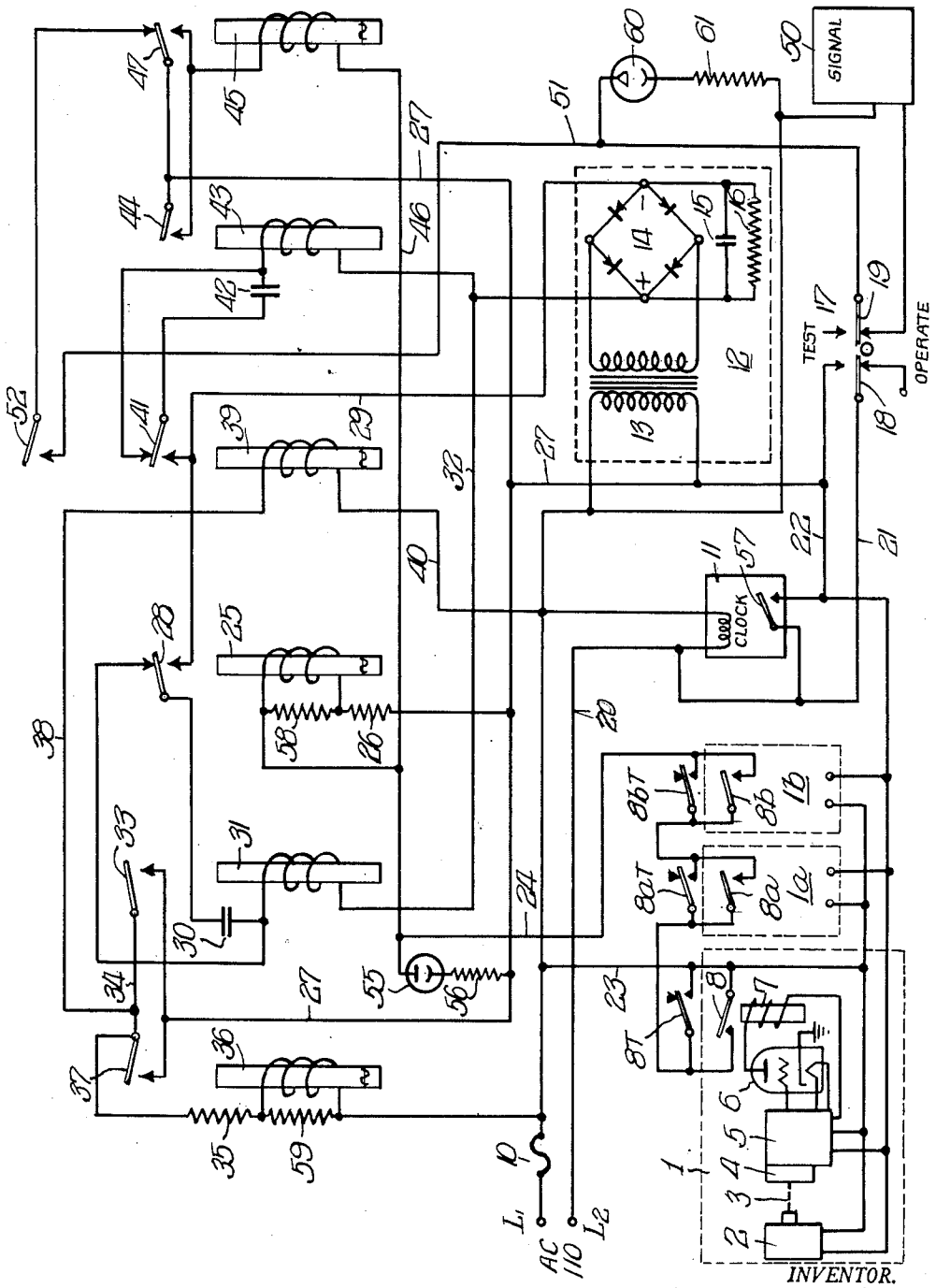
April 21, 1953 E. V. GARDINER 2,636,163

BURGLAR ALARM SYSTEM

Filed April 19, 1951



Earle V. Gardiner,

BY

George H. Simmons

Atty

Patented Apr. 21, 1953

2,636,163

UNITED STATES PATENT OFFICE

2,636,163

BURGLAR ALARM SYSTEM

Earle V. Gardiner, Chicago Heights, Ill.

Application April 19, 1951, Serial No. 221,919

9 Claims. (Cl. 340—213)

1

This invention relates to a control device for alarm systems and has for its principal object the provision of a new and improved device of this type.

It is a main object of the invention to provide a control device for an alarm system, such as a burglar alarm system, that operates on commercial current, which control device turns on the system at a prescribed hour, turns off the system at a prescribed hour, prevents sounding a false alarm in the event that the voltage of the commercial current falls below a safe operating minimum or is interrupted, and restores the system to operative condition upon the return to normal of the current supply.

Another object of the invention is to provide a control device for an alarm system which permits testing the system preliminarily to placing it in service to make sure that it is in condition for proper functioning.

Another object of the invention is to provide a control device for alarm systems, which can be added to existing system of this type.

Further objects of the invention not specifically mentioned here will be apparent from the detailed description and claims which follow, reference being had to the accompanying drawing in which the invention is shown by usual schematic circuit symbols.

Alarm systems such as are commonly employed as burglar alarms are of two general types: first, a light ray system, and, second, a foil tape system. Such systems are placed in operation when premises are left unattended and arranged to give an alarm signal should the premises be entered while the system is in operation, which signals are either audible and visual at the premises, or audible and visual at a central watch station, such as a police station, or both.

In the case of a light ray system, power is usually taken off of commercial lines, most generally 110 volts alternating current. This power is utilized to activate a source of light, usually invisible light such as infra red, which is reflected about the premises and picked up by a photoelectric cell to control the current output of an amplifier unit that maintains a relay operated as long as the light beam is continuous. Interruption of the beam causes the relay to drop back thereby operating an alarm signal to indicate trouble at the premises.

Such systems are sensitive and in the event that the voltage of the source of current drops below a definite minimum value or is interrupted even momentarily, false alarms result. Once the system has been tripped and the alarm signal operated, the operation continues until the premises is visited and the alarm turned off.

2

The present invention provides a control device which contains marginal relays maintained operated when the system is in operation and arranged to restore at a voltage value slightly higher than the minimum upon which the system operates successfully. Thus, in the event that the voltage of the source of supply drops, the marginal relays restore and through circuits controlled thereby disable the signal to prevent a false alarm. As soon as the voltage returns to normal, reset mechanism in the control device re-operates the relays to re-condition the signal for normal operation. In the event that the source of supply fails completely, even for a moment, the signal is likewise disabled and restored to operative condition as soon as the voltage of the source of supply is restored.

It is common practice in burglar alarm systems to provide a clock that is arranged to turn on the system at a prescribed hour and to turn it off again at a prescribed hour. The control device of the present invention includes such a clock switch and incorporates also a testing arrangement so that when the proprietor of the premises is preparing to close for the day he can test the alarm system to make sure that everything is in readiness for normal operation when the clock switch operates.

In the case of the foil tape type systems, a conducting tape is attached to windows and the like and connected in series with door-operated switches which are included in a circuit with local batteries to maintain energized an alarm control relay while the system is in operation. Breaking of this series circuit trips the alarm which is then operated usually from commercial current. The control device of the present invention is also adaptable to systems of this type, although the need for such a control in such systems is not as great as in the case of systems operating completely on commercial current.

Referring now to the drawing, the apparatus included in the lined-off area 1 may be an existing burglar alarm system comprising a source of light 2 which directs a beam 3 onto a photoelectric cell 4 that controls an amplifier 5, the output tube 6 of which has a relay 7 connected in its plate circuit. The relay 7 carries a mainspring 8 which is closed against its make contact when the beam 3 is continuous and after the amplifier unit has warmed up. Interruption of the beam 3 causes the relay 7 to restore, thereby opening spring 8 from its make contact to sound an alarm.

The maximum length of light beam 3 that can

be used is oftentimes insufficient to cover a premises, in which case several units are employed with the alarm circuit extended through these units in series. Such additional units are indicated at 1a and 1b, and since these units duplicate unit 1, only the alarm circuit springs 8a and 8b are shown.

The control device of the present invention is connected to a source of commercial current, usually alternating current, designated by terminals L–1 and L–2, through a suitable fuse 10, and consists of a clock 11 preferably an electric clock whose motor is connected across the line over the obvious circuit. The control device also consists of a source of direct current 12, comprising a transformer 13 and a full wave rectifier 14 which may be a selenium cell rectifier, the output terminals of which are bridged by a condenser 15 and resistance 16 to smooth out undulations in the output current of the rectifier.

The control equipment also contains a test key 17 by which the operative condition of the system is determined irrespective of the position of the clock switch.

The details of the control device will best be understood by a description of a typical operation. Upon preparing to leave the premises, test key 17 is operated to move spring 18 into engagement with its make contact and to move spring 19 away from its break contact. A circuit may now be traced from the L–2 terminal over conductor 20, conductor 21, through spring 18 and its make contact, conductor 22 to the alarm systems 1, 1a and 1b, thereby connecting the light sources and amplifier units across the line to conductor 23 which leads to the L–1 terminal of the commercial current. The light sources and amplifiers are thus put into operation and after a brief warm-up period relays 7 energize, provided nothing obstructs the path of the light beams. In many instances where such a beam is extended across stock bins containing valuable equipment, misplacement of such equipment will interrupt the beam and consequently relay 7 will not operate. Such a condition will be readily apparent and steps can be taken to correct it.

Light beams unobstructed

Assuming that none of the light beams 3 is obstructed, the relay 7 in each of the units 1, 1a and 1b will operate and close their respective springs 8 against their make contacts. A circuit may now be traced from L–1, through fuse 10, conductor 23, spring 8 and its make contact, spring 8a and its make contact, spring 8b and its make contact, conductor 24, through the winding of relay 25, resistor 26, conductor 27, spring 18 and its make contact to L–2 over conductors 21 and 20. Relay 25 operates over this circuit.

One of the light beams is obstructed

In the event that one of the light beams 3 is obstructed, one of the relays 7 will not energize and the foregoing circuit of relay 25 will not be closed and that relay will not operate. Included on the control panel is a push button switch for each of the alarm units designated as 8T, 8aT and 8bT. The operator, noting that relay 25 has not operated, pushes 8T, thereby shunting springs 8 of unit 1. If the beam 3 of unit 1 is unobstructed and it is spring 8 that is holding the circuit of relay 25 open, the above circuit of relay 25 will be completed through 8T and relay 25 will be operated. Through keys 8T, 8aT and 8bT, the obstructed light beam can be located and steps taken to clear the obstruction.

Control unit operation

Relay 25 upon operating moves mainspring 28 away from its break contact into engagement with its make contact, thereby completing a circuit from the negative terminal of the rectifier unit 14, conductor 29, spring 28 and its make contact, through condenser 30, through the winding of direct current trigger relay 31 and thence back to the positive terminal of the rectifier over conductor 32. During the interval that condenser 30 is accepting a charge, sufficient current will flow through the winding of relay 31 to operate that relay which moves spring 33 into engagement with its make contact, thereby closing a circuit from the L–2 terminal of the commercial current on conductor 27, conductor 34, through resistance 35, through the winding of alternating current relay 36 to the other side of the commercial line. Relay 36 operates over this circuit and closes spring 37 against its make contact, thereby establishing a holding circuit for the relay extending to the conductor 27 independently of the spring 33.

A circuit may now be traced from conductor 27 through spring 37 and its make contact, conductor 34, conductor 38, through the winding of alternating relay current 39 to the L–1 terminal of commercial current over conductor 40. Relay 39 operates over this circuit.

A circuit may now be traced from negative on conductor 29 through spring 41 of relay 39 and its make contact, through condenser 42, through the winding of direct current trigger relay 43 to positive on conductor 32. During the interval that condenser 42 is accepting a charge, relay 43 operates, thereby closing spring 44 against its make contact, to extend the circuit from conductor 27 through the winding of relay 45 to the L–1 terminal of the source of power, over conductor 46, conductor 24, springs 8, 8a and 8b and their respective make contacts, and the conductor 23. Relay 45 operates over this circuit, moving mainspring 47 into engagement with its make contact thereby locking itself to conductor 27 independently of springs 44.

When commercial current is placed on conductor 24, as explained above, visual signal 55 is connected across the source of current in series with a resistance 56. Signal 55 may conveniently be a neon glow tube which is thus lighted to indicate that the alarm system is in proper working order.

The foregoing test may be extended to include a test of the control equipment and alarm system. To do this, the test key is maintained in operated position and a light beam 3 is intentionally broken. Relay 7 will drop back and open springs 8, removing the L–1 potential from conductor 46. Relays 45 and 25 drop back. A circuit may now be traced from L–2 potential on conductor 27, spring 47 and its break contact, spring 52 and its make contact, conductor 51, visual signal 60, resistor 61 to L–1 potential on conductor 53. Signal 60 is lighted over this circuit. The circuit of signal 50, which extends from conductor 51, through spring 19 and its break contact, is maintained open by the operation of the test key and signal 50 does not operate. As soon as the light beam is restored, relay 25 re-operates; however, since relay 39 was maintained operated during the test, relay 45 remains unoperated and signal 60 continues to

glow, indicating a proper functioning of the control and alarm equipment.

The signal indicated by the rectangle **50**, which may be an audible signal, visible signal or annunciator at a central watch station, is operated over a circuit extending through spring **19** of the test key **17** and its break contact now open, conductor **51**, through mainspring **52** of relay **39** and its make contact, mainspring **47** and its break contact now open because relay **45** is operated, to commercial current on conductor **27**, the other side of the signal device being connected to the L–1 terminal of commercial current over conductor **53**.

Test key **17**, which is preferably a non-locking key, is biased to return to operate position, in which it is shown in the drawing, as soon as released, thereby insuring that the system will not inadvertently be left in non-operating condition. The test having thus been completed, the proprietor closes the premises and leaves, and nothing happens until the time at which clock **11** is set to turn on the system.

When that hour is reached, the clock closes mainspring **57** against its make contact, thereby extending conductor **20** to conductor **22** and conductor **27**. Power is thus supplied to the alarm system **1** as before, and as soon as that system has warmed up and the relays **7** operated, relays **25**, **31**, **36**, **39**, **43** and **45** operate in the above described manner. Glow light **55** operates to indicate that the system is in operation.

Low voltage operation

The control device guards against false alarms due to failure of the apparatus because of low voltage through the use of maginal relays that are bridged across the line when the apparatus is in operation. Alternating current relays can be made marginal in a number of ways, such as by the use of saturable reactors or by shunting the relay with resistors. In the example shown, the winding of relay **25** is shunted by a resistance **58** and the winding of relay **36** is likewise shunted by a resistance **59**, these resistances being of high ohmic value, in one instance 7500 ohms each. Resistances **26** and **35** being connected in series with the parallel circuits through the windings of the relays and resistances serve to make relays **25** and **36** marginal and incapable of remaining in operating position when the voltage supply to them falls below a definite value, for example 105 volts.

In the event tha the voltage of the source of alterntaing current falls below this minimum, relays **25** and **36** will restore to normal. Relay **36** thus opens spring **37** from its make contact, breaking the previously traced circuit for relay **39**, causing that relay to restore, and at spring **52** to open a point in the circuit of signal **50** to prevent an operation of that signal. Relay **25**, upon restoring, moves spring **28** into engagement with its break contact, thereby short-circuiting condenser **30** to discharge that condenser. Relay **39**, upon restoring, moves spring **41** into engagement with its break contact, thereby short-circuiting condenser **42** in a similar manner.

The reduction of voltage to the value taken by way of example may cause the current supplied to relays **7** by the amplifiers **5** through output tubes **6** to fall sufficiently to cause these relays to restore and thereby open the previously traced circuit for relay **45** which restores and closes spring **47** against its break contact, thereby closing a point in the circuit of alarm signal **50**; however, nothing happens, since the circuit for that signal is now opened at spring **52**.

Voltage restores to normal

As is usually the case, fluctuations in voltage of a commercial source of supply are but momentary, and after a short interval the voltage returns to normal. The alarm system not having been tripped, relays **7** will again operate, whereupon relays **25**, **31**, **36**, **39**, **43** and **45** will be re-operated as before. Thus it will be seen that a momentary dropping of the voltage of the source of supply is prevented from turning in an alarm which would be false.

Voltage failure

Occasionally commercial sources of power fail completely. Relays **36**, **25**, **39** and **45** being operated by such current will automatically restore. Restoration of relay **39** opens a point in the signal circuit as before and no false alarm is given. Upon restoration of the commercial current, which usually takes place after a brief interval, the alarm system warms up again and the relays **7** re-operate, whereupon the control device repeats the above described cycle of operations to re-condition the system for operation.

The alarm system is tripped

Assume now that an intruder enters the premises and thereby breaks the beam of light **3**, even momentarily. Immediately the beam is broken, relay **7** restores and the circuit over which relay **45** is maintained operated is thus broken and that relay restores. A circuit may now be traced from the commercial current on conductor **27**, spring **47** and its break contact, spring **52** and its make contact, conductor **51**, test key spring **19** and its break contact, through the signal **50** to the other side of the source of power on conductor **53**. The signal operates to sound an alarm. Even though the beam be immediately restored and the L–1 circuit immediately reconnected to conductor **24**, relay **45** cannot reoperate so long as relay **39** remains operated, and the signal **50** will continue to operate until the system is turned off at the premises.

Shutting off the system

When the clock **11** opens spring **57** from its make contact, as it will when the "turn off" hour is reached, the L–2 connection is removed from conductors **22** and **27**, and all relays in the system restore. The transformer is removed from across the line and the system is completely disconnected from the line save for the motor of clock **11**.

From the foregoing it will be apparent that the control device of my invention guards an alarm system from false alarms occasioned by a loss of voltage of the commercial source of current supply, even though that drop in voltage is not complete. The control device also functions when the source of commercial current is interrupted. In either event, as soon as conditions are restored to normal, the alarm system is restored to normal so that tripping of the system will sound an alarm in the usual manner.

While I have chosen to show my invention by illustrating and describing a preferred embodiment of it, I have done so by way of example only, as there are many modifications of the specific details shown and adaptations which can be made by one skilled in the art within the teachings of the invention.

Having thus complied with the statutes and shown and described a preferred embodiment of my invention, what I consider new and desire to have patented by Letters Patent is pointed out in the appended claims.

What is claimed is:

1. The combination with a plurality of alarm units each containing a relay that is normally energized when the system is in operation and is deenergized to initiate an operation of a signal when the system is tripped; of a control device comprising a relay operated over a circuit extended through contacts on said unit relays in series; a second relay operated under the control of said first relay to close a point in the circuit of the signal; means including marginal relays for restoring said second relay when the voltage on the system falls below a minimum safe operating value thereby to prevent restoration of a unit relay because of said low voltage from operating said signal; and means including a trigger relay for reoperating said second relay when normal voltage is restored.

2. In a control unit, a source of direct current, a direct current relay, a condenser, an alternating current relay, contacts on said alternating current relay closed by the relay in operated position for closing a circuit from said source through said condenser and direct current relay in series to operate the relay momentarily while said condenser is accepting a charge; a second alternating current relay; contacts on said direct current relay closed by the relay in operated position for closing a circuit for said second alternating current relay to operate that relay; and contacts on said second alternating current relay for closing a holding circuit for the relay.

3. In an alarm system in which an alarm circuit is opened when the system is tripped to effect the operation of a signal device; a control relay; contacts on said relay closed when the relay is operated to close a point in the circuit of said signal device; means including a marginal relay for operating and maintaining said control relay in operated position, said marginal relay restoring said control relay when the voltage on said system drops to prevent operating the signal device when said alarm circuit is opened by said drop in voltage.

4. In a control unit for an alarm system that operates on commercial alternating current, a voltage marginal alternating current relay, a trigger relay, means for momentarily operating said trigger relay, a circuit for said marginal relay closed by said trigger relay in operated position to operate the marginal relay, a holding circuit for said marginal relay closed through normally open contacts on that relay to hold the relay in operated position irrespective of the position of the trigger relay, a circuit for the alarm of said system, and contacts in said circuit operated under the control of said marginal relay and opened when the marginal relay restores to disable the alarm when the voltage supplied to the system falls too low.

5. A control unit as claimed in claim 4, in which the means for momentarily operating the trigger relay comprises a second marginal alternating current relay whose circuit remains closed across the line so that the relay re-energizes when the voltage is restored to normal thereby to reoperate the trigger relay to re-close the circuit of the first marginal relay.

6. A control unit as claimed in claim 4, in which the means for momentarily operating the trigger relay comprises a second marginal alternating current relay, a circuit for said second relay controlled by the alarm system and closed when the system is in operating condition to operate the second marginal relay when the voltage returns to normal, thereby to re-operate the trigger relay to re-close the circuit of the first marginal relay.

7. The combination with an alarm system having a signal and a relay for controlling that signal, which relay is in operated position when the system is in operation and restores when the system is tripped, thereby to operate the signal; of a control unit for the system comprising a signal relay, circuit means over which said signal relay is energized when the system relay is in operated position, a marginal relay connected across the source of commercial current when the system is in operation and maintained in operated position so long as the voltage of said source exceeds the minimum required by the system, a control relay, a circuit for said control relay closed through normally open contacts on said marginal relay over which said control relay operates when the marginal relay is operated, and a circuit for said signal extending through normally closed contacts on said signal relay and normally open contacts on said control relay, which circuit is opened when the control relay restores to prevent operation of the signal when the voltage falls below said minimum irrespective of the position of the system relay.

8. A control unit for an alarm system, in which a relay restores when the system is tripped to operate a signal, for disabling said signal when the current supply to the system is interrupted, and for restoring the signal to operative condition when said supply is restored comprising: a source of direct current; a direct current relay; a condenser; an alternating current relay; a circuit for said alternating current relay closed by contacts on the system relay that are closed when that relay is operated, to operate the alternating current relay; a circuit for said direct current relay closed by contacts on said alternating current relay to connect said condenser and relay in series across said source of direct current to operate said relay momentarily as the condenser is accepting a charge; a second alternating current relay; a circuit for said second relay closed by contacts on said direct current relay in operated position to connect the second relay across said current supply to operate the second relay; a holding circuit for said second relay; a control relay through normally open contacts on which the signal circuit extends; a circuit for said control relay closed by said second relay in operated position, said first and second alternating current relays restoring when said current supply is interrupted thereby to restore said control relay and open the signal circuit; and contacts on said first alternating current relay closed when the relay restores for short-circuiting said condenser thereby preparing said direct current relay for re-operation when said first alternating current re-operates responsive to restoration of said current supply.

9. The combination with an alarm system having a signal and a relay for controlling that signal which relay is in operated position when the system is in operation and restores when the system is tripped, thereby to operate the signal; of a control unit for the system, comprising: a source of commerical alternating current; a clock switch connected across said source of current

and operated thereby to connect the system to said source at a prescribed time and to disconnect the system therefrom at a prescribed time; a marginal alternating current relay; a circuit for said relay closed through normally open contacts on the system relay, when that relays moves to operated position to place the system in operation, to connect the marginal relay across said source of current; a source of direct current in said unit; a direct current relay; a circuit for connecting said direct current relay to said source of direct current closed by said marginal relay in operated position to operate that relay; a second marginal alternating current relay; a circuit for connecting said second marginal relay across said source of alternating current, closed by said direct current relay in operated position to operate the marginal relay; a holding circuit for said second marginal relay closed by that relay in operated position; a circuit for said signal; a control relay operated over a circuit closed by said second marginal relay in operated position to prepare a point in said signal circuit; a second direct current relay; a circuit for said second direct current relay closed by said control relay in operated position to connect said second direct current relay across said source of direct current thereby to operate that relay; a signal relay; a circuit for

said signal relay closed by said second direct current relay in operated position and extending through contacts on said system relay, to operate the signal relay; and normally closed contacts on said signal relay included in said signal circuit to close that circuit to operate the signal when the system is tripped and the signal relay thereby restored, said second marginal relay restoring when the voltage of said alternating current source falls below a definite minimum thereby restoring said control relay and opening said signal current to prevent an operation of the signal should the system relay and signal relay restore because of said low voltage.

EARLE V. GARDINER.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,672,049	Almquist	June 5, 1928
1,789,566	Spray	Jan. 20, 1931
1,909,212	Muehter	May 16, 1933
2,249,891	Ekman et al.	July 22, 1941
2,294,043	Nicon	Aug. 25, 1942
2,439,405	Zierdt, Jr.	Apr. 13, 1948
2,469,001	Poitras	May 3, 1949