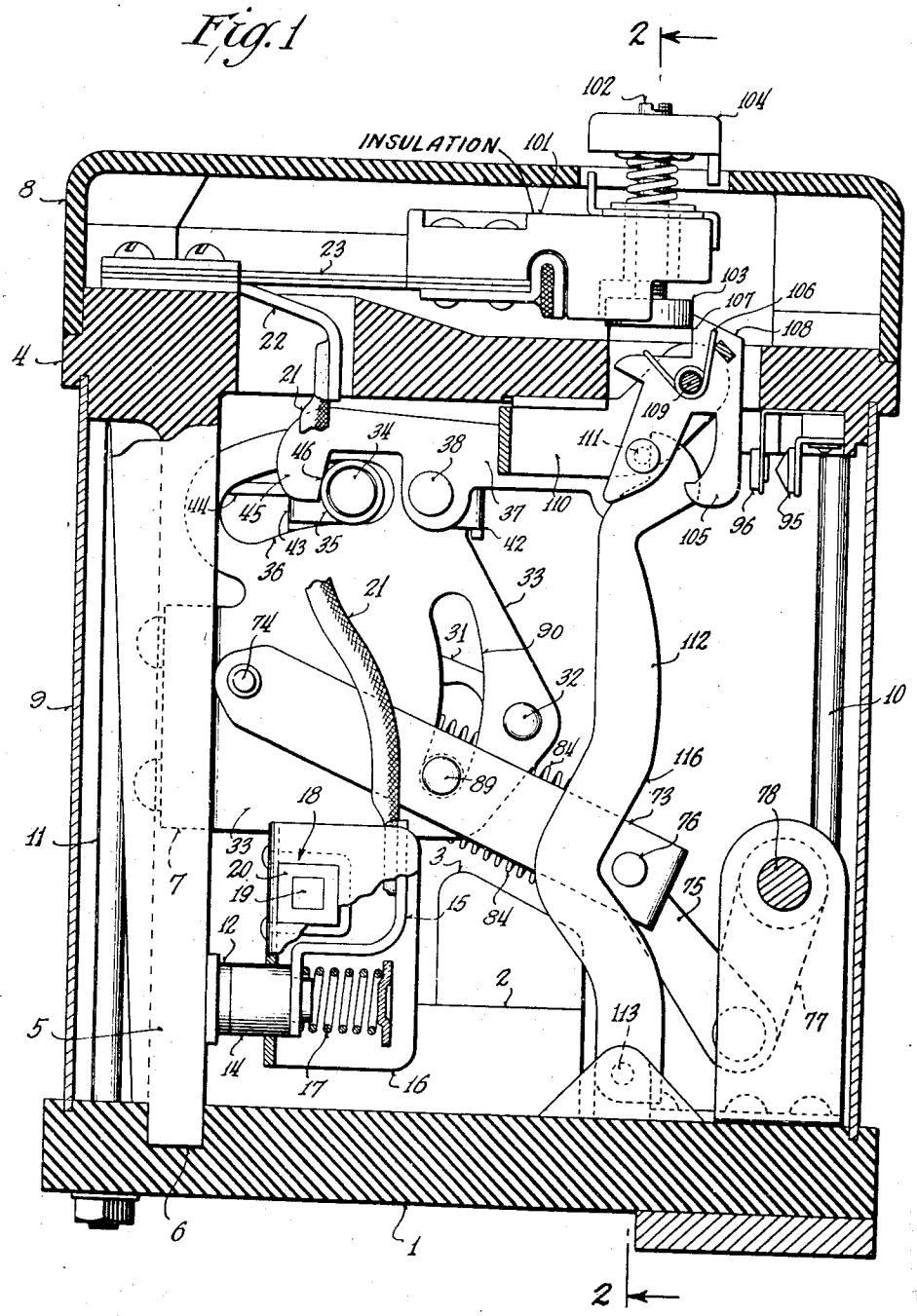
June 1, 1948. E. A. LINK 2,442,464

SWITCH CONSTRUCTION

Filed June 2, 1944

9 Sheets-Sheet 1

Fig. 1



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SWITCH CONSTRUCTION

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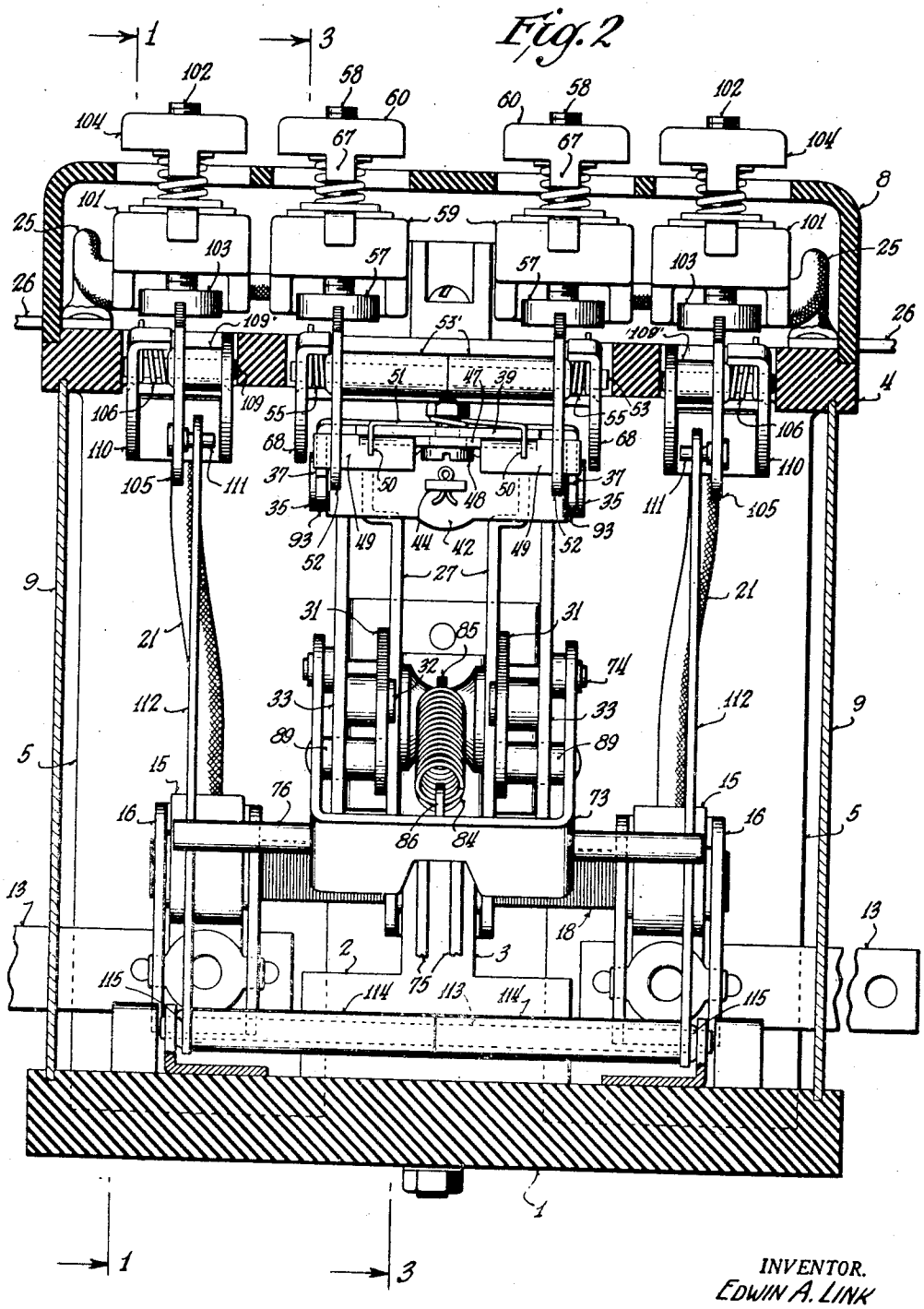
Fig. 2



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SWITCH CONSTRUCTION

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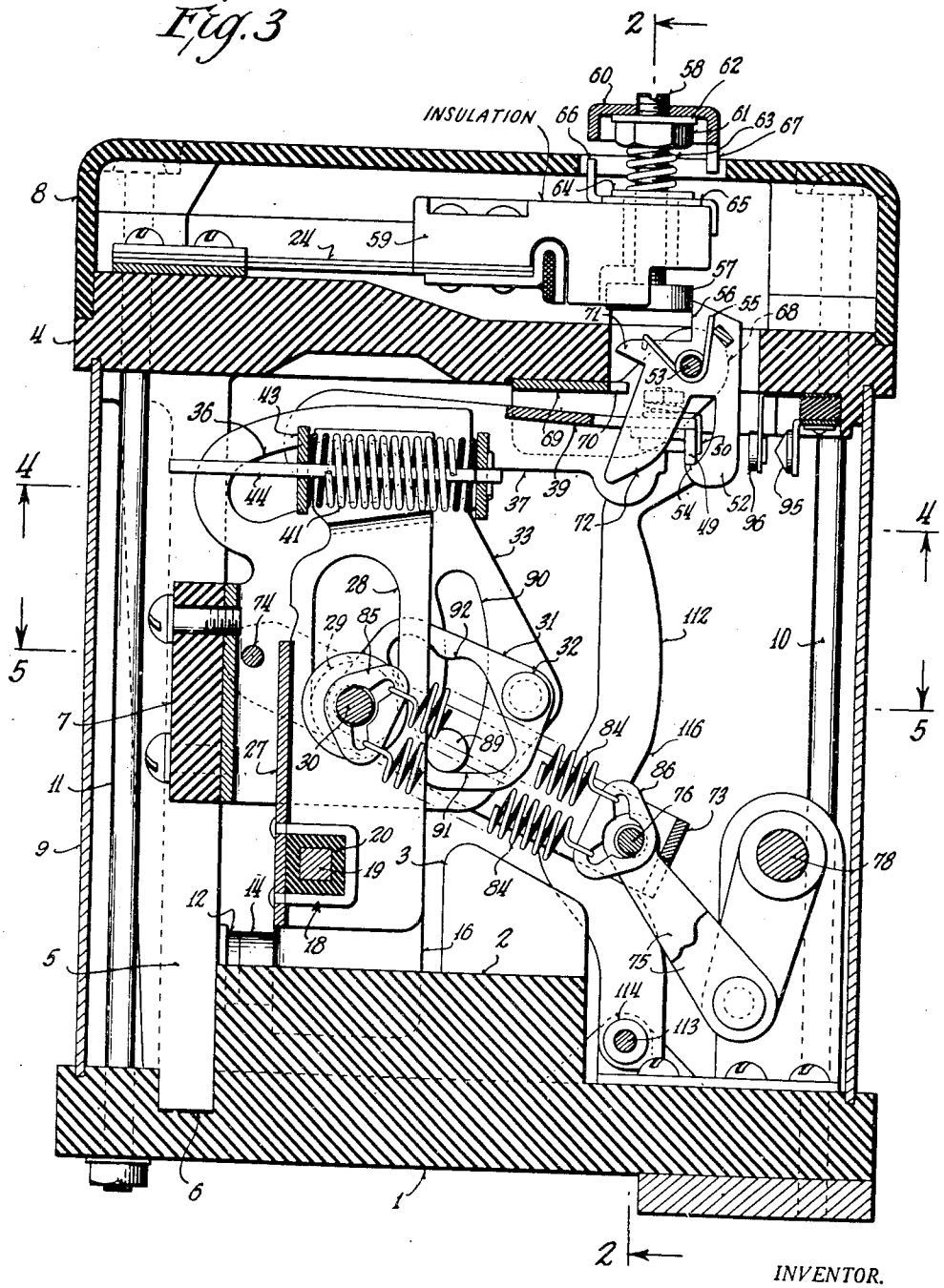
Fig. 3



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SWITCH CONSTRUCTION

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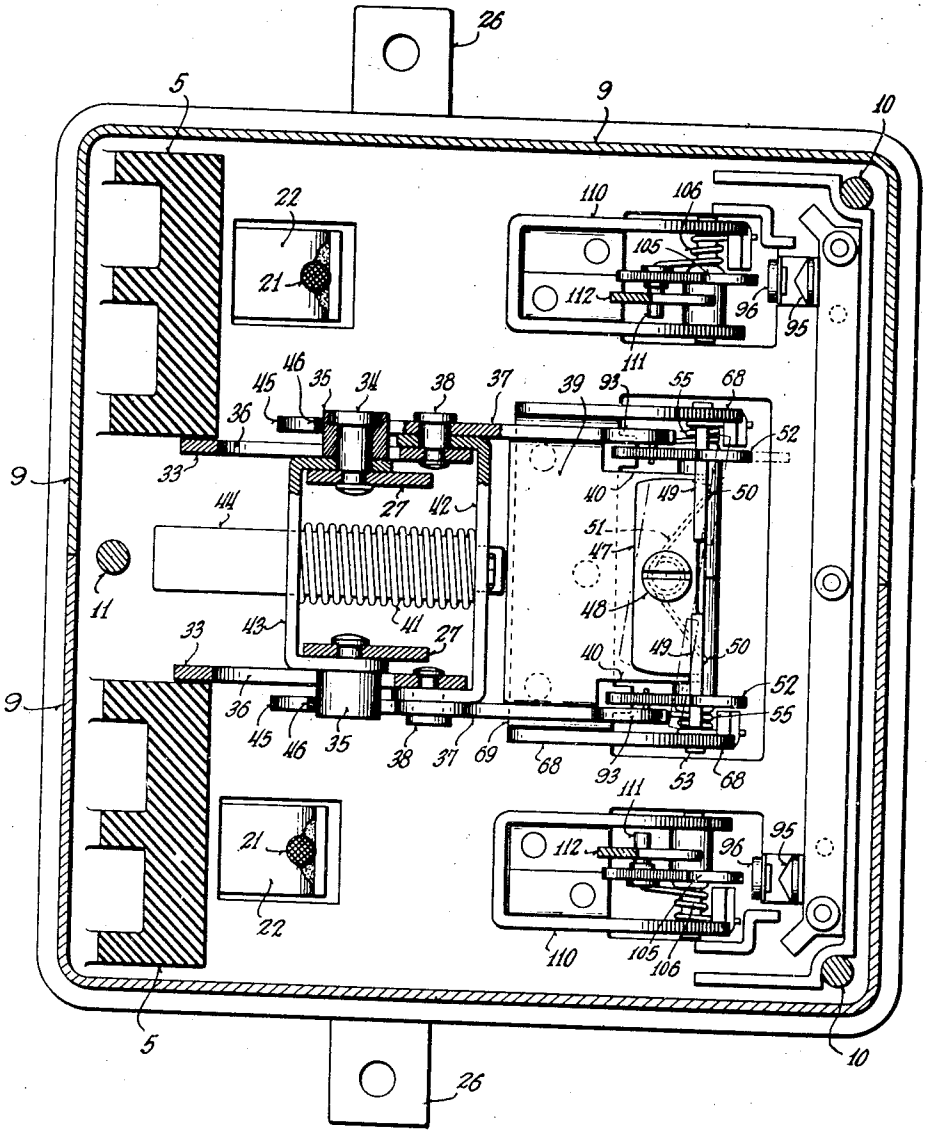

Fig. 4

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SWITCH CONSTRUCTION

Filed June 2, 1944

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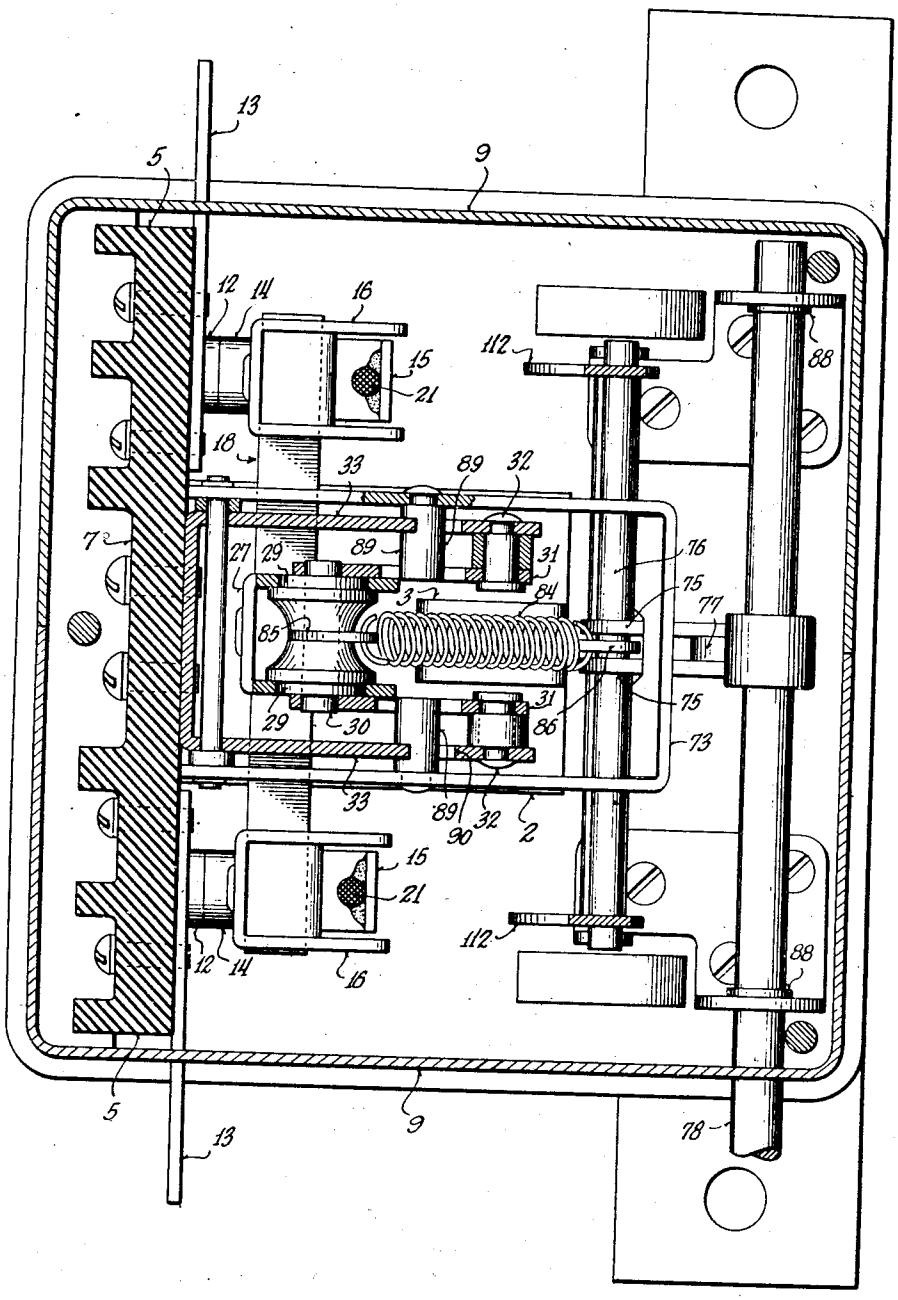

Fig. 5

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SWITCH CONSTRUCTION

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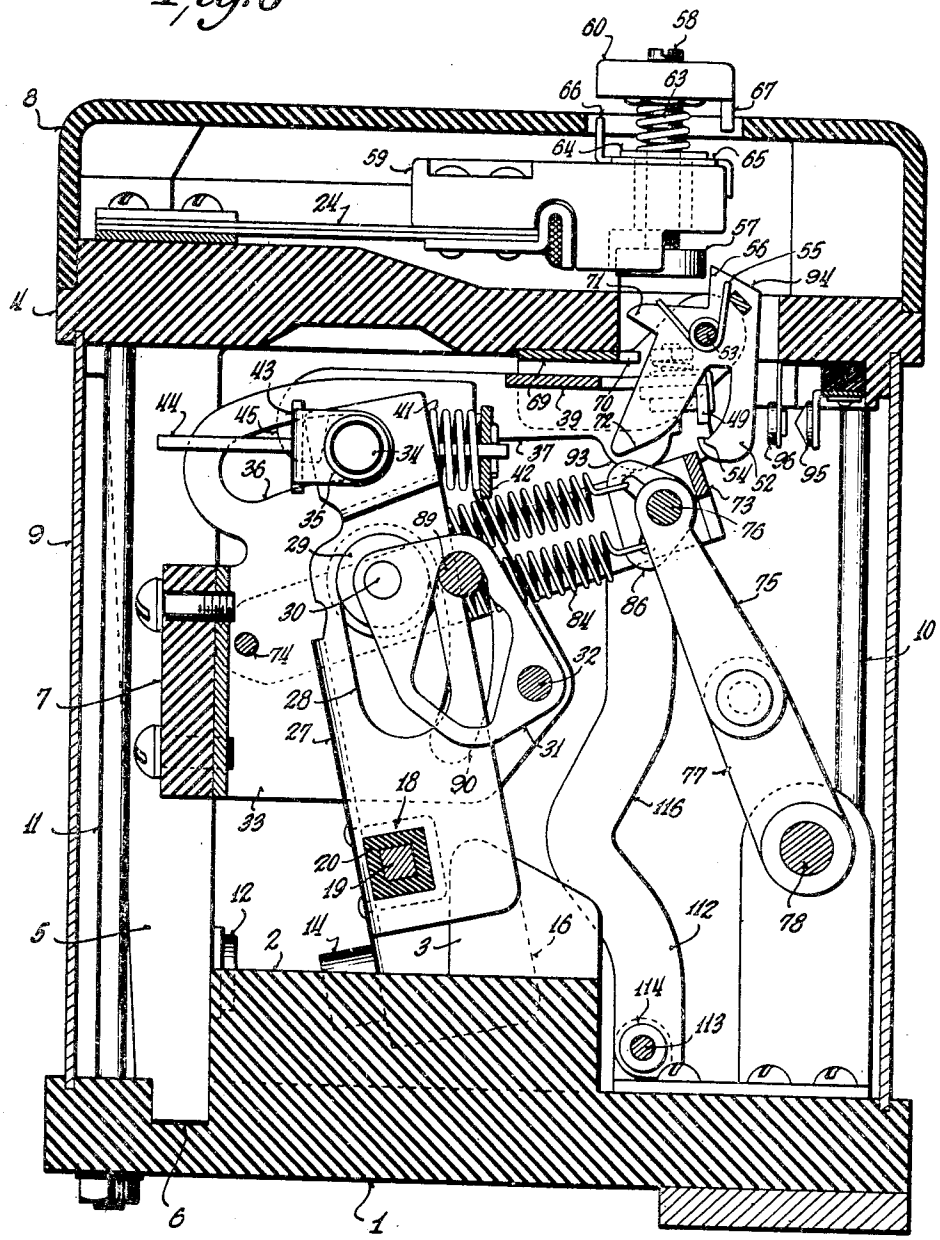
Fig. 6



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SWITCH CONSTRUCTION

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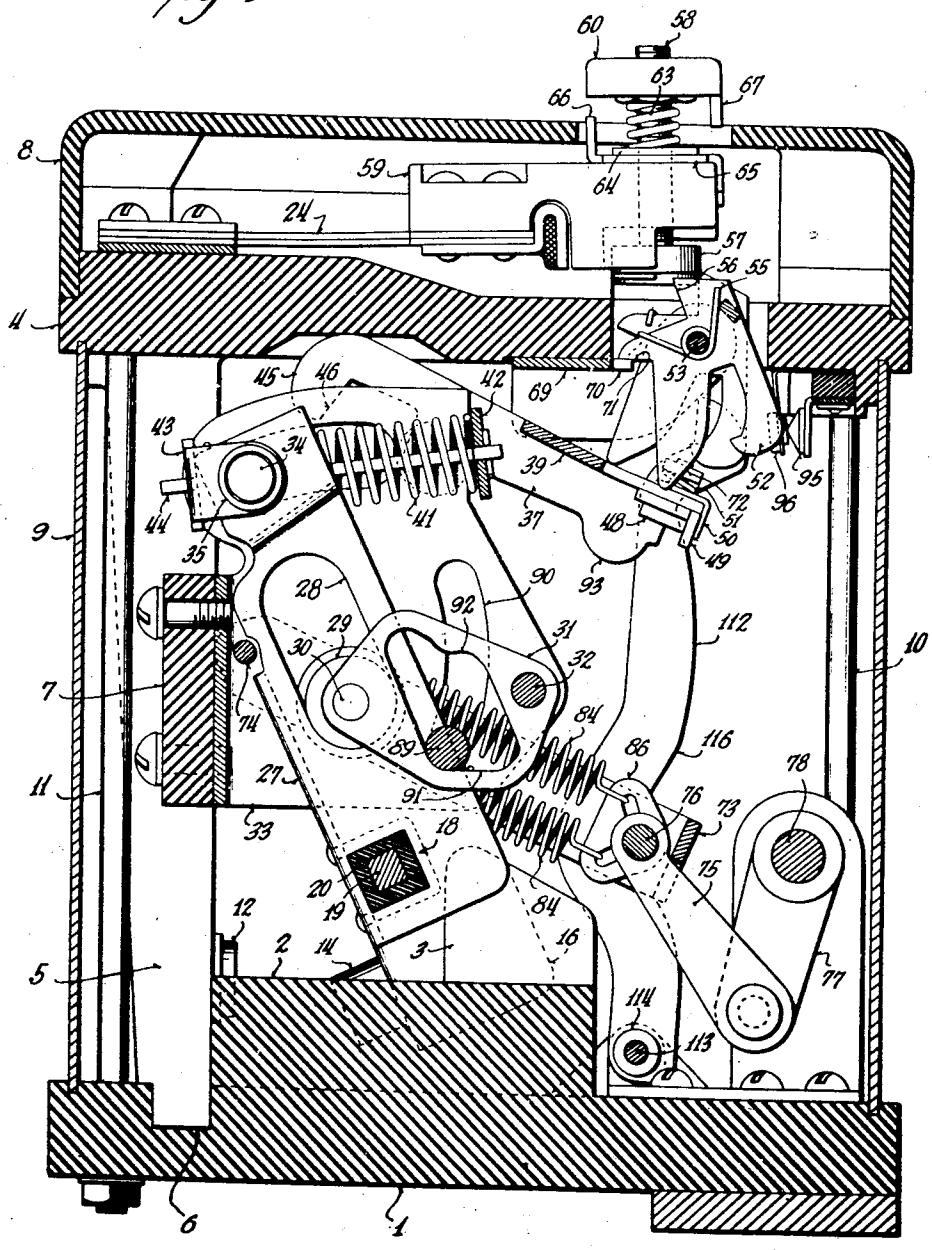
Fig. 7



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SWITCH CONSTRUCTION

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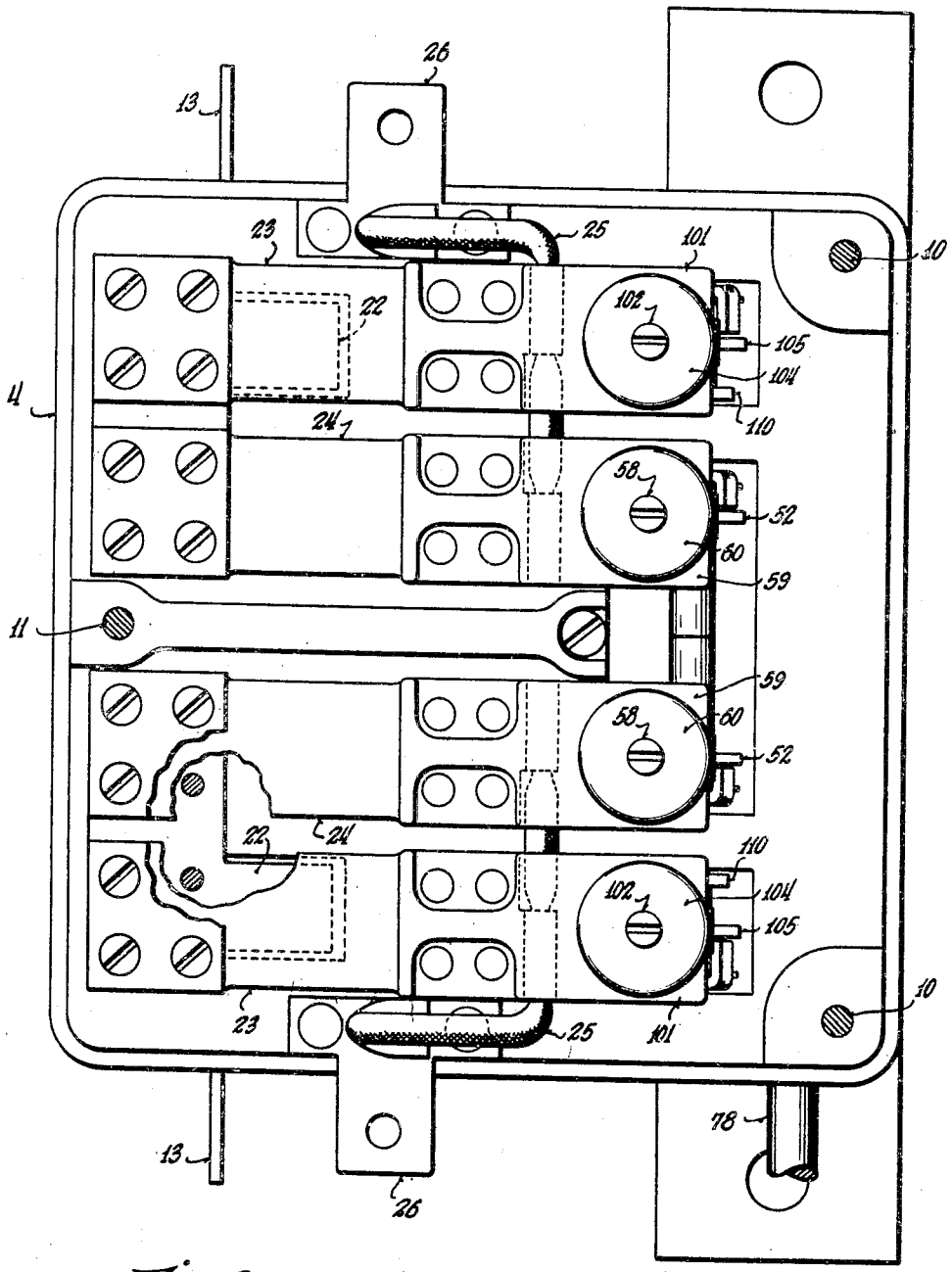

Fig. 8

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Fig. 9

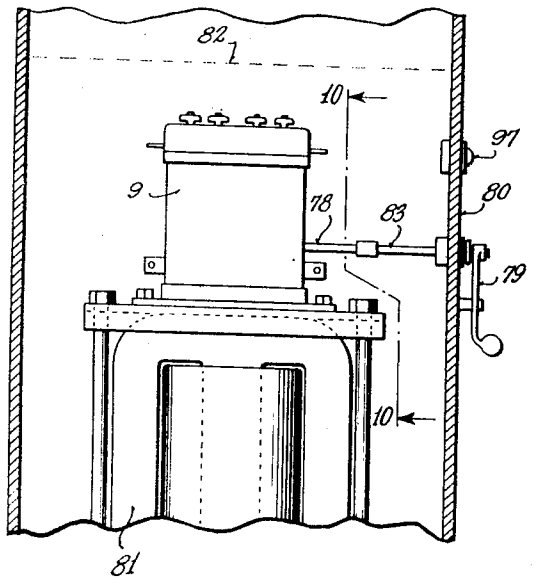


Fig. 10

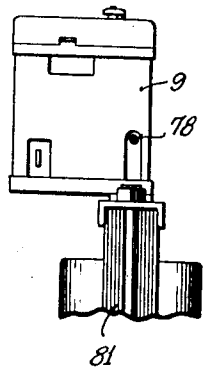


Fig. 11

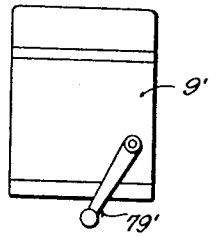
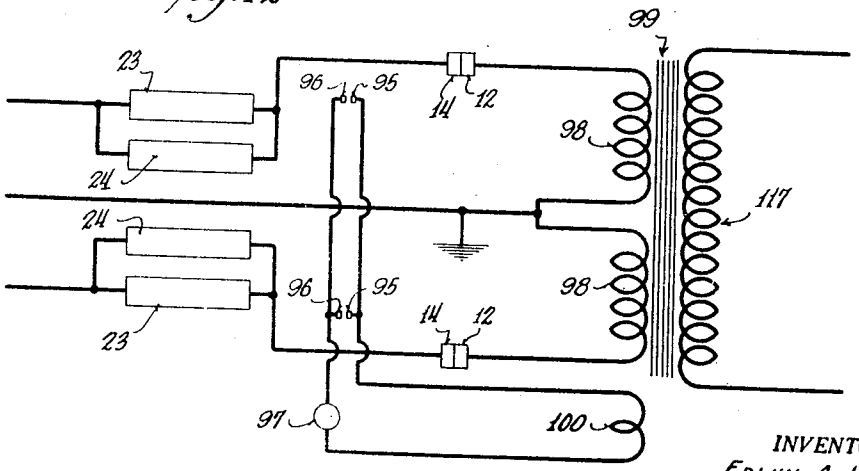


Fig. 12



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Patented June 1, 1948

2,442,464

UNITED STATES PATENT OFFICE

2,442,464

SWITCH CONSTRUCTION

Edwin A. Link, South Milwaukee, Wis., assignor to Line Material Company, Milwaukee, Wis., a corporation of Delaware

Application June 2, 1944, Serial No. 538,365

15 Claims. (Cl. 200—116)

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This invention relates to a switch construction.

In greater detail, this invention relates primarily to a switch construction of the circuit breaker type.

Objects of this invention are to provide a circuit breaker which has a quick make and a quick break, which has condition responsive means of the trip type, which is so constructed that it releases the circuit breaker so that the circuit breaker will open under predetermined conditions, and which is provided with a handle or other operating means for normally opening and closing the circuit breaker and for resetting the trip means, the trip means and the operating means being so related that the trip means will operate to release the circuit breaker irrespective of the position of the operating means and irrespective of any motion that the operating means may be executing at the time the trip means operates so that the trip means is trip free and will operate no matter whether the operating means is forcibly held in closed position or is being moved from one position to another.

Further objects are to provide a circuit breaker which is so constructed that the circuit breaker cannot be closed until the trip means has moved back to normal position, and in which the resetting of the trip means is accomplished by moving the operating means towards open position, such motion being followed by movement to closed position after the resetting of the trip means when it is desired to again close the circuit breaker after the occurrence of the predetermined condition.

Further objects are to provide a circuit breaker construction which may be installed within a transformer casing and may be mounted above or submerged in the oil in the transformer casing, if desired, and which may be arranged so that the thermostatic means responds solely to the heat generated by the current passing through the thermostatic means or to the combined action of the heat of the oil from the transformer as well as the heat due to current passing through the thermostatic means or which may be arranged to respond solely to the heat of the oil.

Further objects are to provide a circuit breaker which has a heavy contact pressure when it is closed, in which this heavy contact pressure is maintained during the operation of the circuit breaker until the instant at which the contacts are suddenly separated, thereby avoiding burning of the contacts under overload conditions.

Further objects are to provide a circuit breaker in which the trip means is required to exert only

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a very small force in order to cause automatic operation, the relation of the parts insuring relatching without any chance of wedging or jamming either the trip mechanism as a whole or any portion of the latch means.

Further objects are to provide a circuit breaker which has switch operating means adapted to selectively pivot about either of two different movable pivots, the pivotal motion occurring about the first pivot due to the motion of the second pivot when the circuit breaker is automatically actuated and occurring about the second pivot when the circuit breaker is manually operated, the second pivot after automatic operation being restored to its initial position when the circuit breaker is manually reset.

Further objects are to provide a circuit breaker which is so made that it has a quick opening and quick closing motion when it is manually or automatically opened or when it is manually closed, respectively, which has spring actuated quick acting means so arranged that the quick acting means is adapted to rock over dead center, when manually operated, and is mechanically assisted in this motion at approximately the instant that it is passing dead center, and which is so constructed that although the spring means may break, nevertheless the circuit breaker may be positively manually opened independently of any spring action, thus providing additional security in the operation of the circuit breaker.

Embodiments of the invention are shown in the accompanying drawings, in which:

Figure 1 is a sectional elevation of the circuit breaker, such view corresponding to a section on the line 1—1 of Figure 2, and showing the circuit breaker in closed position.

Figure 2 is a sectional view on the line 2—2 of Figure 1 and on the line 2—2 of Figure 3.

Figure 3 is a sectional view on the line 3—3 of Figure 2.

Figure 4 is a sectional view on the line 4—4 of Figure 3.

Figure 5 is a sectional view on the line 5—5 of Figure 3.

Figure 6 is a sectional view corresponding to Figure 3 with some of the parts shown in full, such view showing the circuit breaker in manually open position.

Figure 7 is a view corresponding to Figure 3 showing some of the parts in full and showing the circuit breaker in automatically tripped position.

Figure 8 is a top plan view with the cover removed and with parts broken away.

Figure 9 is a fragmentary view showing the circuit breaker mounted in a transformer casing.

Figure 10 is a view taken on the line 10—10 of Figure 9.

Figure 11 shows the circuit breaker positioned in a casing for wall mounting.

Figure 12 is a wiring diagram.

The circuit breaker comprises a base portion 1 formed of insulating material and provided with a raised, centrally located portion 2 which has an upwardly extending, integral projecting part or stop member 3. A top portion 4 is also formed of insulating material and is spaced upwardly from the base portion. The top is provided with a pair of downwardly extending integral leg portions 5 which fit within recesses 6 formed in the base. The legs 5 are joined by an integral transverse web or bar 7. A cover 8 is provided above the top portion 4 and is suitably seated in a flanged marginal portion of the top 4 as shown. A metal casing or housing 9 is positioned between the top and bottom portions and is seated in grooves formed in such portions. The cover, top and bottom portions are held together by means of a pair of front tie rods 10 and a rear tie rod 11.

It will be seen that the construction provides a relatively large housed portion between the base 1 and the top 4 within which substantially all of the operating mechanism is positioned and that the space between the cover 8 and the top 4 provides a housed space within which the thermostatic members or condition responsive means is positioned.

The circuit breaker chosen for illustration is a two pole circuit breaker provided with a pair of stationary contacts 12 which are connected to the line terminals 13. The movable contacts are indicated at 14 and are in the form of plug-shaped members secured to rigid arms 15, see Figure 1. The movable contacts are each carried by a channel-shaped metal member 16 and are freely slidable through the rear wall of such member. Each movable contact 14 is urged outwardly by a spring 17. The metal channel-shaped members 16 loosely house the rigid arms 15. The metal channel members 16 are rigidly secured to a rock shaft indicated generally at 18. This rock shaft, as shown most clearly in Figure 3, is provided with a rectangular metal center member 19 which is encased in a rectangular insulating sheath 20. The rigid arms 15 are connected to flexible leads or conductors 21 which extend upwardly on opposite sides of the device and are connected to connecting portions 22 in turn electrically connected to the right and left-hand pair of thermostatic members, as may be seen from Figures 1 and 8.

Each pair of thermostatic means comprises an outer thermostatic member 23 adapted to control a light switch and an inner thermostatic member 24 adapted to control the circuit breaker. These thermostatic members are bimetal members and will be described in greater detail hereinafter. The thermostatic members 23 and 24 are individually anchored at their rear ends and adjacent their free ends are electrically joined by means of flexible connectors 25 to the load terminals 26, see Figure 8. This permits independent mechanical motion of the thermostatic members 23 and 24 although such members are electrically connected. The purpose of this will appear hereinafter.

Switch operating means in the form of a channel-shaped metal member 27 is rigidly secured to the shaft 18, as shown in Figures 3, 6 and 7. The switch operating means 27 is provided with

elongated, longitudinally extending slots 28 in its side walls within which flanged rollers 29 are adapted to travel. The rollers 29 are carried by a transverse shaft 30. The shaft 30 is carried by an actuator formed of a pair of members 31 which are pivoted as indicated at 32 to a rigid channel-shaped frame 33. The frame 33 is carried by the transverse web 7. The rollers 29 and the shaft 30 constitute the first pivot means and are adapted to rock the switch to open and closed position when the actuator is rocked about the pivot pins 32 in a manner hereinafter to appear.

The upper end of the switch operating means 27 has spaced arms which are provided with a second pivot means which consists of shafts 34 upon which rollers 35 are mounted, see Figures 1, 4 and 7. The rollers 35 are adapted to travel in arcuate slots 36 formed in the rigid frame 33 and the shaft and rollers constitute the second pivot means for the switch operating member 27. Normally the second pivot means is held locked in its outermost position, that is to say, adjacent the right-hand end of the slot 36 as viewed in Figure 1, by means of the main latch lever 37. This latch lever is provided with a pair of arms located on opposite sides of the rigid frame 33 and pivoted as indicated at 38 to such frame. The arms are joined by means of a transverse web 39 provided with cut out portions 40, see Figure 4.

Biasing means are provided which bias the second pivot means 34, 35 to the left as viewed in Figures 4 and 7. This biasing means consists of a compression spring 41 which bears at opposite ends against U-shaped bail like members 42 and 43. The bail like member 42 is loosely pivoted on the pins 38 and the bail like member 43 is loosely pivoted on the pins 34. A flat bar 44 extends loosely through the spring 41 and through the bail member 43 and is secured to the bail member 42. However, as stated the second pivot means 34, 35 is prevented from moving to the left under normal conditions by means of the latch lever 37. Each of the arms of the latch lever is provided with a downwardly projecting portion 45, see Figure 1, which is provided with a face 46 which has a slight slant, as may be seen from Figure 1 so that it acts like a cam and tends to bias the latch lever 37 towards clockwise or unlatching motion. It is also to be noted that the latch lever, due to the fact that its right-hand portion is heavier than its left-hand portion, is also biased towards clockwise motion by means of gravity.

The latch lever is normally prevented from moving to releasing position by means of a latch bar 47 pivoted intermediate its ends by means of the headed screw member 48 to the web 39 of the latch lever, as shown most clearly in Figure 2. The latch bar 47 is provided with a pair of outwardly projecting end portions 49 which are engaged by downwardly projecting fingers 50 of a spring 51 loosely coiled about the member 48.

The parts are so arranged, as may be seen from Figures 2, 3 and 4, that the fingers 50 bear against the front face of the web 39 of the main latch lever and thus normally hold the latch bar 47 in a definite predetermined position transversely of the main latch lever 37. Auxiliary latch members 52 are loosely mounted on a pivot pin 53 and are preferably rigid with sleeves 53', see Figure 2, to provide adequate bearing surface on the pin. The auxiliary latch members 52 are provided with flat faces 54 which normally engage beneath the projecting portions 49 of the latch

bar, see Figure 3. These auxiliary latches or latch members 52 are urged in a counterclockwise direction by means of springs 55. They are normally prevented from rotation by means of shouldered portions 56 formed thereon and respectively engaging circular pads or members 57 rigid with threaded stems 58, which stems are threaded through insulating blocks 59 rigidly carried by the outer or free ends of the inner thermostatic members 24. Adjusting knobs 60 are carried by each of the threaded stems 58 but are not threaded thereon. Nuts 61 and washers 62 are also carried by the threaded stems 58 and springs 63 bear against the nuts and against washers 64 which in turn rest upon fittings 65 carried by the insulating blocks 59, see Figure 3. The fittings 65 are each provided with an upturned finger 66 which is adapted to be engaged by the upturned finger 67 to thereby limit the extent of rotation of the adjusting knob 60.

It is to be noted that bimetal thermostatic members vary due to differences in material and in the process followed in their manufacture. Wide variations are taken care of by properly adjusting the threaded stems 58, it being noted that the upper end of the stems are slotted to receive a screw driver. After proper adjustment has been obtained, the knobs 60 are soldered or otherwise secured to the threaded shanks 58. Thereafter a certain range of adjustment is permitted as the knobs 60 may be rotated approximately a full revolution. In other words, the range through which the thermostatic members are to work is determined by the rough adjustment of the stems 58 in the insulating members 59 by means of a screw driver, as previously described, and within this range the exact adjustment at which the thermostatic members are adapted to release the trip means is determined by the adjustment of the knobs 60.

The pin 53 may be carried by upturned arms 68 integral with a plate 69 secured to the top portion 4. The plate 69 is provided with projecting fingers 70 which are adapted to be engaged by the extensions 71 of the auxiliary latches 52 to thus limit their counterclockwise motion.

It is to be noted that each of the auxiliary latches 52 is provided with a cam like extension or finger 72. The purpose of these fingers 72 will be apparent when the operation of one of the thermostatic members 24 is considered. Suppose, for example, that one of the thermostatic members 24 operates and releases its auxiliary latch 52. This latch will execute a counterclockwise motion and in so doing the fingers 72 will strike the corresponding finger 49 of the latch bar and will rock the latch bar and cause disengagement of the other end of the latch bar from the other auxiliary latch 52, thus releasing the main latch lever 37. If both thermostatic members 24 release their auxiliary latches 52 simultaneously, it will be seen that both auxiliary latches move away from the transversely extending latch bar and disengage the respective ends 49 thereof and allow the main latch lever 37 to move to releasing position.

The automatic release on overload is apparent from the above described structure. For example, when one or both of the thermostatic members or condition responsive members 24 releases its corresponding auxiliary latch lever 52, the main latch lever 37 will rock in a clockwise direction due to the fact that it is biased by gravity towards this motion as its right-hand end is considerably longer than its left-hand end. However, it is

more heavily biased towards this releasing motion due to the fact that the latching face 46, see Figure 1, is in reality a cam face and the pressure of the second pivot means 34, 35 against such face tends to cause clockwise or releasing rocking motion of the main latch lever 37. When the main latch lever 37 releases the second pivot means 34, 35, the switch operating means 27 pivots about the first pivot means 29, 30 as it is biased towards counterclockwise motion by means of the spring 41 and the switch operating means and movable contacts 14 move from the position shown in Figures 1 and 3 to the position shown in Figure 7.

Main operating means are provided for operating the switch and for resetting the automatic tripping means. This main operating means comprises a U-shaped, bail like member 73 which is pivoted as indicated at 74 on opposite sides of the stationary frame 33. The main operating member 73 may be rocked from the position shown in Figures 1 and 3 to that shown in Figure 6 in any suitable manner, as by means of connecting links 75 pivotally connected by means of a transverse pin 76 with the main operating means 73 at their outer ends and at their inner ends pivoted to a crank 77 rigidly mounted on a transverse rock shaft 78 carried in suitable supports and extending laterally through one side of the housing 3 as shown in Figure 5.

The rock shaft 78 may be operated in any suitable manner as by means of a handle 79 located externally of a transformer casing 80, the circuit breaker being preferably carried by the transformer indicated generally by the reference character 81 and mounted below the level 82 of the oil within the casing, see Figure 9. Obviously the rock shaft 78 could be operated in any other manner desired, as by means of cranks and link mechanism from a rock shaft mounted above the oil level if desired. If the outwardly projecting extension 83 of the rock shaft is below the oil level 82, a suitable packing is provided to prevent loss of oil.

The main operating means 73 is connected by means of a pair of springs 84 with the first pivot means 29, 30. Preferably fittings 85 and 86 are provided for the outer ends of the springs 84. These fittings are seated within grooves formed in the pins or shafts 76 and 30, see Figure 3. The fitting 85 is mounted between the flanged rollers 29. It is also preferable to provide collars 88 on the shaft 78 to prevent shifting of such main operating shaft.

The main operating member 73 is provided with pins 89 which project inwardly from opposite sides and which are adapted to operate within slots 90 formed in opposite sides of the frame 33. These pins project into cut out portions 91 in the actuator formed of the members 31. It is to be noted that the cut out portions 91 in the actuators 31 are so shaped that shoulders 92 are provided, see Figure 3. The purpose of these shoulders will appear from the following description of the manual operation of the apparatus.

Assume that the circuit breaker is in closed position and it is desired to manually open it. This is accomplished by rocking the rock shaft 78 and thereby moving the main operating means 73 from the position shown in Figures 1 and 3 to the position shown in Figure 6. During this rocking motion the line of pull of the springs 84 will pass across the pivot means 32 of the actuator composed of the members 31 and will cause the actuator to suddenly rock in a clock-

wise direction to the position shown in Figure 6, thereby suddenly opening the circuit breaker. Obviously closing motion is accomplished by moving the main operating means from the position shown in Figure 6 to the position shown in Figure 3, the closing motion of the circuit breaker being very quick in view of the fact that the line of pull of the springs again crosses the pivot 32 of the actuator in passing from the position shown in Figure 6 to that shown in Figure 3. The shoulders 92 on the members 31 constituting the actuator, see Figure 3, have a double function. One of the functions is to start motion of the actuator at approximately the instant that the line of pull of the springs 84 is crossing the pivot point of the actuator when the main operating means 73 is being moved from the position shown in Figure 3 to that shown in Figure 6. The other purpose of the shoulders 92 is to insure opening of the circuit breaker by positive engagement between the pins 89 and the shoulders 92 even though the springs 84 should break, thus providing this additional safety feature.

The resetting after automatic tripping is accomplished by moving the main operating means 73 from the position shown in Figure 7 to the position shown in Figure 6. Prior to the time that the main operating means 73 arrives at the position shown in Figure 6, it will be noted that the line of pull of the springs 84 passes across the pivot point of the actuator and consequently pulls the upper end of the switch operating means 27 to the right as viewed in Figure 6, thus compressing the spring 41 as the springs 84 exert a greater force than the spring 41. It is to be noted that the projecting portion 3 which extends upwardly from the base 1 is engaged by the transverse insulated shaft 18 of the switch operating means 27 during this resetting operation and consequently the switch operating means 27 pivots about the point of engagement between the shaft 18 and the projection 3. As the main operating means 73 continues upwardly to the position shown in Figure 6, it will engage the downwardly projecting portions 93 of the main latch lever 37 and will rock such main latch lever to the position shown in Figure 6, the second pivot means 34, 35 having been first positioned to the right of the hook-shaped left-hand end of the main latching lever 37.

It is to be noted also that the auxiliary latches 52 are also reset. If both of the auxiliary latch levers 52 have been released by simultaneous action of the thermostatic members 24, it will be noted that the latch bar 47 will move upwardly and will simultaneously engage the cam portions 72 of each of the auxiliary latch levers 52 and will rock such latch levers to the position shown in Figure 6. During this motion, assuming that the thermostatic members 24 have cooled, the cam like portion 94 of the auxiliary levers will ride beneath the stops or pads 57 and will slightly raise the pads until the latching faces 56 of the auxiliary latch levers 52 are to the right as viewed in Figure 6 of the members 57. Thereafter when the main operating means 73 is moved downwardly towards closed position from the position shown in Figure 6, the transverse latch bar will rest upon the flat portions or hook portions 54 of the auxiliary latch levers 52.

If only one of the thermostatic members 24 had operated, its auxiliary latch lever 52 would be released but the other latch lever would still be held by its thermostatic member 24. Under these conditions when the main latch lever 37 is rocked from the position shown in Figure 7 to that shown in Figure 6 during resetting, the appropriate end 49 of the latch bar will first engage the cam portion 72 of the released auxiliary latch lever 52 and its opposite end 49 will be rocked inwardly and will thus clear the hook portion of the unreleased auxiliary latch member 52. Continued upward motion of the latch lever 37 will cause the latch bar 47 to reset the released auxiliary latch lever 52 as the cam portion 72 of the unreleased auxiliary latch lever 52 will rock the latch bar 47 by engaging one end 49 thereof and cause the other end 49 to rock inwardly and reset the released auxiliary latch lever 52.

A pair of signal switch members are provided and are connected together. Each signal switch member comprises a stationary contact member 95 and a movable contact member 96 normally spring urged towards open position as shown in Figure 1. These signal switches are connected in parallel as is obvious and in series with a signal lamp or other signal means indicated by the reference character 97 in Figures 9 and 12. This signal lamp may be supplied from either secondary winding 98 of the transformer 99, see Figure 12, or may be, in the preferred form, supplied from a separate secondary 100 of the transformer 99. The signal switch means are controlled by the outer thermostatic members 23, see Figures 1 and 8. These thermostatic members are provided with insulating blocks 101 at their free ends through which threaded stems 102 pass. These stems are provided with pads or stop members 103 and with adjusting knobs 104 of identically the same construction as those previously described and initially set and subsequently accurately adjusted in exactly the same manner as that previously described.

The independence of the adjustment of the members 60 and 104 and such other associated parts relating thereto form the subject matter of the copending application of Alwin G. Steinmayer for Switch constructions, Serial No. 536,335, filed May 19, 1944.

Each thermostatic member 23 controls a signal switch operating means 105 which is mounted opposite the movable contact 96 of the signal switch and which is urged by means of a spring 106 in a counterclockwise direction towards signal switch closing motion. It is normally restrained by the engagement of the shoulder 107 of the signal switch operating means 105 with the stop or pad 103 of the thermostatic member. When the thermostatic member releases the signal switch operating means 105, such signal switch operating means closes its signal switch. The signal switch operating means 105 is provided with a cam face 108 so that the cam face will ride beneath and raise the pad or stop 103 when the signal switch operating means 105 is reset.

Each signal switch operating means 105 is pivotally mounted upon a fixedly positioned pin 109 carried by the stationary arms of a bracket 110 secured to the top 4. Preferably sleeves 109' have their ends riveted to the members 105 to provide extensive bearing surfaces on the pins 109. The signal switch operating means 105 are provided with projecting pins 111 which are adapted to be engaged by the upper ends of resetting levers 112 pivotally supported on the shaft 113 which in turn is supported from the base 1, see Figures 1 and 2. Preferably tubular members or sleeves 114 are riveted as indicated at 115 to the resetting levers 112 so as to provide the re-

setting levers with elongated bearings which are supported by the shaft 113.

The levers 112 are provided with cam portions 116 adapted to be engaged by the transverse pin 76 of the main operating means 73 when such main operating means is rocked upwardly. The cam portions 116 of the resetting levers 112 are so positioned that resetting takes place when the main operating means 73 is moved towards switch open position but prior to the opening of the circuit breaker so that it is possible, if it becomes desirable, to open the signal switch means by resetting the signal switch operating means without opening the circuit breaker.

The adjustment of the threaded stems 50 and 102, see Figures 1 and 3, which are supported from the thermostatic members 24 and 23 respectively, is such that any desired spread between current values required to operate the respective thermostatic members may be obtained so that the signal switch means will be closed for a current value and time interval less than that for which the circuit breaker will be opened.

The circuit breaker may be adapted for wall mounting as indicated in Figure 11 and may be completely housed as indicated at 9' and may be provided with an external lever or arm 79' for operating such circuit breaker. The signal lamp or other signal means, not shown in Figure 11, may be mounted either on the casing of the circuit breaker or at any desired point.

Referring to the wiring diagram of Figure 12, it will be seen that the primary of the transformer is indicated by the reference character 117 and that the secondary has a grounded neutral in the particular form chosen for illustration. It is obvious that either a single pole circuit breaker could be used where a single secondary is employed or a two pole circuit breaker could be used for the three wire grounded neutral system shown in Figure 12, or any number of poles could be provided by suitably extending the shaft 18, see Figure 1, and providing it with the necessary number of movable contacts 14 and providing a corresponding number of stationary contacts 12.

It will be seen that a circuit breaker has been provided which has a quick closing motion when it is manually closed and which has a quick opening motion when it is either manually or automatically opened. It will be seen that the circuit breaker has heavy contact pressure though it may be easily operated either automatically or manually.

It will be seen further that relatively simple means are provided for automatically releasing the circuit breaker on overload and that the manual means is so arranged in collaboration with the automatic release means so as to reset the release means after automatic release when the manual means is moved towards switch open position without danger of jamming any of the parts.

It will be seen further that the switch operating means is so arranged that it is adapted to pivot about either of two pivot means so that when it is manually operated, it pivots about one of the pivot means and when it is automatically actuated, it pivots about the other of the pivot means.

It will be seen further that the circuit breaker is trip free and will release itself no matter whether the main operating means is forcibly held in switch closed position or is moving from one position to another position.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

1. A circuit breaker comprising contact means, switch operating means for opening and closing said contact means, a first and a second pivot means, said first pivot means being movable longitudinally of said switch operating means for causing said switch operating means to pivot about said second pivot means to open and close said contact means, main operating means for causing said first pivot means to move longitudinally of said switch operating means, said second pivot means being a normally stationary pivot means about which said switch operating means normally bodily pivots, means biasing said second pivot means towards motion to cause said switch operating means to bodily rock about said first pivot means to open said contact means, and condition responsive means normally restraining said second pivot means against motion and releasing said second pivot means for motion upon the occurrence of a predetermined condition.

2. A circuit breaker comprising contact means, switch operating means for opening and closing said contact means, a first pivot means intermediate the ends of said switch operating means and a second pivot means adjacent one end of said switch operating means, said switch operating means being adapted to selectively bodily pivot about said first or said second pivot means, main operating means operatively coupled to said first pivot means for rocking said switch operating means bodily about said second pivot means to open and close said contact means, said second pivot means being a normally stationary pivot means, means biasing said second pivot means for motion to cause said switch operating means to rock about said first pivot means to open said contact means, and condition responsive means normally preventing motion of said second pivot means and releasing said second pivot means for motion upon the occurrence of a predetermined condition.

3. A circuit breaker comprising contact means, switch operating means for opening and closing said contact means, a first and a second pivot means, said first pivot means being movable longitudinally of said switch operating means for causing said switch operating means to pivot about said second pivot means to open and close said contact means, main operating means for causing said first pivot means to move longitudinally of said switch operating means, said second pivot means being a normally stationary pivot means about which said switch operating means normally bodily pivots, means biasing said second pivot means towards motion laterally of said switch operating means to cause said switch operating means to bodily rock about said first pivot means to open said contact means, and condition responsive means normally restraining said second pivot means against motion and releasing said second pivot means for motion upon the occurrence of a predetermined condition.

4. A circuit breaker comprising contact means, switch operating means for opening and closing said contact means, a first and a second pivot means, said first pivot means being movable longitudinally of said switch operating means for causing said switch operating means to pivot about said second pivot means to open and close said contact means, main operating means for causing said first pivot means to move longitu-

dinally of said switch operating means, said second pivot means being a normally stationary pivot means about which said switch operating means normally bodily pivots, means biasing said second pivot means towards motion to cause said switch operating means to bodily rock about said first pivot means to open said contact means, and condition responsive means normally restraining said second pivot means against motion and releasing said second pivot means for motion upon the occurrence of a predetermined condition, said main operating means coacting with said second pivot means to move said second pivot means back to its initial position when said main operating means is moved to switch open position after release of said second pivot means.

5. A circuit breaker comprising contact means, switch operating means for opening and closing said contact means, a first and a second pivot means, said first pivot means being movable longitudinally of said switch operating means for causing said switch operating means to pivot about said second pivot means to open and close said contact means, main operating means for causing said first pivot means to move longitudinally of said switch operating means, said second pivot means being a normally stationary pivot means about which said switch operating means normally bodily pivots, means biasing said second pivot means towards motion to cause said switch operating means to bodily rock about said first pivot means to open said contact means, and condition responsive means normally restraining said second pivot means against motion and releasing said second pivot means for motion upon the occurrence of a predetermined condition, said main operating means coacting with said second pivot means to move said second pivot means transversely of said switch operating means back to its initial position when said main operating means is moved to switch open position after release of said second pivot means.

6. A switch construction comprising stationary contact means, movable contact means, switch operating means for moving said movable contact means into and out of contact with said stationary contact means, a first pivot means movable longitudinally of said switch operating means for moving said switch operating means, a second movable pivot means pivotally supporting said switch operating means and biased towards motion to move said switch operating means to switch open position, and condition responsive means controlling said second pivot means.

7. A switch construction comprising stationary contact means, movable contact means, switch operating means for moving said movable contact means into and out of contact with said stationary contact means, a first pivot means movable longitudinally of said switch operating means for moving said switch operating means, a second movable pivot means pivotally supporting said switch operating means and biased towards motion to move said switch operating means to switch open position, condition responsive means controlling said second pivot means, and means for guiding said second pivot means.

8. A switch construction comprising stationary contact means, movable contact means, switch operating means for moving said movable contact means into and out of contact with said stationary contact means, a first pivot means movable longitudinally of said switch operating means for moving said switch operating means, an actuator carrying said first pivot means, spring means having one end attached to said actuator, main operating means attached to the other end of said spring means for moving said spring means to cause motion of said actuator, a second movable pivot means pivotally supporting said switch operating means and biased towards motion to move said switch operating means to switch open position, and condition responsive means controlling said second pivot means.

9. A switch construction comprising stationary contact means, movable contact means, switch operating means for moving said movable contact means into and out of contact with said stationary contact means, a first pivot means movable longitudinally of said switch operating means for moving said switch operating means, a pivoted actuator carrying said first pivot means, spring means operatively coupled to said actuator, main operating means for moving the line of action of said spring means back and forth across the pivot point of said actuator to move said first pivot means back and forth longitudinally of said switch operating means, a second movable pivot means pivotally supporting said switch operating means and biased towards motion to move said switch operating means to switch open position, and condition responsive means controlling said second pivot means.

10. A switch construction comprising stationary contact means, movable contact means, switch operating means for moving said movable contact means into and out of contact with said stationary contact means, a first pivot means movable longitudinally of said switch operating means for moving said switch operating means, a second movable pivot means pivotally supporting said switch operating means and biased towards motion to move said switch operating means to switch open position, a main latch lever normally latching said second pivot means against motion, and condition responsive means controlling said main latch lever.

11. A switch construction comprising stationary contact means, movable contact means, switch operating means for moving said movable contact means into and out of contact with said stationary contact means, a first pivot means movable longitudinally of said switch operating means for moving said switch operating means, a second movable pivot means pivotally supporting said switch operating means and biased towards motion to move said switch operating means to switch open position, a main latch lever normally latching said second pivot means against motion, condition responsive means controlling said main latch lever, and main operating means for moving said first pivot means to operate said switch operating means, said main operating means when moved to switch open position coacting with said second pivot means to move said second pivot means back to its initial position after an operation of said condition responsive means.

12. A switch construction comprising stationary contact means, movable contact means, switch operating means for moving said movable contact means into and out of contact with said stationary contact means, a first pivot means movable longitudinally of said switch operating means for moving said switch operating means, a second movable pivot means pivotally supporting said switch operating means and biased towards motion to move said switch operating means to switch open position, a main latch lever biased

towards releasing motion and normally holding said second pivot means against motion, condition responsive means controlling said main latch lever, and main operating means for moving said first pivot means to operate said switch means, said main operating means when moved to switch open position after an operation of said condition responsive means coacting with said second pivot means and said main latch lever to move said second pivot means back to its initial position and said main latch lever back to latching position.

13. A switch construction comprising stationary contact means, movable contact means, switch operating means for moving said movable contact means into and out of contact with said stationary contact means, a first pivot means movable longitudinally of said switch operating means for moving said switch operating means, a second movable pivot means pivotally supporting said switch operating means and biased towards motion to move said switch operating means to switch open position, a main latch lever biased towards releasing motion and normally holding said second pivot means against motion, condition responsive means controlling said main latch lever, and main operating means for moving said first pivot means to operate said switch means, said main operating means when moved to switch open position after an operation of said condition responsive means coacting with said second pivot means and said main latch lever to first move said second pivot means back to its initial position and to thereafter move said main latch lever back to latching position.

14. A switch construction comprising stationary contact means, movable contact means, switch operating means for moving said movable contact means into and out of contact with said stationary contact means, a first pivot means movable longitudinally of said switch operating means for moving said switch operating means, an actuator carrying said first pivot means, spring means having one end attached to said actuator, main operating means attached to the other end of said spring means for moving said spring means to cause motion of said actuator, a second movable pivot means pivotally supporting said switch

operating means and biased towards motion to move said switch operating means to switch open position, a frame having a slot for guiding said second pivot means, a main latch lever pivoted to said frame and normally holding said second pivot means against motion, and condition responsive means controlling said main latch lever.

15. A switch construction comprising stationary contact means, movable contact means, switch operating means for moving said movable contact means into and out of contact with said stationary contact means, a first pivot means movable longitudinally of said switch operating means for moving said switch operating means, an actuator carrying said first pivot means, spring means having one end attached to said actuator, main operating means attached to the other end of said spring means for moving said spring means to cause motion of said actuator, a second movable pivot means pivotally supporting said switch operating means and biased towards motion to move said switch operating means to switch open position, a frame having a slot for guiding said second pivot means, a main latch lever pivoted to said frame and normally holding said second pivot means against motion and biased towards releasing motion, and condition responsive means controlling said main latch lever, said main operating means being pivoted on said frame and coacting with said second pivot means and with said main latch lever to first move said second pivot means back to its initial position and to thereafter move said main latch lever to latching position when said main operating means is moved to switch open position after an operation of said condition responsive means.

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