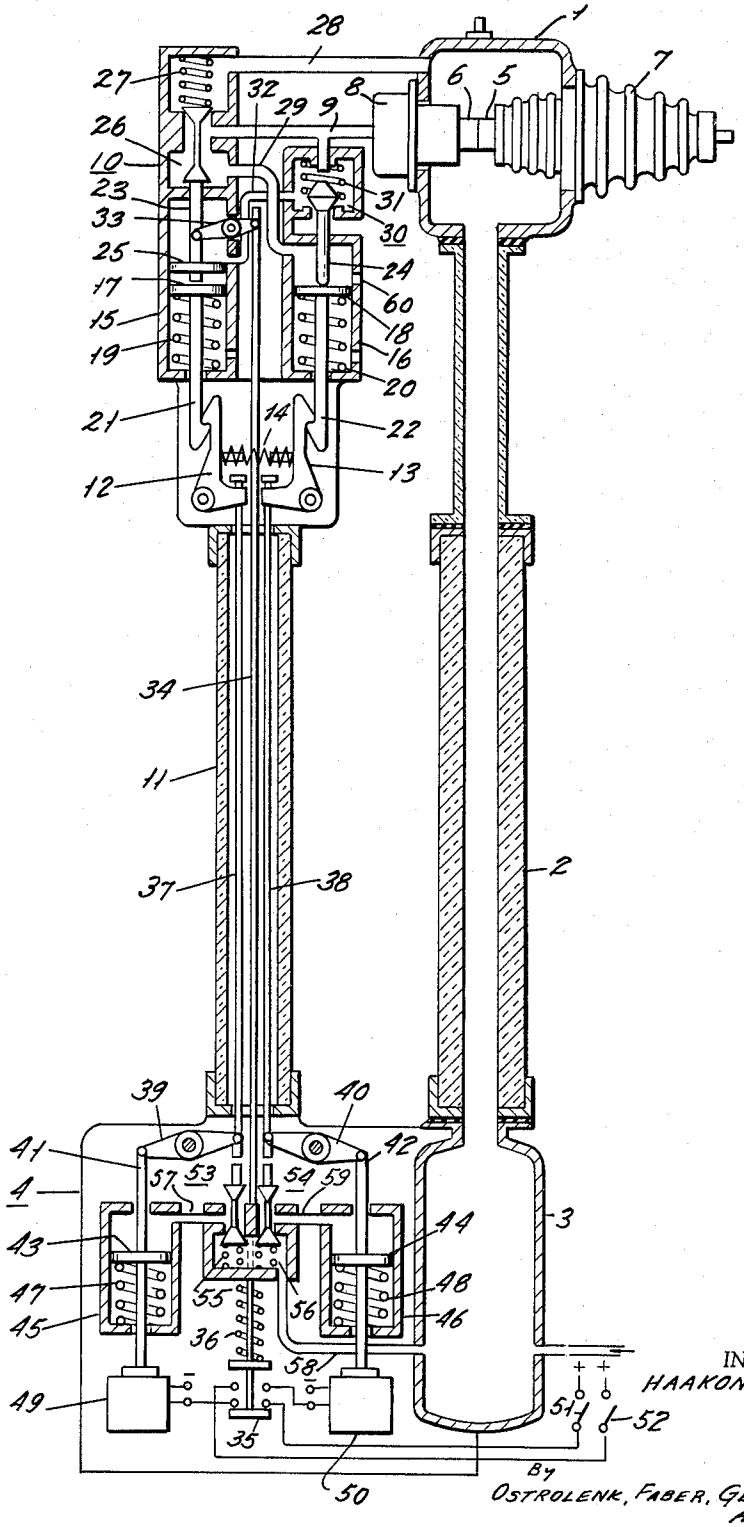
April 5, 1966 H. FORWALD 3,244,844

ENERGY STORAGE OPERATING MEANS FOR AIR BLAST CIRCUIT BREAKERS

Filed Dec. 24, 1962



United States Patent Office 3,244,844 Patented Apr. 5, 1966

3,244,844

ENERGY STORAGE OPERATING MEANS FOR AIR BLAST CIRCUIT BREAKERS

Haakon Forwald, Ludvika, Sweden, assignor to I-T-E Circuit Breaker Company, Philadelphia, Pa., a corporation of Pennsylvania

Filed Dec. 24, 1962, Ser. No. 246,696
1 Claim. (Cl. 200—148)

This invention relates to an operating means for an air blast circuit breaker, and more specifically relates to a high speed operating means for operating the control valves of an air blast circuit breaker.

In accordance with the invention, the various control valves which connect and disconnect high pressures to an air blast circuit breaker operating mechanism are controlled by a high speed mechanical system in which a stored energy means is normally latched against operation and is unlatched by mechanical linkages which extend from the grounded base of the circuit breaker to the latched stored energy means carried at the upper part of the circuit breaker and at the high potential of one of the lines of the circuit breaker.

Accordingly, a primary object of this invention is to provide a high speed operating means for air blast circuit breakers.

Another object of this invention is to provide a normally latched stored energy mechanism for operating the control valves of an air blast circuit breaker wherein the stored energy means and latch means are contained physically adjacent the interrupter housing and are at the same potential as the interrupting housing.

A further object of this invention is to provide a novel high speed operating mechanism for air blast circuit breakers in which an operating signal is transmitted from the grounded base of the circuit breaker to a normally latched stored energy mechanism, electrically and mechanically connected to the interrupter housing of the air blast circuit breaker.

These and other objects of this invention will become apparent from the following description when taken in connection with the accompanying drawing which shows a partially side cross-sectional view of the circuit breaker adapted in accordance with the present invention.

Referring now to the drawing, I have illustrated therein an air blast circuit breaker having a conductive main container 1 which is permanently filled with compressed air. Container 1 is arranged at the high voltage potential of the system, and is supported by an insulator 2 which is, in turn, secured to a compressed air container 3 carried in the support base 4 of the circuit breaker.

The main breaking gap is arranged within container 1 which includes a stationary contact 5 and a movable contact 6. Stationary contact 5 is supported by a lead-through bushing 7 which passes through the wall of container 1 and forms one terminal of the device. The movable contact 6 is supported by a standard type of mechanism housing 8 which extends through the wall of container 1 with the movable contact 6 permanently electrically connected to the conductive container 1.

The mechanism housing 8 may be provided with suitable air outlets (not shown) for passage of extinguishing air during contact interruption and includes operating mechanism (not shown) of such a type that the movable contact is open when conduit 9 is filled with compressed air, while the contact is closed when the contact is empty of compressed air.

A control housing 10 is then provided adjacent housing 1 and is at the same potential as housing 1 and carries the latch means, energy storage means, and operating valves for appropriately operating the circuit breaker

by applying pressure to conduit 9 or removing pressure from conduit 9.

The housing 10 contains, as an input thereto, appropriate signal transmitting members which include rods which extend from the grounded support 4 of the circuit breaker and which pass through insulator 11, as will be described more fully hereinafter.

A pair of hook-shaped levers 12 and 13 are pivotally mounted within housing 10 and serve as latch members which are biased counterclockwise and clockwise respectively by a compression spring 14 interposed between members 12 and 13.

Energy storage springs 19 and 20 are then carried in cylinders 15 and 16, and bear against pistons 17 and 18 which are contained within cylinders 15 and 16 respectively. Pistons 17 and 18 have downwardly extending latch elements 21 and 22 respectively which move into and out of latching engagement with latch elements 12 and 13 respectively, as illustrated.

So long as latch members 21 and 22 are engaged by cooperating latch members 12 and 13 respectively, springs 19 and 20 respectively will be held in the compressed condition shown with pistons 19 and 20 in a downwardly disposed position.

A pair of piston rods 23 and 24 are aligned with pistons 17 and 18 respectively, and influence respective operating valves for the mechanism of movable contact 6. More specifically, piston rod 23 is secured at its bottom to a piston 25 which is carried in cylinder 15 along with piston 17. The top of piston rod 23 is connected to a two-way valve 26 which is normally biased downwardly by the biasing spring 27. The two-way valve 26 is connectable to the operating mechanism 8 of movable contact 6 through the conduit 9 to the container 1 by means of conduit 28, and is alternatively connected to the upper part of cylinder 16 by means of the conduit 29.

Piston rod 24 is connected to the two-way valve 30 which is normally biased downwardly by spring 31. Valve 30 is connectable to conduit 9 and cylinder 15 by means of conduit 32 or to open air. Conduit 32 communicates with cylinder 15 immediately above piston 17 when piston 17 is in its uppermost position.

The piston rod 23 is pivotally connected to pivotally mounted lever 33 which, in turn, is pivotally connected to an operating rod 34 which extends through insulator 11 and which terminates on a switch contact 35 carried to the support base 4 of the circuit breaker. The switch contact 35 is normally biased downwardly and to a contact disengaged position by the biasing spring 36.

Levers 12 and 13 are pivotally connected to operating rods 37 and 38 which extend through insulator 11 with the lower ends of rods 37 and 38 being pivotally connected to pivotally mounted levers 39 and 40 respectively. Levers 39 and 40 are, in turn, pivotally connected to the upper ends of piston rods 41 and 42 respectively which are connected, in turn, to pistons 43 and 44 respectively. Note that all of components 39 through 44 are carried within the grounded base 4 of the circuit breaker.

The rods 34, 37 and 38 are, of course, of insulation material since the components in housing 10 are at the high potential of container 1. Pistons 43 and 44 are contained within cylinders 45 and 46 respectively, and are normally disposed upwardly by biasing springs 47 and 48 respectively. Each of piston rods 41 and 42 extend through their respective pistons 43 and 44 and terminate their respective pistons 43 and 44 and terminate at the bottoms on respective armatures in magnets 49 and 50 respectively. Magnets 49 and 50 are arranged so that their energization causes disconnection and connection, respectively, of the contacts 5 and 6, as will be made clear hereinafter.

A pair of two-way valves 53 and 54 are then carried within grounded housing 4, and are directly influenced by the lower ends of operating rods 37 and 38, as illustrated by an abutting engagement. Valves 53 and 54 are normally biased in an upward position by biasing springs 55 and 56 respectively with valve 53 being connectable to open air and the upper part of cylinder 45 through conduit 57, or to the container 3 through the conduit 58. In a similar manner, the two-way valve 54 is connectable to open air, and the upper part of cylinder 46 through conduit 59 or to container 3 through the conduit 58.

The operating rods 37 and 38 will be disconnected from the two-way valves 53 and 54 respectively when the rods 37 and 38 are in their upper position.

In operation, and in order to open the circuit breaker from the closed position shown in the drawing, contact 51 is closed. This demagnetizes magnet 49 (by appropriate electrical circuitry in which closure of contact 51 defeats the energization of magnet 49) so that the armature on piston 41 is released. Thus, spring 47 moves piston 43 upwardly so that operating rod 37 is pulled downwardly by lever 39. Lever 12 is, therefore, rotated clockwise so that the latch engagement between members 12 and 21 is defeated. The spring 19 may now force piston 17 upwardly to move piston rod 23 upwardly so that two-way valve 26 changes position. Conduit 28 is then connected to conduit 9 which is filled with compressed air, thus causing the movable contact 6 to be moved to its open position. At the same time, the conduit 32 is filled with compressed air through valve 30. Therefore, piston 17 is moved back to its lower position when the pressure on top of piston 17 overcomes the upward biasing force of spring 19.

The operating rod 37 has by this time moved the two-way valve 53 downwardly so that cylinder 45 above piston 43 is connected to compressed air container 3 through conduits 57 and 58. Thus, the piston 43 is returned to its lower end position. At the same time, contact 35 has changed position in the electrical operating circuitry under the influence of the downward movement of operating rod 34 so that the winding of magnet 49 conducts no current, whereby the armature on the piston rod may be attracted by a permanent magnet within magnet body 49. At the same time, the two-way valve 53 is returned to its initial position by spring 55. The lever 12 has thus returned to its initial position before the piston 17 and piston rod 21 is returned to its initial position so that members 12 and 21 are relatched.

In order to now close the circuit breaker, contact 52 is closed. Thus, the winding of magnet 50, because switch contact 35 is in its lower position, conducts current. Thus a parmanent magnet contained in the magnet (not shown) is demagnetized, and the armature secured to piston rod 42 is released. Piston 44 is then moved upwardly by spring 48, and operating rod 38 is thereby pulled downwardly to release lever 13 and piston rod 22. The piston 18 is then forced upwardly by spring 20 to change the position of two-way valve 30 to connect conduit 32 to open air. Thus, the space in cylinder 15 between pistons 17 and 25 is depressurized and the two-way valve 26 returns to its lower end position by spring 27.

The compressed air in conduit 9 will then flow out through valve 26 and conduit 29 and into cylinder 16 above piston 18. Piston 18 is then returned to its lower end position, whereby an opening 60 in cylinder wall 16 is uncovered so that the compressed air above piston 18 can be exhausted to open air. Conduit 9 is then emptied of compressed air and movable contact 6 moves to the closed position shown in the drawing.

During this operation, the switch contact 35 has returned to its upper position shown in the drawing, whereby the current to the winding of magnet 50 is broken to cause the armature on piston rod 42 to be attracted toward magnet 50 when piston 44, under the influence of compressed air from container 3 and through conduits 58 and 59, has returned to its lower end position. This permits piston rod 22 to relatch with lever 13 as soon as the piston rod 22 reaches its lowest position. The breaker is thus immediately ready for the next opening operation.

Although this invention has been described with respect to preferred embodiments thereof, it should be understood that many variations and modifications will now be obvious to those skilled in the art, and it is preferred therefore that the scope of this invention be limited not by the specific disclosure herein but only by the appended claim.

What is claimed is:

An operating mechanism for a circuit breaker; said circuit breaker having a pair of cooperable contacts movable between an engaged and disengaged position; said circuit breaker having a grounded base; said pair of cooperable contacts being contained in a conductive enclosure at a relatively high potential with respect to the said base of said circuit breaker; at least one of said pair of cooperable contacts being operatively connected to a conduit means; application and removal of gas pressure to said conduit causing movement of said cooperating contacts between said engaged and disengaged position; said operating mechanism including valve means connected to said conduit and movable from a first to a second position for controlling the application and removal respectively of pressure to said conduit and control means for said valve means; said control means for said valve means including a stored energy means, a latch means for latching said stored energy means against movement and a latch defeating means; said latch means normally latching said stored energy means in a stored energy position to maintain said valve means in one of said first or second valve positions; operation of said latch defeating means defeating said latch means and releasing said energy storage means to move said valve means to the other of its first or second positions; and second valve means connected to second conduit means; said second valve means being movable between a first and second position for controlling the application and removal respectively of pressure from said second conduit means; said second conduit means being connected to said valve means and moving said second valve means from its said second to its said first position responsive to application of pressure to said second conduit means; and second control means for said second valve means; said second control means for said second valve means being identical to said control means for said valve means.

References Cited by the Examiner

UNITED STATES PATENTS

2,766,348	10/1956	Forwald	200—148
2,783,338	2/1957	Beatty	200—148
2,911,492	11/1959	Beatty	200—148

KATHLEEN H. CLAFFY, *Primary Examiner*,

ROBERT K. SCHAEFER, *Examiner*.