring 31 is mounted around the bolt 30, between the head of the bolt and the housing 29. The bolt passes into the housing 29 and therein makes contact with bolt 31. This bolt is rigidly mounted to, but insulated from the housing 29. The battery lead wire is connected to this bolt. The force of the coil spring 8 acting on lever arm 9 forces bolt 30 against the pressure of the spring 31 into the housing 29 and contacts bolt 30 with bolt 31, thus maintaining the switch 5 in circuit-closing position.

The operating assembly is connected to the switch assembly through a flexible connector 33, which connector is slidably mounted to the lever arm 9. An adjustable stop 33*a* is mounted on the extremity of the flexible connector. The operating assembly is mounted to the switch assembly by any means such as metal fastener 35, rigidly mounted to metal strip 36 by any suitable means. The metal strip 36 is mounted to the supporting frame 11 by any suitable means.

The operating assembly is adapted to apply a force against the force of the spring to the lever arm 9. When such a force is applied, the flexible connector 33 which is slidably mounted to the lever arm 9, will cause the adjustable stop to exert a force against the lever arm 9 in opposition to the force of the coil spring 8. The lever arm will then move in a direction in opposition to the force of the coil spring, the contact rod 22 will release its pressure against the contact point 21 of the switch 4, thus opening this switch, and will cause the spring 32 about the bolt 30 to force the bolt 30 in the direction of movement of the arm 9, breaking the contact between the bolt 30 and bolt 31 within the housing 29 of the switch 5. This places the switch 5 in circuit-opening position. It will be noted that both switches are opened or closed simultaneously since they are actuated by the movement of the lever arm 9. The lever arm 9 is caused to pivot about its point of pivot by reason of the force acting

upon it contra to the force of the coil spring **8**. This contra force is applied by the operating sub-assembly **7**. This sub-assembly will be more clearly explained by a detailed analysis of Figure 4.

Referring now to Figure 4, the flexible connector **33**, which, as shown in Figures 2 and 3, is slidably mounted to the lever arm **9** in the switch sub-assembly, is carried in a flexible conduit **34**. The connector is free to move in this conduit and relays to the switch assembly the force necessary to move switches **4** and **5** into a circuit-opening position. This force is applied by the operator of the vehicle to the operating handle **35** of the operating assembly. The operating handle **35** is moved into a "circuit-opening position" by depressing the push button **36** and applying a pulling force to the handle. The push button **36** is a portion of an elongated cylindrical member **37** which is slidably mounted within and normally protrudes from the operating handle. It is normally held in this protruding relation due to the force of the spring **44** within the handle acting against the flange **45** on the cylindrical member **37**. The movement of the handle as the result of this force is translated to the flexible connector through an inner sleeve member **38**. This member is rigidly mounted at one end to the connector and the other end to the handle. Before the push button is depressed the sleeve **38** is locked into position and the handle is not free to move. The locking is accomplished by virtue of the peculiar construction and arrangement of the cylindrical member **37**, the inner sleeve and a partially threaded outer sleeve **39** which threaded sleeve **39** is rigidly mounted at one end to the conduit **34**, and the housing **40** threaded on the threaded portion of the outer sleeve **39**. A ball **41**, within the housing **40**, is urged by a spring or other means within the housing into a position to prevent any movement between the housing, the inner sleeve and the cylindrical member. It is urged into an annular groove **42** in the cylindrical member and through a slot **43** normally cooperating therewith in the inner sleeve. Since the housing is mounted to the dashboard of the vehicle as shown in Figure 2, no movement whatever can take place as long as the ball in the housing is in this position, regardless of what damage may take place at the location of the circuit breaker **3**.

When the operator wishes to place switches **4** and **5** in circuit-opening position, the push button is depressed. The annular groove **42** of the cylindrical member **37** forces the ball back into the housing and permits the inner sleeve **38** to move within the outer sleeve **39**. Since the inner sleeve is rigidly mounted to the handle, a force applied thereto may now be converted into linear movement. This movement of the handle is translated to the connector **33** through the inner sleeve and through the connector to the switch sub-assembly. When the handle has been moved either in or out to its new position and the push button is released, the ball within the housing drops into another cooperating slot and annular groove and locks the handle and consequently the connector in this new position.

The flexible connector is encased in the flexible conduit **34** and connects the operating sub-assembly to the switch sub-assembly. It is mounted to the switch sub-assembly by any convenient means as heretofore described with respect to Figure 2.

What has been described is a preferred embodiment of this invention. The invention may

obviously be carried out in other specific ways than that herein described without in any way departing from the spirit of the invention.

What is claimed is:

1. In a powered vehicle having a battery, a generator assembly intended to be separately grounded and load circuits therefor, a switch assembly including two switches, means adjacent said switches normally to bias them to circuit-closing position, means remote from said assembly for overcoming the bias of said biasing means to simultaneously move said switches to circuit opening position, a lock associated with said remote means at the remote location thereof for holding said remote means in the position for maintaining said switches in circuit opening position, a connection from each switch to ground, and a connection from one of said switches to the battery and from the other of said switches to the generator assembly.

2. In a switch assembly, a pair of fixed contacts, a lever pivoted at one end, a pair of movable contacts including parts radially spaced on said lever and adapted to move from a circuit closing position with said pair of fixed contacts to a circuit-opening position in response to an angular displacement of said pivoted lever about its point of pivot, a lost motion connection in the radially outermost movable part to compensate for the difference in radial movement of said pair of movable parts, means for holding said movable contacts in circuit-closing position with said fixed contacts, remote means for simultaneously releasing said both pairs of contacts from circuit-closing position to circuit opening position, and means associated with said remote releasing means for locking said switch assembly in circuit opening position.

3. In a powered vehicle having a battery, a generator assembly intended to be separately grounded and load circuits therefor, a switch assembly including two switches, each of said switches having one fixed contact and a sub-assembly including one movable contact, a lever pivoted at one end, at least a portion of said sub-assemblies being radially spaced on said lever, the radially outermost sub-assembly including a lost motion connection to compensate for the difference in radial movement of said sub-assemblies, means adjacent said switches normally to bias them to circuit-closing position, means remote from said switches for overcoming the bias of said biasing means to simultaneously move said switches to circuit-opening position, and a locking means associated with said remote means at the remote location thereof for holding said remote means in the position maintaining said switches in circuit-opening position, a connection from each switch to ground and a connection from one of said switches to the battery and from the other of said switches to the generator assembly.

4. In a powered vehicle having a battery and a generator assembly intended to be separately grounded and load circuits therefor, a switch assembly including two switches, a spring adapted to maintain said switches in circuit-closing position, means remote from said assembly for simultaneously moving said switches to circuit-opening position, said means including a flexible connector for connecting said means to said switch assembly, an operating handle mounted on said flexible connector at the remote location of said remote means, and a lock for holding said remote means in a position for

maintaining said switches in a circuit-opening position, a connection from each switch to ground and a connection from one of said switches to the battery and from the other of said switches to the generator assembly.

5. In a switch assembly, a pair of fixed contacts, a lever pivoted at one end, a pair of movable contacts including parts radially spaced on said lever and adapted to move from circuit-closing position with said pair of fixed contacts to circuit-opening position in response to an angular displacement of said pivoted lever about its point of pivot, a lost motion connection in the radially outermost movable part to compensate for the difference in radial movement of said pair of movable parts, a spring in said switch assembly for maintaining said switches in circuit-closing position, a remote means acting contra to said spring for simultaneously releasing both pairs of contacts from circuit-closed position to circuit-opening position, said means including a flexible connector for connecting said remote means to said switch assembly, an operating handle mounted on said flexible connector at the remote location of said remote means, and a lock for holding said remote means in a position for maintaining said switches in a circuit-opening position.

6. A powered vehicle having an occupancy compartment and a battery-generator compartment, said battery-generator compartment including a battery and generator assembly and electrical circuits therefor, a switch assembly located in said electrical circuits, one of said switches being located in the ground circuit of the battery and the other of said switches being located in the ground circuit of said generator assembly, means for normally maintaining said switches in circuit closing position, said occupancy compartment including a means for simultaneously releasing said switches to circuit-opening position, said releasing means including an operating handle for actuating said means, a flexible connector connecting said operating handle to said switch assembly in said battery-generator compartment, a locking means associated with said operating handle for maintaining said switches in circuit-opening position.

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