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J. SACHS

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AUTOMATIC CIRCUIT BREAKER ASSEMBLY

Original Filed April 15, 1938

Fig. 1

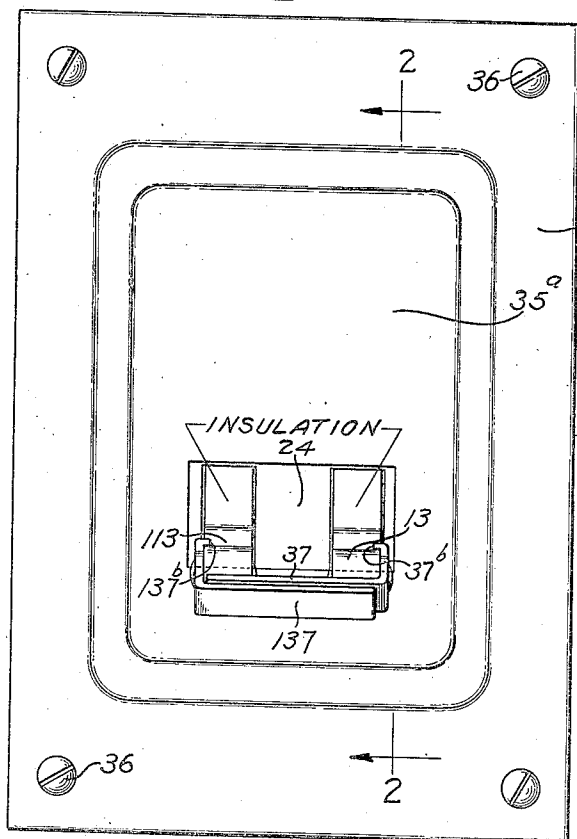


Fig. 2

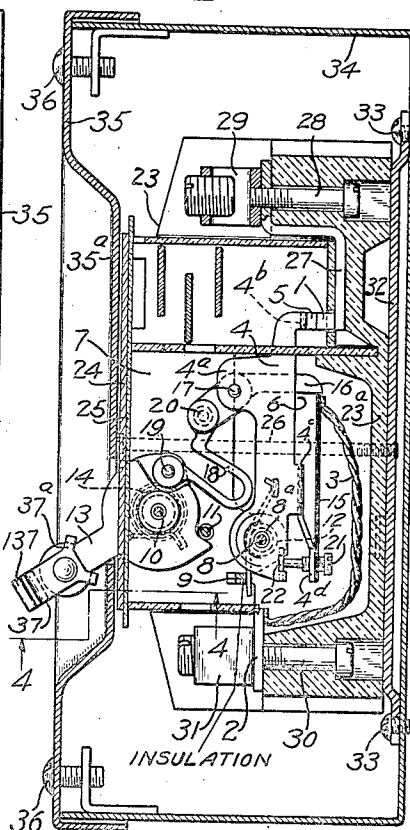


Fig. 4

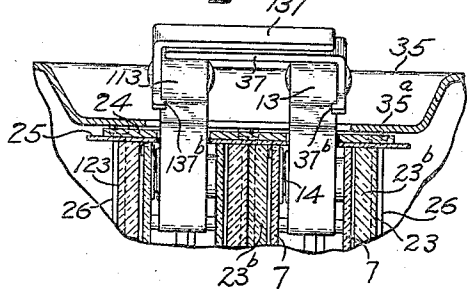


Fig. 3

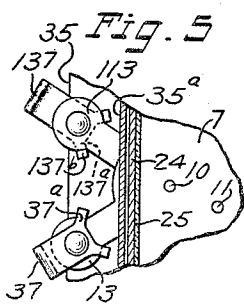
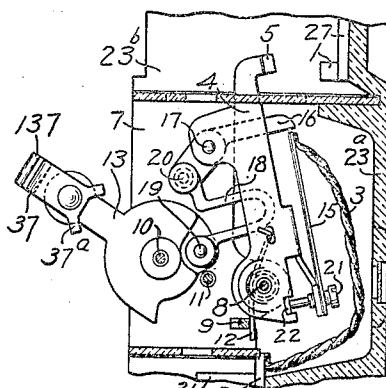
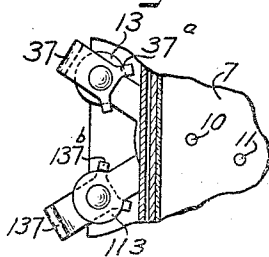


Fig. 6



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UNITED STATES PATENT OFFICE

2,209,353

AUTOMATIC CIRCUIT BREAKER ASSEMBLY

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Colt's Patent Fire Arms Manufacturing Com-
pany, Hartford, Conn., a corporation of Con-
necticut

Application April 15, 1938, Serial No. 202,296
Renewed October 26, 1939

4 Claims. (Cl. 200—5)

The invention relates particularly to an as-
sembly of two or more circuit breaking mecha-
nisms adapted to be respectively connected in
different portions of a circuit, that is, in differ-
ent legs or branches thereof. With such an as-
sembly it is sometimes highly desirable to pro-
vide for the circuit opening or closing operation
of all of the mechanisms by a number of manual
movements substantially less than the total
number of mechanisms.

With circuit breaking mechanisms of certain
types it is essential that each mechanism be free
to operate automatically entirely independently
of any other mechanism; and it is the general
object of the present invention to provide an
assembly of circuit breaking mechanisms of such
a type wherein without interfering with the in-
dependent automatic operation of the respec-
tive mechanisms all of them can be conveniently
operated manually to open or close the circuit by
a reduced number of manual movements. This
object is attained by combining in one sub-
assembly two similar circuit breaking mecha-
nisms which are connectible in two different legs
or branches of a circuit and which are positioned
in closely adjacent side-by-side relationship with
their handles movable in parallel paths, each
mechanism being of the type wherein the han-
dle automatically moves to open-circuit position
when the circuit is automatically broken. Trans-
verse projections on the two adjacent handles
enable the user to easily operate both of them
in unison so that for purposes of manual oper-
ation the two mechanisms constitute a single
sub-assembly normally operable as such. The
handles, however, are not mechanically con-
nected and each is free to move to open-circuit
position when the corresponding mechanism
operates automatically.

By way of example, it will be apparent that in
an assembly comprising eight mechanisms, the
number of sub-assemblies may be reduced to
four; or by utilizing the invention for only two
pairs of mechanisms the number of sub-
assemblies may be reduced to six. While the in-
vention is well adapted for use in assemblies or
panels having a large number of mechanisms, as
for instance eight or more, it is equally useful
for an assembly comprising only two mechanisms,
and such an assembly is shown in the accom-
panying drawing. It will be understood that the
drawing is intended for illustrative purposes only
and is not to be construed as defining or limiting
the scope of the invention, the claims forming a

part of this specification being relied upon for
that purpose.

Of the drawing:

Fig. 1 is a front view of a circuit breaker as-
sembly embodying the invention.

Fig. 2 is a vertical sectional view taken along
the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary vertical sectional view
similar to Fig. 2, but showing the parts in their
open-circuit position.

Fig. 4 is a fragmentary transverse sectional
view taken along the line 4—4 of Fig. 2.

Fig. 5 is a fragmentary view similar to Figs.
2 and 3, but showing the right handle in closed-
circuit position and the left handle in open-cir-
cuit position.

Fig. 6 is a fragmentary view similar to Figs. 2
and 3, but showing the left handle in closed-
circuit position and the right handle in open-
circuit position.

As concerns the details of the mechanisms
there may be wide variation and I do not limit
myself as to such details. One suitable mech-
anism is shown in the drawing, this embodying
the invention set forth in the co-pending appli-
cation of Joseph Sachs and Paul M. Christensen
for Automatic circuit breakers, Serial No. 202,295
filed on even date herewith. One mechanism
will be described, it being understood that the
other is or may be similar in construction.

A stationary main contact 1 is provided and
also a stationary conductor 2 which is separated
from the contact. The contact 1 and the con-
ductor 2 are both mounted upon a suitable base
or housing. Directly connected electrically with
the stationary conductor 2 is a flexible conduc-
tor 3. For making and breaking the circuit be-
tween the contact 1 and the conductors 2 and 3
there is provided a contact member which is piv-
otally movable about a fixed axis. The said con-
tact member comprises a conducting element 4
which carries a movable contact 5 adapted to en-
gage and disengage the stationary contact 1.

The conducting element 4 is formed of sheet
metal bent so as to have a U-shape in transverse
section. The legs 4^a of the U extend forward and
these legs are connected at the rear by a yoke
which has an aperture 6 therein, thus providing
two separated transverse yoke portions 4^b and 4^c.
The before mentioned movable contact 5 is car-
ried by the transverse yoke portion 4^b at the
center thereof.

For supporting the contact member and asso-
ciated parts there is provided an inner frame
which includes two opposite similar insulating

plates 7, 7 spaced apart and connected with each other by transverse members 8, 9, 10 and 11. The transverse member 8 is a pivot or bearing member which extends through holes 8^a in the legs of the conducting element 4, thus providing a pivotal support for the entire contact member. Surrounding the member 8 is a coil spring 12 which engages the conducting element 4 and also engages the insulating transverse member 9, this spring thus serving to bias the contact member in the contact disengaging or circuit opening direction.

A handle or operating member 13 is pivotally supported on the said inner frame, the transverse member 10 being utilized as the pivotal support. The operating member 13 is biased in the clockwise direction by a spring 14.

In order that the operating member 13 may operate the contact member, there is provided a connecting mechanism which is controlled by means of a bi-metallic latch 15 bodily movable with the contact member and cooperating directly with an actuator 16 which is mechanically connected with the operating member. The actuator 16 is pivotally mounted at 17 between the two legs 4^a of the conducting element 4. The actuator 16 has a portion which extends rearward and projects through the aperture 6 in the conducting element 4.

A link 18 is pivotally connected with the operating member 13 at 19 and with the actuator 16 at 20. With the parts in the normal closed-circuit position as shown in Fig. 2, the pivotal axis at 19 is above or in front of a straight line connecting the pivotal axes at 10 and 20, the operating member itself thus cooperating with the link 18 to form a normally locked or overset toggle. The before-mentioned transverse member 11 engages a suitable shoulder on the operating member to limit movement thereof in the counter-clockwise direction.

The before-mentioned bi-metallic latch 15 normally engages the actuator 16 and holds it in its normal relationship with the other parts as shown in Fig. 2. The latch is rigidly secured by brazing or otherwise to an integral downward extension 4^a on the yoke portion 4^c of the conducting element 4. The latch is thus connected near the pivot end of the conducting element, and it extends substantially parallelly therewith to its point of engagement with the actuator 16. The before-mentioned flexible conductor 3 is electrically connected directly with the bi-metallic latch 15 near the upper latching end thereof. This connection may be effected by brazing.

The stationary contact 1 is rigidly supported and the before-mentioned link 18 is U-shaped and resilient so as to be adapted to yield as the toggle approaches its overset relationship, and the link thereupon serves to apply to the contact member the force necessary to provide the required pressure between the contacts. The force exerted by the link also normally serves to hold the toggle in overset relationship.

With the circuit breaker in closed-circuit position as shown in Fig. 2 it will be apparent that electrical connection is established from the stationary contact 1 to the movable contact 5, thence through the conducting element 4 and the bi-metallic latch 15, and thence through the flexible conductor 3 to the stationary conductor 2. As already stated, the contact member is biased in the circuit-opening direction by means of the spring 12, and the operating member is biased in the clockwise or circuit-opening direc-

tion by means of the spring 14. However, actual movement in the circuit-opening direction is normally prevented by reason of the described overset toggle relationship between the operating member itself and the link 18, it being understood that the latch 15 normally holds the actuator 16 from relative movement in the clockwise direction. Normally the operating member 13 may be moved to move the contact member and thus open or close the circuit. During such normal movements the latch 15 remains engaged with the actuator 16.

If the handle or operating member be held in its closed-circuit position as shown in Fig. 2 and if an abnormal current condition such as an overload is attained, the bi-metallic latch 15 is automatically deflected rearward so as to disengage and release the actuator 16. This deflection ordinarily occurs chiefly by reason of the heating of the bimetallic element. When the actuator is no longer held by the latch 15, the entire contact member is moved by the spring 12 to its open-circuit position this movement occurring even though the handle be held in closed-circuit position. Ordinarily however the handle is not held and the spring 14 moves the operating member away from its closed-circuit position, and preferably to its open-circuit position, position shown in Fig. 3. In moving to the position shown in Fig. 3, the operating member moves the link 18 and the actuator 16 to the positions shown in that figure. This movement of the operating member and the actuator occurs as soon as the actuator has moved far enough in the clockwise direction to break the locking relationship between the operating member 13 and the link 18. All of the parts thus move practically instantaneously to the position shown in Fig. 3, the actuator being immediately restored to engaging relationship with the latch. As soon as the latch has cooled sufficiently the operating member can be moved to again close the circuit.

In order to adjust the bi-metallic latch 15 for purposes of calibration it may be desirable to provide an adjusting screw 21 extending through a threaded hole in the latch and in the yoke extension 4^a. This screw abuts against a plate 22 extending transversely between the legs 4^a of the conducting element. It will be apparent that by adjusting the screw 21 the extension 4^a may be deflected and the latch 15 may be moved within certain narrow limits so as to change its relationship with the actuator and so as to be adapted to release the actuator upon the attainment of a definite predetermined overload condition.

A main base or housing is provided which supports the circuit breaker mechanism and all of the conducting parts. When there are two or more mechanisms there may be a corresponding number of separate housings, although this is not essential. As shown there are two separate housings 23 and 23 for the respective mechanisms, each housing being an integral structure comprising a rear wall 23^a and two forward projecting side walls 23^b, 23^b which are spaced apart and which are identical in construction. A front cover 24 is provided which may be of metal, and there is also provided an insulating sheet 25 at the rear of the cover 24. The cover 24 and the sheet 25 will be referred to collectively as constituting the front cover plate, and this cover plate is shown as being of such size as to cover the fronts of both of the housings 23 and

123. The front cover plate is held in place by screws 26, 26 and it has an opening through which projects the operating member or handle 13 for the mechanism at the right and also the operating member or handle 113 for the mechanisms at the left.

The before-mentioned stationary contact 1 is carried by a relatively heavy stationary conductor 27 located near the upper end of the base or housing 23 and held in place by a screw 28. This conductor 27 directly engages at the rear with a portion of the housing. Thus the contact is rigidly supported so that it cannot yield when pressure is applied. A wire terminal 29 cooperates with the conductor 27, being held in place by the screw 28. The before-mentioned stationary conductor 2 is secured to the base or housing 23 near the lower end thereof by means of a screw 30. A wire terminal 31 being held in place by the screw 30 cooperates with the conductor 2.

The housings 23 and 123 are secured to a rear metallic supporting plate 32 by means of the said screws 26, 26 the said plate 32 being in turn secured by means of screws 33, 33 to the rear wall of an outer metallic casing 34. The casing 34 has an openable front cover 35 secured by screws 36, 36, the said cover preferably having a central depressed portion 35^a closely adjacent the housing front cover plate. The cover 35 also has an opening for the operating members or handles 13 and 113.

The two circuit breaking mechanisms are connectible in two portions of a circuit, and in order that they may be conveniently operated in unison as a sub-assembly, the handles 13 and 113 are provided with projections extending transversely in opposite directions so as to be normally in close proximity to each. The two handles with their projections are movable in parallel paths and are in fact movable about a common axis. The two projections facilitate simultaneous manual movement of both handles in either direction, and therefore simultaneous operation of both mechanisms, without interfering with the automatic movement of either mechanism independently of the other from the closed-circuit position to the open-circuit position and without interference with the automatic movement of the corresponding handle away from its closed-circuit position.

The handle projections may vary as to details but I prefer and have shown thin metallic bars 37 and 137 secured respectively to the handles 13 and 113 and extending transversely in overlapping relationship, one of them being at a slightly greater distance than the other from the common axis. When the handles are in similar positions, as for instance in their closed-circuit positions as shown in Figs. 1, 2 and 4 or in their open-circuit positions as shown in Fig. 3, the projections are parallel and closely adjacent, the projection 137 being at the outer side of the projection 37. The projections are respectively provided with angularly bent attachment portions 37^a and 137^a, which are riveted to the respective handles. Inwardly bent teeth at 37^b and 137^b prevent the projections from pivotal movement on the rivets. In view of the fact that the projections 37 and 137 are very close to each other it will be obvious that the operator or user will normally engage both of the projections to move both of the handles simultaneously either in the circuit-opening direction or in the circuit-closing direction. Only by taking particular care

would it be possible for one of the handles to be operated independently of the other and it therefore follows that the user would not move one of the handles separately unless he had a particular reason for doing so. So far as manual operation is concerned, the two mechanisms constitute a unitarily operable sub-assembly which is readily operable to simultaneously open or close both legs or branches of the circuit.

Notwithstanding the adaptation of the sub-assembly for simultaneous manual operation of both mechanisms there is no interference with the highly desirable automatic movement of each handle away from the closed-circuit position in the event of operation of the mechanism as the result of overload. Fig. 5 shows the handle 113 moved away from the closed-circuit as the result of overload and Fig. 6 shows the handle 13 similarly moved. It will be observed that in each case only one handle has moved, and the very fact that it has moved indicates that automatic overload operation has occurred. When the handles move to the open-circuit positions as here shown, it is merely necessary, in order to restore the circuit, to return to closed-circuit position the single handle which has automatically moved to open-circuit position.

What I claim is:

1. In an automatic circuit breaker assembly, the combination of two similar circuit breaking mechanisms connectible in two different portions of a circuit and each comprising a substantially stationary contact and a movable contact and each comprising a manually operable handle for moving the movable contact to open or close the corresponding portion of the circuit and each comprising means automatically operable upon the attainment of excess current conditions in the corresponding portion of the circuit to cause the movable contact to move to open-circuit position and also to cause the handle to substantially simultaneously move away from its closed-circuit position, the two circuit breaking mechanisms being positioned in closely adjacent side-by-side relationship with their handles movable in similar parallel paths, and projections on the respective handles extending transversely in opposite directions so as to be normally in close proximity to each other and thus facilitate simultaneous manual operation of both handles in either direction to open or close both portions of the circuit without interfering with the automatic movement of either handle independently of the other away from its closed-circuit position.

2. In an automatic circuit breaker assembly, the combination of two similar circuit breaking mechanisms connectible in two different portions of a circuit and each comprising a substantially stationary contact and a movable contact and each comprising a manually operable handle for moving the movable contact to open or close the corresponding portion of the circuit and each comprising means automatically operable upon the attainment of excess current conditions in the corresponding portion of the circuit to cause the movable contact to move to open-circuit position and also to cause the handle to substantially simultaneously move to its open-circuit position, the two circuit breaking mechanisms being positioned in closely adjacent side-by-side relationship with their handles movable in similar parallel paths, and projections on the respective handles extending transversely in opposite directions so as to be normally in close proximity to each other and thus facilitate simultaneous manual

operation of both handles in either direction to open or close both portions of the circuit without interfering with the automatic movement of either handle independently of the other from its closed-circuit position to its open-circuit position.

3. In an automatic circuit breaker assembly the combination of two similar circuit breaking mechanisms connectible in two different portions of a circuit and each comprising a substantially stationary contact and a movable contact and each comprising a manually operable handle for moving the movable contact to open or close the corresponding portion of the circuit and each comprising means automatically operable upon the attainment of excess current conditions in the corresponding portion of the circuit to cause the movable contact to move to open-circuit position and also to cause the handle to substantially simultaneously move away from its closed-circuit position, the two circuit breaking mechanisms being positioned in closely adjacent side-by-side relationship with their handles movable in similar parallel paths, and projections on the respective handles extending transversely in opposite directions and overlapping each other, the said projections being normally in close proximity to each other so as to thus facilitate simultaneous manual operation of both handles in either direction to open or close both portions of the circuit without interfering with the automatic movement of either handle independently of the other away from its closed-circuit position.

4. In an automatic circuit breaker assembly the combination of two similar circuit breaking mechanisms connectible in two different portions of a circuit and each comprising a substantially stationary contact and a movable contact and each comprising a manually operable pivotally movable handle for moving the movable contact to open or close the corresponding portion of the circuit and each comprising means automatically operable upon the attainment of excess current conditions in the corresponding portion of the circuit to cause the movable contact to move to open-circuit position and also to cause the handle to substantially simultaneously move away from its closed-circuit position, the two circuit breaking mechanisms being positioned in closely adjacent side-by-side relationship with their handles movable in similar parallel paths about a common axis, and relatively thin metallic projections on the respective handles extending transversely in opposite directions and overlapping each other, the said projections being normally in close proximity to each other but at slightly different distances from the common axis so as to facilitate simultaneous manual operation of both handles in either direction to open or close both portions of the circuit without interfering with the automatic movement of either handle independently of the other away from its closed-circuit position.

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