

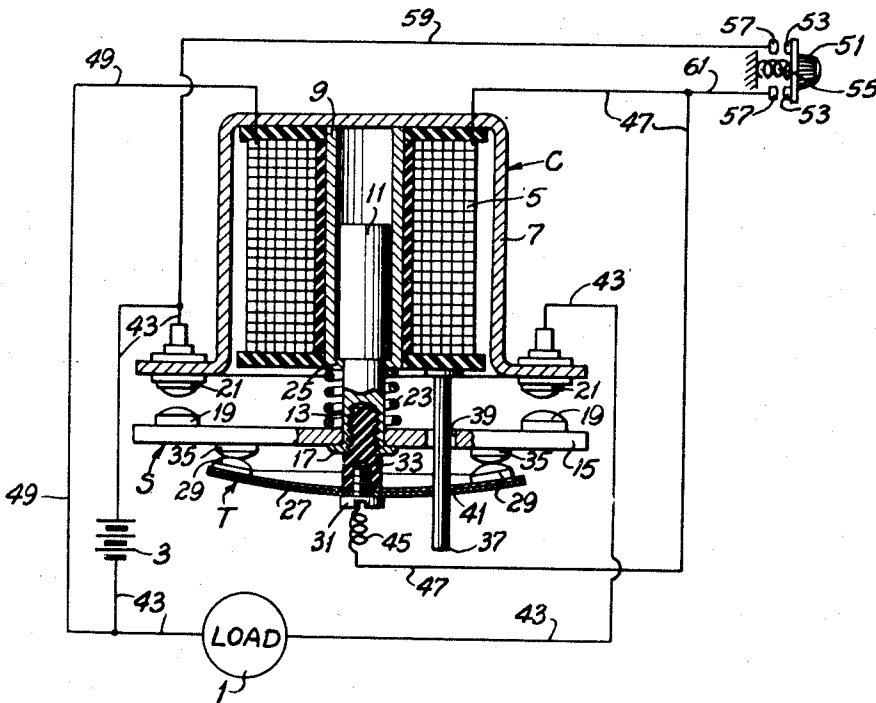
Sept. 27, 1949.

H. M. WILSON

2,482,955

CIRCUIT BREAKER

Original Filed April 22, 1943



Harold M. Wilson,
Inventor.
Haynes and Koenig
Attorneys.

UNITED STATES PATENT OFFICE

2,482,955

CIRCUIT BREAKER

Harold M. Wilson, Lexington, Mass., assignor to
Metals & Controls Corporation, Attleboro,
Mass., a corporation of Massachusetts

Original application April 22, 1943, Serial No.
483,984. Divided and this application Decem-
ber 8, 1947, Serial No. 790,403

8 Claims. (Cl. 175-294)

1

This invention relates to combined electromag-
netic and thermal protective circuit breaker sys-
tems, and more particularly to remote-control
circuit breaker systems of this class particularly
for use on aircraft and the like.

This application is a division of my co-pending
application of the same title, Serial No. 483,984,
filed April 22, 1943, now Patent No. 2,434,186.

Among the several objects of the invention may
be noted the provision of a simple form of manual
reset, combination magnetic and thermal circuit
breaker system for opening a load circuit if cur-
rents of dangerous value flow therein; the pro-
vision of apparatus of the class described ar-
ranged to permit placement of a control switch
on an operating panel without the use of large
copper conductors to outlying devices; the pro-
vision of apparatus of this class which permits
the use of a remote-controlled circuit breaker as
large as needed near an outlying device, and the
provision of a circuit breaker of this class wherein
the thermal responsive element is not called upon
to carry all of the load current. Other objects
will be in part apparent and in part pointed out
hereinafter.

The invention accordingly comprises the ele-
ments and combinations of elements, features of
construction, and arrangements of parts which
will be exemplified in the structures hereinafter
described, and the scope of the application of
which will be indicated in the following claims.

In the accompanying drawing, in which one
of various possible embodiments of the inven-
tion is illustrated, the single figure is a vertical
section of the circuit breaker and a wiring dia-
gram of the system of this invention.

Referring to the drawing, there is shown at
numeral 1 an electrical load, such as an electric
motor or similar translating device, which is con-
nected in a load circuit energized by a suitable
source of power, herein illustrated as a battery
3. The load circuit is controlled by the combined
electromagnetic and thermal circuit breaker C
of this invention. The circuit breaker comprises
a solenoid switch S having a solenoid coil 5 fixed
in a case 7 surrounding a guide 9. Sliding in the
guide is a magnetic armature core 11 which has
an extension 13 of reduced diameter extending
out of the guide. A bus bar switch arm 15 is
riveted on the outer end of extension 13 as indi-
cated at 17. The switch arm carries contacts 19
facing the case 7. These contacts are cooperable
with contacts 21 fixed on but insulated from
case 7.

The armature core 11 (and its extension 13)

2

and switch arm 15 are biased outward by a spring
23 reacting from a flanged portion 25 of the
guide 9 against the arm. The flanged portion
25 also acts as a stop limiting outward movement
of the arm. The latter is movable toward the
case 7 against the bias of spring 23 when the
solenoid coil is energized to close the solenoid
switch by engaging the contacts 19 and 21. Cur-
rent may thereupon flow from one of fixed con-
tacts 21 through the arm 15 to the other con-
tact 21.

The circuit breaker includes a thermal switch
T adapted under non-overload conditions for
connection in shunt with the arm 15 to carry a
part of the load current. This thermal switch
controls a holding circuit for solenoid coil 5, as
will be made clear. It comprises an electrically
conductive thermostatic element 27, herein illus-
trated as a snap-acting thermostatic disc of the
type known in the art as a Spencer disc, having
contacts 29 thereon. The disc is centrally
mounted by a screw 31 on the outer end of a pin
33 of insulating material threaded into the outer
end of armature extension 13. The disc 27 is
mounted to snap upon overheating from a nor-
mal position wherein its contacts 29 engage a set
of contacts 35 on the arm 15 and close the hold-
ing circuit to a position wherein contacts 29 and
35 are disengaged to open the holding circuit. A
pin 37 of insulating material extends from the
solenoid body through apertures 39 and 41 in the
arm 15 and disc 27, respectively, for maintain-
ing the contacts 19 and 21 of the solenoid switch
and the contacts 29 and 35 of the thermal switch
in alignment.

The load 1 is connected in series with the bat-
tery 3 and the solenoid switch S in a load circuit
designated 43. This load circuit is completed
when switch S is closed, i. e., when the bus bar
switch arm 15 is in a position wherein contacts
19 and 21 are engaged. Under such conditions
load current flows through the arm. If the disc
27 is in its normal position closing contacts 29
and 35, part of the load current will flow there-
through.

A holding circuit for the solenoid switch is con-
nected across the battery and includes the switch
S and the thermal switch T in series. As illus-
trated, the disc 27 is connected through a pigtail
connection 45 and a line 47 to one terminal of the
coil 5. The other terminal of the coil is connected
by a line 49 to the load circuit 43 at a point on the
other side of the battery with respect to the
switches.

The above-described arrangement is such that

3

when the arm 15 is moved inward with respect to the solenoid to close contacts 19 and 21, load circuit 43 is completed to energize the load 1. Assuming that the disc 27 is not overheated and is in its normal position closing contacts 29 and 35, the holding circuit for the solenoid coil 5 is completed from one terminal of the battery 3, through the arm 15 of switch S, through disc 27, pigtail 45, line 47, coil 5, and line 49 to the other terminal of the battery. Coil 5 is thus energized to hold the arm 15 in load-circuit-closing position.

The disc 27 is calibrated to heat and snap to open-circuit position at predetermined overload shunt current therethrough. Thus, upon overload, the disc 27 snaps to disengage contacts 29 and 35, thereby breaking the holding circuit. Spring 23 thereupon biases arm 15 outward to disengage contacts 19 and 21 and break the load circuit.

One way of initially energizing the holding circuit through coil 5 to make the load circuit is manually to move the arm 15 to circuit-closing position. It is preferred, however, to provide a remote-control reset switch 51 for energizing solenoid coil 5 to close the solenoid switch S and establish the holding circuit. The switch 51 has contacts 53 movable against the bias of spring 55 to close contacts 57. One of contacts 57 is connected by a wire 59 to load circuit 43 on one side of the battery 3. The other contact 57 is connected by a wire 61 to line 47 on the other side of the battery. Thus, when switch 51 is closed, a circuit is completed from the load circuit on one side of the battery through line 59, switch 51, line 61, part of line 47, coil 5, and line 49 to the load circuit on the other side of the battery. This energizes coil 5 to close both the load circuit and the holding circuit for coil 5 (assuming disc 27 to be in its normal position closing contacts 29 and 35), and switch 51 may be released without opening the load and holding circuits.

Wires 59 and 61 may be small since they carry only a small amount of current. Thus, switch 51 may be located on a control board remote from the circuit breaker C without use of heavy control wires. This is desirable, particularly in aircraft installations, where saving in weight is essential. At the same time, use of switch 51 permits disc 27 to be located close to the load 1 if it is desired to protect the load from overheating. For example, in such instances the circuit breaker C may be strapped directly to a motor or generator and the wires 59 and 61 carried over to switch 51 on the pilot's instrument panel. It is to be understood, however, that the circuit breaker need not be near the load 1 where the object is simply protection against overload currents.

It will be understood that the thermostatic element 27, while preferably a snap-acting disc of the Spencer type, may be of a strip, creep-acting or other type under circumstances of low current value in the work circuit.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A thermostatic switch comprising fixed contacts, a fixed solenoid coil, an assembly comprising a movable contact bus engageable and disengageable with said fixed contacts and organized with a movable armature responding to energization of the coil, means biasing said assembly toward disengagement of said bus from said fixed contacts, a thermostatic member mounted on and bodily carried with said bus, movable contacts controlled by said thermostatic member and adapted when said member is cold electrically to engage the bus to form a shunt path through said thermostatic member, said thermostatic member when hot moving to a position to break the shunt circuit therethrough, a load circuit including said fixed contacts, a holding circuit including said thermostatic member when it is in cold position and also said bus, and manually-operable means for initially moving the assembly of said armature and bus to engage the bus with said fixed contacts.

2. A manually resettable circuit breaker comprising an electromagnetic switch having a coil and a switch arm controlled thereby for making and breaking a load circuit, a thermal switch comprising a thermostatic element normally connected in shunt with said switch arm and disconnectable therefrom upon overheating, said thermal switch being connected in series with the coil and the switch arm of the electromagnetic switch in a holding circuit for the latter so that the coil is energized when both the electromagnetic and thermal switches are closed.

3. A manually resettable circuit breaker comprising an electromagnetic switch having a coil and a switch arm controlled thereby for making and breaking a load circuit, a thermal switch comprising a thermostatic element mounted on the switch arm for movement, upon heating, from a normal position wherein it is connected in shunt with the switch arm to a position wherein it is disconnected from the switch arm, said thermal switch being connected in series with the coil and the switch arm of the electromagnetic switch in a holding circuit for the latter so that the coil is energized when both the electromagnetic and thermal switches are closed.

4. A manually resettable circuit breaker comprising a solenoid switch having a coil and a bus bar switch arm controlled thereby to make a load circuit upon energization of the coil, a thermostatic element mounted on the switch arm for movement, upon heating, from a normal position wherein it engages the switch arm to provide a shunt path through said element to a position disconnected from the switch arm, and a holding circuit having said thermostatic element, switch arm and coil connected in series.

5. A circuit breaker as set forth in claim 4, further including a solenoid-energizing circuit including the solenoid coil and a reset switch.

6. A manually resettable circuit breaker system comprising a load, a load circuit including a source of power and a solenoid switch having a coil, an armature movable in response to energization of the coil, and a switch arm mounted on the armature for making the load circuit upon energization of the coil, the switch arm being biased to load-circuit-breaking position, a snap-acting thermostatic disc mounted on the switch arm for movement, upon heating, from a normal position wherein it engages the switch arm and provides a shunt path through the disc to a position disconnected from the switch arm, and a

5

holding circuit for the solenoid switch having said disc, switch arm and coil connected in series across the source of power.

7. A circuit breaker system as set forth in claim 6, further including a solenoid-energizing circuit including the solenoid coil and a reset switch connected in series across the source of power.

8. A manually resettable circuit breaker comprising a solenoid switch having a coil, an armature movable in response to energization of the coil, and a switch arm mounted on the armature for making a circuit when the coil is energized, the switch arm being biased to circuit-breaking position, a snap-acting thermostatic disc mounted on the switch arm for movement with the switch arm and for movement relative to the switch arm between a normal cold position wherein it engages the switch arm and provides a shunt

6

path through the disc and a hot position wherein it is electrically disconnected from the switch arm, said disc being connected in series through the switch arm with the coil in a holding circuit for the latter so that the coil is energized when the switch arm is in circuit-making position and the disc is in normal cold position.

HAROLD M. WILSON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,764,374	White	June 17, 1930
1,922,452	Parks et al.	Aug. 15, 1933
1,932,808	Van Valkenburg	Oct. 31, 1944