Aug. 11, 1964 E. T. PLATZ ETAL 3,144,588

BOLTED CONNECTION FOR PLUG-IN DEVICE

Filed Jan. 20, 1960

FIG. 2

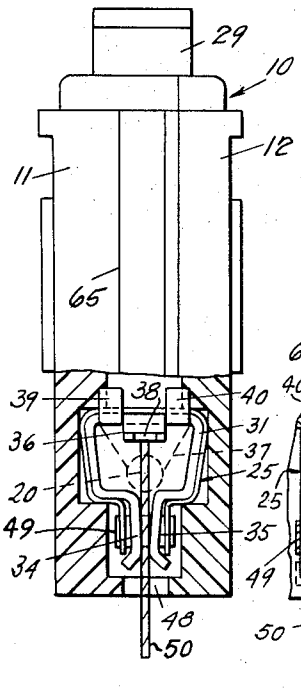


FIG. 1

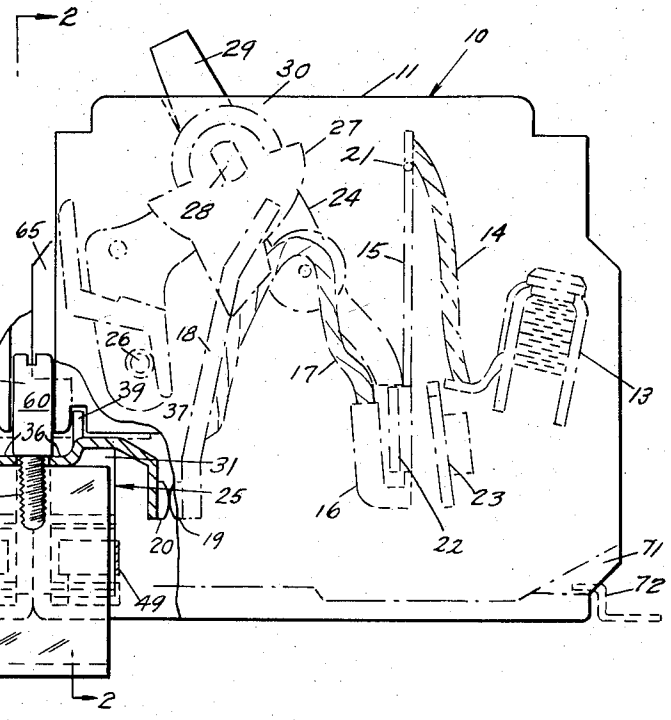


FIG. 4

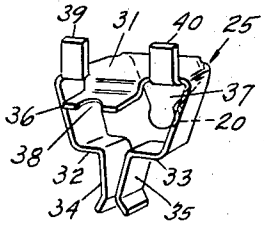


FIG. 3

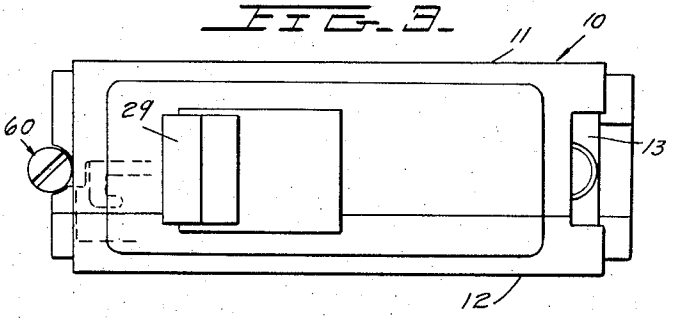


FIG. 5

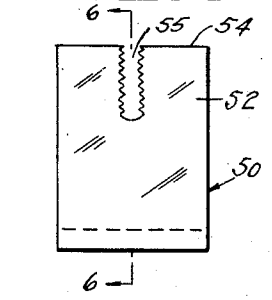


FIG. 6

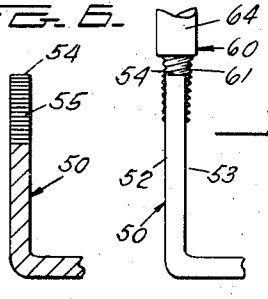


FIG. 7

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3,144,588

BOLTED CONNECTION FOR PLUG-IN DEVICE

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Filed Jan. 20, 1960, Ser. No. 3,525
20 Claims. (Cl. 317—119)

This invention relates to molded case circuit breakers in general and more particularly to a combination terminal means therefore which includes provisions for a plug-in connection to a panelboard stab and, in addition thereto, a bolted connection to the stab.

Spring clips of the type disclosed in U.S. Patent 2,875,289 for connecting the line side of a circuit breaker to the feeder bus of a panelboard are in wide spread use today. However, for certain applications it is desirable to utilize a bolted connection. That is, additional contact area may be desired or for applications in which the panelboard will be subjected to severe mechanical shock additional secureness is desired.

The instant invention provides a bolt type connection while still retaining the convenience of a plug-in spring clip connection. This is accomplished by utilizing a conventional terminal means which includes a spring clip provided with a forwardly extending lug. The lug is provided with a notch in the forward end thereof through which the threaded portion of a clamping screw passes and is thereafter received by a threaded slot in the panelboard stab with which the spring clip is engaged. Thus, the spring clip engages the side of the stab in the conventional manner and the lug is firmly seated against the top surface of the stab through the action of the clamping screw.

Accordingly, a primary object of the instant invention is to provide a novel terminal means for plug-in devices whereby a bolted connection is also obtained.

Another object is to provide a novel combination terminal construction including spring clip means and means for a bolted connection with the latter being utilizable as desired in conjunction with the spring clip means.

These as well as other objects of the instant invention shall become readily apparent after studying the following description of the accompanying drawings in which:

FIGURE 1 is a side elevation of a circuit breaker including the combination terminal means of the instant invention, with the housing cover removed to reveal portions of the circuit breaker operating mechanism. The circuit breaker is shown bolted to a connecting stab of a panelboard. In addition, a fragmentary view of another circuit breaker is shown with the line terminal thereof connected to the same panelboard stab.

FIGURE 2 is a partial cross-section of the circuit breaker of FIGURE 1 taken through line 2—2 of FIGURE 1 looking in the direction of the arrows 2—2.

FIGURE 3 is a plan of the circuit breaker of FIGURE 1.

FIGURE 4 is a perspective view of the combination line terminal means.

FIGURE 5 is a side elevation of a panelboard terminal stab adapted to be utilized in cooperation with the terminal means of FIGURE 4.

FIGURE 6 is a cross-section of the stab of FIGURE 5 taken through line 6—6 of FIGURE 5 looking in the direction of the arrows.

FIGURE 7 is an end view of the stab of FIGURE 5 showing a clamping screw mounted thereto.

Now referring to the figures, circuit breaker **10** is of a type described in detail in the Felix E. Myers copending application Serial No. 807,885, now Pat. No. 2,996,589, filed April 21, 1959, entitled "Pivoted Bimetal," and assigned to the assignee of the instant invention.

Briefly, circuit breaker **10** includes a housing comprised of a base **11** and a mating cover **12** secured to each other by rivet means (not shown). Base **11** and cover **12** cooperate to form a cavity having suitable internal recesses to position and maintain the other elements of circuit breaker **10** in a manner well known to the art.

The current path through circuit breaker **10** comprises load terminal **13**, flexible braid conductor **14** to one end of bimetal **15**, bifurcated conducting member **16** at the other end of bimetal **15**, a pair of flexible braided conductors **17**, contact arm **18**, movable contact **19**, stationary contact **20** and line terminal means **25**. Bimetal **15** is pivoted near the upper end thereof at pin **21** while the lower end of bimetal **15** carries magnet **22** which cooperates with stationary armature **23** to form a magnetic trip means for circuit breaker **10**. The upper surface of magnet **22** forms a latch for releasable cradle **24** which is pivoted to base **11** at embossment **26**. A main spring (not shown) interconnects cradle **24** and contact arm **18**.

The upper end of contact arm **18** is urged against operating member **27** through the action of the main spring. Member **27** is pivoted to housing **11**, **12** at projections **28** and includes a portion **29** extending through top opening **30** of case **11**, **12** to form a manual operating handle for circuit breaker **10**.

Line terminal means **25** comprises an inverted U-shaped body portion **31** having inwardly turned arms **32**, **33** from which a pair of jaws **34**, **35** extend downwardly. A first lug **36** extends rearwardly and downwardly from body **31**. Contact **36** includes a semi-circular notch **38** at the forward end thereof, for a reason to be hereinafter explained, while stationary contact **20** is mounted to lug **37** near the free end thereof. Terminal means **25** also includes lugs **39**, **40** which extend upwardly from body portion **31** on opposite sides of lug **36** to cooperate with suitable recesses of housing **11**, **12** to maintain terminal means **25** in operative position in a manner well known to the art.

As illustrated in FIGURE 1, the right portion of panelboard stab **50** extends through housing opening **48** and is positioned between terminal means jaws **34**, **35** with U-shaped spring **49** urging jaws **34**, **35** against the side surfaces **52**, **53**, respectively of stab **50**. Forwardly extending lug **36** rests against the top surface **54** of stab **50** being urged thereagainst through the action of clamping screw **60** whose reduced diameter threaded portion **61** passes through notch **38** to be received by the threaded formation of elongated notch **55** formed in stab **50** and communicating with top surface **54** thereof. A semi-circular depression **65** in the line end of housing **11**, **12** cooperates with the elongated enlarged head **64** of clamping screw **60** to act as means for guiding threaded portion **61** through notch **38** into slot **55**.

In FIGURE 1 two combination line terminals **25** are shown engaging the single panelboard stab **50**. Circuit breaker **10** is mounted to this position by entering panelboard mounting lug **72** into load side housing depression **71** and thereafter pivoting housing **11**, **12** about lug **72** until terminal means lug **36** rests against top surface **54** of stab **50**. The other circuit breaker **90** is shown with its line end in juxtaposition to the line end of circuit breaker **10**.

In this position the semi-circular depressions **65** cooperate to form a circular guide slot of diameter slightly greater than the diameter of screw head **64**. Also in this position notches **38** cooperate to form a circular aperture of a diameter slightly greater than the outside diameter of threaded screw portion **61**. It is to be noted that the single clamping screw **60** mechanically secures the line terminals **25** of both circuit breakers **10** and **90**.

It is now apparent that end to end breakers can be plugged into a panelboard in the conventional manner, and if additional secureness or contact area is desired, it is merely necessary to insert and tighten screw **60** until the lugs **36** on the connectors **25** are drawn tightly down on the surface **54** of the feeder bus stab **50**. In some cases only one breaker may be connected to the stab **50** causing an unbalanced condition relative to novel connector **25**. However, it has been found that in those cases although the top of screw **60** may lean slightly away from case **11**, **12**, the length of the threads on screw **60** is sufficient to stabilize screw **60** to provide adequate clamping pressure.

As to the method of forming the threads in the slot **55** of stab **50**, several methods may be employed. If the thickness of the stab **50** is substantially greater than the diameter of the screw threaded portion **61**, stab **50** can be drilled and tapped in the usual manner or a self-tapping screw may be used.

However, practical proportions are such that the screw diameter is very close to or larger than the thickness of the stab **50** as shown in FIGURE 7. In this case, stab **50** can be economically notched with staggered teeth that correspond with the cross-section of the screw to be used as shown in FIGURE 5. These teeth are not spiral but are straight and normal to the broad face of the feeder bus as shown in FIGURE 6. In this manner, these teeth can be punched out in a single operation.

Thus, the instant invention provides a novel terminal means having spring clip means for plug-in connections as well as lug means for a bolted type connection. The plug-in means is for convenience of mounting under ordinary conditions while the addition means for the bolted connection secures additional contact area and achieves mechanical stability.

Although we have here described preferred embodiment of our novel invention, many variations and modifications will now be apparent to those skilled in the art, and we therefore prefer to be limited, not by the specific disclosure herein, but only by the appending claims.

We claim:

1. A circuit breaker terminal means comprising a pair of confronting jaws adapted to engage therebetween a panelboard terminal stab member through engagement with side surfaces thereof, a body portion integrally joining said jaws at their upper ends; a first lug connected to said body portion and operatively positioned above said jaws to engage a top surface adjacent the side surfaces of a panelboard terminal stab member; said first lug extending more in a forwardly direction than said jaws; registry means, including a formation in said first lug, constructed to provide securable engagement between said terminal means and the top surface of a panelboard stab.

2. A circuit breaker terminal means comprising a pair of confronting jaws adapted to engage therebetween a panelboard terminal stab through engagement with side surfaces thereof, an integral central portion connecting said jaws at their upper ends; a first lug extending from said central portion to engage a top surface of a panelboard terminal stab member; said first lug extending more in a forwardly direction than said jaws; registry means, including a formation in said first lug, constructed to provide securable engagement between said terminal means and the top surface of a panelboard stab; said formation adapted to receive a clamping screw.

3. A circuit breaker terminal means comprising a pair of confronting jaws adapted to engage therebetween a panelboard terminal stab through engagement with side surfaces thereof, a central portion integral with said jaws at their upper ends for connecting said jaws; said central portion including a first lug operatively positioned above said jaws to engage a top surface of a panelboard terminal stab; said first lug extending more in a forwardly direction than said jaws; registry means, including a

formation in said first lug, constructed to provide securable engagement between said terminal means and the top surface of a panelboard stab; said formation adapted to receive a clamping screw; said formation comprising a substantially semi-circular notch extending to the most forward edge of said first lug.

4. A circuit breaker terminal means comprising a pair of confronting jaws adapted to engage therebetween a panelboard terminal stab through engagement with side surfaces thereof, a central portion integral with said jaws at their upper ends for connecting said jaws; said central portion including a first and a second lug; said first lug operatively positioned above said jaws to engage a top surface of a panelboard terminal stab; said first lug extending more in a forwardly direction than said jaws; registry means, including a formation in said first lug, constructed to provide securable engagement between said terminal means and the top surface of a panelboard stab; said formation adapted to receive a clamping screw; said second lug extending rearwardly and a contact secured to said second lug near the rear end thereof.

5. A circuit breaker terminal means comprising a pair of confronting jaws adapted to engage therebetween a panelboard terminal stab through engagement with side surfaces thereof, a central portion integral with said jaws at their upper ends for connecting said jaws; said central portion including a first and a second lug; said first lug operatively positioned above said jaws to engage a top surface of a panelboard terminal stab; said first lug extending more in a forwardly direction than said jaws; registry means, including a formation in said first lug, constructed to provide securable engagement between said terminal means and the top surface of a panelboard stab; said formation adapted to receive a clamping screw; said second lug extending rearwardly and a contact secured to said second lug near the rear end thereof; said jaws, said first lug, and said second lug being integral.

6. A circuit breaker including a housing, a stationary contact disposed in said housing, a movable contact disposed in said housing and operable into and out of engagement with said stationary contact and a terminal means secured to said housing at a first end thereof; one of said contacts being electrically connected to said terminal means; said terminal means comprising a pair of confronting jaws adapted to engage therebetween a panelboard terminal stab through engagement with side surfaces thereof, a central portion integral with said jaws at their upper ends for connecting said jaws; said central portion having a first lug operatively positioned above said jaws to engage a top surface of a panelboard terminal stab; registry means, including a formation in said first lug, constructed to provide securable engagement between said terminal means and the top surface of a panelboard, stab.

7. A circuit breaker including a housing, a stationary contact disposed in said housing, a movable contact disposed in said housing and operable into and out of engagement with said stationary contact and a terminal means secured to said housing at a first end thereof; one of said contacts being electrically connected to said terminal means; said terminal means comprising a pair of confronting jaws adapted to engage therebetween a panelboard terminal stab through engagement with side surfaces thereof, a central portion integral with said jaws at their upper ends for connecting said jaws; said central portion including a first lug operatively positioned above said jaws to engage a top surface of a panelboard terminal stab; said first lug extending more in a forwardly direction than said jaws; registry means, including a formation in said first lug, constructed to provide securable engagement between said terminal means and the top surface of a panelboard stab.

8. A circuit breaker including a housing, a stationary contact disposed in said housing, a movable contact disposed in said housing and operable into and out of en-

gagement with said stationary contact and a terminal means secured to said housing at a first end thereof; one of said contacts being electrically connected to said terminal means; said terminal means comprising a pair of confronting jaws adapted to engage therebetween a panelboard terminal stab through engagement with side surfaces thereof; a central portion integral with said jaws at their upper ends for connecting said jaws; said central portion including a first lug operatively positioned above said jaws to engage a top surface of a panelboard terminal stab; said first lug extending more in a forwardly direction than said jaws; registry means, including a formation in said first lug, constructed to provide securable engagement between said terminal means and the top surface of a panelboard stab; said formation adapted to receive a clamping screw.

9. A circuit breaker including a housing, a stationary contact disposed in said housing, a movable contact disposed in said housing and operable into and out of engagement with said stationary contact and a terminal means secured to said housing at a first end thereof; one of said contacts being electrically connected to said terminal means; said terminal means comprising a pair of confronting jaws adapted to engage therebetween a panelboard terminal stab through engagement with side surfaces thereof; a central portion integral with said jaws at their upper ends for connecting said jaws; said central portion including a first lug operatively positioned above said jaws to engage a top surface of a panelboard terminal stab; said first lug extending more in a forwardly direction than said jaws; registry means, including a formation in said first lug, constructed to provide securable engagement between said terminal means and the top surface of a panelboard stab; said formation adapted to receive a clamping screw; said housing having at its said first end a guide formation constructed and operatively positioned to direct a clamping screw through the formation of said first lug.

10. A circuit breaker including a housing, a stationary contact disposed in said housing, a movable contact disposed in said housing and operable into and out of engagement with said stationary contact and a terminal means secured to said housing at a first end thereof; one of said contacts being electrically connected to said terminal means; said terminal means comprising a pair of confronting jaws adapted to engage therebetween a panelboard terminal stab through engagement with side surfaces thereof a central portion integral with said jaws at their upper ends for connecting said jaws; said central portion having a first and second lug; said first lug operatively positioned above said jaws to engage a top surface of a panelboard terminal stab; said first lug extending more in a forwardly direction than said jaws registry means, including a formation in said first lug, constructed to provide securable engagement between said terminal means and the top surface of a panelboard stab; said formation adapted to receive a clamping screw; said second lug extending from said central portion rearwardly for receiving said stationary contact which is mounted thereto.

11. A circuit breaker including a housing, a stationary contact disposed in said housing, a movable contact disposed in said housing and operable into and out of engagement with said stationary contact and a terminal means secured to said housing at a first end thereof; one of said contacts being electrically connected to said terminal means; said terminal means comprising a pair of confronting jaws adapted to engage therebetween a panelboard terminal stab through engagement with side surfaces thereof, a central portion integral with said jaws at their upper ends for connecting said jaws; said central portion including first and second lugs; said first lug operatively positioned above said jaws to engage a top surface of a panelboard terminal stab; said first lug extending more in a forwardly direction than said jaws registry means, including a formation in said first lug, constructed to provide securable engagement between said terminal means and the top surface of a panelboard stab; said formation adapted to receive a clamping screw; said second lug being extended rearwardly from said central portion for receiving said stationary contact; said jaws, said first lug, and said second lug being integral.

12. In combination a panelboard terminal stab and a circuit breaker electrically connected thereto; said circuit breaker including a housing, a stationary contact disposed in said housing, a movable contact disposed in said housing and operable into and out of engagement with said stationary contact and a terminal means secured to said housing at a first end thereof; one of said contacts being electrically connected to said terminal means; said terminal means comprising a pair of confronting jaws biased into engagement with side surfaces of said stab, a central portion integral with said jaws at their upper ends for connecting said jaws; said central portion including a first lug operatively positioned in engagement with a top surface of said stab; said stab including thread receiving means extending to said top surface; a screw extending through a formation of said first lug and received by said thread receiving means for clamping said terminal means to said stab.

13. In combination a panelboard terminal stab and a circuit breaker electrically connected thereto; said circuit breaker including a housing, a stationary contact disposed in said housing, a movable contact disposed in said housing and operable into and out of engagement with said stationary contact and a terminal means secured to said housing at a first end thereof; one of said contacts being electrically connected to said terminal means; said terminal means comprising a pair of confronting jaws biased into engagement with side surfaces of said stab; a central portion integral with said jaws at their upper ends for connecting said jaws; said central portion including a first lug operatively positioned in engagement with a top surface of said stab; said stab including thread receiving means extending to said top surface; a screw extending through a formation of said first lug and received by said thread receiving means for clamping said terminal means to said stab; said housing at its said first end having a guide formation constructed and operatively positioned to direct said screw through the formation of said first lug.

14. In combination a panelboard terminal stab and a circuit breaker electrically connected thereto; said circuit breaker including a housing, a stationary contact disposed in said housing, a movable contact disposed in said housing and operable into and out of engagement with said stationary contact and a terminal means secured to said housing at a first end thereof; one of said contacts being electrically connected to said terminal means; said terminal means comprising a pair of confronting jaws biased into engagement with side surfaces of said stab; a central portion integral with said jaws at their upper ends for connecting said jaws; said central portion including a first lug operatively positioned in engagement with a top surface of said stab; said stab including thread receiving means extending to said top surface; a screw extending through a formation of said first lug and received by said thread receiving means for clamping said terminal means to said stab; said housing at its said first end having a guide formation constructed and operatively positioned to direct said screw through the formation of said first lug; said screw having an elongated head.

15. In combination a panelboard terminal stab and a first and second circuit breaker electrically connected thereto; each of said circuit breakers including a housing, a stationary contact disposed in said housing, a movable contact disposed in said housing and operable into and out of engagement with said stationary contact and a terminal means secured to said housing at a first end thereof; one of said contacts being electrically connected to said terminal means; said terminal means comprising

a pair of confronting jaws biased for engagement with side surfaces of said stab; a central portion integral with said jaws at their upper ends for connecting said jaws; said central portion including a first lug operatively positioned for engagement with a top surface of said stab; said stab including thread receiving means extending to said top surface; a screw extending through a formation of said first lug of said first circuit breaker and received by said thread receiving means for clamping said terminal means to said stab; said housing at its said first end having a guide formation; said second circuit breaker having its terminal means jaws in engagement with said stab side surfaces and its terminal means first lug in engagement with said stab top surface; said screw also passing through the first lug formation of said second circuit breaker; the guide formations of said circuit breakers cooperating to form an elongated slot for guiding said screw.

16. In combination a panelboard terminal stab and a first and second circuit breaker electrically connected thereto; each of said circuit breakers including a housing, a stationary contact disposed in said housing, a movable contact disposed in said housing and operable into and out of engagement with said stationary contact and a terminal means secured to said housing at a first end thereof; one of said contacts being electrically connected to said terminal means; said terminal means comprising a pair of confronting jaws biased for engagement with side surfaces of said stab; a central portion integral with said jaws at their upper ends for connecting said jaws; said central portion including a first lug operatively positioned for engagement with a top surface of said stab; said stab including thread receiving means extending to said top surface; a screw extending through a formation of said first lug of said first circuit breaker and received by said thread receiving means for clamping said terminal means to said stab; said housing at its said first end having a guide formation; said second circuit breaker having its terminal means jaws in engagement with said stab side surfaces and its terminal means first lug in engagement with said stab top surface; said screw also passing through the first lug formation of said second circuit breaker; the guide formations of said circuit breakers cooperating to form an elongated slot for guiding said screw; said screw having an elongated head.

17. In combination a panelboard terminal stab and a first and second circuit breaker electrically connected thereto; each of said circuit breakers including a housing, a stationary contact disposed in said housing, a movable contact disposed in said housing and operable into and out of engagement with said stationary contact and a terminal means secured to said housing at a first end thereof; one of said contacts being electrically connected to said terminal means; said terminal means comprising a pair of confronting jaws biased for engagement with side surfaces of said stab; a central portion integral with said jaws at their upper ends for connecting said jaws; said central portion including a first lug operatively positioned for engagement with a top surface of said stab; said stab including thread receiving means extending to said top surface; a screw extending through a formation of said first lug of said first circuit breaker and received by said thread receiving means for clamping said terminal means to said stab; said housing at its said first end having a guide formation; said second circuit breaker having its terminal means jaws in engagement with said stab side surfaces and its terminal means first lug in engagement with said stab top surface; said screw also passing through the first formation of said second circuit breaker; the guide formations of said circuit breakers cooperating to form an elongated slot for guiding said screw; said slot being substantially circular in cross-section.

18. In combination a panelboard terminal stab and a first and second circuit breaker electrically connected thereto; each of said circuit breakers including a housing,

a stationary contact disposed in said housing, a movable contact disposed in said housing and operable into and out of engagement with said stationary contact and a terminal means secured to said housing at a first end thereof; one of said contacts being electrically connected to said terminal means; said terminal means comprising a pair of confronting jaws biased for engagement with side surfaces of said stab; a central portion integral with said jaws at their upper ends for connecting said jaws; said central portion including a first lug operatively positioned for engagement with a top surface of said stab; said stab including thread receiving means extending to said top surface; a screw extending through a formation of said first lug of said first circuit breaker and received by said thread receiving means for clamping said terminal means to said stab; said housing at its said first end having a guide formation; said last recited circuit breaker having its terminal means jaws in engagement with said stab side surfaces and its terminal means first lug in engagement with said stab top surface; said screw also passing through the first lug formation of said second circuit breaker; the guide formations of said circuit breakers cooperating to form an elongated slot for guiding said screw; said screw having an elongated head; said formations of said first lugs cooperating to define a substantially circular aperture for said screw.

19. In combination a panelboard terminal stab and a circuit breaker electrically connected thereto; said circuit breaker including a housing, a stationary contact disposed in said housing, a movable contact disposed in said housing and operable into and out of engagement with said stationary contact and a terminal means secured to said housing at a first end thereof; one of said contacts being electrically connected to said terminal means; said terminal means comprising a pair of confronting jaws biased into engagement with side surfaces of said stab; a central portion integral with said jaws at their upper ends for connecting said jaws; said central portion having a first lug operatively positioned in engagement with a top surface of said stab; said stab including thread receiving means extending to said top surface; a screw extending through a formation of said first lug and received by said thread receiving means for clamping said terminal means to said stab; the thread receiving means of said stab comprising an elongated slot notched with staggered teeth.

20. In combination a panelboard terminal stab and a circuit breaker electrically connected thereto; said circuit breaker including a housing, a stationary contact disposed in said housing, a movable contact disposed in said housing and operable into and out of engagement with said stationary contact and a terminal means secured to said housing at a first end thereof; one of said contacts being electrically connected to said terminal means; said terminal means comprising a pair of confronting jaws biased into engagement with side surfaces of said stab; a central portion integral with said jaws at their upper ends for connecting said jaws; said central portion having a first lug operatively positioned in engagement with a top surface of said stab; said stab including thread receiving means extending to said top surface; a screw extending through a formation of said first lug and received by said thread receiving means for clamping said terminal means to said stab; the thread receiving means of said stab comprising an elongated slot notched with staggered teeth; said teeth being normal to the faces of said stab.

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