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CIRCUIT BREAKER OPERATING DEVICE

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Fig 1

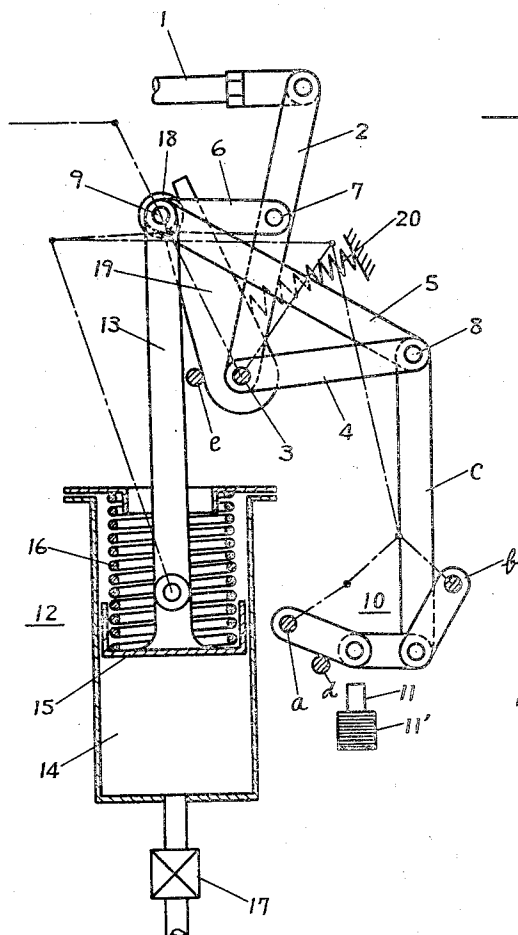
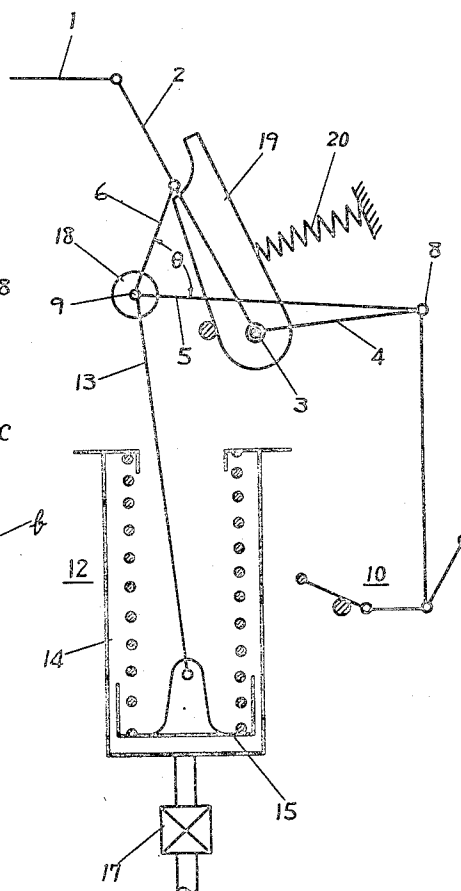


Fig 2



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CIRCUIT BREAKER OPERATING DEVICE

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4 Claims. (Cl. 200—82)

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This invention relates to an operating device of electric circuit breakers, and more particularly to a special arrangement of link mechanism and air pressure operating device for operating electric circuit breakers, and has for its object to provide a circuit breaker operating device which has simple and compact construction to be easily manufactured at a reduced cost and which occupies smaller space.

My invention is illustrated in the accompanying drawings, in which

Figure 1 is a general view partly in section showing essential parts of the circuit breaker operating device embodying my invention, and

Figure 2 is a diagrammatic view taken for the explanation of the operation of the link mechanism shown in Fig. 1 when the toggle links are reset after the circuit breaker is opened.

Now referring to the drawing, 1 designates a rod connected to moving parts of a circuit breaker, not shown. 2 is a main operating lever pivoted to the pin 3 and connected to the rod 1 at its free end. 4, 5 and 6 designate a Z-shaped inversely operating linkage, pivoted at one end of the link 4 to the pin 3 and at the other end of the link 6 to the lever 2 by the pin 7. 8 and 9 are hinge pins of the Z-link. 10 represents a toggle link device pivoted to the fixed pins *a* and *b* and connected to the hinge pin 8 by the link *c*, and *d* represents a stop at the lower dead centre position of the linkage. 11 designates the tripper of a releasing electromagnet 11'. 12 represents a pneumatic operating device consisting of a cylinder 14, a piston 15, a spring 16 acting on the piston and a piston rod 13 which is joined to the pin 9 of the links 5 and 6. 19 is a holding arm pivoted to the pin 3 and pressed by a spring 20 against a stop *e* at a definite position. 18 is a roller mounted on the pin 9 adapted to engage on the free end of the arm 19.

Fig. 1 shows a condition of the present device when the circuit breaker is closed. The effort to swing the main operating lever 2 about its pivot pin 3 in counterclockwise direction to open the circuit breaker tends to pull up the hinge pin 8 to the left of Fig. 1 by means of links 6 and 5, while the pulling force transmitted to the pin 3 through the link 4 is resisted by the pin and a component of the pulling force is transmitted to the toggle link mechanism 10. The force acting in the direction to open the circuit breaker consists of the resultant of the weight of the moving parts of the circuit breaker and the resilience of spring 16 compressed in the pneumatic cylinder 14 and acting on the piston 15. The resilient

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force of spring 16 is transmitted to the pin 9 through the piston rod 13 and acts on the holding arm 19 by means of the roller 18 which is supported at the top end of arm 19 so that the force is transmitted in part to the pivot pin 3 of the arm 19. Thus the greater part of the force acting in the direction to open the circuit breaker is transmitted to the pin 3 and supported thereby.

Now if the releasing electro-magnet 11' is energized and the tripper 11 operates to disengage the toggle link mechanism 10, the hinge pin 8 is released of its bias so that the force acting in the direction to open the circuit breaker will shift the link mechanism to the condition as shown by dotted lines in Fig. 1. By deforming the link mechanism the roller 18 is disengaged from the holding arm 19 so that the piston 15 is forced down by the energy of spring 16. Then the Z-linkage 6, 5 and 4 is shifted by the above releasing movement and deformed as shown diagrammatically in Fig. 2 so that the toggle link mechanism 10 is returned to the lower dead centre or locking condition and where it will hold the hinge pin 8 ready for the next closing operation.

The closing of the circuit breaker is effected by supplying air pressure to the cylinder 14 through the valve 17 when the device is in the condition as shown in Fig. 2, thereby to force up piston 15 together with piston rod 13. The operating force of piston rod 13 acting on the pin 9 is divided between two links 6 and 5. Since the angle θ between these links is gradually reduced as the closing operation proceeds, the switching force of the circuit breaker increases almost linearly so that the circuit breaker can be positively closed.

The characteristic feature of this invention lies in that each co-operating link acts on a pivot pin 3 in concentration so that the operating device is made very compact and of smaller size occupying reduced space.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. An operating device for electric circuit breakers comprising a main operating lever pivoted to a main pin and connected at the other end to a rod for operating the moving parts of the circuit breaker, a Z-shaped linkage pivoted to said main pin at one end and to said main operating lever at the other end, a power operating means connected to one of the hinge pins of said Z-shaped linkage, an interlocking link de-

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vice connected to the other hinge pin of said Z-shaped linkage and a holding arm hinged to said main pin and biased by a spring to a predetermined position to hold the upper hinge pin of said Z-shaped linkage when the linkage mechanism is moved to the closing position of the circuit breaker.

2. A device for operating electric circuit breakers comprising a link mechanism, a toggle link device, and a driving means, said link mechanism comprising a main operating lever connected to a moving part of a circuit breaker at one end and pivoted to a main pin at the other end, a Z-shaped linkage hinged to said main pin at one end and to said main lever at the other end, one of the hinge pins of said Z-shaped linkage being connected to said toggle link device, a tripping electro-magnet operative to shift said toggle link device from a dead centre position, and a holding arm pivoted to said main pin and biased by a spring to a definite position, said driving means consisting of a pneumatic cylinder, a piston moving in said cylinder, a piston rod connected to a hinge pin of said Z-shaped linkage and a spring acting on said piston, the said parts being so arranged and interconnected that at a closed position of the circuit breaker the top end of the piston rod connected to one of the hinge pins of the Z-shaped linkage engages on the free end of said holding arm, while said toggle link device connected to the other hinge pin of said Z-shaped linkage is in a dead centre position.

3. In a circuit breaker operating device having link mechanism comprising a main operating lever hinged at one end to a main pin, an inversely operating Z-shaped linkage connected to said main axis at one end and to said main lever at the other end, an interlocking link mechanism connected to one of the hinge pins of said Z-shaped linkage having a trip magnet to collapse the interlocking link when the magnet is energized, a pneumatic operating device connected to the upper hinge pin of said Z-shaped linkage and a holding arm hinged to said main pin and pressed by a spring to a predetermined

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position to engage a roller mounted on the hinge pin on top of said piston rod, said parts being so arranged that the force tending to open the circuit breaker which acts on the free end of said main operating lever is sustained by said Z-shaped linkage through the interlocking link mechanism connected to one hinge pin of said Z-shaped linkage and is also held by said holding arm engaging the other hinge pin of said Z-shaped linkage.

4. In a circuit breaker operating device comprising a pivoted main operating lever, an interlocking link mechanism connected to a pivot pin of said main operating lever, a pneumatically operated piston having a reversing spring and connected through the piston rod and a link to said main operating lever, a diagonal link connecting said interlocking link end and said piston rod end so as to form an inversely operating Z-shaped linkage, a holding arm biased by a spring for engaging and holding the joint end of said piston rod at the closed position of the circuit breaker, said parts being so arranged that the pneumatic force acting on said piston, while compressing the spring, is transmitted through the piston rod and a link to turn said main operating lever and to shift said interlocking link mechanism through the diagonal link so as to operate the complete device to the circuit breaker closing position, while if said interlocking link is tripped by the energization of an electro-magnet, the complete device is moved towards the open position of circuit breaker by the spring force assisted by the weight of moving parts of the circuit breaker.

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