

March 25, 1947.

C. BANGERT, JR

2,418,006

CIRCUIT BREAKER

Filed Aug. 23, 1944

Fig. 1.

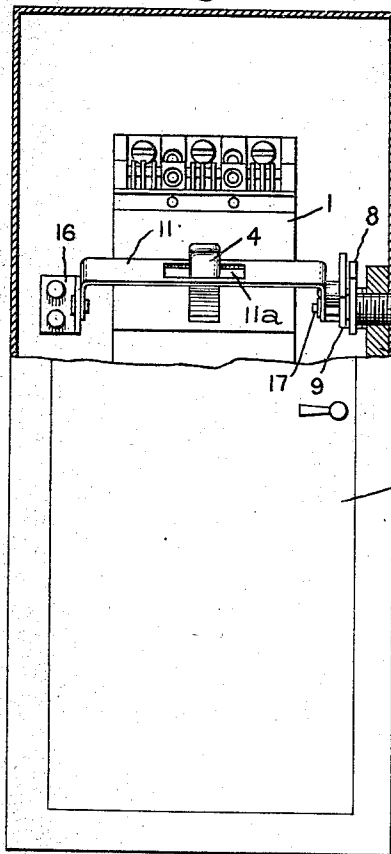


Fig. 2.

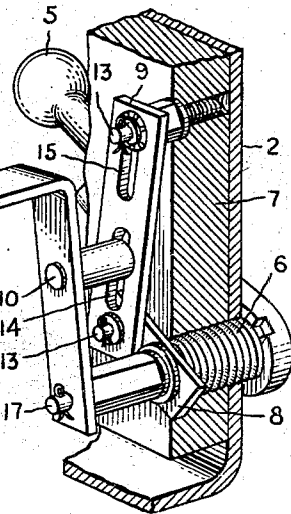


Fig. 3.

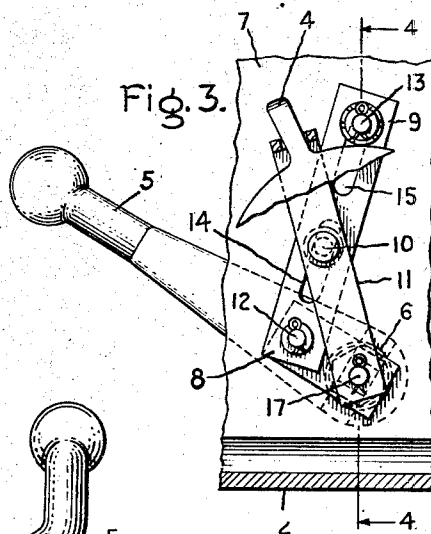
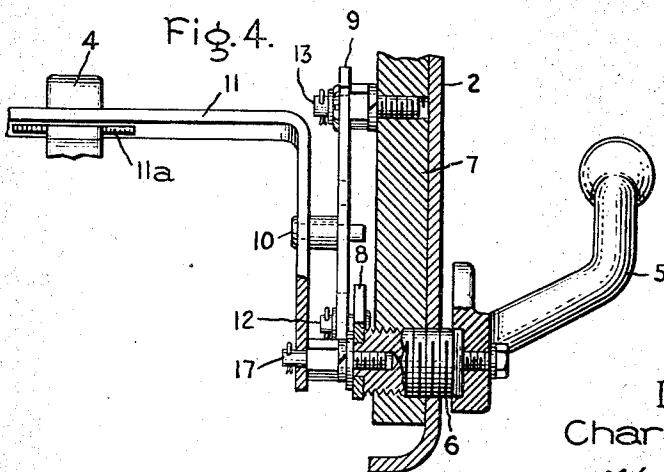


Fig. 4.



Inventor:
Charles Bangert Jr.,
by *Harry E. Dunham*
His Attorney.

UNITED STATES PATENT OFFICE

2,418,006

CIRCUIT BREAKER

Charles Bangert, Jr., Ballston Spa, N. Y., assignor
to General Electric Company, a corporation of
New York

Application August 23, 1944, Serial No. 550,708

3 Claims. (Cl. 200—172)

1

2

My invention relates to circuit breakers, more particularly to manually operated circuit breakers which are mounted in metal housings or enclosures and are manually operated from the outside of the housing, such as used in electric motor circuits, and has for its object a simple and inexpensive operating mechanism providing a changing mechanical advantage to offset the spring gradient of the circuit breaker in such manner as to provide for operation of the circuit breaker by a predetermined constant operating force applied to the operating handle on the exterior of the housing.

In carrying out my invention in one form, I provide an operating handle on the exterior of the housing which is mounted on the shaft extending through the housing together with an operating arm in the housing adjustably connected to the handle of the circuit breaker and pivotally mounted on an axis coincident with the axis of the shaft. I further provide a pair of operating arms, one of which is secured to the shaft and the other of which is pivotally mounted on the housing. The ends of these arms are connected together to form a toggle and the second arm is pivotally connected to the operating arm for the circuit breaker, suitable slidable connections being provided and the arms being arranged to give a varying leverage offsetting the spring gradient of the operating handle for the circuit breaker.

For a more complete understanding of my invention reference should be had to the accompanying drawing, Fig. 1 of which is a front elevation view of an enclosed circuit breaker provided with operating mechanism embodying my invention and with the housing partly broken away; Fig. 2 is an enlarged view in perspective partly in section of the operating mechanism; Fig. 3 is an enlarged elevation view of the operating mechanism; while Fig. 4 is a sectional view of Fig. 3 taken along the line 4—4 and looking in the direction of the arrows.

I have shown my invention in one form as applied to the operation of the small enclosed circuit breaker 1 which in turn is mounted in a metal enclosing casing or housing 2 on the front of which is a door 3. The circuit breaker 1 is moved between its closed circuit and open circuit extreme positions by means of a pivotally mounted handle 4 projecting from the casing of the circuit breaker. The circuit breaker 1 is of the type provided with overcenter spring snap mechanism such, for example, as described and claimed in United States Patent No. 2,218,-

374, issued to Winfield A. Atwood on October 15, 1940. Thus, a relatively great force is required to start movement of the handle to either close or open the circuit breaker, this force decreasing as the handle is moved and decreasing to a small value at the instant the circuit breaker snaps to its opposite position.

In accordance with my invention, I provide an operating handle 5 for the circuit breaker which is mounted on the housing on its exterior and connected to the handle 4 through operating mechanism providing for operation of the handle 5 by a substantially uniform force applied to the handle 5. The handle 5 is mounted on the end of the shaft 6 journaled in a side wall of the housing 2 and extending through the side wall. As shown, the shaft 6 is threaded and extends through a tapped hole in the wall of the housing and in an auxiliary plate 7 secured to the wall of the housing, this mounting of the shaft providing a substantially fluid-tight joint around the shaft.

On the inside of the housing, the shaft 6 is operatively connected through arms 8 and 9, a pin 10 and an inverted U-shaped operating arm 11 to the handle 4. The arm 8 has one end rigidly secured to the shaft 6 and its other end connected by a pivot pin 12 to the lower end of the arm 9, the upper end of which is mounted on a pivot 13 secured to the side wall of the housing. The pin 10 is secured to one side of the arm 11 substantially midway of the length of the arm and has its other end extending through a slot 14 in the arm 9. A slot 15 is also provided in the upper end of the arm for the pivot pin 12. The arm 11 has one of its sides pivoted on a bracket 16 secured to the housing and its other side pivoted on a pin 17 secured to the shaft 6 in concentric relation with the axis of the shaft, the pivot on the bracket 16 being coincident with the pivot pin 17. A detachable connection is provided between the arm 11 and the handle 4 consisting of an intermediate aperture 11a in the arm 11 through which the handle 4 extends loosely. Preferably the pivot axis of the supports 16 and 17 is substantially coincident with the pivot axis of the handle 4.

In order to provide a varying leverage, the arm 8 is secured to the shaft 6 in such angular position therewith as to extend a substantial angle with the arm 9 when the handle 4 is in either of its extreme positions. Thus, with the handle 4 in its uppermost position as shown, the arm 8 extends an angle somewhat greater than 90° with respect to the arm 9 as shown in Fig. 3. Conse-

3

quently, when the handle 5 is turned in a clockwise direction as seen in Fig. 3, a relatively great angular movement of the handle 5 is at first required for a predetermined angular movement of the arms 9 and 11 and the handle 4, which gives a relatively great leverage. As the movement of the handle 5 continues the arm 8 moves toward alignment with the arm 9 and this leverage decreases. To provide for this movement the pins 10 and 13 slide in slots 14 and 15. The relative lengths of the arms 8 and 9 and the position of the pin 10 are so chosen that this decrease in the leverage for the arm 5 substantially corresponds with the decreasing spring gradient on the handle 4, i. e., decreasing component of the over-center operating spring of the circuit breaker 1, which component opposes movement of the arm 11 and the switch mechanism.

While I have shown a particular embodiment of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made, and I therefore contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In combination, walls forming a housing, a circuit breaker in said housing provided with a first operating handle and over-center snap spring operating means biasing said first handle in one or the other of two extreme positions, a first arm pivotally mounted on said housing and connected to said handle, a second handle rotatably mounted on the exterior of said housing on an operating shaft extending through a wall of said housing, a second arm secured to said shaft, a third arm having one end pivotally mounted on said wall of said housing and its other end pivotally connected to the end of said second arm, and a pivotal connection between said first arm and said third arm for operation of said first handle by said second handle, said second and third arms being arranged to extend at a substantial angle with respect to each other when said first handle is in either of said extreme positions thereby to provide a varying operating leverage between said second handle and said first handle offsetting the varying force of said over-center spring operating means.

2. In combination, walls forming a housing, a circuit breaker in said housing provided with a first operating handle and an over-center snap spring operating means biasing said first handle to one or the other of two extreme positions, a first arm pivotally mounted on said housing and detachably connected to said handle, a second handle rotatably mounted on the exterior of said housing on an operating shaft extending through a wall of said housing, said operating shaft having its center substantially coincident with the

4

pivot axis of said first handle, a second arm secured to said shaft, a third arm having one end pivotally mounted on said wall of said housing and its other end pivotally connected to the end of said second arm, and a pivotal connection between said first arm and said third arm for operation of said first handle by said second handle, at least two of said pivotal connections being slidable and said second and third arms being arranged to extend at a substantial angle with respect to each other when said first handle is in either of said extreme positions thereby to provide an increased operating leverage between said second handle and said first handle offsetting the varying force of said over-center spring operating means.

3. In combination, walls forming a housing, a circuit breaker in said housing provided with a first operating handle and an over-center snap spring operating means biasing said first handle in one or the other of two extreme positions, a U-shaped first arm extending over said circuit breaker and provided with an intermediate aperture through which said first operating handle extends, pivot supports on said housing for the ends of said first arm whereby said first arm is pivoted for movement about an axis substantially coincident with the pivot axis of said first handle, an operating shaft extending through a wall of said housing and having its center substantially coincident with the pivot axis of said first handle, a second handle on the exterior of said housing secured to said shaft, a second arm in said housing secured to said shaft, a third arm in said housing having one end pivotally connected to a wall of said housing and its other end pivotally connected to the end of said second arm, and a pivotal connection between said first arm and said third arm for operation of said first handle by said second handle, at least two of said pivotal connections being slidable, and said second and third arms being arranged to extend at a substantial angle relative to each other when said first handle is in either of said extreme positions thereby to provide an increased operating leverage between said second handle and said first handle offsetting the varying force of said over-center spring operating means.

CHARLES BANGERT, JR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,766,526	Martin	June 24, 1930
2,240,922	Bissell	May 6, 1941

FOREIGN PATENTS

Number	Country	Date
107,493	British	July 5, 1917