Oct. 6, 1964 J. H. LEONARD 3,152,232

CIRCUIT BREAKER HAVING BIMETAL RIGIDLY SECURED TO CRADLE

Filed Feb. 29, 1960 3 Sheets-Sheet 1

FIG. 1.

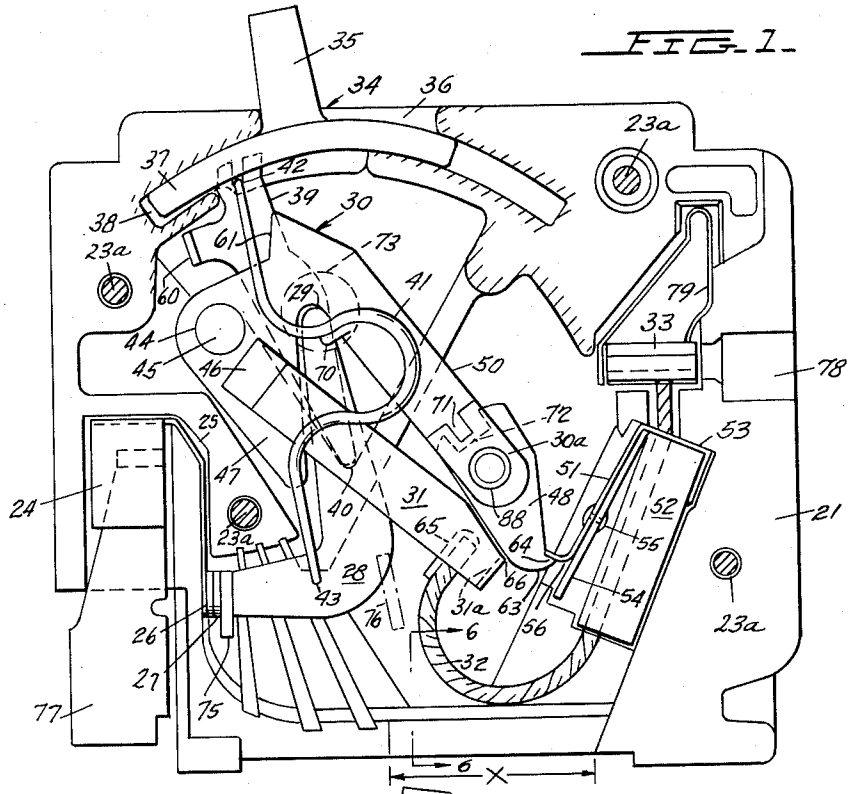
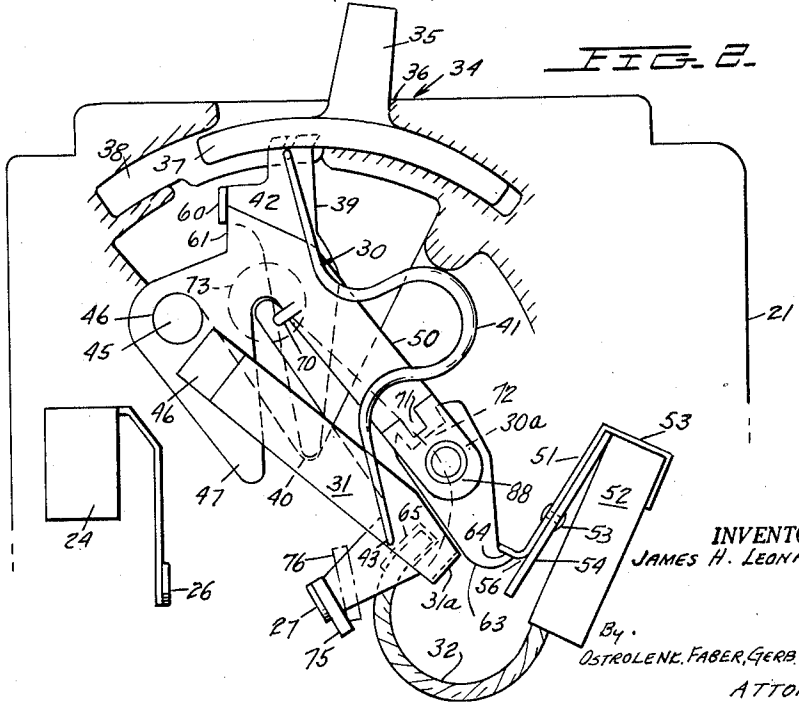


FIG. 2.



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FIG. 3.

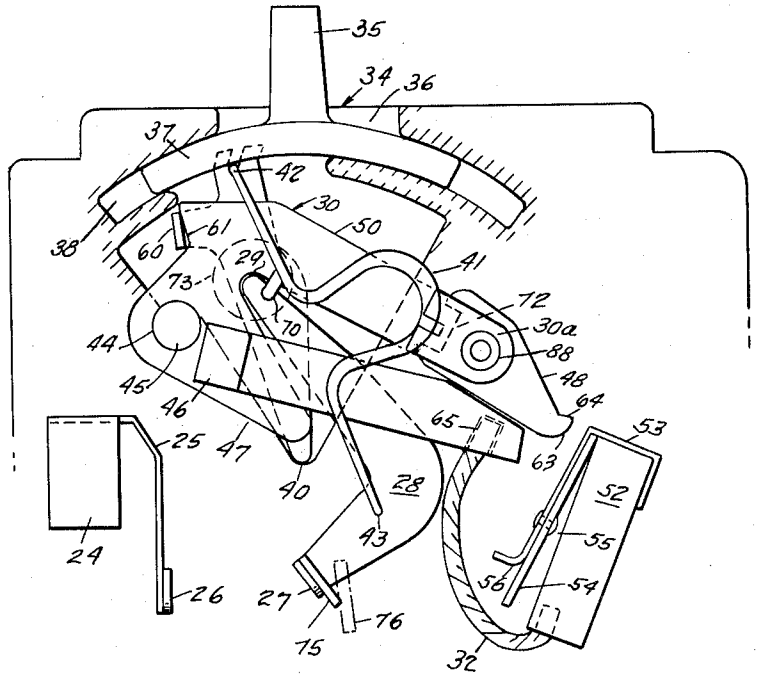


FIG. 4B.

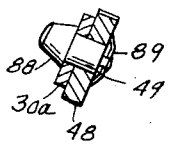


FIG. 4.

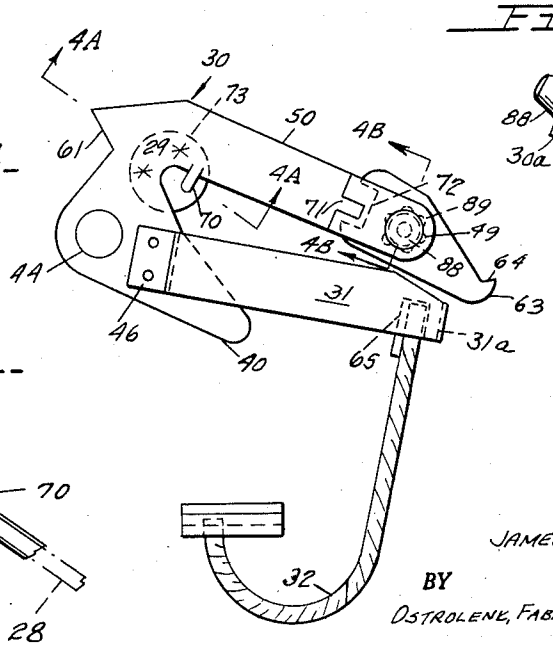
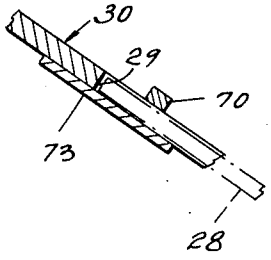


FIG. 4A.



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FIG. 5.

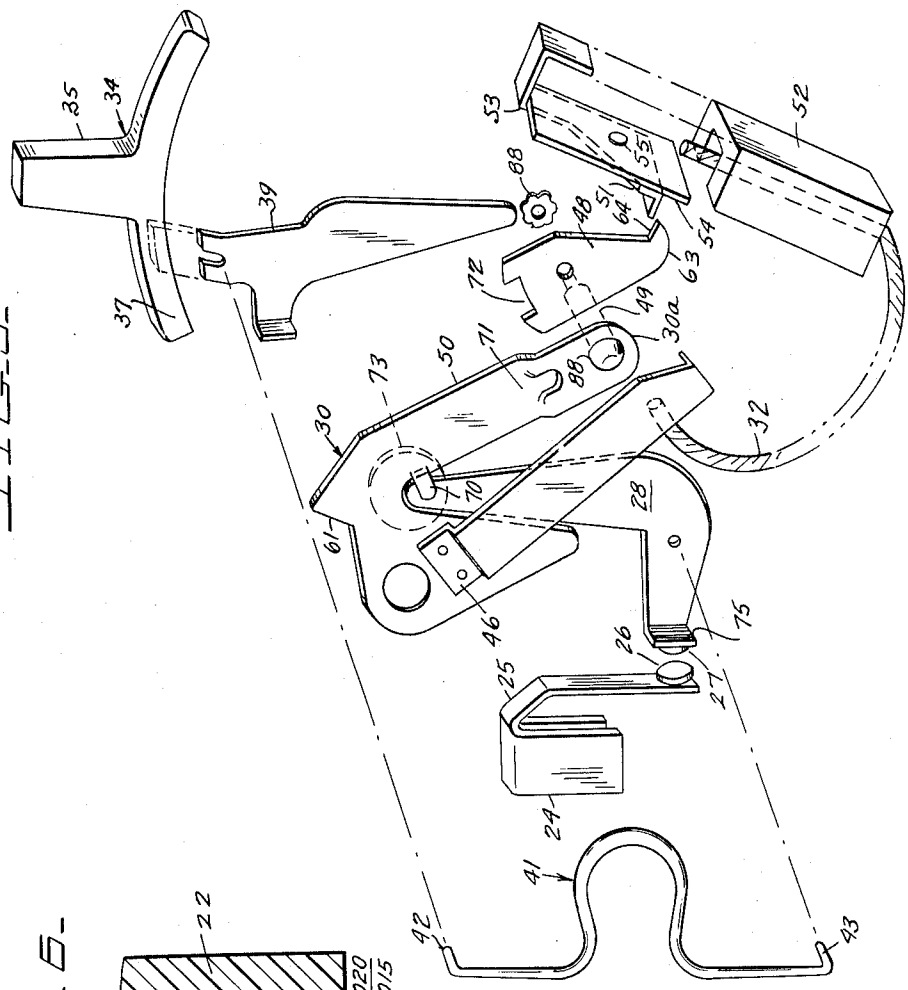
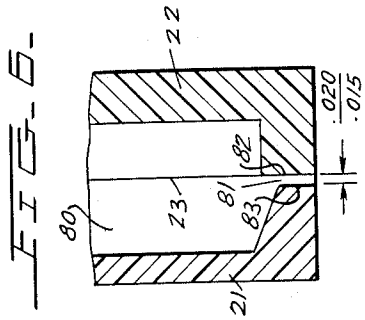


FIG. 6.



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United States Patent Office 3,152,232 Patented Oct. 6, 1964

3,152,232

CIRCUIT BREAKER HAVING BIMETAL RIGIDLY SECURED TO CRADLE

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Filed Feb. 29, 1960, Ser. No. 11,768
12 Claims. (Cl. 200—116)

The instant invention relates to circuit breakers in general and more particularly to a circuit breaker mechanism housed within a narrow casing.

In recent years it has been the practice to construct circuit breakers for home and light industrial applications with casings whose widths are one inch or multiples thereof.

More recently, the trend has been to supply individual circuit breaker protection to many circuits even those carrying light loads. Because of this, the capacity of existing panelboards, while sufficient electrically, were not sufficient in physical size to accommodate the greater numbers of circuit breakers. Further, panelboards having the requisite physical size to accommodate the greater number of circuit breakers were wasteful of material and space.

Thus, it became necessary to construct circuit breakers having narrow housing. For example, a typical circuit breaker of 20 amp rating was usually provided with a molded casing having a one inch width. A circuit breaker of this rating can be replaced by a circuit breaker whose molded insulating housing is one-half inch in width.

Accordingly, it is a primary object of the instant invention to provide a narrow molded case circuit breaker which is economical to construct, is reliable in operation and is simple to calibrate.

It has been a problem in circuit breakers of low current rating, say in the range of 10 to 20 amperes, to generate and confine heat in the current sensing element or bimetal to elevate the temperature thereof to such a point that the thermal tripping of the circuit breaker is not substantially affected by fluctuations in ambient temperature. In low rated circuit breakers a large amount of the heat generated in the bimetal escapes through the electrical connections to the bimetal out through the connecting conductors. If electrical connections are made to the bimetal through pressure joints, as opposed to welded braid connections, the pressure joints will act as thermal barriers confining heat generated within the bimetal to the bimetal. This will cause the bimetal to operate at an elevated temperature so that normal variations in ambient temperature appear as a smaller percentage of the temperature change required for tripping the circuit breaker.

In the device of the instant invention a pressure joint is formed between the movable contact arm and the releasable cradle with contact pressure being established through the tensioning action of the main operating spring. Each operation of the circuit breaker between the open and closed position thereof causes a wiping action to take place at the pressure point thereby cleaning the joint so that a high electrical resistance is not formed.

Cost is maintained at a minimum without sacrificing reliability of operation by eliminating as many elements as possible and also providing a construction wherein many elements perform dual functions.

The instant invention provides a construction wherein the thermal and magnetic trips are calibrated independently of one another. The magnetic trip is of the low current type while the thermal trip is such that its calibration may be established prior to the mounting thereof in the circuit breaker case.

In most prior art circuit breakers a single latching surface is utilized to retain the releasable cradle. Tripping was initiated either thermally or magnetically by causing motion of the single latching surface so that both thermal and magnetic trips were interdependent.

In the circuit breaker of the instant invention a latch means is provided which is comprised of main and intermediate latch members with the intermediate latch member having one portion thereof utilized as a latch surface for magnetic tripping and another portion utilized as a latch surface for the thermal tripping. The bimetal, or thermal tripping element, is positioned to deflect out of the plane of movemnet of the releasable cradle to which the bimetal is affixed while the latch members are arranged to pivot around axes perpendicular to the releasable cradle. Until automatic tripping has actually occurred the relationship between the bimetal and intermediate latch member is unaffected by the position of the main latch member which is movable directly through the action of the magnetic tripping device. Similarly, a deflection of the bimetal will in no way affect the relationship between the elements comprising the magnetic trip means.

The absolute independence of the thermal and magnetic trip device results in the advantage of being able to adjust the trip characteristics of the breaker so as to achieve low magnetic tripping without utilizing a coil. Further, the thermal tripping characteristic may be calibrated prior to installing the thermal trip unit into the circuit breaker case.

The latter is accomplished by providing a sub-assembly comprising a releasable cradle, the bimetal having one end rigidly secured to the cradle and the intermediate latch member pivoted to the cradle and operatively positioned so as to cooperate with the free end of the bimetal to form the latch for the thermal tripping means.

The circuit breaker of the instant invention includes novel means for deionizing and directing arcing gases through the case vent opening. This means is comprised of a narrow elongated slit at the bottom of the case formed by the cooperation of the mating halves comprising the case. The slit forming portions of the mating halves are offset so that the slit is not formed as a small opening in the center of a large surface but as an opening positioned adjacent to a wall. The wall initially acts to create a turbulence in the arcing gases and thereafter serves to direct the deionized gases through the vent opening.

Thus, it is another object of the instant invention to provide a novel circuit breaker of narrow construction including a sub-assembly whereby the thermal tripping characteristic of the breaker may be calibrated externally thereof.

Still another object is to provide a novel circuit breaker sub-assembly wherein the bimetal element is rigidly secured to a releasable cradle with the free end of the bimetal movable away from the plane of movement of the cradle.

Still another object is to provide a circuit breaker construction wherein the contact arm is electrically connected to the circuit through a pressure joint formed by the abutment of the contact arm against the releasable cradle.

A still further object is to provide improved venting for the arc gases by utilizing a housing construction wherein an optimum degree of turbulence is created and at the same time the gases are directed out of the circuit breaker case so as to prevent excess back pressures from being created.

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

FIGURES 1–3 are side elevations of a circuit breaker constructed in accordance with the instant invention with the cover of the casing removed to reveal the operating mechanism. In FIGURE 1 the circuit breaker is in the On position, in FIGURE 2 the circuit breaker is in the manual Off position, and in FIGURE 3 the circuit breaker is in the tripped position.

FIGURE 4 is a side elevation of the cradle sub-assembly.

FIGURES 4A and 4B are cross-sections taken through lines 4A—4A and 4B—4B, respectively, of FIGURE 4 looking in the directions of the respective arrows.

FIGURE 5 is an exploded perspective view of the circuit breaker mechanism.

FIGURE 6 is a fragmentary cross-section of the breaker housing taken through line 6—6 of FIGURE 1 looking in the direction of arrows 6—6.

Now referring to the figures, circuit breaker **20** includes a housing comprised of a case **21** and cover **22** mated to each other along line **23** and secured by rivets **23***a*. The current path through circuit breaker **20** comprises line terminal **24**, conducting strap **25**, stationary contact **26**, movable contact **27**, contact arm **28**, the pressure joint **29** at the upper end of contact arm **28**, releasable cradle **30**, bimetal **31**, conducting braid **32** and load terminal contact member **33**.

Spring **79** acts as a gripping means for a load conductor (not shown) which passes through case opening **78** into engagement with load contact **33**. Adapter means **77**, of a type fully described in my copending application Serial No. 18,411, filed March 29, 1960, entitled "Panelboard Adapter," and assigned to the assignee of the instant invention is utilized to electrically connect line terminal **24** to a panelboard bus bar (not shown).

Circuit break **20** includes an operating member **34** having an extension or handle **35** which extends upwardly through an opening **36** in the top of housing **21**, **22** to provide a manual operating handle. Operating member **34** is also provided with an arcuate portion **37** extending in the direction of movement of handle **35** and disposed within arcuate groove **38** of case **21** and a similar groove in cover **22**. The upper end of handle arm **39** extends into suitable recesses of operating member **34** while the lower end of arm **39** abuts a rounded internal formation of case **21** to form a pivot **40** for operating member **34**.

Main operating spring **41** is secured at one end **42** thereof to arm **39** where the bifurcated end thereof engages member **34** while the other end **43** of spring **41** is connected to movable contact arm **28**. Spring **41** is a tension spring comprised of an open loop with elongated arms extending in opposite directions. The tension force exerted by spring **41** urges the upper end of contact arm **28** to abut cradle **30** at joint **29**.

With sub-assembly **100** (FIGURE 5) in the latched position of FIGURES 1 and 2, circuit breaker **20** may be operated manually between the On and Off positions. When handle **35** is moved to the right with respect to FIGURE 1 at such time as the spring end at **42** passes to the right of a line joining spring end **43** and joint **29**, the line of action of spring **41** will be so positioned so as to effect a snap opening of contacts **26**, **27** by pivoting contact arm **28** in a counterclockwise direction about joint **29** to the Off position of FIGURE 2. The reverse action takes place as handle **35** is moved to the left with respect to FIGURE 2. During this operation, at such time as the line of action of spring **41** extending between spring ends **42**, **43** passes to the left of the line joining spring end **43** and joint **29** in FIGURE 2, contact arm **28** will be snapped in a clockwise direction about joint **29** to the closed position of FIGURE 1.

Sub-assembly **100** comprises cradle **30** which is a generally V-shaped member having an opening **44** near the apex

thereof which receives a case embossment **45** serving as a pivot for sub-assembly **100**. Bimetal **31**, which forms a part of sub-assembly **100**, is fixedly secured at one end **46** thereof as by welding to cradle leg **47** in the region of aperture **44**. Sub-assembly **100** further includes intermediate latch member **48** pivotally secured by rivet **49** to cradle **30** at the free end portion **30***a* of cradle leg **50**. The free end portion **30***a* of leg **50** as well as tab **70** are embossed formations offset from the general plane of cradle **30**. In forming portion **30***a* stop formation **71** is also formed. Stop **71** cooperates with the notch **72** in latch member **48** to limit movement of latch **48** about its pivot **49**.

Tab **70** is raised above one surface of cradle **30** while disk **73** is welded to the other surface of cradle **30**. Thus, tab **70** and disk **73** are operatively positioned and spaced from one another to form means (FIGURE 4B) which receives the upper end of contact arm **28** in the region of joint **29** to provide guidance for arm **28** as it moves between the positions of FIGURES 1–3.

In order to insure a uniform latch bite between bimetal tip **31***a* and intermediate latch member **48** a spring in the form of star washer **89** (FIGURE 4B) is mounted to rivet **49**. Spring **89** urges latch member **48** axially along rivet **49** to establish the same latch bite for successive resettings after thermal tripping. The large round tripped head **88** of rivet **49** serves to align sub-assembly **100** with respect to the internal walls of housing **21**, **22**.

Since contact arm **28** abuts cradle **30** at joint **29** to the right of embossment **45**, the force exerted by main operating spring **41** acts to rotate sub-assembly **100** counterclockwise about pivot **45**. However, subassembly **100** is restrained against movement in a counterclockwise direction through the engagement of intermediate latch member **48** with main latch member **51**. Main latch member **51** is comprised of spring material and includes a portion of reduced area which extends over the back of magnet **52** so as to form a pivot at **53** for armature **54** which is secured to main latch member **51** by rivet **55**.

Magnet **52** is of generally U-shaped cross-section with braid **32** passing between the arms of the U to form the energizing turn therefor. The biasing action of the spring material forming main latch member **51** urges armature **54** in a clockwise direction about its pivot **53** away from magnet **52**. The lower end of armature **54** abuts a case formation **56** to establish the air gap between armature **54** and magnet **52** and also establishes the latching position for member **51**. Magnetic tripping takes place when a predetermined magnitude of current flows through braid **32** causing magnet **52** to generate flux which attracts armature **54** counterclockwise about pivot **53**. This moves main latch member **51** to the right with respect to FIGURE 1 so that sub-assembly **100** is no longer restrained. Thus, sub-assembly **100** under the influence of main operating spring **41** rotates in a counterclockwise direction about pivot **45**. When pivot **29** moves to the left of the line of action of spring **41** in its position of FIGURE 1, spring **41** will urge contact arm **28** in a counterclockwise direction about pivot **29** to bring about a snap opening of contacts **26**, **27**.

The circuit breaker elements are now in the tripped position of FIGURE 3 with sub-assembly **100** being positioned by the abutment of handle arm extension **60** and cradle surface **61** while offset **75** of contact arm **28** abuts cover formation **76**.

After magnetic tripping resetting is accomplished by moving operating handle **35** to the extreme right position from the intermediate tripped position of FIGURE 3. During this movement handle arm extension **60** engages cradle **30** along surface **61** so that subassembly **100** is moved clockwise against the force of spring **41** to the latched position of FIGURE 2. As latch member **48** moves past latched member **51** the rounded portion **63** of intermediate latch member **48** cams latch **51** to the

right until latch surface **64** passes below the lower end of main latch member **51**.

Time delay tripping is accomplished by a deflection of the free end of bimetal **31** out of the plane of movement of cradle **30**. When this deflection is sufficient to free bimetal offset **31***a* from intermediate latch **48** the action of tension spring **41** will rotate cradle **30** in a counterclockwise direction about pivot **45**. Initially intermediate latch member **48** is retained by main latch member **51** so that there is relative movement between cradle **30** and intermediate latch member **48** about pivot **49**. As the distance between pivot **49** and main latch member **51** increases, a point is reached where intermediate latch member **48** is free of main latch member **51** and the subassembly **100** moves to the tripped position of FIGURE 3.

Resetting after thermal tripping is accomplished by moving handle **35** from the intermediate trip position of FIGURE 3 to the extreme right position of FIGURE 2. At the latter portion of this movement intermediate latch member **48** engages case embossment **65** which forces intermediate latch member **48** in a counterclockwise direction about its pivot **49** to a point where member **48** is free of the edge of bimetal extension **31***a* and at this time the free end of bimetal **31** moves toward the plane of movement of cradle **30** into latching position.

It is to be noted that as the latch bite between bimetal offset **31***a* and member **48** changes due to a deflection of bimetal **31** the latch bite between surface **64** and member **51** is not affected. Similarly, a change in the magnetic latch bite **64**, **51** in no way effects the thermal latch bite **31***a*, **48**. Thus, the thermal and magnetic trips are operated independently of one another.

Cover **22** is mated with case **21** to form housing chamber **80**, wherein the operating mechanism is disposed, also forms vent opening **81** (FIGURE 6) which extends for distance X (FIGURE 1) along the bottom of housing **21**, **22**. Vent **81** is greatly elongated being very narrow in width, say .020". It is to be noted that the cover surface **82** forming vent **81** extends beyond the case surface **83** forming vent **81**. Thus, gases formed during circuit interruption in rushing toward vent **81** initially experience turbulence within chamber **81** since vent **81** is so narrow. After the gases are substantially deionized the upper portion of surface **82** not confronted by surface **83** acts to direct the deionized gases through vent **81** out of housing **21**, **22**.

Thus, I have provided a novel circuit breaker mechanism which is especially adapted for narrow housings.

Although I have here described 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.

I claim:

1. A circuit breaker comprising a pair of cooperating contacts and an operating mechanism for operating said contacts into and out of engagement; said mechanism including a releasable cradle, latch means for restraining said cradle in a reset position, an operating spring urging said cradle to a tripped position, and a manually operable member for operating said contacts into and out of engagement; said mechanism further including a thermal tripping element having a free end operatively positioned for engagement with said latch means and when deflected sufficiently to disengage said latch means permitting said spring to move said cradle to its said trip position wherein said contacts are disengaged; said thermal tripping element having another end fixedly secured to said cradle; said free end being positioned to deflect away from the plane of movement of said cradle upon heating of said thermal tripping element; said latch means comprising a first member pivotally mounted to said cradle to an axis extending perpendicular to the plane of movement of said cradle; biasing means urging said first member in the direction of its axis.

2. A circuit breaker comprising a pair of cooperating contacts and an operating mechanism for operating said contacts into and out of engagement; said mechanism including a releasable cradle, latch means for restraining said cradle in a reset position, an operating spring urging said cradle to a tripped position, and a manually operable member for operating said contacts into and out of engagement; said mechanism further including a thermal tripping element having a free end operatively positioned for engagement with said latch means and when deflected sufficiently to disengage said latch means permitting said spring to move said cradle to its said trip position wherein said contacts are disengaged; said thermal tripping element having another end fixedly secured to said cradle; said free end being positioned to deflect away from the plane of movement of said cradle upon heating of said thermal tripping element; a movable contact arm carrying at one end thereof one of said cooperating contacts and at the other end thereof being mounted to said cradle to form a pivotal connection therewith for movement relative to said cradle.

3. A circuit breaker comprising a pair of cooperating contacts and an operating mechanism for operating said contacts into and out of engagement; said mechanism including a releasable cradle, latch means for restraining said cradle in a reset position, an operating spring urging said cradle to a tripped position, and a manually operable member for operating said contacts into and out of engagement; said mechanism further including a thermal tripping element having a free end operatively positioned for engagement with said latch means and when deflected sufficiently to disengage said latch means permitting said spring to move said cradle to its said trip position wherein said contacts are disengaged; said thermal tripping element having another end fixedly secured to said cradle; said free end being positioned to deflect away from the plane of movement of said cradle upon heating of said thermal tripping element; a movable contact arm carrying at one end thereof one of said cooperating contacts and at the other end thereof being mounted to said cradle to form a pivotal connection therewith; said pivotal connection comprising a portion of the sole electrical path between said contact arm and said thermal tripping element.

4. A circuit breaker comprising a pair of cooperating contacts and an operating mechanism for operating said contacts into and out of engagement; said mechanism including a releasable cradle, latch means for restraining said cradle in a reset position, an operating spring urging said cradle to a tripped position, and a manually operable member for operating said contacts into and out of engagement; said mechanism further including a thermal tripping element having a free end operatively positioned for engagement with said latch means and when deflected sufficiently to disengage said latch means permitting said spring to move said cradle to its said trip position wherein said contacts are disengaged; said thermal tripping element having another end fixedly secured to said cradle; said free end being positioned to deflect away from the plane of movement of said cradle upon heating of said thermal tripping element; a movable contact arm carrying at one end thereof one of said cooperating contacts and at the other end thereof being mounted to said cradle at a pivotal connection; said operating spring comprising a tension producing member connected between said manually operable member and said contact arm; and in tension corresponding to said contacts being in their engaged position.

5. A circuit breaker comprising a pair of cooperating contacts and an operating mechanism for operating said contacts into and out of engagement; said mechanism including a releasable cradle, latch means for restraining said cradle in a reset position, an operating spring urging said cradle to a tripped position, and a manually

operable member for operating said contacts into and out of engagement; said mechanism further including a thermal tripping element having a free end operatively positioned for engagement with said latch means and when deflected sufficiently to disengage said latch means permitting said spring to move said cradle to its said trip position wherein said contacts are disengaged; said thermal tripping element having another end fixedly secured to said cradle; said free end being positioned to deflect away from the plane of movement of said cradle upon heating of said thermal tripping element; a movable contact arm carrying at one end thereof one of said cooperating contacts and at the other end thereof being mounted to said cradle at a pivotal connection; said operating spring comprising a tension producing member connected between said manually operable member and said contact arm; and in tension corresponding to said contacts being in their engaged position; said tension producing member comprising a single open ended loop having arms extending in opposite directions.

6. A circuit breaker comprising a pair of cooperating contacts and an operating mechanism for operating said contacts into and out of engagement; said mechanism including a releasable cradle, latch means for restraining said cradle in a reset position, an operating spring urging said cradle to a tripped position, and a manually operable member for operating said contacts into and out of engagement; said mechanism further including a thermal tripping element having a free end operatively positioned for engagement with said latch means and when deflected sufficiently to disengage said latch means permitting said spring to move said cradle to its said trip position wherein said contacts are disengaged; said thermal tripping element having another end fixedly secured to said cradle; said free end being positioned to deflect away from the plane of movement of said cradle upon heating of said thermal tripping element; said latch means comprising a first member pivotally mounted to said cradle to an axis extending perpendicular to the plane of movement of said cradle and a second member for restraining movement of said first member; said mechanism also including an instantaneous trip means for moving said second member for release thereby of said first member with release of said first member by said second member permitting said spring to move said cradle to its said trip position.

7. A circuit breaker comprising a pair of cooperating contacts and an operating mechanism for operating said contacts into and out of engagement; said mechanism including a releasable cradle, latch means for restraining said cradle in a reset position, an operating spring urging said cradle to a tripped position, and a manually operable member for operating said contacts into and out of engagement; said mechanism further including a thermal tripping element having a free end operatively positioned for engagement with said latch means and when deflected sufficiently to disengage said latch means permitting said spring to move said cradle to its said trip position wherein said contacts are disengaged; said thermal tripping element having another end fixedly secured to said cradle; said free end being positioned to deflect away from the plane of movement of said cradle upon heating of said thermal tripping element; said latch means comprising a first member pivotally mounted to said cradle to an axis extending perpendicular to the plane of movement of said cradle and a second member for restraining movement of said first member; said mechanism also including an instantaneous trip means for moving said second member for release thereby of said first member with release of said first member by said second member permitting said spring to move said cradle to its said trip position; said second member being pivotally mounted about an axis perpendicular to the plane of movement of said cradle.

8. A circuit breaker comprising a pair of cooperating contacts and an operating mechanism for operating said contacts into and out of engagement; said mechanism including a releasable cradle, latch means for restraining said cradle in a reset position, an operating spring urging said cradle to a tripped position, and a manually operable member for operating said contacts into and out of engagement; said mechanism further including a thermal tripping element having a free end operatively positioned for engagement with said latch means and when deflected sufficiently to disengage said latch means permitting said spring to move said cradle to its said trip position wherein said contacts are disengaged; said thermal tripping element having another end fixedly secured to said cradle; said free end being positioned to deflect away from the plane of movement of said cradle upon heating of said thermal tripping element; said latch means comprising a first member pivotally mounted to said cradle to an axis extending perpendicular to the plane of movement of said cradle and a second member for restraining movement of said first member; said mechanism also including an instantaneous trip means for moving said second member for release thereby of said first member with release of said first member by said second member permitting said spring to move said cradle to its said trip position; said second member being pivotally mounted about an axis perpendicular to the plane of movement of said cradle; a movable contact arm carrying at one end thereof one of said cooperating contacts and at the other end thereof being mounted to said cradle at a pivotal connection.

9. A circuit breaker comprising a pair of cooperating contacts and an operating mechanism for operating said contacts into and out of engagement; said mechanism including a releasable cradle, latch means for restraining said cradle in a reset position, an operating spring urging said cradle to a tripped position, and a manually operable member for operating said contacts into and out of engagement; said mechanism further including a thermal tripping element having a free end operatively positioned for engagement with said latch means and when deflected sufficiently to disengage said latch means permitting said spring to move said cradle to its said trip position wherein said contacts are disengaged; said thermal tripping element having another end fixedly secured to said cradle; said free end being positioned to deflect away from the plane of movement of said cradle upon heating of said thermal tripping element; said latch means comprising a first member pivotally mounted to said cradle to an axis extending perpendicular to the plane of movement of said cradle and a second member for restraining movement of said first member; said mechanism also including an instantaneous trip means for moving said second member for release thereby of said first member with release of said first member by said second member permitting said spring to move said cradle to its said trip position; said second member being pivotally mounted about an axis perpendicular to the plane of movement of said cradle; a movable contact arm carrying at one end thereof one of said cooperating contacts and at the other end thereof being mounted to said cradle at a pivotal connection; said operating spring comprising a tension producing member connected between said manually operable member and said contact arm.

10. A circuit breaker comprising a pair of cooperating contacts and an operating mechanism for operating said contacts into and out of engagement; said mechanism including a releasable cradle, latch means for restraining said cradle in a reset position, an operating spring urging said cradle to a tripped position, and a manually operable member for operating said contacts into and out of engagement; said mechanism further including a thermal tripping element having a free end operatively positioned for engagement with said latch means and when deflected sufficiently to disengage said latch means permitting said spring to move said cradle to its said trip position wherein said contacts are disengaged; said thermal tripping element having another end fixedly

secured to said cradle; said free end being positioned to deflect away from the plane of movement of said cradle upon heating of said thermal tripping element; said latch means comprising a first member pivotally mounted to said cradle to an axis extending perpendicular to the plane of movement of said cradle and a second member for restraining movement of said first member; said mechanism also including an instantaneous trip means for moving said second member for release thereby of said first member with release of said first member by said second member permitting said spring to move said cradle to its said trip position; said instantaneous trip means comprising a magnet and cooperating armature; biasing means urging said second member to latching position wherein said second member is engageable with said first member; movement of said armature toward said magnet being effective to move said second member away from said latching position to release said first member.

11. A circuit breaker comprising a pair of cooperating contacts and an operating mechanism for operating said contacts into and out of engagement; said mechanism including a releasable cradle, latch means for restraining said cradle in a reset position, an operating spring urging said cradle to a tripped position, and a manually operable member for operating said contacts into and out of engagement; said mechanism further including a thermal tripping element having a free end operatively positioned for engagement with said latch means and when deflected sufficiently to disengage said latch means permitting said spring to move said cradle to its said trip position wherein said contacts are disengaged; said thermal tripping element having another end fixedly secured to said cradle; said free end being positioned to deflect away from the plane of movement of said cradle upon heating of said thermal tripping element; said latch means comprising a first member pivotally mounted to said cradle to an axis extending perpendicular to the plane of movement of said cradle and a second member for restraining movement of said first member; said mechanism also including an instantaneous trip means for moving said second member for release thereby of said first member with release of said first member by said second member permitting said spring to move said cradle to its said trip position; said instantaneous trip means comprising a magnet and cooperating armature; biasing means urging said second member to latching position wherein said second member is engageable with said first member; movement of said armature toward said magnet being effective to move said second member away from said latching position to release said first member; a movable contact arm carrying at one end thereof one of said cooperating contacts and at the other end thereof being mounted to said cradle at a pivotal connection; said operating spring comprising a tension producing member connected between said manually operable member and said contact arm.

12. A circuit breaker comprising a pair of cooperating contacts and an operating mechanism for operating said contacts into and out of engagement; said mechanism including a releasable cradle, latch means for restraining said cradle in a reset position, an operating spring urging said cradle to a tripped position, and a manually operable member for operating said contacts into and out of engagement; said mechanism further including a thermal tripping element having a free end operatively positioned for engagement with said latch means and when deflected sufficiently to disengage said latch means permitting said spring to move said cradle to its said trip position wherein said contacts are disengaged; said thermal tripping element having another end fixedly secured to said cradle; said free end being positioned to deflect away from the plane of movement of said cradle upon heating of said thermal tripping element; a movable contact arm carrying at one end thereof one of said cooperating contacts and at the other end thereof being mounted to said cradle to form a pivotal connection therewith for movement relative to said cradle.

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