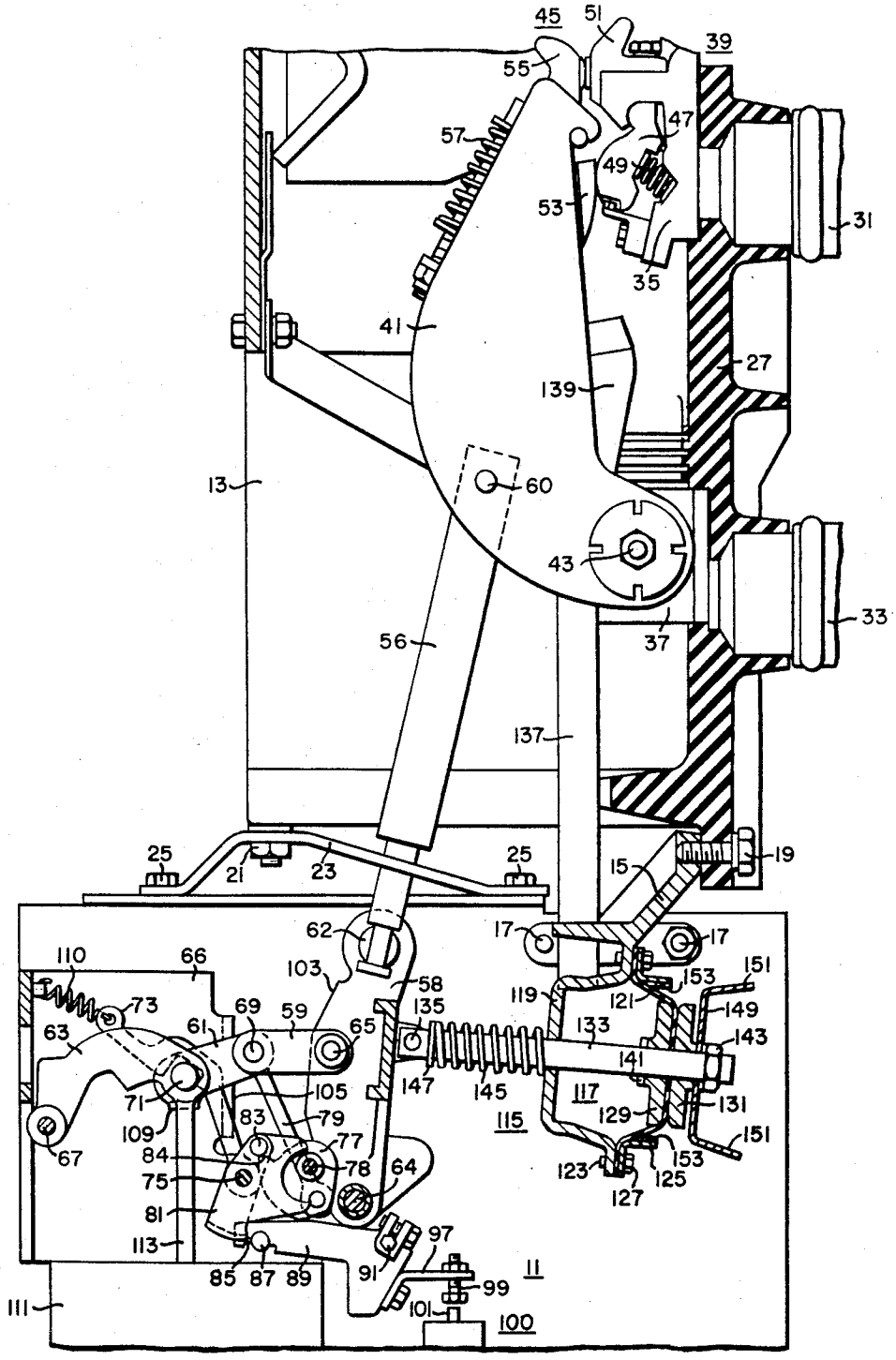
Nov. 17, 1959 S. A. BOTTONARI 2,913,558

CIRCUIT BREAKER

Filed Aug. 30, 1957



United States Patent Office 2,913,558
Patented Nov. 17, 1959

2,913,558

CIRCUIT BREAKER

Samuel A. Bottonari, Pittsburgh, Pa., assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

Application August 30, 1957, Serial No. 681,215

3 Claims. (Cl. 200—148)

This invention relates to circuit breakers and more particularly to means for controlling rebound of the moving contact structure.

An object of the invention is to provide a circuit breaker embodying a movable contact structure movable at high speed with means for preventing rebound of the moving contact structure.

Another object of the invention is to provide a circuit breaker embodying a high-speed movable contact structure with means preventing rebound of the contact structure when it is suddenly stopped in its opening movement.

The invention both as to structure and operation together with additional objects and advantages thereof, will be best understood from the following detailed description thereof, when read in conjunction with the accompanying drawing which comprises an elevational view, partly in section, of a circuit breaker embodying the principles of the invention.

Referring to the single figure of the drawing, the circuit breaker comprises generally a plurality of pole units (only one being shown) mounted on a base structure indicated generally at **11**. The pole unit comprises a channel-shaped frame **13** of molded insulating material rigidly supported on the base structure **11** by means of a bracket **15** secured to the base structure **11** by means of bolts **17**, the frame **13** being secured to the bracket by bolts **19** (only one being shown). The front of the frame **13** is secured by bolts **21** to a bracket **23** which is secured to the base structure **11** by bolts **25**.

Supported in the rear wall **27** of the insulating frame **13** is an upper terminal stud **31** and a lower terminal stud **33**. The studs **31** and **33** extend through suitable openings in the rear wall **27** of the frame **13** and have contact blocks or feet **35** and **37** respectively, suitably secured to their inner ends.

The upper block **35** supports the stationary contact structure indicated generally at **39** and a movable switch arm **41** comprising a pair of spaced arms (only one being shown) is pivotally supported by a pin **43** on the lower contact foot **37**. A movable contact structure indicated generally at **45** is mounted between the movable switch arms **41** for movement into and out of engagement with the stationary contact structure **39**. The detail contact structure is fully disclosed in copending application Serial No. 530,062, filed August 23, 1955 by Robert C. Dickinson and Paul Olsson and assigned to the assignee of the present invention. For this reason only a brief description of the contact structure is given herein.

The stationary contact structure **39** comprises a main stationary contact **47** biased by a spring **49** for contact follow, and a stationary arcing contact **51**. The movable contact structure **45** comprises a main movable contact **53** rigidly supported between the contact arms **41** and a movable arcing contact **55** biased by a spring **57** for contact follow.

The movable contact arm is connected by means of an operating rod **56** to an operating lever **58** forming part

of the breaker operating mechanism mounted in the base structure **11**. The rod **56** is pivotally connected by a pin **60** to the switch arms **41** and by a pin **62** to the operating lever **58** which is pivotally supported on a pin **64** in the base **11**.

An operating linkage comprising toggle links **59**, **61** and **63** is provided to releasably hold the operating lever **58** and consequently the movable contact structure in the closed position and to operate the movable contact structure to open and closed positions. The toggle link **59** is pivotally connected by means of a pivot pin **65** to the operating lever **58** and the toggle link **63** is pivoted on a fixed pivot **67** supported on a frame **66** mounted on the base structure **11**. The toggle link **61** is pivotally connected to the links **59** and **63**, respectively, by knee pivot pins **69** and **71**.

The linkages **59**, **61**, **63** comprise two toggles, one of which **59—61** may be designated as the tripping toggle and the other **61—63** as the closing toggle. The tripping toggle **59—61** is normally slightly underset above a line drawn through the center of the pivot pins **65—71** and the closing toggle **61—63** is normally underset below a line drawn through the centers of pivot pins **67—69**. The closing toggle **61—63** is normally prevented from collapsing downward by a support member **73** pivoted on a pin **75** supported in the frame **66** and having a shoulder portion engaging under the knee pivot pin **71**. The tripping toggle **59—61** is normally prevented from collapsing by means of a main latch member **77** pivoted on a pin **78** in the base **11** and connected by means of a link **79** to the knee pin **69** of the tripping toggle.

The main latch member **77** is held in latching position by an intermediate latch lever **81** pivoted on the pins **75** and biased (by means not shown) to latching positions. The intermediate latch lever carries at its upper end a latch roller **83** engaging a latch nose **84** on the main latch **77** and at its lower end has a latching portion **85** normally engaging a latch roller **87** on a trip member **89** pivoted on a pin **91** in the frame **66**. The trip member **89** is biased by spring means (not shown) to latching positions. A bracket **97** secured to the trip member **89** has a screw **99** adjustably mounted thereon for cooperating with a trip device **100** shown in the form of a tripping electromagnet.

The circuit breaker is tripped open by operation of the tripping magnet **100** whose armature **101**, upon energization of the magnet by a tripping impulse, engages the screw **99** and rotates the trip member counterclockwise causing the latch roller **87** to release the intermediate latch **81**. The latching engagement of the main latch **77** with the latch roller **83** is of the slip-off type and as soon as the intermediate latch **81** is released it is moved to unlatching positions by the upward force applied to the main latch through the link **79**. The tripping toggle **59—61** immediately collapses upwardly permitting counterclockwise movement of the operating lever **58** and opening movement of the movable contact structure. During the collapse of the tripping toggle **59—61** a portion of the toggle link **61** engages and actuates the support member **73** against the bias of a spring **110** to a non-supporting position, thereby freeing the closing toggle **61—63**. The closing toggle thereupon collapses downward and during its collapse resets and relatches the tripping toggle **59—61**.

The circuit breaker is closed by energization of a closing solenoid **111**, the armature (not shown) of which is connected by means of a rod **113** to the knee pin **71** of the closing toggle. When the solenoid **111** is energized which may be effected either manually or automatically by closing a suitable switch (not shown), the rod **113** is thrust upwardly straightening the closing toggle **61—63**,

and, since the tripping toggle **59—61** is now held in thrust transmitting position, the operating lever **58** is moved clockwise to close the breaker.

The opening movement of the movable contact structure is arrested by engagement of a surface **103** on the operating lever **58** with an abutment **105** on the frame **66**. Due to the mass of the movable contact structure and the high-speed of its opening movement, the moving contact structure has a tendency to rebound after striking the abutment **105**. Means are provided to prevent such contact rebound. This means forms a part of a gas-blast device puffer indicated generally at **115** which provides a blast of air between the separating contacts. This puffer device is described in more detail in Lingal and Frink Patent No. 2,734,971 issued February 14, 1956. The puffer **115** comprises generally a chamber **117** defined by a cup-shaped base casting **119** extending across the three poles of the breaker and integral with and supported by the bracket **15** which supports the frame **13**, and a diaphragm **121**. The edge of the diaphragm **121** is clamped to a flange **123** on the casting **119** by clamp members **125** secured to the flange **123** by bolts **127**. The center portion of the diaphragm **121** is clamped between two clamping members **129** and **131** which are secured on one end of a rod **133**, the other end of which is pivotally connected by a pivot pin **135** to the operating lever **58**.

Threaded into an opening in the upper portion of the casting **119** is a pipe **137** which at its upper end is provided with a suitable nozzle **139** for delivering a blast of air to the contacts upon opening movement of the movable contact structure. The clamp members **129** and **131** are secured to the rod **133** on opposite sides of the diaphragm **121** by nuts **141** and **143** which are threaded on the rod. A compression spring **145** compressed between the casting **119** and a washer **147** on the rod **133** biases the rod and the operating lever **58** in contact opening direction.

The means for preventing the rebound of the moving contact structure when it is stopped during an opening operation comprises a U-shaped member **149** rigidly clamped between the nut **143** and the clamp member **131** and movable with the rod **133**. The resilient side portions **151** of the U-shaped member **149** are tapered slightly outwardly as shown and are adapted when the breaker approaches open position to engage friction material **153** securely bonded to the facing sides of the clamp members **125** with a wedging or squeezing action. As the breaker nears the open position the flared portions **151** engage the friction material and the friction generated thereby quickly and smoothly decelerates the opening movement of the parts thus preventing any rebound of the moving structure.

By changing the angle of the portions **151** or **153** or both, or by selecting a friction material having a greater or lesser coefficient of friction more or less decelerating action can be obtained.

The invention provides an anti-rebound device that is efficient and requires few parts in addition to those used in devices without the anti-rebound device. No critical adjustment is required and such critical parts as pistons, cylinders, etc., are eliminated.

While the invention has been disclosed in accordance with the provisions of the patent statutes, it is to be understood that various changes and modifications may be made in the structural details without departing from the spirit of the invention.

I claim as my invention:

1. A circuit breaker having stationary contact means and a movable contact structure having movable contact means thereon cooperating with said stationary contacts to open and close said breaker and to draw an arc, operating mechanism operable to effect opening and closing movement of said movable contact structure, a gas-blast device having a fixed part and a part movable by said operating mechanism for assisting in the extinction of said arc, spaced friction means mounted on said fixed part, and a member movable with said movable part of said gas-blast device having resilient portions disposed to engage said spaced friction means during an opening operation to decelerate the opening movement of the movable parts of said circuit breaker.

2. A circuit breaker having stationary contact means and a movable contact structure having movable contact means thereon for cooperating with said stationary contact means to open and close said breaker and to draw an arc, operating mechanism operable to move said movable contact structure to open and closed positions, a gas-blast device comprising a diaphragm connected to be actuated by said operating mechanism to assist in the extinction of said arc, spaced friction means fixedly mounted on said gas-blast device, a member having resilient portions thereon movable with said diaphragm and engaging said spaced friction means during an opening operation to decelerate the moving parts of said circuit breaker.

3. A circuit breaker comprising stationary contact means and a movable contact structure having movable contact means thereon for cooperating with said stationary contact means to open and close said breaker and to draw an arc, operating mechanism including an operating lever operable to move said movable contact structure to open and closed positions, a gas-blast device comprising a fixed chamber and a diaphragm for assisting in the extinction of said arc, a rod connecting said operating lever and said diaphragm for actuating said diaphragm, spaced friction means rigidly mounted on said fixed chamber, and a member mounted on said rod and having resilient portions engageable with said spaced friction means during a closing operation to decelerate the moving parts of said breaker.

References Cited in the file of this patent

UNITED STATES PATENTS

1,602,277	McCarty	Oct. 5, 1926
2,137,000	Deans	Nov. 15, 1938
2,349,681	Slepian	May 23, 1944
2,734,971	Lingal et al.	Feb. 14, 1956

FOREIGN PATENTS

378,567	Great Britain	Aug. 18, 1932