

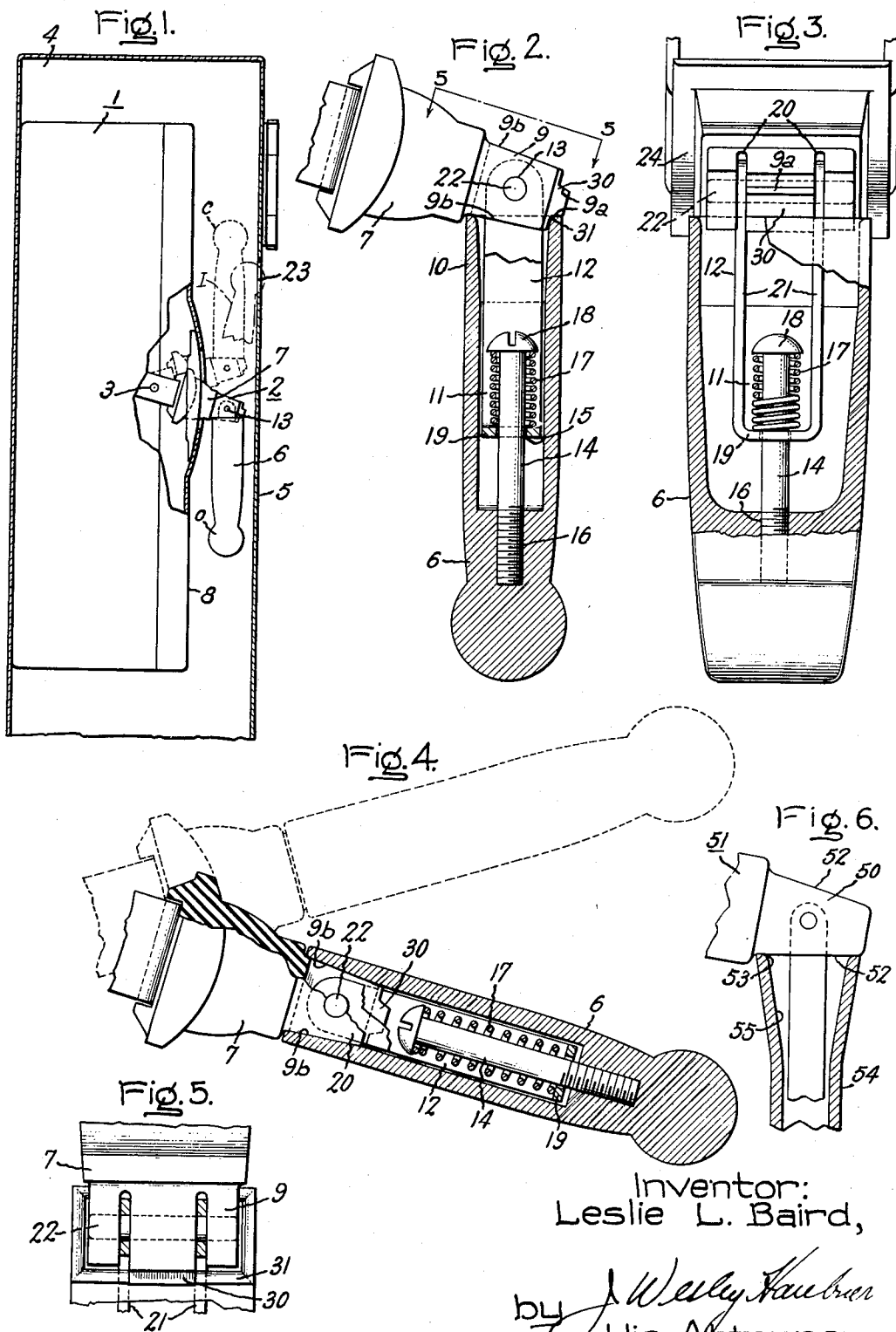
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FOLDING HANDLE CONSTRUCTION FOR ELECTRIC SWITCHGEAR

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FOLDING HANDLE CONSTRUCTION FOR ELECTRIC SWITCHGEAR

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This invention relates to a folding handle construction and, more particularly, to improvements in handle structures for enclosed electric switchgear.

In many types of circuit breakers equipped with operating handles for opening and closing the breaker, it is desirable to have as long an operating handle as possible in order to reduce the force required to open or close the breaker. If such a long handle is made in one piece, the dimensions of the usual enclosing case surrounding the breaker must be unduly large. If, to solve this problem, a short handle having a removable extension is used, there is a danger that the loose extension will become misplaced, especially if the circuit breaker is operated infrequently.

It is, therefore, an object of this invention to provide a new and improved handle construction.

It is a further object of this invention to provide a novel and inexpensive handle structure comprising an extension which will provide sufficient length for ease of operation and which is adapted to be collapsed into a folded position wherein the extension is free from interference with the closely adjacent parts of an enclosing structure.

A still further object is to provide a folding handle structure comprising a body portion and an extension coacting in such a manner that when the extension is unfolded from its folded position, it is guided so as to readily snap into rigid operating relation with the body portion.

The objects of my invention may be realized through the provision of a handle structure which includes an extension and a body portion cooperating in a novel manner whereby the extension may be readily collapsed and yieldably seated in an optimum folded position wherein the extension is free from interference with surrounding enclosing structure. Additionally, the body portion is provided with a generally tapered configuration which not only cooperates with the extension to restrain said extension in the optimum folded position but also serves to guide the extension as it is unfolded so that said extension will readily snap into rigid aligned relationship with the body portion.

The invention will be better understood by considering the following description taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

In the drawing, Fig. 1 is a side view partly in section showing an enclosed circuit breaker embodying the present invention. Fig. 2 is an enlarged detailed view partly in section of one form of handle structure, the structure being shown in its lower collapsed condition. Fig. 3 is a front view of Fig. 2 with portions of the handle extension shown broken away. Fig. 4 is a view showing the handle body portion and extension structure in their rigidly coupled operative condition. Fig. 5 is a view taken along the line 5—5 of Fig. 2, with a portion of the device shown in cross-section. Fig. 6 is a view partly in section of a

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second form of handle structure constructed in accordance with the present invention.

Referring now to the drawing, and more particularly to Fig. 1, there is shown a circuit breaker generally indicated at 1 having a manually-operable handle structure 2, suitably pivoted at 3, for opening and closing the breaker contacts (not shown). The circuit breaker and its handle structure are mounted within a panel box 4 having a cover 5 detachably or pivotally connected thereto in any conventional manner.

In order to reduce the manual force required for operating the handle, it is desirable to have as long a handle as possible. It is obvious, however, that if the handle for circuit breaker 1 were formed as a relatively long one-piece structure, then the dimensions of the surrounding casing 4 would have to be undesirably large in order that the casing completely enclose the breaker and its operating handle. A considerable saving in the amount of material and space required for the surrounding casing has been obtained in the apparatus embodying the present invention by constructing the handle in such a manner that it may be collapsed into the predetermined folded positions O and C shown in Fig. 1 during the time it is in an inoperative state. To operate the handle from the solid line position O of Fig. 1 to the dotted line position C shown therein, the cover 5 is opened, after which the extension 6 of the handle structure can be rotated about the pivot at 13 into alignment with the handle body portion 7, as shown in solid lines in Fig. 4. As will be explained in detail hereinafter, the handle body portion and the extension possess mating plug and socket portions, respectively, so that when in the aligned condition of Fig. 4 they constitute a single long rigid operating lever, which may be moved about pivot 3 to effect operation of the circuit breaker 1. At such a time, the handle structure would be moved to the position shown in dotted lines in Fig. 4, after which the handle extension would then be folded into its other folded position indicated by the dotted lines at C in Fig. 1, thus permitting the cover 5 to be closed and locked, as required.

From Fig. 1 it should be apparent that in order to obtain a simple, straight handle extension of maximum length which will fit into the smallest possible covered panel box 4, it is necessary that the extension 6, in each of its folded conditions, be located in a plane substantially parallel to the adjacent parallel parts of the enclosed breaker structure, namely, the juxtaposed wall 8 and cover 5. If the plane of the folded extension were such that it intersected the wall 8 or the cover 5, then the length of the extension would be limited by the intersecting surface. In accordance with this invention, the body portion 7 terminates outwardly in a rectangularly-sectioned tapered plug portion 9 for receiving firmly thereon the correspondingly tapered hollow socket portion 10 of the extension 6. The plug portion 9 is provided with a longitudinally extending projection 30 which is formed so as to provide a pair of opposing tapered supplementary seating surfaces 9a. The seating surfaces 9a together with the inner wedge surfaces 9b of the plug portion 9, afford oppositely disposed alternate seating means for engaging with the longitudinally inner surface 31 of the extension 6 so as to, normally restrain the folded extension 6 in the optimum plane referred to above, as may be seen at O or C in Fig. 1.

Referring now to Figs. 2, 3 and 5, the extension 6, which is preferably of die-cast aluminum, is shown collapsed and seated in its folded condition, wherein it is resiliently biased by a spring means 11 into stable but yielding engagement with the molded insulation handle base 7. The spring means 11 comprises a U-shaped link 12 pivotally mounted at 13 on the handle base 7, a headed screw 14 passing through an aperture 15 in the bight 19

of the link and tightly threaded into extension 6 at 16, and a compression spring 17 disposed between the head 18 of the screw and the bight portion 19 of the link 12. The compression spring 17 tends to force apart the head 18 and the bight portion 19, as a result of which the extension 6, when anchored at the pivot 13, is always urged toward engagement with the body portion 7.

The pivot structure for link 12 shown generally at 13 comprises the above-mentioned generally rectangular plug portion 9 which has formed therein a pair of slots 20. The arms 21 of the U-shaped link 12 fit freely into the slots 20 and are held assembled by a pivot pin 22 which may be pressed into fixed position in the plug portion 9. The arms 21 have apertures receiving the pin 22 with sufficient clearance to permit free pivotal motion of the link 12 about said pin. It is to be noted that both the upper and lower surfaces of the plug 9, that is, wedge surfaces 9b and seating surfaces 9a, are disposed at such an angle that, irrespective of the operative position of the handle structure, i. e., whether the breaker is open or closed, the extension 6 when folded will be seated in the predetermined optimum plane.

In order to move the handle extension from the folded condition of Fig. 2 to the rigid aligned operative condition shown in Fig. 4, it is necessary merely to pivot the extension 6 in a counter-clockwise direction about the pin 22. The spring 17, which is sufficiently strong for holding the light aluminum handle extension in either of its folded positions, yields readily under this pivotal action so that the seating surfaces of the socket portion 10 ride with little opposition over the shoulders 9a of the projection 30 of the plug portion 9 until, when approaching alignment, the socketed extension will readily snap into firm mating cooperation with the handle base in readiness for receiving the relatively large manual force necessary to operate the switch contacts. It is to be noted that initiation of this snap action is facilitated by the generally tapered configuration of the plug 9 and socket 10, since this tapered configuration in effect forms a guide means which readily guides the extension 6, as it is unfolded, into alignment with the body portion 7. Thus, the generally tapered configuration of the plug 9 serves the dual function of holding the extension in the optimum folded plane and of readily guiding the extension into alignment with the body portion.

In order to collapse the handle from the coupled aligned condition of Fig. 4 to the folded condition of Fig. 2, it is necessary merely to axially withdraw the extension 6 from the handle body portion 7 against the bias of spring 17 until the extension clears the end of the body portion 7. At this time, the extension may be rotated about pivot pin 22 and released into the position shown in Fig. 2, wherein the extension 6 is seated or restrained in this folded condition by the wedge surface 9b and the shoulder 9a engaging the longitudinally inner surface 31 of the extension.

The type of switch operated by the folding handle of this invention might be, e. g., one such as is described in U. S. Patent 2,490,514, to Favre, assigned to the assignee of this invention, wherein the upper handle position, like that shown dotted at C in Fig. 1, corresponds to the switch "on" or closed position and the lower (full-line) position O corresponds to the "off" or open position. Such a switch conventionally has a third position for the handle intermediate the "on" and "off" positions which indicates that the breaker has tripped automatically responsive to some abnormal current or voltage conditions. When such a switch is enclosed and provided with the handle structure of my invention and tripping occurs, the body portion 7 merely assumes an intermediate (horizontal) position. Since the extension 6 is yieldably seated by its spring 17, as said extension encounters the door 5 during movement toward the intermediate position, it simply folds back slightly about its inner seating surface 9b and assumes the somewhat lower position indicated

by the dot and dash lines at I in Fig. 1. In accordance with the present invention, a suitable indicating aperture 23 is provided in the door 5. Thus, the cylindrical end of the handle would, in the event of an automatic tripping operation, protrude slightly through the aperture and afford a visual indication of this newly assumed condition of the circuit breaker.

From the above explanation, it will be apparent that, instead of providing the seating surfaces 9a in stepped relation to the wedging surfaces of the plug portion 9, the extension socket 10 may be arranged to seat wholly upon one or other of the wedging surfaces without the benefit of supplementary stepped seating surfaces such as 9a. In other words, I may make the taper of the plug and socket portions agree with the angle to be assumed by the extension in its desired folded position, as best seen in Fig. 6. In this Figure 6, the outwardly tapering plug 50, which is formed on body portion 51, has wedge surfaces 52 against which the longitudinally inner surface 53 of the extension 54 is adapted to seat and be restrained in the desired folded position. The extension has a tapered socket portion 55 which is adapted to cooperate with the tapered plug 50 in substantially the same manner as described with regard to the embodiment of the invention shown in Figs. 2-5. In all other respects, the structure of the two handles correspond.

While there has been shown and described a particular embodiment of the invention, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention, and that it is intended by the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

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

1. A handle structure comprising a body portion having side surfaces which taper outwardly to form a tapered plug at the outer end of said body portion, a hollow handle extension formed at its inner end into a tapered socket for mating with said plug so as to rigidly couple said extension to said tapered plug, spring means pivotally interconnecting said extension and said body portion and resiliently biasing said extension toward engagement with said body portion, said extension when withdrawn from said rigidly coupled relationship being adapted for pivotal movement into at least one predetermined folded position, the end surface of said socket abutting against a side surface of said tapered plug when the extension is in a folded position so that said extension is yieldably seated upon said body portion when folded.

2. A handle structure comprising a body portion having side surfaces which taper outwardly to form a tapered plug at the outer end of said body portion, said plug being stepped at its outer end so as to define thereat a pair of laterally opposed supplementary seating surfaces, a hollow handle extension formed at its inner end into a tapered socket for mating with said plug so as to rigidly couple said extension to said tapered plug, spring means pivotally interconnecting said extension and said body portion and resiliently biasing said extension toward engagement with said body portion, said extension when withdrawn from said rigidly coupled relationship being adapted for pivotal movement into alternate predetermined folded positions, the end surface of said socket abutting against a tapered surface of said plug and one of said supplementary seating surfaces when the extension is in either of said folded positions so that said extension is yieldably seated upon said body portion when folded.

3. A handle structure comprising a body portion extending in a longitudinal direction and having at its outer end a longitudinally-extending tapered projection defining a tapered seating surface; a tubular extension adapted to telescope over said body portion, spring means pivotally interconnecting said extension and said body portion

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and resiliently biasing said extension into engagement with said body portion, said extension when withdrawn from said telescoping relationship being adapted for pivotal movement into a folded position, said extension having at its inner longitudinal end a surface which abuts against said tapered seating surface when the extension is in said folded position so as to restrain said extension in said folded position.

4. A handle structure comprising an outwardly tapering body portion defining a seating surface; a tubular extension having a tapered socket portion adapted to telescope over said body portion, spring means pivotally interconnecting said extension and said body portion, said spring means comprising a U-shaped link pivotally connected to said body portion, a headed element rigidly connected to said extension and extending through an aperture in said link, and resilient means interposed between said link and said element and biasing said extension into engagement with said body portion, said extension when withdrawn from said telescoping relationship being adapted for pivotal movement into a folded position, said extension having at its inner longitudinal end a surface which abuts against said seating surface when the extension is in said folded position so as to restrain said extension in said folded position.

5. In an enclosed electric apparatus having inner and outer enclosures provided respectively with walls in parallel spaced-apart relationship, an operating mechanism disposed within said enclosures and including a manually operable member extending from said inner enclosure into the space between said walls, said manually operable member being movable between two operative positions, the extending end of said member tapering outwardly to define opposed seating surfaces, and an extension resiliently and pivotally interconnected to said body portion, said extension being adapted to be folded into the space between said walls when said operating mechanism is

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in either of said two operative positions, said extension having at its inner end a surface which is adapted to seat and be restrained against one of said seating surfaces when said extension is folded, the slope of said seating surfaces being such that when said manually operable member is in either of said two operative positions, the extension when seated in folded position is disposed in a plane substantially parallel to said parallel walls.

6. In combination; an electric switch; structure enclosing said switch and comprising a pair of substantially parallel spaced walls; an operating mechanism for said switch comprising an operating member manually movable between two operative positions and automatically movable in response to tripping of said switch to a position intermediate said two positions; said operating member having an outwardly tapering body portion defining opposed seating surfaces and an extension resiliently and pivotally interconnected to said body portion; said extension being adapted to be folded into the space between said wall when said operating mechanism is in either of said two operative positions; said extension having at its inner end a surface which is adapted to seat and be restrained against one of said seating surfaces when said extension is folded; the slope of said seating surfaces being such that when said operating mechanism is in either of said two operative positions, the extension, when seated in folded position, is disposed in a plane substantially parallel to said parallel walls; one of said walls having an indicating aperture which is disposed to receive said folded extension when said switch is moved to said intermediate position.

References Cited in the file of this patent

UNITED STATES PATENTS

1,928,487 Hammerly ----- Sept. 26, 1933