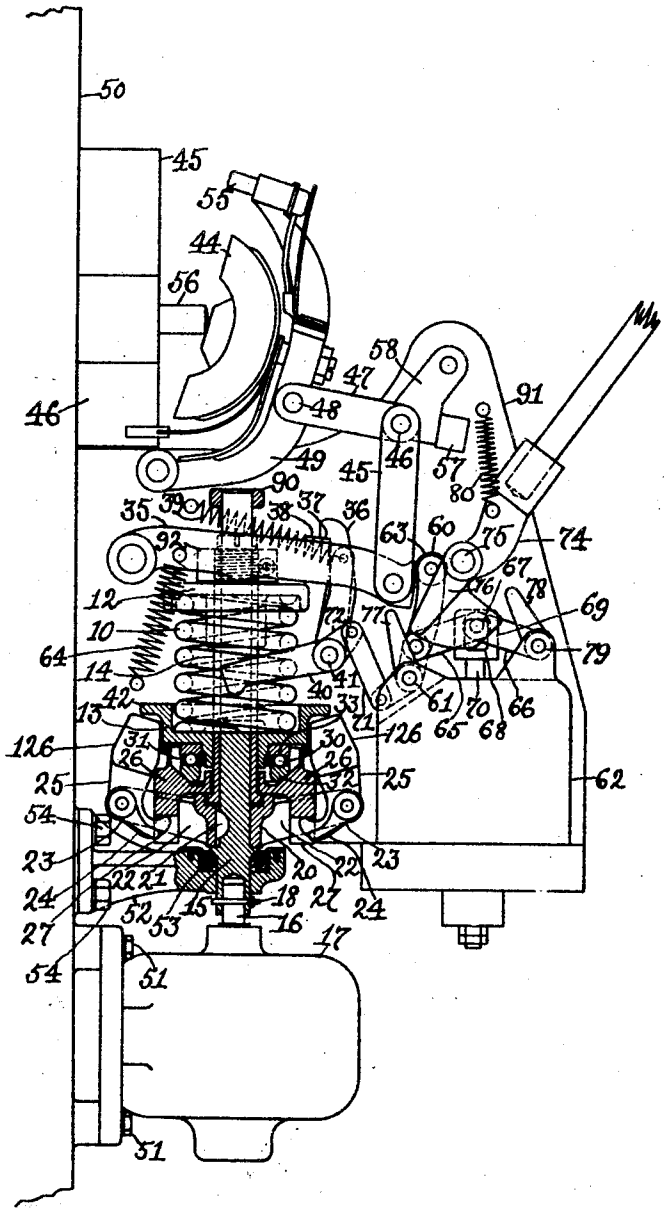
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MOTOR ACTUATED OPERATING MECHANISM

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MOTOR-ACTUATED OPERATING MECHANISM

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This invention relates to an operating mechanism for circuit breakers or other devices in which a spring or other compressible member is employed and is held inactive upon the breaker or other device while said member is being compressed to a predetermined point.

The present invention has for its object to provide a superior operating mechanism of the character described, in that the spring or other compressible member may be compressed to the point desired in a minimum time, so that the circuit breaker or other device may be operated in a minimum time and substantially in an instant.

The invention further has for its object to provide an operating mechanism capable of handling relatively large circuit breakers or other devices in which a relatively small electric motor may be used to effect the compression of the compressible member and especially an alternating current electric motor, and provision is made for starting said alternating current electric motor without load.

These and other features of the invention will be pointed out in the claims at the end of this specification.

The drawing represents an operating mechanism embodying the invention and a circuit breaker operated by it.

In the present instance, the compressible member of the operating mechanism is shown as a coiled spring 10 interposed between a cap member 12 and a seat member 13 mounted to slide on a tubular member 14, through which is extended a rotatable shaft 15 fastened to the armature shaft 16 of an electric motor 17, which may be a direct current motor or an alternating current motor.

The shaft 15 constitutes a detachable extension of the armature shaft 16 being shown as secured to the latter by a pin 17 and will be hereinafter referred to as the armature shaft.

The armature shaft 15 is operatively connected to mechanism interposed between the electric motor and the seat member 13 for the spring 10, whereby compression of the spring may be effected by the electric motor.

In the present instance a preferred construction of intermediate mechanism is illustrated, which consists of a spider-like member having a hub 20 secured to the armature shaft 15 by a key 21 and provided with radially extended arms 22 to whose outer ends are pivoted levers 23, two of which are herein shown, and each of which is provided with arms 24, 25 extended substantially at right angles to each other.

The arms 24 are extended under a disk-like member 26 loosely mounted on the tubular member 14 and normally resting on the hub 20 of the spider. The arms 25 are provided with weights 126 represented as enlarged end portions of said arms. The weighted arms are thrown outwardly by centrifugal action when the spider is rotated with the armature shaft, and the outer ends of the arms 24 are moved upwardly and effect movement of the disk-like member 26 lengthwise of the armature shaft at the same time said member is being rotated with the armature shaft by being engaged with the arms 22 of the spider. The disk-like member 26 is provided with arms 27 which depend from its underside and engage the spider arms 22 to couple the member 26 with the spider so as to rotate therewith, and the arms 27 are made of sufficient length to maintain the member 26 coupled with the spider while said member is being moved lengthwise of the armature shaft.

Movement of the member 26 lengthwise of the armature shaft 15 effects movement of the seat member 13 for the spring 10, through a ball bearing comprising a series of balls 30 carried by a cage or holder 31 and interposed between a bearing member 32 resting on the disk-like member 26 and a bearing member 33 engaging the underside of the seat member.

The seat member 13 when moved lengthwise of the armature shaft as just described compresses the spring 10 against the cap member 12, which at such time is held stationary by a lever 35 which bears upon the cap member.

The lever 35 is normally locked or held against movement of the spring 10 by a lock-

ing lever 36 provided at its upper end with a latch 37 which engages a bar 38 carried by the lever 35.

The locking lever 36 is acted upon by a spring 39 which keeps the latch 37 engaged with the bar 38 until the spring 10 has been compressed a predetermined or desired amount, whereupon the latch is disengaged from the bar 38 by a releasing lever 40 fast to the pivot 41 for the locking lever 36 and having its lower end extended into the path of the seat member to be engaged by a rim 42 on said seat member.

The lever 35 is operatively connected with the device to be operated, which is herein shown as the movable contact member 44 of a circuit breaker but which may be any other device which it is desired to move, as for instance a valve for controlling the flow of fluids.

In the present instance, the spring-actuated device or lever 35 is shown as connected by a link 45 with the center pin 46 of a toggle lever, one member 47 of which is pivotally connected at 48 with a lever 49 carrying the movable contact member 44 which co-operates with fixed contact members 45, 46 secured to a panel or switch board 50 to which the electric motor 17 may be secured by the bolts 51, and to which a bracket 52 carrying the ball bearings 53 for the lower end of the armature shaft 15 is also secured as by bolts 54.

The circuit breaker is of known construction and as shown is provided with an auxiliary movable contact member 55 which co-operates with the fixed contact member 45.

The movable contact member 44 is opened by a spring-pressed plunger 56, and is arrested in its open position by a back-stop 57 with which co-operates the member 58 of the toggle lever.

In the present instance, the movable contact member 44 is locked in its closed position by a lever 60 pivoted at 61 to a solenoid or electromagnet 62 and having its upper end carrying a roller 63 arranged to co-operate with the lever 35 to pass under the free end of the lever and lock it from being returned to its normal or starting position by the spring 64.

The locking lever 60 is moved into its locking and unlocking positions by a toggle lever comprising the members 65, 66 whose center pin 67 is extended into a slot or opening 68 in the head 69 of a core or armature 70 for the solenoid 62. The locking lever 60 is also connected by a link 71 to a crank 72 on the shaft or pivot 41 for the latching lever 36, so that the latter may be manually unlatched by a hand-operated lever 74 pivoted at 75 and having a short front arm 76 arranged to engage a crank 77 on the pivot 61 for the locking lever 60.

The short arm 76 of the hand-operated lever 74 also co-operates with a crank or arm 78 on the pivot 79 for the toggle member 66, so that the toggle lever 65, 66 may be broken to move the locking lever 60 into its unlocking position by the hand lever 74, with the circuit breaker closed.

The handle 74 is normally elevated by a spring 80.

The solenoid 62 is energized by closing the circuit in which it is included in a manner well understood.

The electric motor 17 is preferably an alternating current motor which is included in an alternating current circuit which is also controlled in a manner well understood.

The operation of the motor-actuated operating mechanism may be briefly described as follows:

As represented in the drawing, the circuit breaker is open and the operating device or lever 35 is locked in its inoperative position by the latching lever 36. The spring 10 is uncompressed, and the electric motor 17 is cut out of circuit and idle.

By closing the circuit for the electric motor, the latter is started practically without load, as the motor is only required to rotate the armature 15, the spider 20, 21, and the disk-like member 26.

As the speed of the motor increases, the weighted arms 25 are moved outwardly by centrifugal force and the arms 24 are moved upwardly, thereby moving the disk-like member 26 and the seat member 13 for the spring 10 lengthwise of the armature shaft, thereby compressing said spring member against the cap member 12 until sufficient energy has been stored up in the spring to move the movable member 44 of the circuit breaker into its closed position, and when the spring has been thus compressed, the latching lever 36 is moved by the seat member 13 and disengaged from the operating lever 35, and the latter is then free to be moved by the compressed spring 10 which expands and through the link 45 and toggle 47—58 moves the contact member 44 into engagement with the stationary contact members 45, 46 to close the breaker.

When the circuit breaker is closed, the lever 35 is locked in its operative position by the locking lever 60 which is moved under the end of the lever 35 by the toggle 65, 66 which is straightened by the weight of the armature 70 of the solenoid 62.

When it is desired to open the breaker, the locking lever 60 is moved into its inoperative position shown in the drawing, either by closing the circuit of the solenoid 62 or manually by means of the handle 74.

When the operating lever 35 is locked by the latching lever 36, it may be manually unlocked by means of the handle, as above described.

From the above description it will be ob-

served that an alternating current motor is employed which is started without substantial load and can be quickly brought up to the desired speed, and while being brought up to speed, it effects compression of the spring 10 by means of a centrifugally operated device, with the result that sufficient energy to operate the circuit breaker is stored up in the spring in a few seconds or substantially in an instant, and a very quick acting circuit breaker or other device is obtained, which is especially desirable when circuit breakers of large size are used in alternating current circuits carrying heavy loads. So also, relatively small and inexpensive alternating current motors may be used with breakers of relatively large size.

The armature shaft 15 is supported at its upper or free end by a bearing 90 attached to the framework 91 which supports the movable parts of the circuit breaker, and the sleeve or bushing 14 is threaded at its upper end and engaged by a nut 92 which co-operates with the cap member 12 to initially compress the spring 10 against the seat member 13.

I have herein described the device to be operated by the compressible member or spring as the movable contact member of a circuit breaker, but it is not desired to limit the invention in this respect.

What is claimed is:

1. In apparatus of the character described, in combination, a compressible member, a device operated by said member when compressed a given amount, means independent of said compressible member for locking said device against movement while the compressible member is being compressed, an electric motor, a centrifugal device driven by said electric motor, means movable by said centrifugal device for compressing said compressible member, and means cooperating with said locking means for rendering said compressible member active when it has been compressed to a predetermined amount.

2. In an apparatus of the character described, in combination, a compressible member, means for compressing said member, means independent of said compressible member for rendering said compressible member inactive while it is being compressed, an electric motor for actuating said compressing means, and means cooperating with said independent means for releasing the compressible member to permit it to become active when it has been compressed a predetermined amount.

3. In an apparatus of the character described, in combination, a compressible member, a device operated by it, an electric motor, a rotatable member driven by said electric motor, a centrifugally operated device carried by said rotatable member, a device actuated by said centrifugally operated device and movable axially of said motor for compressing said compressible member, means for restraining positively said compressible member while it is being compressed, and means for releasing said compressible member when it has been compressed a given amount to render it active to operate said device.

4. In an apparatus of the character described, in combination, a circuit breaker provided with a movable contact member, a lever operatively connected with said contact member, a latching device for positively holding said lever against movement with the contact member in its open position, a compressible member co-operating with said lever, centrifugally operated means for compressing said compressible member, an electric motor for operating said centrifugally operated means, and means for unlatching said lever when the compressible member has been compressed a predetermined amount to permit the compressible member to actuate the movable contact member.

5. In an apparatus of the character described, in combination, a compressible member, a device operated by said member when compressed a given amount, means for locking said device against movement while the compressible member is being compressed, an electric motor, a centrifugal device driven by said electric motor, and means movable axially of the said motor by said centrifugal device for compressing said compressible member and for releasing said locking device to permit said compressible member to become active when it has been compressed a predetermined amount.

6. In an apparatus of the character described, in combination, a rotatable shaft, an electric motor for rotating it, a device mounted on said shaft to move axially thereon, a centrifugally operated device actuated by said motor and cooperating with the device mounted on said rotatable shaft to move the said device axially of said rotatable shaft, a spring mounted on said rotatable shaft and having one end cooperating with said axially movable device to be compressed thereby, means cooperating with the other end of the said spring for positively holding it from movement while it is being compressed to a given amount, and means actuated by said axially movable member for releasing said holding means to permit the restrained end of the spring to become active.

7. In an apparatus of the character described, in combination, an electric motor provided with a rotor, a device movable axially with relation to said rotor, a centrifugal device actuated by said rotor and cooperating with said axially movable device to move the latter axially of the rotor, a spring having one end cooperating with said axially movable device to be compressed thereby, and

means cooperating with the other end of said spring for restraining it from movement while said spring is being compressed by said axially movable device and for releasing said other end of the spring when the latter has been compressed a predetermined amount.

In testimony whereof, I have signed my name to this specification.

CHARLES H. REYNOLDS.