No. 897,514. PATENTED SEPT. 1, 1908.

P. BEHR.

LATCH MECHANISM.

APPLICATION FILED JAN. 23, 1907.

Fig. 1

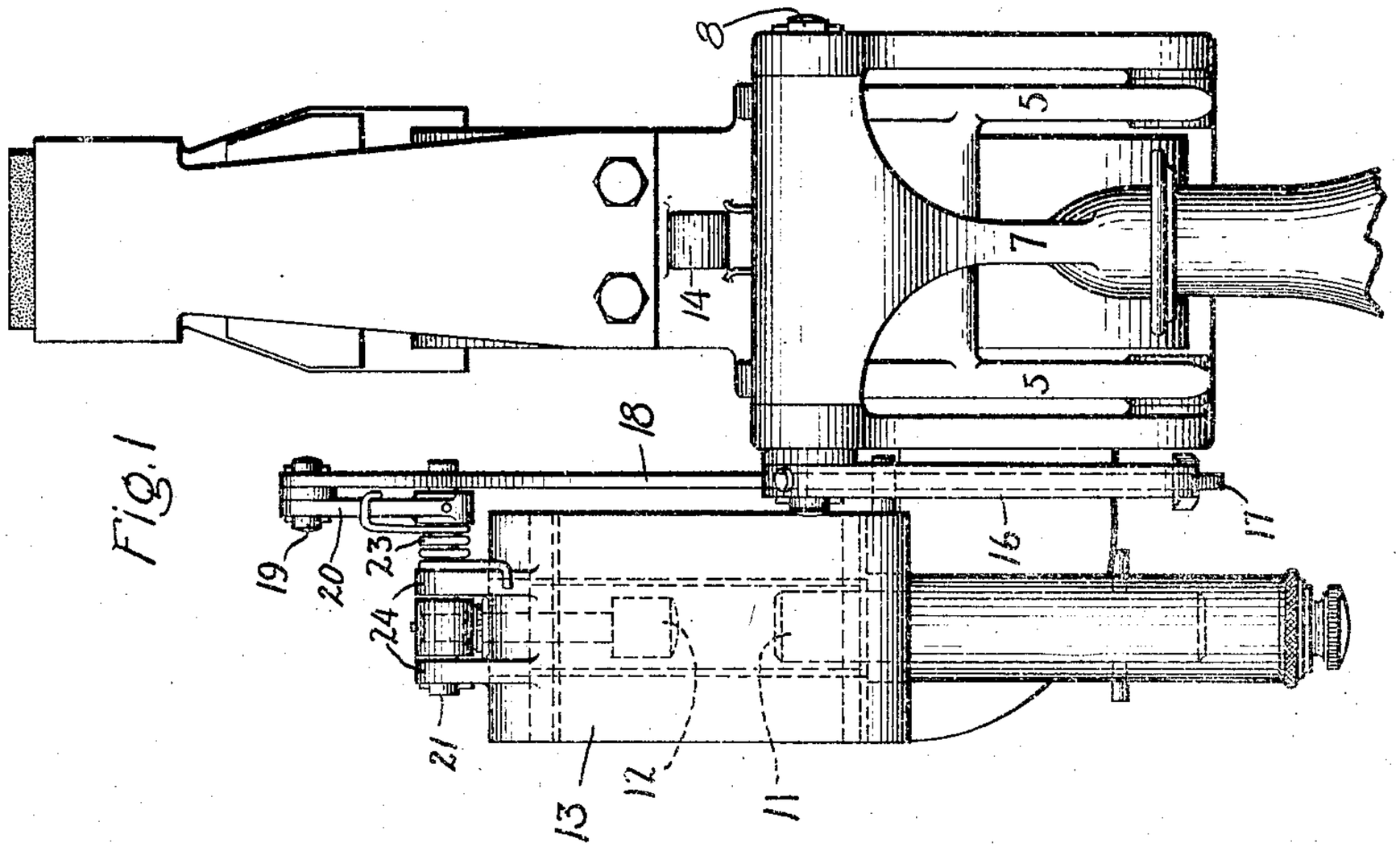
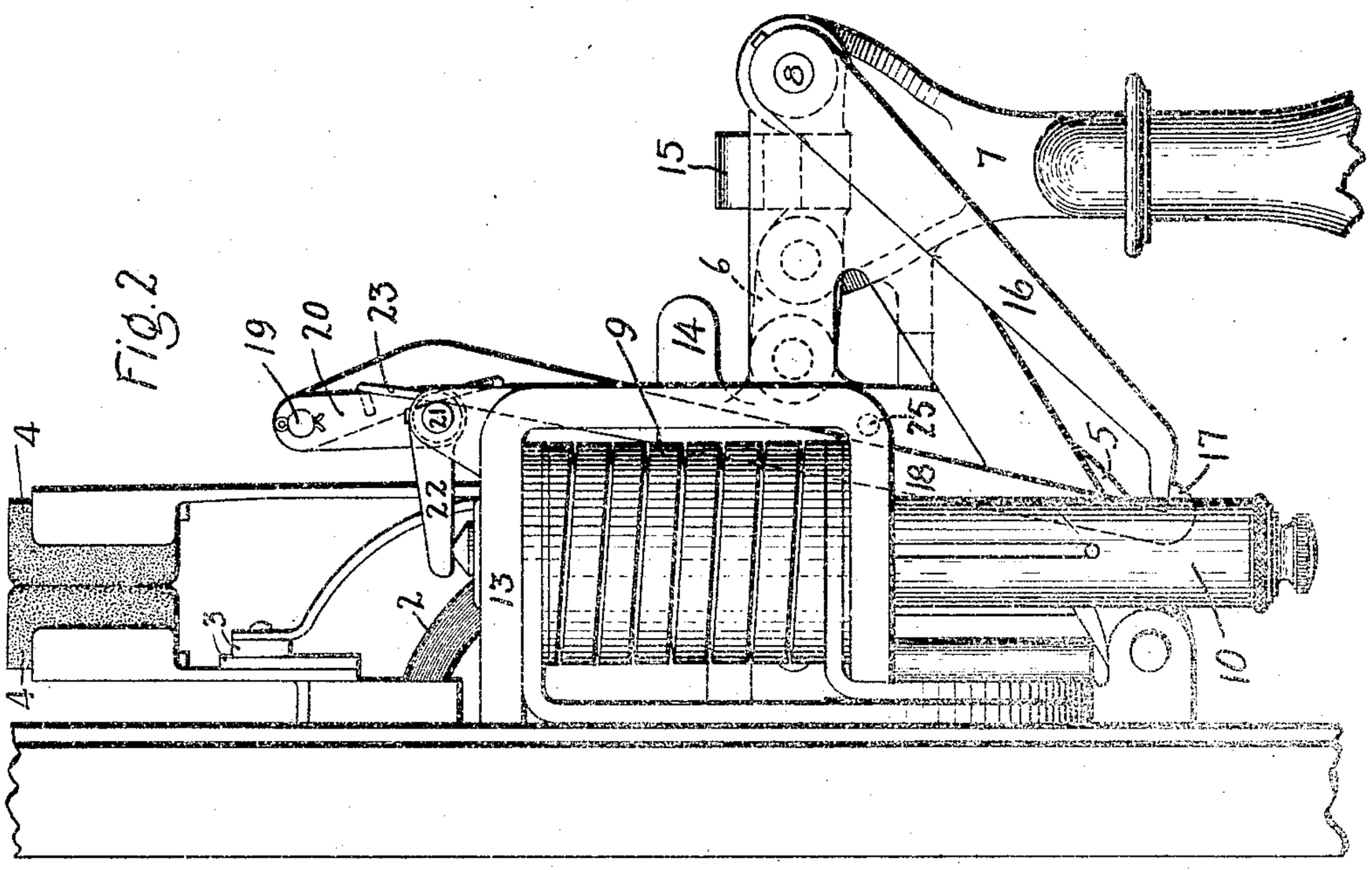


Fig. 2



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LATCH MECHANISM.

No. 897,514. Specification of Letters Patent. Patented Sept. 1, 1908.

Application filed January 23, 1907. Serial No. 353,637.

To all whom it may concern:

Be it known that I, PAUL BEHR, a subject of the Emperor of Germany, residing at Berlin, Germany, have invented certain new and useful Improvements in Latch Mechanism, of which the following is a specification.

This invention relates to a trip or latch mechanism and more particularly to latch mechanisms used in connection with circuit breakers or other pieces of apparatus exposed to shocks or jars or to continued vibration.

The latching mechansim commonly used on circuit breakers consists of a pivoted latch having a hook on one end which engages the locking member and which is held in locking position by the friction between the locking member and the engaging face of the hook, and also by a light spring. These latches are usually arranged to be operated by a solenoid upon the occurrence of an overload and it is necessary that they trip as easily as possible in order to keep the size of the solenoid within commercial limits; hence, the pivoted latch is provided with a light spring and with a form of hook which will release easily. It is found, however, that when a circuit breaker provided with a latch as above described, is subjected to jars or to continued vibration, the pressure between the locking member and the latch varies, owing to the inertia of the parts, and the inertia of the latch moves it away from locking position against the light spring, and the circuit breaker opens.

The object of my invention is to provide a latch so constructed that jars or vibration cannot open it, but will on the contrary cause it to engage the locking member more securely; in which the power for holding the latch in engagement and for throwing the latch out of engagement with the locking member is furnished by the locking member, and in which the only power required to be furnished by the overload coil is that necessary to cause an initial movement of the latch, thereby permitting the use of a smaller solenoid or overload coil than is required with latches heretofore in use.

My invention in its broadest aspect consists of a latch mounted so as to be moved by the locking member when said member moves away from its locked position toward unlocked position, and which coöperates with a supporting or controlling means so constructed that when it bears one relation to the latch the movement of the latch by the locking member will force the latch into firm engagement with the locking member, while if the relation between the controlling means and the latch is slightly altered, the movement of the locking member, carrying the latch in the same direction as before, will force it out of engagement with the locking member and permit the circuit breaker or other similar piece of apparatus to open. If the latch is automatically controlled, an electromagnetic device may be furnished for the purpose of altering the relation between the latch and the controlling means, and the only power to be furnished by the electromagnetic device is the small amount required to change the relation of the latch and the controlling member, the power for actually moving the latch being supplied by the locking member.

More specifically, my invention consists of a latch, a pivoted member or crank having a crank pin for the latch and mounted in such a way that when the latch is in locking position, the crank is slightly over center, but is restrained from going any further over center by some suitable stop engaging the latch between the crank pin and the engaging end of the latch, so that any force tending to move the latch longitudinally and move the crank still more over center, will result in throwing the other end of the latch in the opposite direction and thereby engage still more firmly the locking member with which it coöperates. A trip coil moves the pivoted member or crank in the other direction until it is beyond center, when the locking member moves the latch longitudinally and into engagement with means for throwing the locking end of the latch out of engagement with the locking member.

Other features of the invention will be pointed out more specifically in the specification and the appended claims.

The invention will best be understood by reference to the accompanying drawings in which

Figure 1 is a front view and Fig. 2 is a side view of a well known type of circuit breaker to which one form of my improved latching mechanism has been applied.

My invention may be embodied in many different forms and the form shown in the drawing is simply for the purpose of illustration.

The circuit breaker, which is of a well known type, is mounted on a switchboard 1, and consists of a movable main contact 2, copper shunt contacts 3, and carbon shunt contacts 4; these contacts being mounted upon a rocking arm 5 pivoted to the base of the circuit breaker and actuated by a toggle formed by a link 6 and an operating handle 7, the latter being keyed to a shaft 8 rotatably mounted in the frame of the circuit breaker. An overload coil 9 having a calibrating device 10 and a core 11 which moves upward and engages a tripping pin 12, when the current flowing through the overload coil reaches a predetermined limit, is mounted in a frame 13 secured to the base of the circuit breaker. The rocking arm 5 is provided with a lug or stop 14, which, when the circuit breaker is open, engages a spring buffer 15 mounted upon the operating handle 7.

On the end of the shaft 8 is keyed a locking member or arm 16 which, when the circuit breaker is in the closed position, is engaged by a hook 17, carried by a latch 18. The latch 18 is carried upon a controlling or supporting means which will permit a longitudinal movement of the latch when the locking member 16 moves from its locked position in a direction to open the circuit breaker, and which, as a result of said movement, will force the latch either toward latching position, into firmer engagement with the locking member 16, or away from latching position to release the member 16 and open the breaker, the direction of the movement of the latch depending on the relation between the latch 18 and the controlling means.

In the embodiment of the invention shown in the drawings, the controlling means consists of a pivoted member or crank 20 to which the latch 18 is attached by means of a crank pin 19, and which, in turn, is firmly secured to a shaft 21 carrying an arm 22, preferably at right angles to the crank 20, so that the crank 20 and the arm 22 form, in effect, a bell-crank lever mounted upon the shaft 21; while the crank 20 and the latch 18 form, in effect, a two link tripping toggle which is overset when in the position shown in Figs. 1 and 2.

Spiral spring 23, surrounding the shaft 21, has one end engaging the crank 20 and the other engaging one of the supports 24 in which the shaft 21 is suitably mounted. This spring tends to hold the parts in normal position so that the hook 17 will be in engagement with the locking member 16. Any other form of controlling or supporting means which would give the same results can be substituted for the crank or pivoted member 20. The shaft 21 extends beyond the crank 20, and when the parts are in normal position the shaft is engaged by the latch 18 as shown in Fig. 2 of the drawings, and forms a stop which prevents further movement of the crank pin 19 to the left unless the latch 18 swings about the shaft 21 as a pivot, thereby throwing the hook 17 into firmer engagement with the locking member 16. A stud or pin 25, of such a length, as shown in Fig. 1, that it extends beyond the path followed by the latch 17, is mounted on the frame 13 in such a position that when the latch is in locking position, there is considerable clearance between the surface of the latch and the pin.

The operation of the device is as follows:—When the circuit breaker is closed, the parts are in the position shown in Figs. 1 and 2, and the pin 19 is slightly over center so that the shaft 21 is to the right of a straight line drawn from the hook 17 to the pin 19. As a result of this construction the pressure of the locking member 16 tends to give a longitudinal movement to the latch 18, and also tends to rotate the crank 20 to the left, but this rotation is resisted by the shaft 21 which engages the latch 18 and prevents movement of the upper end of the latch to the left. Any longitudinal movement therefore, will result in throwing the hook 18 to the right and into still firmer engagement with the locking member 16, since the latch 18 will swing about the shaft 21 as a pivot. If the circuit breaker is subjected to jar or vibration, the latch 18 will tend to swing about pin 19 as a pivot, but the only way in which it is free to swing is toward the locking member 16, and this is the direction in which it is urged by any pressure upon the hook 17; hence, all the forces acting upon the latch 18 when in normal position tend to move it toward locking position. If an overload comes upon the circuit the core 11 is attracted and engages and raises the tripping pin 12 which engages the arm 22 and throws the crank 20 to the right. This movement is slight and requires very little power, but it is sufficient to move the crank 20 beyond the dead center so that at the conclusion of this movement the shaft 21 is at the left of a straight line drawn from the hook to the pin, and the pressure of the locking member 16 tends to give a longitudinal movement to the latch 17 and rotate the crank 20 to the right, the only resistance to the rotation being that due to the spiral spring 23, while the only work performed by the overload coil 9 in moving the parts to this position was that required to move the crank 20 from one side of the dead center to the other. The locking member 16 furnishes

the power necessary to move the latch 18 downwards, and as the latch moves downward the crank 20 describing the arc of a circle, throws the upper end of the latch to the right. When the crank has rotated to the right to such a position that the pin 19 is to the right of a line joining the hook 17 and its shaft 21, the surface of the latch 18 is nearly in engagement with the pin 25, and as the latch moves downward and the upper end thereof moves to the right, the latch eventually engages the pin 25 and begins to move about it as a pivot, giving a turning as well as a sliding movement to the latch 18, and since the pin 19 is moving to the right, the entire latch moves about the pin 25 as a pivot and the hook 17 is forced to the left, being quickly disengaged from the locking member 16, whereupon the circuit breaker is free to open. The power for moving the latch longitudinally and throwing the hook 17 out of engagement with the locking member is furnished by the pressure of the locking member 16 on the hook 17.

It is apparent that my invention may be embodied in many different forms and I, therefore, do not wish to be restricted to the specific arrangement shown and described, but intend to cover by the terms of the claims all changes and modifications which are within the scope and spirit of my invention.

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

1. In a tripping mechanism, the combination with a latch for engaging a locking member, of controlling means for causing the strain exerted on the latch by said member to force the latch either toward or away from latching position.

2. In a tripping mechanism, the combination with a latch engaging a locking member and shifted thereby when said member moves from locked position, of controlling means movable relative to said latch and cooperating therewith as said latch is shifted to force it toward latching position when said means is in one position and to force it away from latching position when said means is in another position.

3. In a tripping mechanism, the combination with a latch engaging a locking member and shifted thereby when the said member moves from locked position, of controlling means coöperating with said latch and movable relative thereto, and electromagnetic means for altering the relative position of the latch and the controlling means to cause the shifting of the latch by the locking member to force the latch toward or away from latching position.

4. In a tripping mechanism, the combination with a latch engaging a locking member and shifted thereby when the said member moves from locked position, of pivoted controlling means for said latch movable relative thereto to change the relation of the latch to the pivot of the controlling means, whereby the shifting of the latch by the locking member forces the latch toward or away from locking position.

5. In a tripping mechanism, the combination with a latch engaging a locking member and shifted thereby when the said member moves from locking position, of pivoted controlling means for said latch movable relative thereto to change the relation of the latch to the pivot of the controlling means, whereby the shifting of the latch by the locking member forces the latch toward or away from latching position, and electromagnetic means for changing the relation of said latch to the pivot of the controlling means.

6. In a tripping mechanism, the combination with a latch having a hook engaging a locking member and shifted thereby when said member moves from locking position, of a controlling member pivoted to said latch, a pivot for said member mounted approximately in line between said hook and the point of attachment of the latch to the member and in engagement with the latch when the latch is in latching position, and means for changing the relation of said pivot to the line joining said hook and said point of attachment.

7. In a tripping mechanism, the combination of a latch, a pivoted member coöperating therewith to form a toggle, and means for causing movement of the toggle toward overset position to force the engaging end of the latch toward latching position.

8. In a tripping mechanism, the combination of a latch, a pivoted member coöperating therewith to form a tripping toggle, and means coöperating with said latch to force it toward latching position as said toggle moves toward overset position and towards tripping position as said toggle moves toward underset position.

9. In a tripping mechanism, the combination of a latch, a pivoted member coöperating therewith to form a tripping toggle, said latch being engaged by the pivot of said member and forced toward latching position as said toggle moves toward overset position, and means coöperating with said latch to force it toward tripping position as said toggle moves toward underset position.

10. In a tripping mechanism, the combination of a latch, a pivoted member coöperating therewith to form a tripping toggle, said latch being engaged by the pivot of said member and forced toward latching position as said toggle moves toward overset position, and a pin engaged by the latch as the toggle moves toward underset position to throw said latch toward tripping position.

11. In a tripping mechanism, the combination with a pivoted member forming one link of a toggle, of a latch forming the other link of the toggle and engaging the locking member, a stop on one side of the latch for engaging and forcing it toward latching position as the toggle moves toward overset position and a stop on the other side of the latch for forcing it toward tripping position as the toggle moves toward underset position.

In witness whereof, I have hereunto set my hand this 9th day of January, 1907.

PAUL BEHR.

Witnesses:

JULIUS RUMLAND,

KARL G. RICKEBEN.