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Maier et al.

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[54] **CIRCUIT BREAKER WITH PRE-LOADED TERMINAL CONNECTORS**

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[52] **U.S. Cl.** ..... **339/147,** 339/64, 200/50 AA, 339/258 R

[51] **Int. Cl.** **H01r 3/00**

[58] **Field of Search** ..... 339/19, 147, 258, 222, 339/64; 206/257, 258, 288, 50 AA, 48 KB

[56] **References Cited**

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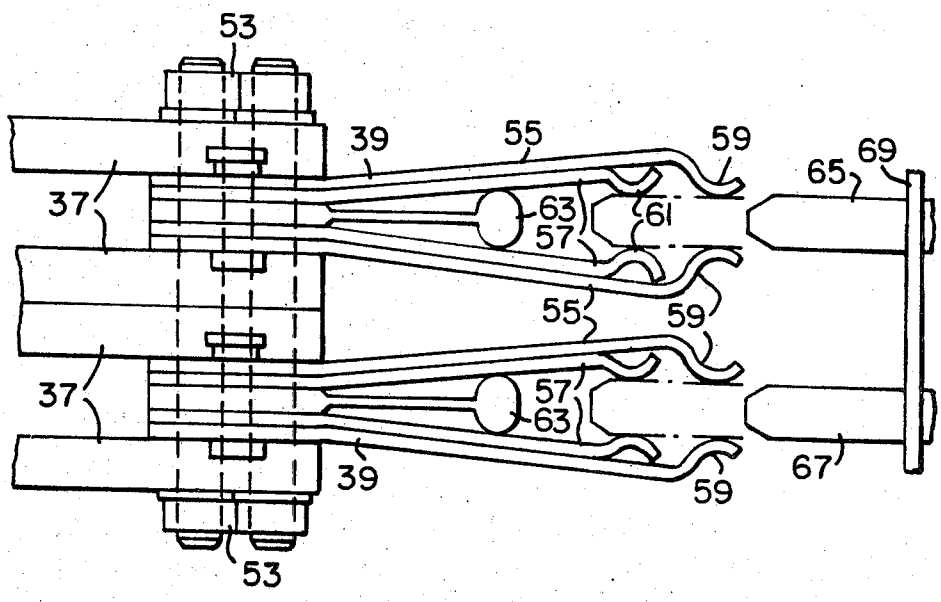
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Assistant Examiner—Robert A. Hafer
Attorney, Agent, or Firm—L. P. Johns

[57] **ABSTRACT**

An electrical control device characterized by a draw-out circuit breaker and spaced electrical stabs. The circuit breaker includes quick-detachable terminal connectors comprising a pair of oppositely disposed flexible stab contacts engageable with opposite sides of a stab and a spacer between the stab contacts for holding the stab contacts in spaced pre-loaded positions by a distance less than the thickness of the stab, whereby engagement of the stab contacts with the stab provides tight electrical contact therebetween.

6 Claims, 3 Drawing Figures



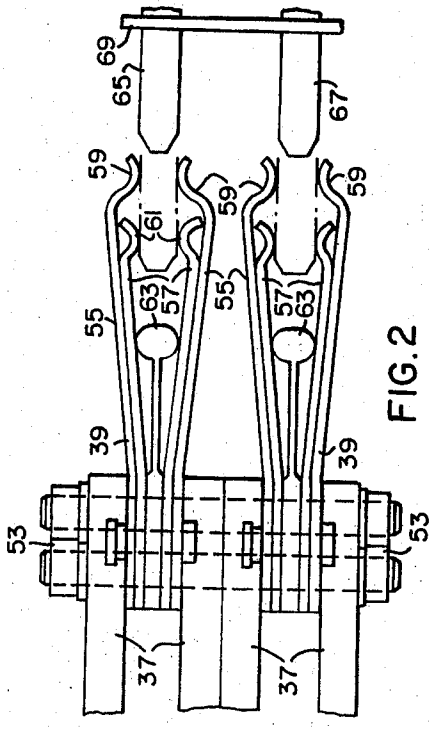


FIG. 2

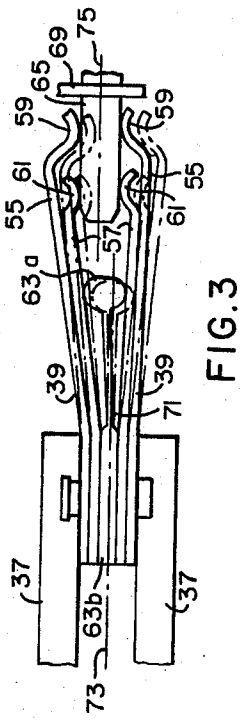


FIG. 3

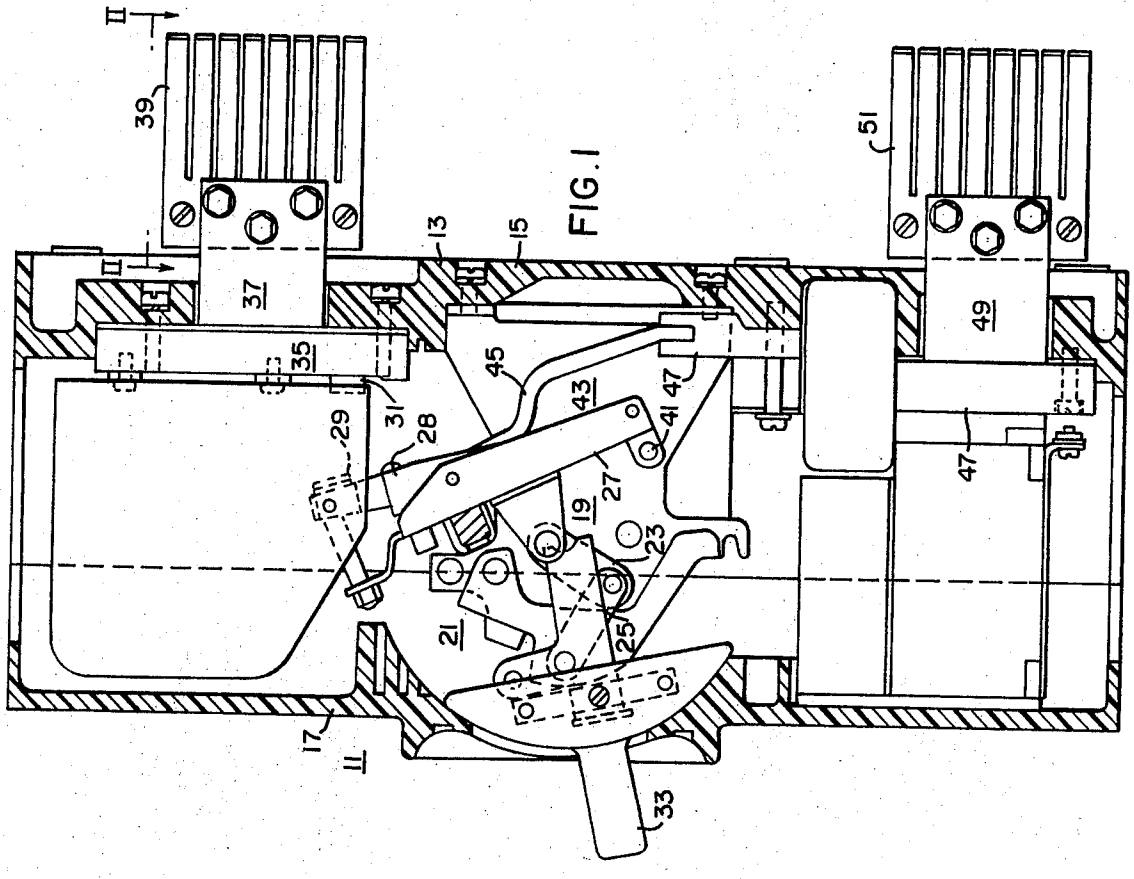


FIG. 1

CIRCUIT BREAKER WITH PRE-LOADED TERMINAL CONNECTORS

BACKGROUND OF THE INVENTION

1. Field of the Invention:

This invention relates to detachable terminal connectors for a circuit breaker and more particularly to flexible contacts for engagement with corresponding stabs.

2. Description of the Prior Art:

Generally, circuit breakers of the drawout type are provided with spring contact fingers that require only a small amount of movement to obtain full engagement with electrical stabs that are aligned with the fingers. Where a large number of spring contact fingers and stabs for engagement therewith are involved, a considerable amount of work is required for complete engagement. Accordingly, there is a need for a more suitable means for obtaining a good electrical contact between the spring contact fingers and the stabs without reducing the force of engagement between the fingers and the stabs when they are fully engaged.

SUMMARY OF THE INVENTION

In accordance with this invention it has been found that the foregoing problem may be overcome by providing a circuit breaker having quick-detachable terminal connectors, each connector comprising a pair of oppositely disposed flexible conductors engageable with opposite sides of an electrical stab, the oppositely disposed stab connectors being spring biased in positions spaced from each other by a distance less than the thickness of the stab, and a spacer between each pair of stab contacts and spaced from the location of the stab contact engagement with the stab.

The advantage of the pre-loaded spring fingers of the drawout type circuit breaker is that where a considerable number of spring contact fingers are involved the amount of work required for engagement with corresponding electrical stabs can be reduced without reducing the force of contact between the fingers and the stabs.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical sectional view through a circuit breaker of the drawout type;

FIG. 2 is a plan view of pre-loaded spring fingers or terminal conductors taken on the line II—II of FIG. 1; and

FIG. 3 is a plan view of one set of spring-fingers in contact with a stab.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1 a circuit breaker is generally indicated at **11** and is generally similar in construction and operation to that disclosed in U.S. Pat. No. 3,343,042 for which reason an abbreviated description is set forth herein.

Briefly, the circuit breaker **11** comprises a housing **13** and a three-pole circuit breaker mechanism **19** supported within the housing. The housing **13** includes a base **15** and a cover **17** both of which are composed of molded insulating material.

The circuit breaker mechanism **19** comprises an operating mechanism **21** which includes a pair of toggle links **23** and **25**, a switch arm **27**, a contact **28**, a movable contact **29**, a stationary contact **31**, and a handle **33**. As shown in FIG. **1** the handle **33** is in the OFF position with the contact **29** and **31** separated in the open position. The stationary contact **31** is mounted on a conductor **35** on which a terminal **37** is mounted. A terminal connector **39** is mounted on the outer end of the terminal **37**. The switch arm **27** is pivotally mounted on a pivot pin **41** on a separate support bracket **43**.

When the handle **33** is moved to the ON position, the contacts **29** and **31** are closed and a circuit through each pole unit of the circuit breaker extends from the terminal connector **39**, the terminal **37**, the conductor **35**, the contacts **31** and **29**, the contact arm **28**, a flexible conductor **45**, a conductor **47**, a terminal **49**, and a terminal connector **51**.

As shown more particularly in FIG. **2** each terminal **37** comprises a plurality of horizontal members extending from the conductor **35**. Moreover, the terminal connectors **39** and **51** of which the terminal connectors **39** are shown in FIG. **2**, comprise a pair of clip-on type or quick-detachable contacts which are connected by suitable means, such as nut and bolt assemblies **53**, to and between the outer end portions of the members of the terminals **37**. Each terminal connector **39** comprises two outer contacts or fingers **55** and two inner contacts or fingers **57**, which contacts or fingers are elongated electrical conducting members composed of a flexible material such as sheet metal. As shown in FIG. **1** each terminal connector **39** is split to provide eight separate pairs of contacts or fingers. In FIG. **2** each outer pair of contacts **55** is bent over at the outer end thereof to provide a generally rounded end portion forming a contact surface **59**. Likewise, the inner pairs of contacts **57** are provided with rounded end portions forming contact surfaces **61**.

In accordance with this invention the terminal connectors **39** comprise the contacts **55, 57** as well as the spacer **63** between each pair of oppositely disposed contacts **55** and **57**. Each pair of contacts **55** and **57** are flared outwardly from their base positions on both sides of the spacer **63**. In the position shown in FIG. **2**, the contacts **55** and **57** are maintained in stressed positions so that both sides press against opposite sides of the spacer **63**. In fact, there may be enough stress on the flexible contacts **55** and **57** to cause them to come together if the spacer **63** were eliminated. Suffice it to say, in the positions shown in FIG. **2** the contacts **55** and **57** are spaced from each other by distances slightly less than the thickness of stabs **65** and **67** which extend through and are mounted in a support wall **69**. Accordingly, when the circuit breaker **11** moves to the right, as viewed in FIG. **2**, the opposite pairs of contact surfaces **59** and **61** are in tight surface-to-surface electrical contact with the stabs **65** and **67** and, inasmuch as the stabs are thicker than the spacing between said surfaces before insertion of the stabs, the contacts **55** and **57** are moved away from opposite sides of the spacer **63**. It is noted that the prestressing of the contacts **55** and **57** by the spacer **63** does not diminish the final force of the contacts on the surfaces of the stabs **65** and **67**.

Another aspect of this invention is the provision of a spacer mounting portion or neck **71** between the base portion **63*b*** the spacer head portion **63*a***. The neck **71** is flexible in order to yield in response to pressure from either side of the spacer. Such pressure occurs when the spacing between the center lines of a pair of stabs **65** and **67** is greater or less than the center lines between an adjacent pair of spacers **63**. As shown in FIG. **3** a center line **73** for the terminal connector **39** which

extends through the spacer **63** is out of alignment with a center line **75** of the stab **65** for some reason, such as improper spacing between the stabs **65** and **67** or between phases. Accordingly, when the terminal connector **39** moves into engagement with the connector the upper side of the stab **65** moves into engagement with the contact surfaces **59** and **61** and thereby raises the contacts **55** and **57** away from the upper side of the spacer **63***a*. In response to the elimination of pressure from that side of the spacer, the contacts **55** and **57** move the spacer **63** *a* upwardly due to there prestress condition until the contact surfaces **59** and **61** engage the lower side of the stab **65.** If the neck **71** were not a flexible member, the spacer **63***a* would not yield in response to the pressure of the lower side contacts **55** and **57** and would therefore prevent those contacts from engaging the stab **65.**

Accordingly, the device of this invention provides pre-loaded spring contacts or fingers for which only a small amount of lateral movement of the fingers is necessary when the drawout circuit breaker is moved into engagement with the stabs. The contact force between the fingers and the stabs remain the same as though no spacer were provided and reduces the work required to move the circuit breaker into place. Finally, by providing a spacer with a flexible neck or mounting portion the entire assembly of the fingers on opposite sides of the stab may move into complete electrical contact with any stab which is out of proper alignment.

What is claimed is:

1. A circuit breaker for use in drawout switchgear having spaced line stabs and including a circuit breaker and a stationary housing having stationary terminals, the stationary terminals being movable into and out of contact with the line stabs, the circuit breaker comprising a pair of separable contacts, means for moving the contacts between open and closed positions, first conductor means for connecting one of the contacts to one of the stationary terminals, second conductor means for connecting the other contact to the other terminal, each stationary terminal comprising a quick detachable terminal connector, each connector including a pair of oppositely disposed flexible terminal contacts engageable with opposite sides of a line stab, said oppositely disposed terminal contacts being spaced from each other by a distance less than the thickness of a line stab when out of contact with said stab, and a spacer between each pair of said terminal contacts, said spacer being flexibly mounted to yield in response to pressure from either side of the spacer.

2. The circuit breaker of claim **1,** in which the terminal connectors are elongated members having corresponding end portions fixedly mounted and having other end portions adapted to receive a terminal.

3. The circuit breaker of claim **2,** in which the terminal contacts comprise at least two members disposed on opposite sides of the spacer and retained by the spacer in spaced tension.

4. The circuit breaker of claim **3,** in which the terminal contacts comprise a pair of flexible members on opposite sides of the spacer, the pair of members on each side comprising a longer outer terminal contact and a shorter inner terminal contact.

5. The circuit breaker of claim **4,** in which the end portions of the terminal contacts are turned inwardly and outwardly for surface contact with the terminals.

6. The circuit breaker of claim **2,** in which the spacer is an elongated element having one end portion seated between the fixedly mounted end portions of the elongated members, the element having another end portion between the pair of oppositely disposed flexible portions of the terminal contacts, and the element having a flexible intermediate portion which is deflectable in response to pressure from the terminal contacts on one side when pressure of the terminal contacts on the other side is removed.

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