This invention relates to valve mechanisms and more particularly to blast valve mechanisms designed for high-speed operation to supply compressed gas for operating the contacts and extinguishing the arc drawn between the contacts of large circuit interrupters.

Modern circuit interrupters have been constructed for operation by fluid pressure, such as compressed air, and have been provided with means for separating the contacts and extinguishing the arc drawn upon separation of the contacts comprising a blast valve mechanism operation at the proper instant to subject the contacts to a sudden blast of fluid under pressure.

A blast valve mechanism designed for such service must be adapted for high-speed operation since it is desirable to insure operation of the circuit breakers within a very small time interval. The blast valve mechanism must also be capable of high-speed closing in order to prevent excessive loss of fluid pressure, and should be operative to control the supply of fluid under high pressure, which may be in the neighborhood of 350 pounds per square inch.

An object of the invention is to provide an improved blast valve mechanism capable of high-speed opening and closing operations.

Another object of the invention is to provide an improved high-speed, fluid-pressure-operated blast valve embodying a fluid-pressure-operated pilot valve for controlling the operation of the blast valve.

Still another object of the invention is to provide an improved high-speed blast valve mechanism according to the proceeding paragraphs embodying valve means operable to prevent loss of fluid pressure during opening and closing movement of the pilot valve and when the pilot valve is open.

The invention both as to structure and operation, together with additional objects and advantages thereof, will be best understood from the following detailed description of a preferred embodiment thereof, when read in conjunction with the accompanying drawings.

In said drawings:

Fig. 1 is a side elevational view of a circuit interrupter embodying the principles of the invention.

Fig. 2 is an enlarged sectional view of a portion of the circuit interrupter showing the arc extinguishing structure of the circuit interrupter and the blast valve mechanism.

Fig. 3 is an enlarged sectional view of the blast valve mechanism showing the blast valve in the closed position.

Fig. 4 is a view similar to Fig. 3, but showing the blast valve in the open position.

The invention is illustrated as applied to a circuit interrupter of the general type disclosed in co-pending application Serial No. 180,447, filed by Benjamin P. Baker, August 19, 1950, now Patent No. 2,664,876, issued July 7, 1953, and assigned to the assignees of the instant invention.

Referring to Fig. 1 of the drawings, the circuit interrupter is suitably supported on a base comprising a framework indicated generally at 11. Mounted on the framework 11 are tubular insulators 13 and 15 and a metal housing indicated generally at 17 is mounted on the upper end of the tubular insulator 15. A tubular insulator 19 mounted on the housing 17 supports a metal housing 21 which encloses the moving contact structure of an interrupter. Mounted on the metal housing 21 is a tubular insulator 23 which at its upper end supports a metal housing 25 enclosing an exhaust chamber and a metal cap 27 is mounted on the housing 25.

Suitably supported in the framework 11 is a compressed-air tank or reservoir 29 having an elbow 31 secured to one end thereof upon which elbow is supported an insulating tube 33 which extends upwardly within the tubular insulators 13 and 15 and terminates below the housing 17. As shown in Fig. 2, the housing 17 is divided into two compartments, the lower compartment 35 comprising a high-pressure compartment and the upper one 37 comprising an exhaust compartment. A Y-shaped tube 39 (only one leg of which is shown) is connected to a cap 40 mounted on the upper end of the tube 33 and communicates with the high-pressure compartment 35. One of the legs of the tube 39 is disposed back of the blast valve mechanism, indicated generally at 41, and the other (not shown) communicates with the high-pressure chamber in front of the blast valve mechanism.

The housing 17 for the high-pressure exhaust chamber 37 and for enclosing the mechanism in the space just below the high pressure compartment comprises a base casting 43 (Figs. 1 and 2) mounted on top of the tubular insulator 15. A plate 45 is suitably secured preferably by welding, on the casting 43 and plates 47 and 49 are secured to the plate 45 to form a box-like enclosure having cover members 51 (Figs. 1 and 2) removable mounted thereon for covering access openings. Mounted on the plate 47—49 is a plate 53 forming the bottom of the high-pressure chamber and a similar plate 58 forms the top of the high-pressure chamber. Side walls 57 mounted between the bottom disc 53 and the top disc 55 complete the high-pressure chamber.

The exhaust chamber 37 is formed by the plate 55 and a casting 59 having side members 61 mounted thereto between the parts being secured preferably by welding. Integral with the casting 59 is a tubular extension 63 which extends downwardly into the exhaust chamber and disposed centrally within the tubular extension is a tubular divider 65 closed at its lower end and supported by means of a spider 67 integral with the casting 59 and with the divider 65. Openings 69 through the spider communicates the interior of the divider 65 with the exhaust chamber 37.

A tubular stationary contact member 71 threadedly engaging the upper end of the divider 65 has a stationary contact 75 mounted on the upper end thereof for cooperation with a lower movable contact member 75 disposed in the contact housing 21. An upper movable contact 77 also disposed in the contact housing 21 cooperates with an upper stationary contact 79 which is supported on an upper stationary contact member (not shown) like the contact member 71. The upper stationary contact member is housed in the tubular insulator 23 and terminates in the exhaust chamber 25, the arrangement of the upper stationary contact and exhaust chamber 25 is the same as that for the cover contact except that it is inverted.

The movable contacts 75 and 77 are connected by a
flexible conductor 81 and are pivotally supported respectively on the inner ends of links 83 and 85 by means of pivot pins 87 and 89. The outer ends of the links 83 and 85 are pivoted respectively on pivot pins 91 and 93 supported on a removable cover plate 95. The inner ends of the links 83 and 85 are connected by a toggle comprising toggle links 97 and 99 which are pivoted on the pins 87 and 89 and pivotally connected together by a knee pivot pin 91. A spring seat 83 is mounted on the knee pivot pin 101 and a coil spring 105 compressed between the spring seat 103 and the plate 95 biases the knee of the toggle 97—99 in a direction to extend the toggle, thereby applying contact pressure between the movable contacts 75 and 77 and the corresponding stationary contacts 73 and 79. A spring guide 107 is provided on the plate 95 for guiding the spring 105.

The circuit through the interrupter extends from a line terminal 109 (Fig. 1) through the upper exhaust housing 25 and the upper stationary contact means (Fig. 2) including the upper stationary contact 79, the upper movable contact 77, the flexible conductor 81, the lower movable and stationary contacts 75, 73, lower contact member 71, the housing 171 (Fig. 1), a shunt conductor 111, a disconnect switch comprising a support member 113 secured to the casing 43 by means of bolts (not shown), a disconnect switch blade 115, a stationary disconnect contact 117 and a line terminal 119. The support member 113 which is rigidly mounted on the casing 43 is also supported on a rotatable column comprising an insulator 121 and a member 123. The stationary disconnect contact 117 and the line terminal 119 are mounted on an insulator 125 supported on the general housing framework 11. Since the disconnect switch forms no part of the present invention, a detailed description thereof will not be given. It is believed sufficient to set forth that the switch is operated to the open position by means of a compressed gas operating mechanism indicated generally at 127 which, when actuated, swings the column 121—123 to effect opening movement of the disconnect switch blade 115.

The blast valve mechanism for admitting a blast of compressed gas to blast the movable contacts open and extinguish the arc is mounted in a casing or cylinder 129 (Figs. 2, 3 and 4) disposed in central openings in the bases 53 and 55 and rigidly secured thereto preferably by welding. The upper end of the casing 129 abuts against the lower end of the extension 63 with a sealing gasket therebetween to form a continuous passage. As best seen in Figs. 3 and 4 a cylindrical valve member 131 is movably mounted in a bore in the lower end of the cylinder 129 with the upper end thereof abutting a shoulder 133 in the bore of the cylinder 129. A member 135 disposed in the lower end of the bore of the cylinder 129 has a flange 137 thereon closely fitting in the bore of the cylinder 129 at the lower end of the valve member 131. The member 135 and the valve member 131 are held in place by an annular member 139 having a cylindrical extension 141 cooperating with the flange 137 of the member with a sealing gasket therebetween. The annular member 139 is provided with a flange 143 and is secured to the enlarged lower end of the cylinder 129 by means of a series of bolts 145 passing through openings in the flange 143 and threaded into tapped openings in the end of the cylinder 129.

A valve seat 147 integral with the upper end of the cylindrical valve member 131 cooperates with a blast valve 149 on the upper end of a valve piston or abutment 151 which is movable in the bore of the valve member 131. The valve piston or abutment 151 is in the shape of an inverted cup and together with the valve element 131 forms a chamber 152 below the abutment 151. A central tubular extension 153 extends downward from the upper portion of the valve piston and has a bore 154 therein. Slidable in the bore 154 of the tubular extension 153 is a secondary valve 155 closed at its upper end and having radial passages 156 therein adjacent the upper end thereof. A flange 157 supported by a spider 158 by means of a pivot pin 160 of the secondary valve 155 is normally biased by means of a compression spring 159, disposed between the abutment 151 and the flange 157 of the secondary valve, into engagement with an inner flange 161 on the member 135. The spring 159 also biases the blast valve 149 closed.

A pilot valve 165 is mounted on the upper end of a valve stem 167 slidably mounted in a valve guide 169. The valve guide 165 forms the center portion of a spider 171 which is secured to the valve seat 165 by screw bolts 173 (only one being shown) and both the spider 171 and the valve seat are secured in a counterbore in the bottom of the member 135 by means of screw bolts 175 (only one being shown). A coil spring 177 compressed between the lower side of the spider 171 and a washer 179 seated against a nut 181 threaded onto the lower portion of the valve stem 167 biases the pilot valve 163 into engagement with the valve seat 165, thus closing off the central passage through the valve seat.

By removing the bolts 145 and disconnecting a link 185, the entire blast valve device including the cylindrical valve member 131 may be removed from the cylinder 129 for inspection or repairs.

Disposed for sliding movement within the bore of the secondary valve 155 is a piston valve 184 having an integral portion 186 biased against the upper face of the pilot valve 163 by means of a spring 188 compressed between the closed end of the secondary valve 155 and the portion 186 of the piston valve 184.

It will be noted that in the closed positions of the pilot valve 163 and the blast valve 149, the secondary valve 155 closes off the chamber 152 below the abutment 151 from the high-pressure chamber 35 and that the upper end of the piston valve 184 is just below the radial passages 156 in the secondary valve.

In order to operate the pilot valve 163 to effect opening of the blast valve 149, a member 183 threaded onto the lower end of the valve stem 167 has its lower end biturated to receive the upper end of the link 185 which is pivotally connected to the member 183 by means of a pivot pin 187. The lower end of the link 185 is pivotally connected by means of a pivot pin 189 to one end of a lever 191 pivotally supported between its ends by a pivot pin 193 mounted in a bracket 195 (Fig. 2) secured to the cap 40 preferably by welding. Pivoted to the other end of the lever 191 is a piston 201 (Fig. 1) connected to the lower end thereof. The piston 201 is disposed in a cylinder 203 supported on the framework 11 by means of brackets 205. Compressed gas is admitted to the cylinder 203 above the piston 201 to operate the rod 199 and the pilot valve 163 by means of a valve mechanism indicated generally at 207, operated by an electromagnet 209. The valve mechanism is connected to the reservoir 29 by means of a pipe 211. The valve mechanism is of a well-known type in which the closed position shuts off a passage for admitting compressed gas to the operating cylinder on the working side of the piston and opens a passage which vents the cylinder on the working side of the piston to atmosphere. When operated by the electromagnet, the valve closes off the vent to atmosphere and opens the passage to admit compressed gas to the working side on the working side of the piston to operate the piston. The blast valve is of the balanced pressure type and is operated to open position by the high-pressure gas on top of the abutment upon unbalancing the pressure below the abutment. This is effected by opening the pilot valve 163 and dumping the pressure from the space below the abutment 151.

When the electromagnet 209 (Fig. 1) is energized it operates the valve device 207 to admit compressed gas to
the cylinder 203 above the piston 201 moving the piston and the operating rod 199 downward. This movement rocks the lever 191 (Figs. 2 and 3) clockwise unsealing the pilot valve 163 and dumping the gas pressure from the space below the abutment 151 to atmosphere. The opening movement of the pilot valve moves the piston valve 184 upward to the position shown in Fig. 4 shutting off the passages 156 in the secondary valve 154. As soon as this pressure in the chamber 152 below the abutment 151 is dumped to atmosphere the high-pressure gas above the abutment 151 blasts the abutment downward open the blast valve port and admitting a blast of high pressure gas upwardly through this cylinder 129, through the passages around the divider 65 (Fig. 2) and through the space between the stationary contact member 71 and the inner wall of the tubular insulator 19 to the space around the lower stationary contact 73 and lower movable contact 75. The blast of high-pressure gas flows through passages 217 (Fig. 2) past the contact housing 21 to the space around the upper movable and stationary contacts 77—79. The high-pressure gas blasts the movable contacts 75 opening inwardly to the open position against a stop member 223 extending in the minor and extending inwardly from cover member 225 secured to the housing 21. The high-pressure gas then flows through openings 219 and 221 respectively in the lower and upper stationary contacts 77 and 79 extinguishing the arc and then passing downward through the insulator of the tubular insulator 71 and through the openings 69 into the exhaust chamber 37. The upper stationary contact 79 is mounted on a tubular contact member (not shown) like the contact member 71 except that it is inverted and the compressed gas flows upwardly through the tubular contact member into an upper exhaust chamber indicated at 25 (Fig. 1). The shock of the high-speed opening movement of the blast valve piston 151 is absorbed by a plurality of spring washers 226.

The compressed gas is not immediately dumped from the exhaust chamber 37. A dump valve indicated generally at 227 (Fig. 2) is provided to control the dumping of the compressed gas from the exhaust chamber, but this dump valve is prevented from functioning until the blast valve closes. The dump valve 227 comprises a valve housing 229 having a threaded portion 231 threaded into a tap member 233 in the member 61. A piston valve 235 disposed in the bore of the housing 229 is biased closed by a spring 237 to normally close an exhaust port 239 in the housing 229. The construction of the valve member 235 is such that compressed gas in the exhaust chamber 37 will blast the exhaust valve open, however, means is provided operative upon opening of the pilot valve 163 to supply high-pressure gas from the high-pressure chamber 35 to the space above the piston valve 235 to prevent opening movement of the valve until the pilot valve 163 closes to effect closure of the blast valve.

The pilot valve 163 is closed by the spring 177 (Figs. 2, 3 and 4) upon deenergization of the electromagnet 209 (Fig. 1). When the magnet 209 is deenergized, the valve device 207 closes off the compressed gas from the cylinder 203 whereupon the spring 177 closes the valve 163 and rocks the lever 191 (Fig. 2) counterclockwise raising the operating rod 199. When the pilot valve 163 closes, the spring 188 causes the piston valve 184 to move downward therewith opening the passages 156 through the secondary valve 155 permitting the pressure above and below the piston 151 to quickly come into balance through openings 213 in the cylinder 129, the radial passages 215 in the abutment 151 and the radial passages 156 in the secondary valve 155. As soon as the pressure above and below the abutment 151 is balanced, the spring 159 snaps the abutment 151 upwardly to quickly close the blast valve.

Conventional valves of the balanced-pressure type are usually provided with a very small bypass passage for balancing the gas pressure on both sides of the valve. Such a restricted bypass passage retards the flow of high-pressure gas and balancing of the pressures thereby delaying closing of the valve. In order to effect high-speed closing of the blast valve a relatively large bypass passage is required to quickly balance the pressures on both sides of the abutment. However, a relatively large bypass passage permits a substantial loss of high-pressure gas when the pilot valve is open or during the opening and closing movements of the pilot valve. An important feature of the invention is the provision of means for closing off the bypass passage except for a period of time after the pilot valve 163 closes and before the abutment 151 is moved to the closed position.

The means for controlling the bypass passage 215—156 comprises the extension 153 on the movable abutment 151, the secondary valve 158 and the piston valve 184. It was previously described how in the closed position of the blast valve mechanism 41 (Fig. 3) the extension 153 on the movable abutment 151 cooperates with the secondary valve 155 to close off the high-pressure chamber 35 (Fig. 2) from the chamber 152 below the abutment, and also how the opening movement of the pilot valve 163 moves the secondary valve 155 during the opening movement of the abutment 151 and while both the abutment and the pilot valve 163 are in the open position as shown in Fig. 4. This prevents any loss of high-pressure gas from the high-pressure chamber during opening of the pilot valve and the blast valve and while both of these members are in the open position.

Upon deenergization of the electromagnet 209 (Fig. 1) the pilot valve 163 is closed by the valve spring 177. As the pilot valve moves to the closed position, the spring 188 forces the piston valve 184 downward to open the passages 156 and allows compressed gas to flow from the high-pressure chamber 35 to the space below the abutment 151. This occurs when the pilot valve 163 is at or near its closed position so that there is little if any loss of high-pressure gas. As soon as the pressure below the abutment 151 is substantially balanced with the pressure above the abutment the spring 159 moves the blast valve to the closed position. Due to the large bypass passages 215 and 156 balanced pressure above and below the movable abutment is quickly attained which results in high-speed closing. When the blast valve is in the closed position balanced pressure is closed off the passages 156 and below the abutment 151 by leakage of fluid pressure past the abutment which compensates for any leakage of fluid pressure past the pilot valve 163. An annular groove 216 (Figs. 3 and 4) is provided in the blast valve just below the valve position to provide a slight flexibility to the outer portion of the valve element which engages the valve seat thereby effecting an air-tight seal.

It was previously mentioned that the compressed gas is not immediately dumped from the exhaust chamber 37 (Fig. 2) and that the dumping of compressed gas is controlled by the dump valve 227 which is, in turn, controlled by compressed gas supplied thereto from the high-pressure chamber 35.

The means for supplying gas pressure above the piston valve 235 (Fig. 2) comprises a valve device indicated generally at 241 (Fig. 2). The valve device includes a housing 243 having a bore 245 therein disposed a piston valve 247 which is operated to open and close positions by the movement of the operating rod 199 through the agency of a piston rod 249. When the mechanism is in the normal position with the pilot valve 163 closed, the piston valve 247 is in the upper position as shown in which the position the valve 247 closes a passage 251 in the housing 229. One end of the passage 251 is connected with a pipe 253 to the high-pressure chamber 35 and the other end of the passage 251 is connected to the space in the housing 229 above the dump valve piston 235 by a pipe 255. Thus the piston valve 247 normally closes off the passage 251 and at the same time opens an exhaust.
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passage 257 which communicates the pipe 255 and hence the space above the dump valve 259 to atmosphere.

When the electromagnet 269 (Fig. 1) is energized to effect downward movement of the operating rod 199 and opening of the pilot valve 163 to initiate opening of the blast valve, the piston valve 247 (Fig. 2) is moved downward to close the exhaust passage 257 and open the passage 255. Compressed gas is thereby admitted to the dump valve 227 to hold the valve closed until the mechanism is operated to effect closure of the blast valve. When the electromagnet 209 (Fig. 1) is deenergized to permit closure of the pilot valve 163 (Fig. 2) the rod 199 is moved upwardly moving the valve 247 upwardly to allow the passage of gas, thereby unbalancing the flow of pressure on the dump valve 227 and vents the pressure from above the valve member 235 to atmosphere through the exhaust passage 257. The high-pressure gas in the exhaust chamber 37 then blasts the valve 235 open and dumps the pressure from the exhaust chamber 37, the space around the movable contacts and above the blast valve to atmosphere. When the pressure adjacent the movable contacts 75 — 77 falls below a predetermined level the spring 103 acts to move the contacts 75 — 77 to the closed position. Also, when the pressure in the exhaust chamber 37 falls to a predetermined level the spring 227 closes the dump valve 235.

A dump valve 227 (Fig. 1) is provided for dumping the compressed gas from the upper exhaust chamber 25. The upper dump valve 227 is exactly like the lower dump valve and is controlled by high-pressure gas admitted through the valve 247 (Fig. 2) through the pipe 255 and an insulating pipe 259 (Figs. 1 and 2).

The invention provides a high-speed air blast valve mechanism for a circuit interrupter that is removable as a unit for inspection and/or repairs. The blast valve is grooved and undercut just below the valve portion to provide a slight flexibility to the outer portion of the valve element which engages the valve seat making an airtight seal. The valve mechanism uses a common spring for biasing the blast valve closed and for providing seating pressure between the pilot valve and the movable secondary valve. The piston valve and the secondary valve cooperate with the pilot valve and the movable abutment to provide high-speed closing of the blast valve and also prevents loss of compressed gas during opening and closing movements of the pilot valve and the movable abutment and when both of these valves are in the open position.

Having described the invention in accordance with the requirements of the patent statutes, it is to be understood that various changes and modifications may be made in the structure details thereof without departing from some of the essential features of the invention.

I claim as my invention:

1. In a circuit interrupter having separable contact means and means for directing a blast of fluid under pressure toward said contact means for separating said contact means and for extinguishing the arc drawn during separation of said contact means, a blast valve device having an inlet passage and a discharge passage, blast valve means for controlling the flow of fluid under pressure from said inlet passage to said outlet passage, a movable abutment operative by the fluid pressure from said inlet passage for actuating said blast valve means, a secondary valve element having passage means therein communicating said inlet passage with the space on the opposite side of said movable abutment for balancing the fluid pressure on both sides of said abutment, a tubular extension on said movable abutment slidably engaging said secondary valve element to normally close said passage means, a normally closed pilot valve controlling an exhaust port from said space on said opposite side of said abutment, means for operating said pilot valve to open position to suddenly unbalance the fluid pressure on one side of said movable abutment to effect opening movement of said blast valve means, and a valve member movable by said pilot valve when said pilot valve is moved to open position to suddenly unbalance the fluid pressure on one side of said movable abutment to effect opening movement of said blast valve means, and a valve member movable by said pilot valve when said pilot valve is moved to open position to suddenly unbalance the fluid pressure on one side of said movable abutment to effect opening movement of said blast valve means, when said pilot valve is in said open position.

2. In a circuit interrupter having separable contact means and means for directing a blast of fluid under pressure toward said contact means for separating said contact means and for extinguishing the arc drawn during separation of said contact means, a blast valve device having an inlet passage and a discharge passage, blast valve means for controlling the flow of fluid under pressure from said inlet passage to said outlet passage, a movable abutment operative by the fluid pressure from said inlet passage for actuating said blast valve means, a secondary valve element having passage means therein communicating said inlet passage with the space on the opposite side of said movable abutment for balancing the fluid pressure on both sides of said abutment, a tubular extension on said movable abutment slidably engaging said secondary valve element to normally close said passage means, a normally closed pilot valve controlling an exhaust port from said space on said opposite side of said abutment, means for operating said pilot valve to open position to suddenly unbalance the fluid pressure on one side of said movable abutment to effect opening movement of said blast valve means, and a valve member movable by said pilot valve when said pilot valve is moved to open position to suddenly unbalance the fluid pressure on one side of said movable abutment to effect opening movement of said blast valve means, when said pilot valve is in said open position.

3. In a circuit interrupter having separable contact means and means for directing a blast of fluid under pressure toward said contact means for separating said contact means and for extinguishing the arc drawn during separation of said contact means, a blast valve device having an inlet passage and a discharge passage, blast valve means for controlling the flow of fluid under pressure from said inlet passage to said outlet passage, a movable abutment operative by the fluid pressure from said inlet passage for actuating said blast valve means, a secondary valve element having passage means therein communicating said inlet passage with the space on the opposite side of said movable abutment for balancing the fluid pressure on both sides of said abutment, a tubular extension on said movable abutment slidably engaging said secondary valve element to normally close said passage means, a normally closed pilot valve controlling an exhaust port from said space on said opposite side of said abutment, means for operating said pilot valve to open position to suddenly unbalance the fluid pressure on one side of said movable abutment to effect opening movement of said blast valve means, and a valve member movable by said pilot valve when said pilot valve is moved to open position to suddenly unbalance the fluid pressure on one side of said movable abutment to effect opening movement of said blast valve means, when said pilot valve is in said open position.

4. In a circuit interrupter having separable contact means and means for directing a blast of fluid under pressure toward said contact means for separating said contact means and for extinguishing the arc drawn during separation of said contact means, a blast valve device having an inlet passage and a discharge passage, blast valve means for controlling the flow of fluid under pressure from said inlet passage to said outlet passage, a movable abutment operative by the fluid pressure from said inlet passage for actuating said blast valve means, passage means communicating said inlet passage with the space on the opposite side of said abutment, a nor-
nally closed pilot valve operable to open position to suddenly unbalance the fluid pressure on one side of said abutment to effect opening of said blast valve means, and normally closed valve means for opening said passage means only when said pilot valve is closed and said blast valve means is open for quickly balancing the fluid pressure on both sides of said abutment to effect high-speed closing of said blast valve means.

5. In a circuit interrupter having separable contact means and means for directing a blast of fluid under pressure toward said contact means for separating said contact means and for extinguishing the arc drawn during separation of said contact means, a blast valve device having an inlet passage and a discharge passage, blast valve means for controlling the flow of fluid under pressure from said inlet passage to said discharge passage, a movable abutment operative by the fluid pressure from said inlet passage for actuating said blast valve means, spring means biasing said blast valve means closed, means defining passage means communicating said inlet passage with the space on the opposite side of said abutment, a normally closed pilot valve operable to open position to suddenly unbalance the fluid pressure on one side of said abutment to effect opening of said blast valve means, and normally closed valve means actuated conjointly by said movable abutment and said pilot valve for opening said passage means only when said pilot valve is closed and said blast valve means is open for quickly balancing the fluid pressure on both sides of said abutment to permit said spring means to effect high-speed closing of said blast valve means.

6. In a circuit interrupter having separable contact means and means for directing a blast of fluid under pressure toward said contact means for separating said contact means and for extinguishing the arc drawn during separation of said contact means, a blast valve device having an inlet passage and a discharge passage, blast valve means for controlling the flow of fluid under pressure from said inlet passage to said discharge passage, a movable abutment operative by fluid pressure from said inlet passage for actuating said blast valve to the open position, means biasing said blast valve closed, passage means communicating said inlet passage with the space on the other side of said abutment to balance the fluid pressure on both sides of said abutment, a normally closed pilot valve operable to open position to suddenly unbalance the fluid pressure on one side of said abutment to effect high-speed opening of said blast valve means, a secondary valve coacting with a portion of said abutment to close said passage means when said blast valve means is closed, a valve member actuated by said pilot valve and coacting with said secondary valve, said secondary valve, said portion of said abutment and said valve member cooperating to open said passage only when said blast valve means is open and said pilot valve is closed to quickly balance the fluid pressure on both sides of said abutment to permit said spring means to effect high-speed closure of said blast valve means.

7. In a blast valve mechanism for a circuit interrupter, the combination of a casing structure having an inlet passage supplied with fluid pressure, a discharge passage and a pressure chamber in said casing structure, a main valve disposed in said casing structure for controlling the flow of fluid under pressure from said inlet passage to said discharge passage, a movable abutment disposed between said inlet passage and said chamber for operating said main valve, means defining a relatively large passage for admitting fluid under pressure from said inlet passage to said chamber, a pilot valve disposed in said casing and automatically operative to vent fluid pressure from said chamber to initiate operation of said main valve by said movable abutment, and normally closed valve means actuated conjointly by said movable abutment and said pilot valve to open said passage only when said movable abutment is in operated position and said pilot valve is in closed position.

8. In a blast valve mechanism for a circuit interrupter, the combination of a casing structure having an inlet passage adapted to be supplied with fluid under pressure, a discharge passage and a chamber in said casing structure, a main valve disposed in said casing structure for controlling the flow of fluid under pressure from said inlet passage to said discharge passage, a movable abutment disposed between said inlet passage and said chamber for operating said main valve, means defining a communication for admitting fluid under pressure from said inlet passage to said chamber, a pilot valve automatically operative to vent fluid pressure from said chamber to effect high-speed opening operation of said main valve by said movable abutment, normally closed valve means for controlling said communication comprising a centrally disposed valve member, a first valve operated by said movable abutment, a second valve operated by said pilot valve, said first and second valves cooperating with said controlling valve means and operative only when said main valve is open and said pilot valve is closed to said communication to admit fluid pressure from said inlet passage to said chamber to initiate a high-speed closing operation of said main valve.

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