March 25, 1930. W. N. CLURMAN 1,752,149

CIRCUIT MAKER AND BREAKER

Original Filed March 29, 1927 2 Sheets-Sheet 1

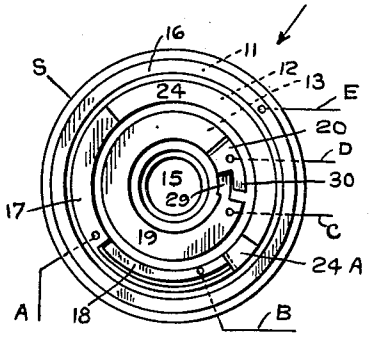

Fig-1

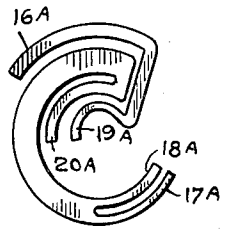

Fig-2

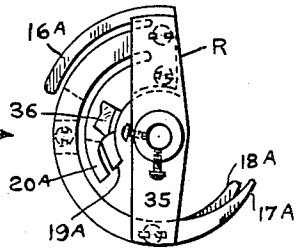

Fig-3

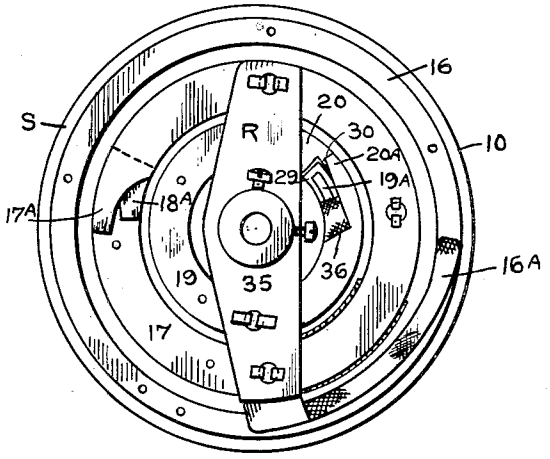

Fig-4

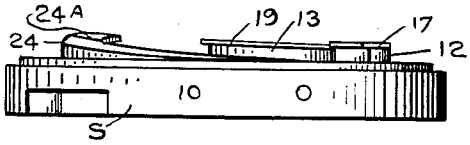

Fig 5

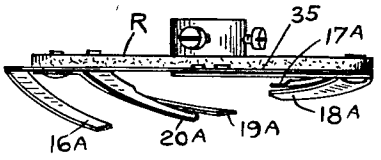

Fig-6

Inventor
Will N. Clurman
By his Attorney

March 25, 1930. W. N. CLURMAN 1,752,149

CIRCUIT MAKER AND BREAKER

Original Filed March 29, 1927 2 Sheets-Sheet 2

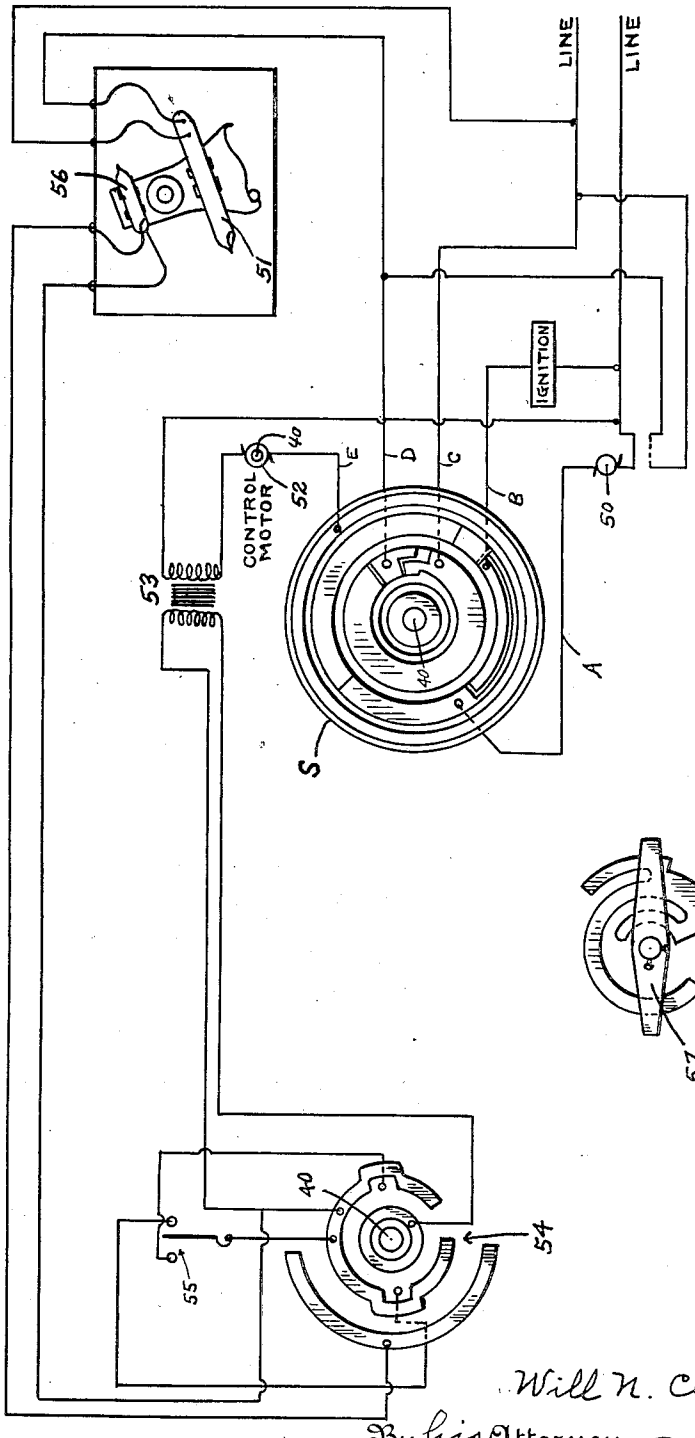

Fig. 7

Fig. 8

Inventor
Will N. Clurman
By his Attorney R. J. Cox

Patented Mar. 25, 1930

1,752,149

UNITED STATES PATENT OFFICE

WILL N. CLURMAN, OF LONG BEACH, NEW YORK

CIRCUIT MAKER AND BREAKER

Original application filed March 29, 1927, Serial No. 179,203. Divided and this application filed March 30, 1929. Serial No. 351,178.

This is a divisional application of my application for Controlling devices for electric motors, Serial No. 179,203 filed March 29, 1927, now Patent No. 1,707,459 of April 2, 1929.

The present improvements are directed in general to a novel type of circuit maker and breaker for controlling electrical circuits and relate more particularly to an improved switch mechanism adapted to be employed in connection with automatically controlled furnaces, oil burners and the like.

A primary object, among others, of the present improvements is to provide a novel switch construction so designed as to automatically accomplish a predetermined cycle of operations without the necessity of human attention or vigilance.

A further object is to provide a switch mechanism for controlling the line current operating a plurality of motors, having novel stationary and movable elements with a plurality of contacts ingeniously arranged for accomplishing new and useful results.

Another object is to provide a novel type of line switch for an oil burner control system, designed and adapted to automatically recycle after restoration of the system to normal condition following an abnormal condition arising in the system which condition occurred subsequent to normal running of the system.

A still further object is to provide a novel circuit maker and breaker which is automatic in its operation and is so designed as to come to rest in a prescribed position, whereby upon failure of line current in the system, and subsequent restoration thereof, said switch, without manual attention, will automatically return to its starting position.

Another object is to provide a switch of the aforementioned character which is simple in design, durable in operation, easy and economical to manufacture and at the same time embodies a few number of parts, thereby facilitating assembly and service in the field.

Other objects and advantages of the improvements will be apparent to those skilled in the art upon reference to the accompanying specification and drawings, in which

Fig. 1 is a plan view of the stationary switch member embodying the present improvements;

Fig. 2 is a plan view of the rotary switch member unassembled;

Fig. 3 is a plan view of the rotary switch member assembled;

Fig. 4 is a plan view of the assembled switch;

Fig. 5 is a side elevation of the stationary switch member looking in the direction of the arrow in Fig. 1;

Fig. 6 is a side elevation of the rotary switch member looking in the direction of the arrow in Fig. 3;

Fig. 7 is a diagrammatic view of an oil burner control system, illustrating one application of the present improvements;

Fig. 8 is a plan view of a switch member of the system illustrated in Fig. 7.

Referring to the drawings, the improved switch comprises a stationary member S and a rotary member R. As seen more clearly in Figs. 1 and 5, the stationary member consists of a disc or support 10 of bakelite or other similar insulating material. As seen in Fig. 1, the face of support 10 is divided into three well defined annular areas 11, 12 and 13, which are concentrically arranged about axial aperture 15 of the support. Each of these areas define an annular trackway comprising contact and insulated portions as hereinafter described.

Mounted on area 11 is a circular track or contact 16 which extends completely around the area for 360°. Annular area 12 has the contact segment 17 mounted thereon which contact occupies approximately 180° and is narrowed in width, near one end, to provide room for a shorter contact segment 18, which, as illustrated, overlaps the narrower portion of contact 17. The remaining portion of area 17 comprises an insulated segment 24, which may be part of the bakelite base, said insulated portion having at one end an insulated plate 24A.

The innermost annular area 13 has contact segment 19 mounted thereon, which extends about the area but does not quite describe a complete circumference. One end

of contact 19 is extended to form the tongue portion 29. The remaining portion of area 13, not occupied by contact 19 has another contact segment 20 mounted thereon and this contact also has an extended tongue 30 which lies beside tongue 29 of contact 19 in overlapping relation. The opposite end of contact 20 is in annular alignment with the straight end of contact 19.

Obviously the contact members are formed of copper, bronze or other good conducting material and are all suitably insulated from one another. As is common in switches of this character, portions of these annular areas are suitably inclined. Accordingly, as seen in Fig. 5, contact 17 slopes from its narrower portion clockwise to its broader end which is the highest portion of the segment. At this point there is a drop, where bakelite segment 24 begins, which latter slopes up to and terminates in the insulated plate 24A. A gradual slope is also present from contact 20, clockwise around contact segment 19, the terminus of the latter being raised, thereby affording a drop to contact segment 20. As illustrated in Fig. 1, each contact member is equipped with an electrical conductor in the form of wires A, B, C, D, and E.

The rotary member R of the switch mechanism consists of spring bronze stamping illustrated unassembled in Fig. 2 and assembled in Fig. 3. One of these bronze members is designed with projecting spring fingers 16A and 19A, while the other is designed with similar spring fingers 17A, 18A and 20A.

These sets of contact fingers are shown in assembled relation in Fig. 3 where they are superimposed on a bakelite or other insulating support 35. Interposed between these sets of fingers is an insulating strip 36, whereby fingers 16A and 19A are suitably insulated from the remaining fingers. The projection of the fingers from the plane of support 35 is seen in Fig. 6.

It is notable upon reference to Figs. 3 and 6 that in the assembled relation, fingers 19A and 20A are side by side, but slightly spaced from each other. These fingers, being of different sets are therefore insulated from each other. Fingers 17A and 18A are also side by side and slightly spaced, but being both of the same set, are conductively connected.

Upon reference to Fig. 4, the improved switch will be seen in operative relation, that is with the rotary member R superimposed on stationary member S. Finger 16A is accordingly adapted to travel along contact 16, finger 17A is adapted to travel along contact 17 and insulated segments 24 and 24A, finger 18A is adapted to travel along contacts 18, 17 and segments 24 and 24A, finger 19A is adapted to travel along contacts 19, 20 and tongue 29, while finger 20A is adapted to travel along contacts 19, 20 and tongue 30.

The stationary member S may be suitably mounted on the end of a control motor, hereinafter referred to, with the rotor shaft 40 projecting therethrough and upon which member the rotary member R is mounted. Rotary movement of said shaft accordingly actuates the member R which moves through a predetermined cycle.

Upon reference to Fig. 7, one application of the present improvements is diagrammatically illustrated. In this view a control system for oil burners is depicted with the stationary member of the improved switch operatively connected therein. Wire A is connected to the power line through burner motor 50, wire B is connected to the line through the ignition, wire C is connected direct to the line, wire D is connected to the line through the mercury tube switch 51, while wire E is connected to the line through control motor 52 and the primary of inductance coil 53. The secondary circuit of said coil includes a maintaining switch, the stationary member of which is shown at 54. This switch comprises a plurality of contacts variously arranged and connected to a room thermostat 55 as well as to a mercury tube switch 56. This tube is mounted for simultaneous operation with tube 51 by a thermal element exposed to the heat of the burner (of burner motor 50).

The stationary member S of the present improvements is mounted on one end of motor 52, and the maintaining switch 54 on the opposite end thereof with rotor shaft 40 extending through both. The rotary member 57 of the maintaining switch (see Fig. 8) is fixed on shaft 40 in cooperative relation with member 54, while rotary member R is also fixed on shaft 40 in cooperative relation with stationary member S.

When the system is inactive, the rotary member R of the switch is 180° from the position illustrated in Fig. 4. Therefore in the starting position, the rotary member R will have fingers on parts of the stationary member S as follows: finger 16A on contact 16, fingers 17A and 18A on insulated plate 24A and fingers 19A and 20A both on contact 19. A complete circuit is thus present through the line switch members R and S, through the control motor and primary of the coil 53, the motor being of a known type which is started by short circuiting the secondary circuit.

When the room thermostat 55 is calling for heat, the secondary is "shorted," and the control motor thus started. The rotary members 57 and R of the switches are thus turned 180°, whence the motor 52 stops through the action of the maintaining switch 54, 57. The position of the switch mechanism of the pres-

ent improvements at this time is illustrated in Fig. 4.

During this 180° starting cycle, the finger 17A has contacted with contact segment 17 thus starting the burner motor 50, while finger 18A has contacted segment 18 incepting the ignition. The oil burner has thus been ignited and the heat of the flame acts on the thermal coil which influences mercury tube switches 51 and 56. These tubes accordingly are turned in a clockwise direction, whence the switch 56 opens the secondary circuit and the switch 51 closes line D leading from contact segment 20.

So long as normal conditions exist, the system will be in the above described "running" position, with the finger 20A on portion 30 of contact 20, finger 19A on portion 29 of contact 19 and fingers 17A and 18A on contact 17 (see Fig. 4). Obviously motor 52 is idle, but burner motor 50 is running and generating heat through the burner nozzle.

It frequently happens that, when in such running condition, some abnormal condition arises, such as interruption of the current at the power source, clogging of the burner nozzle, interruption of the flame, opening of a switch or other similar conditions which will cause the thermal element (carrying switches 51 and 56) to cool and thus cause switch 56 to close and switch 51 to open. Accordingly under these circumstances, the secondary circuit is closed and the contact segment 20 and wire D is "dead". In prior known switches, fingers 19A and 20A were both disposed on contact 20, during "running" position, which being "dead" after occurrence of abnormal conditions, rendered the switch useless until manual recycling of the switch was accomplished. Accordingly when the power was restored in the line, the system lay idle until manual attention was paid thereto.

However, with the novel overlapping of contacts 19 and 20 and fingers 19A and 20A as designed in the present improvements, the return of the switch to starting position is automatically accomplished. When the abnormal condition arises the parts are positioned as seen in Fig. 4. Finger 20A is on portion 30 of contact 20 which (as described) is "dead" so that the burner motor stops. But finger 19A is on contact 19 which is connected directly to the line. Accordingly a completed circuit exists through the control motor 52 and primary circuit, viz, from the line, through wire C, contact 19, finger 19A, finger 16A, contact 16, wire E and thence through the motor 52, coil 53 and back to the line. Due to the cooling of the thermal element (previously described) switch 56 has closed the secondary circuit. Therefore, both primary and secondary circuits are closed after the power source fails and the thermal element cools. Obviously upon resumption or restoration of power, the control motor automatically starts a recycle of 180° to the starting position of the switch, due to the fact that the secondary is "shorted" by the closed switch 56.

The automatic recycling of the switch will likewise occur if an interruption of the flame occurs for any reason. Under such conditions (other than power failure), as soon as the thermal element in the stack cools and switch 56 closes, the control motor 52 will start and accomplish the recycle to starting position. Obviously, the return of the maintaining switch 54, 57 to starting position is likewise accomplished when the above operations transpire.

The importance of the present improvements cannot be overemphasized. Should a power failure or other abnormal condition arise in the middle of the night, under prior devices a cold dwelling is found in the morning, to remain so until the system is personally attended to. Likewise a prolonged absence from habitable quarters, during which an aforementioned abnormal condition arises, may result in freezing of water pipes, etc.

With the improved switch mechanism, however, the above disadvantages of a burner control system are eliminated, since the switch stands ready and automatically "recycles itself", upon the restoration of the system to normal condition.

Further details of the functioning and operation of the system may be had upon reference to my aforementioned copending application, those details above set forth being deemed sufficient to describe the novel switch in one application thereof.

It is notable that the improved circuit maker and breaker may be embodied in forms other than that described and illustrated. For example, the member S may be made the rotary member while member R is adapted to be stationary. Furthermore, the improvements may be embodied in a cylinder having a plurality of projecting contacts adapted to rotate and variously engage fixed spring fingers and thus accomplish the novel results; or the fingers may be designed to rotate about such a cylinder.

Attention is further invited to the fact that the embodiment need not be circular, but may be any desired shape. The improvements may also be embodied in a stationary member having contacts extending straightaway, rather than curved, with a movable member having fingers or other contact means adapted to reciprocate to and fro thereover.

Various advantages of the present improvements will be apparent to those skilled in the art. Other modifications within the scope of the invention will occur to those familiar with the art and may be made without departing from the purview of the im-

provements. It is therefore understood that the invention is not limited to the exact details of construction herein illustrated and described.

I claim:

1. In a circuit maker and breaker, a support, an endless contact thereon, a second contact adjacent said endless contact, a third contact adjacent said second contact and having a part overlapping same, a fourth contact adjacent said second and third contacts and extending beyond the limits thereof, a fifth contact adjacent said fourth contact, parts of said fourth and fifth contacts overlapping each other, all of said contacts being insulated one from the other.

2. In a circuit maker and breaker, a support, a circular contact thereon, a substantially semi-circular contact concentric therewith, a third contact concentric with said contacts, overlapping a portion of each and of less extent than either, a fourth contact concentric with the previously named contacts and being slightly less than 360° in extent, a fifth contact concentric with said previously named contacts, said fifth contact having a portion overlapping said fourth contact, all of said contacts being insulated.

3. In a circuit maker and breaker having a plurality of insulated contacts, a circular contact, a circular contact-area concentric therewith comprising two segmental portions insulated from each other, complementary ends of said portions being in alignment, with other parts thereof in overlapping relation.

4. In a circuit maker and breaker, a support member having a plurality of annular areas concentrically arranged, one of said areas comprising a circular contact, another of said areas comprising a substantially semi-circular insulated portion and a complementary semi-circular contacting portion, said last named portion including two insulated contact segments, and another of said areas comprising two insulated contact segments, portions of said last named segments being overlapping.

5. A switch mechanism comprising a stationary member having a plurality of annular areas concentrically arranged, one of said areas having a circular contact, a second area being half an insulated portion and half a contacting portion, said latter portion having two concentric and overlapping contact segments, a third area having two concentric and overlapping contact segments, a rotary member superimposed on said stationary member and having a plurality of insulated sets of projecting fingers suitably spaced and arranged to travel around said areas, fingers of one set arranged and adapted to contact said second and third areas, fingers of another set arranged and adapted to contact said circular contact and third area, a finger of each set terminating adjacent each other and slightly spaced, whereby said last named fingers are adapted to simultaneously contact a segment of the third area and subsequently contact both segments of said third area simultaneously.

Witness my hand this 28th day of March, 1929, County of New York, State of New York.

WILL N. CLURMAN.