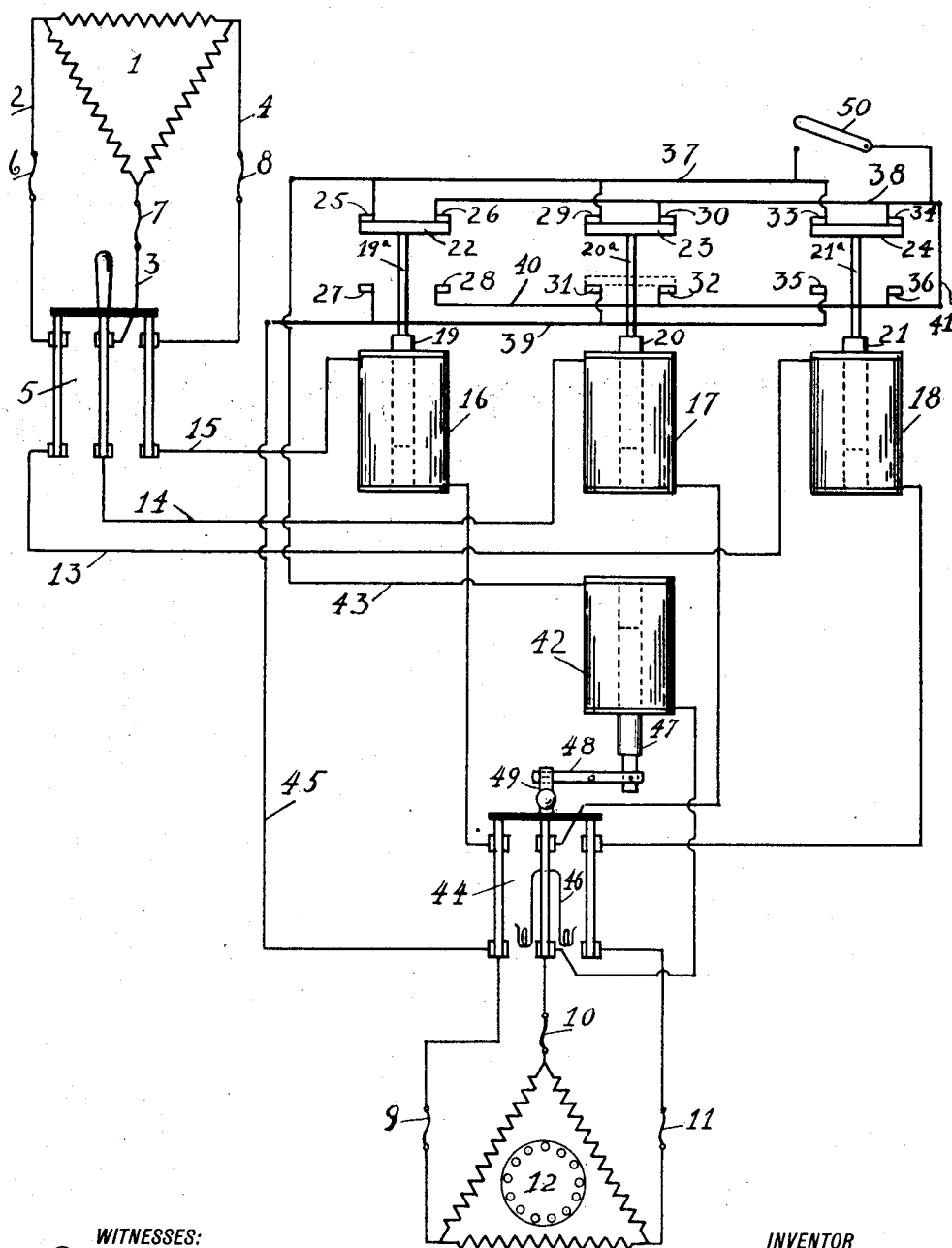


J. A. VAN ALSTYNE.
 AUTOMATIC MOTOR PROTECTING SWITCH.
 APPLICATION FILED JUNE 1, 1915.

1,189,409.

Patented July 4, 1916.



WITNESSES:

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UNITED STATES PATENT OFFICE.

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TO CASPER VINCENT SCHNEIDER, OF SACRAMENTO, CALIFORNIA.

AUTOMATIC MOTOR-PROTECTING SWITCH.

1,189,409.

Specification of Letters Patent.

Patented July 4, 1916.

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To all whom it may concern:

Be it known that I, JOHN ASTOR VAN ALSTYNE, a citizen of the United States, residing at Sacramento, in the county of Sacramento and State of California, have
5 invented certain new and useful Improvements in Automatic Motor-Protecting Switches, of which the following is a specification.

10 This invention relates to improvements in electric switches and is more particularly adaptable for use with a three phase electric motor, although adaptable to a two
15 phase motor. In the operation of this class of motors, there is always a danger of the motor "burning out" when a fuse blows or a main line conductor is disrupted.

One of the objects of this invention therefore is to provide a simple, yet efficient,
20 means whereby when a fuse blows or a main conductor is broken, the switch may automatically be opened, and placed in non-latchable relation.

Another object is to provide a protective
25 switch which under some conditions will not be opened when the entire electric current is cut off, and under other conditions will remain in non-latchable relation though the circuit and fuses shall have been re-
30 paired.

A still further object is to provide a switch which cannot be properly latched so long as any disruption exists in the fuses or main conductors either on the generator
35 side of the protective switch or the motor side.

My improved switch is adaptable for use with float switches, compensators, oil switches and other electrical appliances re-
40 quiring protective switches.

Other objects will appear as the description progresses.

With these objects in view, my invention consists in the novel features of construction and combination of parts more fully
45 described hereinafter and pointed out in the claims.

The figure is a diagrammatic view to illustrate a system of electrical connections and the more easily to trace the various circuits, wherein a three phase alternating current generator 1 is connected by the conductors 2, 3 and 4 to the triple pole service switch 5. Service fuses 6, 7 and 8 may be
50 inserted in the conductors, as well as protec-

tive fuses 9, 10 and 11 for the motor 12. Connected in series in each of the supply conductors 13, 14 and 15 is a solenoid 16, 17 and 18 having respectively a movable
core 19, 20 and 21. In the upper end of each
30 core is secured a nonmagnetic rod 19^a, 20^a and 21^a, supermounted by a metal disk 22, 23 and 24. Above and below these disks are contact points 25, 29 and 33 connected
to bar 37; contact points 26, 30 and 34
65 connected to bar 38; contact points 27, 31 and 35 connected to bar 39; and contact points 28, 32 and 36 connected to bar 40. Bars 40 and 38 are connected by conductor 41. In addition to the three solenoids already
70 mentioned, is a tripping solenoid 42, one of whose terminals is connected to bar 37 by conductor 43 and the other terminal to a main conductor such as 14 at any point
preferably on the motor side of the protec-
75 tive switch 44. Bar 39 is connected to a main line conductor such as 15 preferably below the protective switch 44 by conductor 45. For throwing the switch 44 is a spring
46 and interposed between the movable core
80 47 of solenoid 42 is a tripping lever 48 operating in a catch 49 to hold the switch in closed position or to release the same upon the occurrence of predetermined conditions. The switch 44 is in the main circuit connect-
85 ing the motor 12 to the source of electric energy. For the purpose to be further explained, is a single switch 50 interposed between bars 37 and 38.

The operation of my improved switch
90 will be explained as follows. When the motor 12 is running, all parts are in the positions as shown in the drawing. Should say fuse 7 or conductors 3 or 14 on the generator side of the switch 44 be disrupted,
95 solenoid 17 will become deenergized causing core 20 and disk 23 to drop to position as indicated by the dotted line. This will make a metallic connection between contact points 31 and 32 thereby completing a circuit through conductors 15 and 45, bar 39,
100 across contact points 31 and 32 through disk 23, bar 40, conductor 41, bar 38, across contact points 34 and 33 through disk 24 (which disk as well as disk 22 still remains in its
105 uppermost contact position), thence to bar 37, conductor 43, solenoid 42 to main conductor 14 below switch 44 on the motor side. The tripping solenoid 42 is therefore in complete circuit through the motor windings
110

causing core 47 to be drawn up, thus releasing latch 49 and instantly throwing switch 44 open, thereby protecting the motor.

Should fuse 10 or conductor 14 on the motor side of the switch 44 become disrupted, the circuit will be exactly as above except that the return will be made through conductor 14 on the generator side of the switch. In similar manner may be traced the path of the current when any other fuse or main conductor is disrupted. If the disturbance is in conductor 2 or 13, solenoid 18 will be deenergized and disk 24 will drop; if the disturbance is in conductor 4 or 15, solenoid 16 will be deenergized and disk 22 will drop.

It will be noted that whenever a fuse blows or a main conductor is disrupted anywhere in the entire circuit, two disks will remain in their uppermost contact positions and one disk will drop; and whenever this condition obtains, a current will pass through solenoid 42 causing a tripping of the lever and a consequent throwing of the protective switch.

It will also be noted that should switch 5 (which may be a float switch or a switch operated manually or mechanically) be opened, the entire circuit will be open and all disks will drop, but switch 44 will remain closed as no current can pass through solenoid 42, and when switch 5 is then closed, the motor 12 is again placed in running position. If it is desired in the latter case that the motor 12 shall not run after switch 5 is closed, the switch 50 may be closed thus causing an energization of the tripping solenoid 42 upon the closing of switch 5, for the closing of switch 50 will have the same effect as a disk when in its uppermost contact position of connecting the two upper bars 37 and 38.

It will also be noted, whether switch 50 is on or off, that should any attempt be made to close switch 44 when a disruption exists anywhere in the entire circuit, it will not latch, for while two main solenoids may be energized, one will not be, consequently the tripping solenoid 42 will be energized, holding latch 49 in release position, thus protecting the motor against careless closing of switch 44.

It will be further noted that when all circuits are in working order and the motor running, no current passes through the tripping solenoid.

In further explanation will say that in order to effect a strong pull on the core 47, solenoid 42 is wound with comparatively fine insulated wire, while solenoids 16, 17 and 18 are wound with insulated wire sufficiently heavy to carry all the current required by the motor, hence practically no heating of the coils is occasioned or current consumed.

The novel arrangement of disks, contact points and electrical connections gives a safety switch of a large range of usefulness in a simple and efficient manner.

While I am aware that solenoids have been used for similar purposes, I am not aware that the electrical and mechanical arrangement and grouping of conductors and parts herein described have ever been used.

Also I do not wish to hold myself strictly to the arrangement set forth in the diagrammatic representation of my invention as various modifications in the circuit arrangement and variations in the structural details may be effected within the spirit and scope of this invention.

Having thus described the invention, what I claim as new and desire by Letters Patent to secure, is—

1. In a protective device for a three phase circuit, a solenoid for each phase; a freely movable armature in each solenoid; a metallic member mounted on each armature; a pair of contact points above and below each metallic member, one contact point in each pair being connected together by conductors forming four sets of three contact points each; and a connection between a lower set and an upper set of contact points, whereby when any one metallic member is down, one or both of the other two metallic members being up, an electrical connection exists between the other two sets of contact points.

2. In a protective device for a three phase circuit, a tripping-solenoid having tripping means; a solenoid for each phase of the circuit; a freely movable armature in each solenoid; a metallic member mounted on each armature; a pair of contact points above and below each metallic member, one contact point in each pair being connected together by conductors forming four sets of three contact points each; a connection between a lower set and an upper set of contact points; a connection between the other lower set of contact points and one phase of the circuit; a connection between the other upper set of contact points and one terminal of the tripping-solenoid; and a connection between the other terminal of the tripping-solenoid and another phase of the circuit, whereby when any one metallic member is down, one or both of the other metallic members being up, the tripping-solenoid is electrically connected with two of the phases of the circuit.

3. An automatic circuit-breaker comprising the combination with a three phase motor having a source of supply therefor and main conductors connecting said source to said motor, a tripping-solenoid, a resilient switch for all phases controlled by a latch and the tripping-solenoid, a sole-

noid in series in each phase operating independently of each other, a freely movable armature in each solenoid, a metallic member mounted on each armature, said armature and metallic member being adapted to drop on the disruption of its corresponding phase; of a pair of contact points above and below each metallic member, one contact point in each pair being connected together by conductors forming four sets of three contact points each, a connection between a conductor connected to a lower set and a conductor connected to an upper set of contact points, a connection between a conductor connected to the other lower set of contact points and a main conductor, a connection between a conductor connected to the other upper set of contact points and one terminal of the tripping-solenoid and a connection between the other terminal of the tripping-solenoid and another main conductor, whereby the resilient switch is thrown open or not, and placed in latchable or non-latchable relation according to predetermined conditions.

4. In a protective switch for a three phase circuit, a solenoid for each phase; a freely movable armature in each solenoid; a metallic member mounted on each armature; a pair of contact points above and below each metallic member, one contact point in each pair being connected together forming four sets of three contact points each; a connection between a lower set and an upper set of contact points; and a single switch connecting the two upper sets of contact points, whereby when all the metallic members are down an electrical connection exists between the two lower sets and the two upper sets of contact points.

5. In a protective switch for a three phase circuit, a tripping-solenoid having tripping means; a solenoid in series in each phase; a freely movable armature in each solenoid; a metallic member mounted on each armature; a pair of contact points above and below each metallic member, one contact point in each pair being connected together forming four sets of three contact points each; a connection

between a lower set and an upper set of contact points; a single switch connecting the two upper sets of contact points; a connection between the other lower set of contact points and one phase of the circuit; a connection between the other upper set of contact points and one terminal of the tripping-solenoid; and a connection between the other terminal of the tripping-solenoid and another phase of the circuit, whereby when all of the metallic members are down the tripping-solenoid is electrically connected to two phases of the main circuit.

6. An automatic circuit-breaker comprising the combination with a three phase motor having a source of supply therefor and main conductors connecting said source to said motor, a tripping solenoid, a resilient switch for all phases controlled by a latch and the tripping-solenoid, a solenoid in series in each phase operating independently of each other, a freely movable armature in each solenoid, a metallic member mounted on each armature, said armature and metallic member being adapted to drop on the disruption of its corresponding phase; of a pair of contact points above and below each metallic member, one contact point in each pair being connected together by conductors forming four sets of three contact points each, a connection between a conductor connected to a lower set and a conductor connected to an upper set of contact points, a connection between a conductor connected to the other lower set of contact points and a main conductor, a connection between a conductor connected to the other upper set of contact points and one terminal of the tripping-solenoid, a connection between the other terminal of the tripping-solenoid and another main conductor and a single switch connecting the two upper sets of contact points.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."