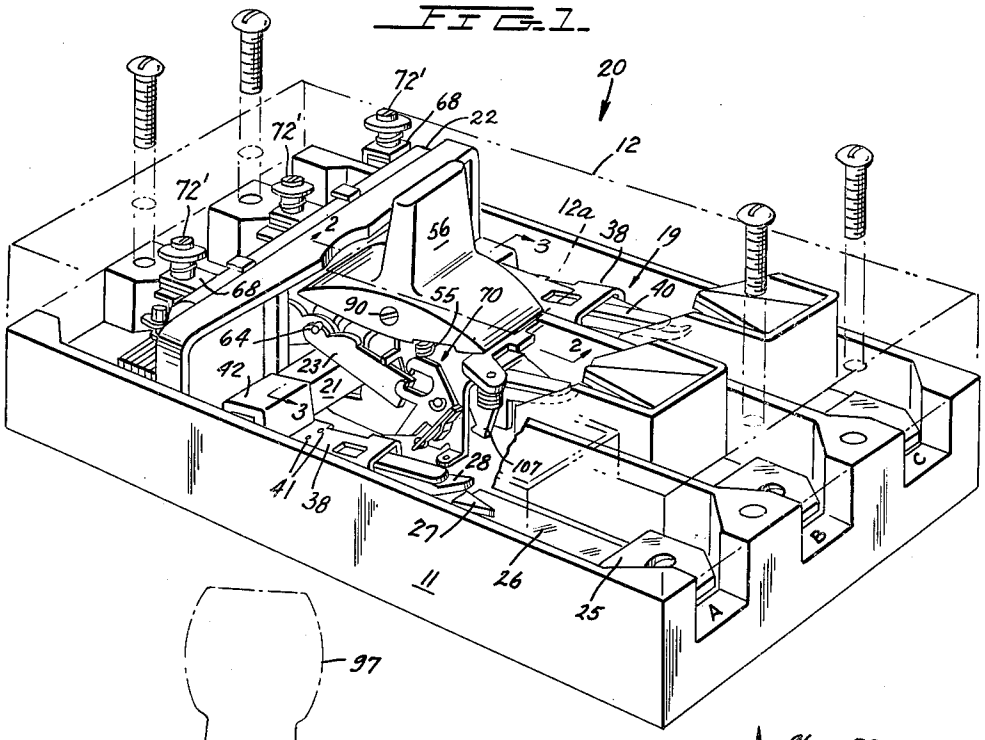
Aug. 17, 1965 W. W. POULTON, JR 3,201,557

CIRCUIT BREAKER HANDLE ASSEMBLY WITH IMPROVED FORCE TRANSFER CHARACTERISTICS

Filed Feb. 13, 1962

FIG. 1.



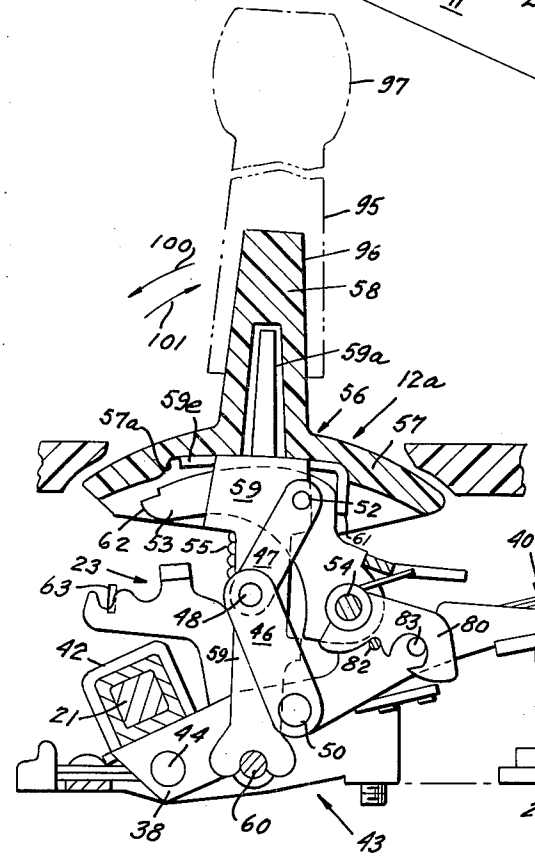


FIG. 2.

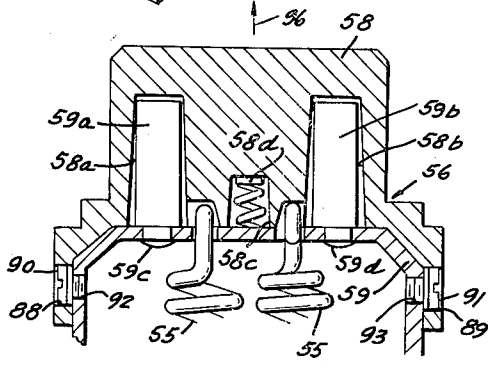


FIG. 3.

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CIRCUIT BREAKER HANDLE ASSEMBLY WITH IMPROVED FORCE TRANSFER CHARACTERISTICS

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5 Claims. (Cl. 200—172)

This invention relates to circuit breakers and more particularly to a circuit breaker handle assembly for molded case breakers wherein the handle assembly is designed to transfer the forces encountered when operating the breaker handle assembly from the handle to the breaker operating mechanism.

Prior art molded case circuit breakers are comprised of a main housing into which all of the operating components of the circuit breaker are secured and positioned. A molded cover is provided for covering the main housing, which cover is provided with an opening through which the breaker handle extends.

In circuit breakers of relatively high capacity, the breaker operating mechanism is so designed as to provide highspeed contact interruption which requires high energy spring members. This design feature, however, prevents the movement of the circuit breaker operating handle in the absence of a handle extending member, which member provides the necessary leverage for moving the handle assembly to either the open or closed position. The necessity for the handle extensions member is due to the need for the leverage necessary to more high energy spring members employed in the breaker assembly which members operate the breaker toggle mechanism at the required speeds.

Since molded case breakers of this general type find widespread use in mountings for panelboard structures, it is undesirable to have handle assemblies which are provided with rather lengthy operating handles, since projections of this nature extending from panelboard structures are hazardous to the safety of the operator.

It therefore becomes advantageous, to utilize breaker handle assemblies having short operating handles and providing removable handle extension members which removably engage the operating handle for the purpose of supplying the necessary leverage to move the operating handle during either a tripping or closing operation.

The operating handle of prior art devices, which is presently being used, is formed of an insulating material such as Bakelite, for example. One end of the handle extends through the opening in the molded case breaker cover means while the opposite end is mechanically coupled to the breaker operating mechanism.

The coupling of prior art handle assemblies to the breaker operating mechanisms consisted of either a bolt and nut fastening arrangement which secures the handle assembly to the operating mechanism, or, of a projection provided on the handle assembly which engages a cooperating aperture provided on the breaker operating mechanism. Due to the substantial forces applied to the operating handle during either a manual closing or tripping operation, the projection provided on the operating handle is placed under excessive strain and has been found to break off after just a few opening or closing operations. Likewise, the portion of the opearting handle surrounding the nut and bolt fastening means is placed under excessive strain causing fracturing of the operating assembly at the point of strain after a few manual opening or closing operations.

The device of this invention employs a breaker operating handle which is so designed as to transfer most of the excessive strain impressed upon the operating handle during the closing or tripping operations to the breaker operating mechanism so as to provide an operating handle having a useful life which is substantially greater than that of prior art devices.

The operating handle assembly of this invention consists of an operating handle having a base portion and a handle portion integral therewith. The base portion is positioned adjacent the operating mechanism cradle member so that the handle portion extends through the opening in the molded breaker cover means. Two recesses are provided in the base portion of the operating handle which recesses extend well in the handle portion for receiving first and second elongated pins which are fixedly secured to the cradle member of the operating mechanism. Apertures on the sides of the operating handle are positioned to cooperate with apertures in the operating mechanism cradle member for receiving fastening means to fixedly secure the operating handle to the cradle member. A third recess is provided in the operating handle base portion and positioned between the operating handle base portion and the cradle member for eliminating vibration therebetween. The peripheral dimensions of the operating handle base portion are greater than the dimensions of the opening provided in the cover means so that the handle assembly may not be removed from the operating mechanism unless the breaker cover means is first removed from the circuit breaker housing the handle assembly may be removed simply by disassembling the fastening means and sliding the handle assembly away from the operating mechanism cradle member.

During the operation of the circuit breaker the handle assembly extending member is positioned into engagement with the handle portion of the operating handle assembly in order to operate the breaker to either the closed or the tripped position. The forces exerted upon the handle portion by the extension member are transferred to the extending pins provided on the cradle member thereby removing excessive strain from the operating handle, thus providing a handle assembly which is not exposed to excessive wear due to strain, even after repeated use.

It is therefore one object of this invention to provide a circuit breaker handle assembly which is easily removable for replacement or maintenance.

Another object of this invention is to provide a circuit breaker handle assembly which is designed as to transfer substantially all of the forces exerted upon the handle assembly, during closing or tripping operations, directly to the breaker operating mechanism.

Another object of this invention is to provide a circuit breaker handle assembly which includes metal inserts provided upon the breaker operating mechanism for receiving substantially all of the manual tripping and closing forces exerted upon the circuit breaker handle so as to relieve the handle assembly of excessive strain during the opening and closing operations.

These and other objects of the invention will be apparent from the following description when taken in connection with the drawings in which:

FIGURE 1 is a perspective view of a three phase molded case circuit breaker employing the operating handle assembly of this invention.

FIGURE 2 is a cross-sectional view of the circuit breaker handle assembly taken along the line 2–2'.

FIGURE 3 is a cross-sectional view of the breaker handle assembly taken along the line 3–3'.

Referring now to the figures, molded case circuit breaker **20** is illustrated as being a three phase device, the three phases of which are electrically isolated from one another by suitable insulating barriers and mechanically tied together by a common insulating bar **21** and a common tripping bar **22**. Tripping bar **22** includes indi-

vidual extension members 68 for each phase of the circuit breaker 20, each including an adjustment means 72' for calibrating the tripping characteristics. The operating mechanism 23 is immediately connected to the center phase B, and by means of insulating bar 21 and tripping bar 22 the operating phases A and C are coordinated with the operation of phase B, so that all three phases A through C are operated simultaneously to the On and Off positions.

Although the circuit breaker 20 shown in the figures is a three phase device, it should be understood that the handle assembly of the instant invention will operate as well with a lesser or greater number of phases and it should be further understood that circuit breaker arrangement 20 lends no novelty to the instant invention.

Each of the phases A through C includes an identical interruptible current path through the circuit breaker 20. Since the configuration and operation of the current paths play no part in the novelty of the instant invention, a description thereof will be omitted. For a detailed description of the current paths provided through the breaker 20, reference should be had to U.S. Patent 2,932,706, entitled "Hold-Open and Anti-Rebound Latches," issued April 12, 1960, to A. Bodenshatz and assigned to the assignee of the instant invention.

The operating mechanism 23 comprises toggle linkage assembly 46, 47 connected at knee pin 48. Linkage 46 includes a U-shaped portion (not shown) which straddles bracket 38 and is pivotally secured thereto by pin 50. Contact arm 19 is positioned between the walls of U-shaped bracket 38 and secured thereto by means of pin 83. One end of leaf spring 40 is secured to bracket 38 by means of rivets 41 while the other end of leaf spring 40 bears against the forward end 29 of contact 19 thereby biasing movable contact 28 in a direction toward engagement with stationary contact 27. Another U-shaped bracket 42 secures bracket 38 to insulating bar 21 so that the movable contacts 28 of each phase are operated in unison. Bracket 38 is pivotally secured to frame 43 by means of pin 44. Frame 43 is in turn rigidly secured to base section 45 of the circuit breaker casing. Movable contact 28 is engageable by stationary contact 27, said contact pair 27–28 being provided for controlling the closing and tripping operations of the circuit breaker 20.

The linkage 47 comprises two aligned members which are secured to one another in spaced relationship by a spacer rivet assembly (not shown). The upper end of linkage 47 is pivotally secured at 52 to the latchable cradle 53. Cradle 53 is keyed to shaft 54, the ends of which are journaled in the circuit breaker housing 12 in any well-known manner. Operating springs 55 are secured at one end to link 48 and at the other end to the upper portion of handle arm 59.

Handle assembly 56 comprises a molded member 57 having an upwardly extending portion 58 which projects through opening 12*a* in the casing cover 12 to provide an external operating handle for the circuit breaker 20. The base portion 57 is secured to the bifurcated arm (handle arm) 59 which straddles bracket 38 and is positioned between the walls 11 which partition off each phase of the circuit breaker 20. The tips of each bifurcated section are forked and engage pin 60 which extends inwardly from the walls of the frame 11. The bifurcated arm or handle arm 59 has two pins 59*a* and 59*b* secured thereto by any well-known means such as rivet means 59*c* and 59*d* respectively, as shown in FIGURE 3, for example.

The handle assembly 56 is provided with recesses 58*a* and 58*b* for receiving pins 59*a* and 59*b* respectively. A centrally located recess 58*c* in handle assembly 56 (see FIGURE 3) is provided for seating spring member 58*d* which is positioned between handle assembly 56 and the upper portion of handle arm 59 to reduce the vibration between these two members.

A pair of apertures 88 and 89 are provided on opposite sides of the base portion of handle assembly 56 through which screw members 90 and 91 respectively are extended for threadedly engaging the threaded apertures 92 and 93 respectively, provided on cradle member 59 for the purpose of fixedly securing handle assembly 56 to the handle arm 59. The operation of the circuit breaker operating mechanism is as follows:

The mechanism that is shown is an overcenter toggle of a type well known in the prior art. FIGURE 2 shows the tripped position and, upon movement of the handle to the left or in the direction of arrow 100, the cradle, through an extension 61 of the handle arm 59, is rotated into latching engagement with a latch 63. During this operation, the pin 52 moves towards the left but the springs 55 move the knee pin 48 still further to the left, keeping the toggles broken, thus moving the breaker to the latched and open position. After the breaker is latched, the handle may be moved to the right or in the direction of arrow 101 to pull the knee 48, through springs 55, to position the toggles 47 and 46 in an overcenter position to the right of pin 52, thus rotating the contact arm clockwise on bearing 44 to the closed position. To open the contacts, the handle is moved to the left or in the direction of the arrow 100 to break the toggle by moving the knee 48 to the left through springs 55 and cause rotation of the contact arm counterclockwise to the open position. When operating handle 58 is moved to the Off position, tip 62 becomes latched under member 63, mounted on pivot 64. Circuit breaker 20 is also shown provided with a hold-close latch 70, hold-open latch 80 and anti-rebound latch 107 as fully described in aforementioned U.S. Patent No. 2,932,706.

Due to the large current carrying capacities of the cooperating contacts 27 and 28 of each phase, it is necessary to provide spring members 55 having substantially large spring constants so as to operate movable contact 28 in a rapid fashion. Thus, in order to operate handle 58 to either the open or the closed positions, an operating handle extending member 95 shown in FIGURE 2 is provided, which member has a recess 96 for receiving handle 58. The central portion of the handle extension member has been removed to simplify the figure. This arrangement provides the necessary leverage for moving operating handle 58 which movement is imparted simply by grasping the grip 97 provided on extending member 95 for moving the operating handle 58 in the directions shown by arrows 100 and 101. In moving the operating handle in this manner, the force exerted upon extending member 95 by the operator is imparted to the handle portion 58 of the operating handle assembly 56. These forces are in turn imparted to the extending pins 59*a* and 59*b* secured to handle arm 59, causing cradle member 59 to be rotated in the appropriate direction.

Operating handle assembly 56 has a notch 57*a* provided on its underside for engagement with the slightly raised edge 59*e* of cradle member 59 which arrangement acts as a keying means for seating handle assembly 56 upon handle arm 59 so that the handle assembly is properly seated only when positioned as shown in FIGURE 2 with respect to cradle member 59.

The outer dimensions of operating handle 56 are greater than the dimensions of the opening 12*a* in cover 12 so that handle assembly 56 may be removed only upon removal of cover member 12. The removal operation is performed simply by removing screw members 90 and 91 from the handle assembly 56 and lifting the handle assembly upward in the direction shown by arrow 96 of FIGURE 3.

It can thus be seen that the present invention provides a handle assembly which is a simple design which lends itself readily to fabrication thereof; which is easily removable and replaceable; and which gives reliable service even after repeated use.

Although I have here described a preferred embodiment of my novel invention many variations and modifications will now be apparent to those skilled in the art and

I therefore prefer to be limited not by the specific disclosure herein but only by the appending claims.

The embodiments of the invention in which an exclusive privilege or property is claimed are defined as follows:

1. A circuit breaker unit, comprising in combination, an operating handle assembly and a circuit breaker operating mechanism connected thereto; said operating mechanism having a cradle member, said cradle member movable between its operating conditions by said handle assembly; high energy biasing means operatively connected to said cradle member for exerting substantial forces during at least portions of said movement; said assembly comprising a handle member having a base portion and a projecting handle portion integral therewith; said projecting handle being accessible outside of the circuit breaker cover, at least one projecting pin extending from said cradle member, said base portion having at least one recess; said recess receiving said projecting pin; said projecting pin and said recess dimensioned to fixedly secure said handle to said operating mechanism and transfer substantially all of the strain imposed upon said operating handle by said substantial forces during operating thereof to said operating mechanism.

2. A circuit breaker unit, comprising in combination, an operating handle assembly and a circuit breaker operating mechanism connected thereto; said operating mechanism having a cradle member, said cradle member movable between its operating conditions by said handle assembly; high energy biasing means operatively connected to said cradle member for exerting substantial forces during at least portions of said movement; said assembly comprising a handle member having a base portion and a projecting handle portion integral therewith; said projecting handle being accessible outside of the circuit breaker cover, at least one projecting pin extending from said cradle member, said base portion having at least one recess; said recess receiving said projecting pin; said projecting pin and said recess cooperating to transfer substantially all of the strain imposed upon said operating handle by said substantial forces during operating thereof to said operating mechanism, said handle member and said cradle member each having an aperture; said apertures being in alignment; fastening means engaging said apertures for securing said handle member to said cradle member.

3. A circuit breaker unit, comprising in combination, an operating handle assembly and a circuit breaker operating mechanism connected thereto; said operating mechanism having a cradle member, said cradle member movable between its operating conditions by said handle assembly; high energy biasing means operatively connected to said cradle member for exerting substantial forces during at least portions of said movement; and a projecting handle having a base portion integral therewith; said projecting handle being accessible outside of the circuit breaker cover, at least one projecting pin extending from said cradle member, said base portion having at least one recess; said recess receiving said projecting pin; said projecting pin and said recess dimensioned to fixedly secure said handle to said operating mechanism and transfer substantially all of the strain imposed upon said operating handle by said substantial forces during operating thereof to said operating mechanism, said recess extending substantially the entire length of said projecting handle portion, the configuration of said projecting pin being substantially the same as the configuration of said recess; said base portion extending transverse to said projecting pin, appreciably beyond said handle portion projecting therefrom.

4. A circuit breaker unit, comprising in combination, an operating handle assembly and a circuit breaker operating mechanism connected thereto; said operating mechanism having a cradle member, said cradle member movable between its operating conditions by said handle assembly; high energy biasing means operatively connected to said cradle member for exerting substantial forces during at least portions of said movement; said assembly comprising a handle member having a base portion and a projecting handle portion integral therewith; said projecting handle being accessible outside of the circuit breaker cover, at least one projecting pin extending from said cradle member, said base portion having at least one recess; said recess receiving said projecting pin; said projecting pin and said recess cooperating to transfer substantially all of the strain imposed upon said operating handle by said substantial forces during operating thereof to said operating mechanism, a second recess provided in said base portion; a biasing member seated in said second recess and between said base portion and said cradle member for eliminating any vibration therebetween.

5. A circuit breaker unit, comprising in combination, an operating handle assembly and a circuit breaker operating mechanism connected thereto; said operating mechanism having a cradle member, said cradle member movable between its operating conditions by said handle assembly; high energy biasing means operatively connected to said cradle member for exerting substantial forces during at least portions of said movement; said assembly comprising a handle member having a base portion and a projecting handle portion integral therewith; said projecting handle being accessible outside of the circuit breaker cover, at least one projecting pin extending from said cradle member, said base portion having at least one recess; said recess receiving said projecting pin; said projecting pin and said recess cooperating to transfer substantially all of the strain imposed upon said operating handle by said substantial forces during operating thereof to said operating mechanism, a second recess provided in said base portion; a biasing member seated in said second recess and between said base portion and said cradle member for eliminating any vibration therebetween, said cradle member having a keyed edge; said handle member having a cooperating recess seating said keyed edge to properly position said handle member relative to said cradle member.

References Cited by the Examiner

UNITED STATES PATENTS

1,718,040	6/29	Forman	200—172
1,940,716	12/33	Hubbell	200—172
2,230,713	2/41	Bulter	200—116
2,807,692	9/57	Leslie	200—172
3,114,023	12/63	Locher	200—116

FOREIGN PATENTS

271,991	6/27	Great Britain.

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