Jan. 21, 1964 W. M. SCOTT, JR 3,118,991

REMOVABLE AND REPLACEABLE AUXILIARY HOUSING FOR CIRCUIT BREAKER CONTAINING TRIP UNIT AND CURRENT LIMITING FUSE

Filed Jan. 26, 1961 2 Sheets-Sheet 1

FIG. 3.

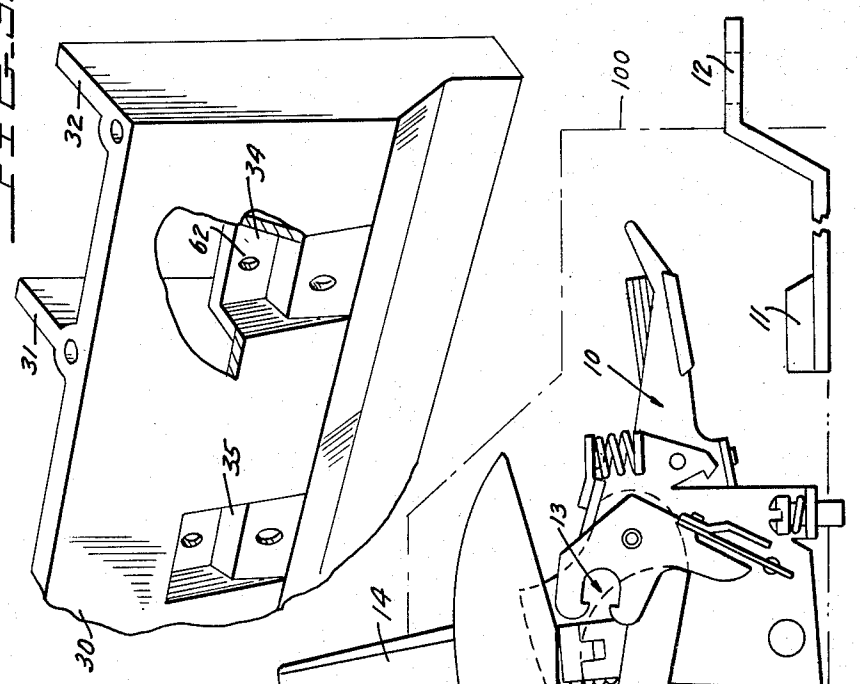
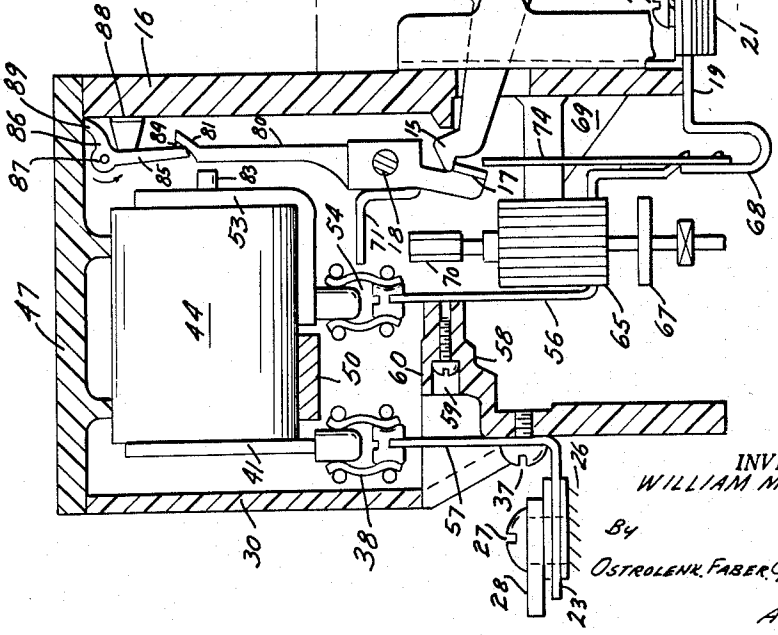


FIG. 1.



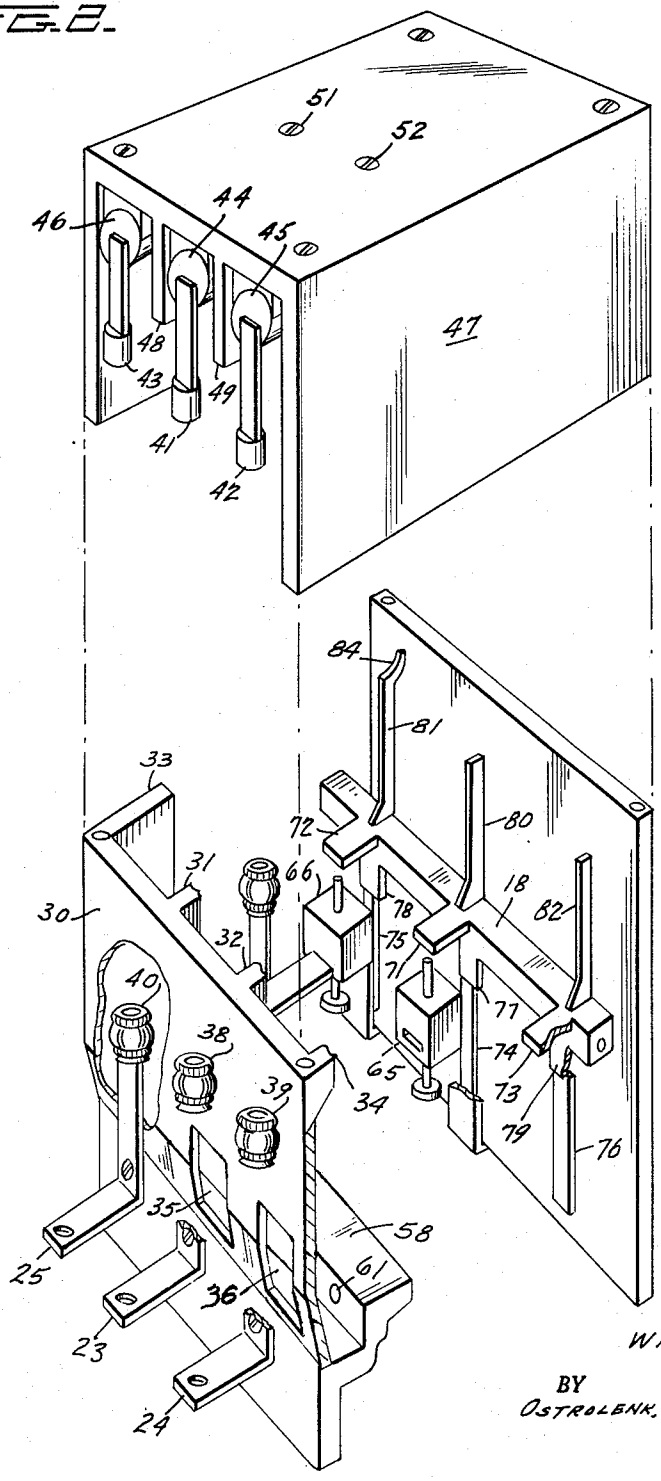
INVENTOR.
WILLIAM M. SCOTT, JR.
By
OSTROLENK, FABER, GERB & SOFFEN
ATTORNEYS

Jan. 21, 1964 W. M. SCOTT, JR 3,118,991

REMOVABLE AND REPLACEABLE AUXILIARY HOUSING FOR CIRCUIT BREAKER CONTAINING TRIP UNIT AND CURRENT LIMITING FUSE

Filed Jan. 26, 1961 2 Sheets-Sheet 2

FIG. 2.



INVENTOR.
WILLIAM M. SCOTT, JR.

BY
OSTROLENK, FABER, GERB & SOFFEN

ATTORNEYS

United States Patent Office 3,118,991 Patented Jan. 21, 1964

3,118,991

REMOVABLE AND REPLACEABLE AUXILIARY HOUSING FOR CIRCUIT BREAKER CONTAINING TRIP UNIT AND CURRENT LIMITING FUSE

William M. Scott, Jr., Bryn Mawr, Pa., assignor to I-T-E Circuit Breaker Company, Philadelphia, Pa., a corporation of Pennsylvania

Filed Jan. 26, 1961, Ser. No. 85,092
8 Claims. (Cl. 200—114)

This invention relates to a novel auxiliary housing for circuit breakers which are coordinated with current limiting fuses wherein the auxiliary housing carries both the current limiting fuses and the circuit breaker trip unit whereby the complete auxiliary housing is removable with respect to the circuit breaker for purposes of maintenance and adjustment.

Circuit breaker units having a removable and replaceable trip unit in an individual housing are shown, for example, in U.S. Patent 2,932,706, issued April 2, 1960, to August Bodenschatz, entitled "Hold Open and Anti-Rebound Latches," and assigned to the assignee of the present invention. This novel construction permits the use of replaceable trip units which are electrically and mechanically connected to the circuit breaker by simple connecting means such as screws.

It is also well-known that where a circuit breaker is coordinated with current limiting fuses, that the current limiting fuses be carried in their own individual housing which is removably connected to the circuit breaker by appropriate disconnect means.

The essence of the present invention is to cause the current limiting fuse housing to be carried by the removable trip unit of a circuit breaker so that the entire auxiliary means of current limiting fuses and trip unit are carried removably with respect to the circuit breaker, and can be removed from the circuit breakers by the simple disconnection of bolt means or screw means. This permits the complete removal of both current limiting fuses and trip units for adjustment or repair of the complete sub-assembly.

Accordingly, a primary object of this invention is to provide a novel auxiliary housing for circuit breakers wherein both the current limiting fuses and circuit breaker trip units are removably connected to a circuit breaker.

Another object of this invention is to provide a novel auxiliary housing for circuit breakers which contains all of the mechanism for the current limiting fuses and circuit breaker trip unit which controls the operation of the circuit breaker contacts.

These and other objects of this invention will become apparent from the following description when taken in connection with the drawings, in which:

FIGURE 1 shows a side cross-sectional view of a typical circuit breaker modified with the novel auxiliary housing of the present invention.

FIGURE 2 shows an exploded perspective view of the auxiliary housing of FIGURE 1.

FIGURE 3 shows a perspective view of the trip unit cover of FIGURES 1 and 2.

Referring now to FIGURE 1, the circuit breaker construction may be of any standard type such as that shown in above noted U.S. Patent 2,932,706 wherein the complete circuit breaker is contained within a molded case housing shown in phantom by line 100.

The contact portion of the circuit breaker is comprised of a movable contact structure 10 which cooperates with a stationary contact 11 which is terminated by a terminal 12 which would extend through the molded case housing of the circuit breaker to be readily accessible for electrical connection. Clearly, in a multi-phase unit the appropriate number of pairs of cooperating contacts are provided.

The movable contact 10 is movable between an engaged and disengaged position with respect to stationary contact 11 under the influence of an operating mechanism generally illustrated by operating mechanism 13 which is fully described in above noted U.S. Patent 2,932,706, and reference is made thereto for a detailed description of the mechanism. It is sufficient for purposes of the present invention to understand that mechanism 13 can be moved under the influence of manual operating handle 14 which extends through the circuit breaker housing, and under the influence of latch member 15 which extends through the trip unit base 16.

Generally, when latch 15 is latched by cooperating latch structure 17 carried from pivotally mounted auxiliary tripper bar 18 which is supported by the molded portion of the auxiliary housing, the contacts 10 and 11 can be moved to an engaged position by operating handle 14 and retained in that engaged position. When the latch between latch members 15 and 17 is defeated, however, there will be an automatic opening of movable contact 10 in the usual manner.

In accordance with the present invention, the trip unit mechanism and current limiting fuse mechanism which control latch 15—17 are all contained within a single auxiliary housing which is removable with respect to the circuit breaker.

As is best seen in FIGURES 1 and 2, the auxiliary housing has extending conductors from each phase such as conductor 19 of FIGURE 2 which extend through trip unit base 16 and are bolted by a bolt such as bolt 20 to a molded case portion 21 of the molded case circuit breaker. The bolt 20 is further connected to conductive means such as a pigtail 22 partially seen in FIGURE 1 which then extends to its respective movable contact structure 10.

In the case of a three-phase unit there will be three such screws 20 which secure the right-hand side of the removable and replaceable housing to the circuit breaker.

A second system of extending conductors such as conductor 23 for the phase shown in FIGURE 1, as well as conductors 24 and 25, as shown in FIGURE 2, extend from the left-hand side of the auxiliary trip unit housing and are similarly connectable to molded case portion 26 of the circuit breaker, as by screws 27 for terminal 23 in FIGURE 1 to support the other end of the current limiting fuse housing. The same screw such as screw 27 can further operate to electrically connect conductors 23, 24 and 25 to appropriate circuit interrupter terminals such as terminal 28 for the phase including terminal 12 of FIGURE 1.

Accordingly, it is clear that by simple removal of six screws for the case of a three-phase circuit interrupter which would be the three screws corresponding to screw 20, and three screws corresponding to screw 27, the complete sub-assembly of trip unit and current limiting fuse can be removed from the circuit breaker portion of the circuit interrupter.

The internal construction of the auxiliary housing includes the aforementioned trip unit base 16 and a trip unit cover 30. The trip unit cover 30 includes extending interphase barriers such as barriers 31 and 32, and end barriers 33 and 34, as seen in FIGURES 2 and 3, and is formed of a unitary molding having openings 34 (FIGURE 3), 35 (FIGURES 2 and 3), and 36 (FIGURE 2). These openings, as is best seen in FIGURE 1, receive L-shaped conductors 23, 24 and 25 of FIGURE 2 which are secured to the cover as by screws such as screw 37. The upper portion of conductors 23, 24 and 25 carry tulip clip-type disconnect contacts schematically illustrated in FIGURE 2 as tulip clips 38, 39 and 40 respectively which cooperate with the projecting

cooperating disconnect contacts 41, 42 and 43 of current limiting fuses 44, 45 and 46.

The current limiting fuses 44, 45 and 46 are carried in a current limiting fuse housing 47 which has projecting isolating barriers 48 and 49 positioned between adjacent fuses and has an internal configuration adapted to receive the contour of fuses 44, 45 and 46 in the usual manner.

A retaining bar 50 seats beneath the fuses, as best shown in FIGURE 1, and is secured to the top of housing 47 as by screws 51 and 52 which thread into appropriate threaded openings in retaining bar 50.

The opposite end of the fuses such as fuse 44 have extending conductors such as conductor 53 which cooperate with tulip clip-type disconnect contacts 54. The tulip clip-type disconnect contacts 54, as well as contact 38, of the rearward phase of FIGURE 2 are connected to contact conductors 56 and 57 for contacts 54 and 38 respectively which are carried from ledge 58 of trip unit cover 30. Thus, as best seen in FIGURE 1, ledge 58 is provided with aperture 59 which receives a screw 60 which can enter conductor 56 for securing purposes.

As shown in FIGURES 2 and 3, the other two phases are provided with securing means in ledge 58 which includes aperture 61 for the phase including current limiting fuse 45, and aperture 62 for the phase including current limiting fuse 46 and conductor 57. Accordingly, it is seen that the disconnect contact structure for receiving the current limiting fuses is completely carried from the trip unit cover 30.

The trip unit structure is comprised of a magnetic tripping means which includes a magnet 65 for the central phase of FIGURE 1, and similar magnets for the other phases such as magnets 66 for the phase including terminal 25, and each of the magnets have a movable armature such as armature 67 for magnet 65, movable therewith.

The magnet is energized by the conductor extending from the current limiting fuse such as conductor 56 which passes through the magnet and terminates at a heater such as heater 68 of the respective phase. Heater 68 is then connected to right-hand terminal of the auxiliary housing such as terminal 19 in FIGURE 1.

The magnets such as magnets 65 and 66 are carried from the trip unit base 16 as by extending projections 69 of FIGURE 1, so that the plungers connected to the magnetic armatures such as plunger 70 of armature 67 can move upwardly to strike a respective projection such as projection 71 of auxiliary tripper bar 18 which is pivotally mounted within the auxiliary housing in any desired manner. Similar projections 72 and 73 are provided for the other phases, as clearly shown in FIGURE 2.

The heater such as heater 68 for the central phase has a bi-metal member such as bi-metal 74 extending therefrom, and in a like manner the other phases have bi-metal elements 75 and 76 extending from their heater. Each of the bi-metals, as best seen in FIGURE 2, are normally behind and out of contact with projections 77, 78 and 79 of auxiliary tripper bar 18, whereby when the bi-metals 74, 75 or 76 warp to the left due to overload heating conditions, their ends will pick up the projecting members 77, 78 or 79 respectively to rotate tripper bar 18.

The tripper bar 18 is further provided with extending members 80, 81 and 82 which extend upwardly and terminate adjacent the striker pin area of each of current limiting fuses 44, 45 and 46. By way of example, projection or extension 80 is immediately adjacent striker pin 83 of current limiting fuse 44. Accordingly, when any of fuses 44, 45 or 46 operate and eject their respective striker pins, the striker pin will engage projecting members 80, 81 or 82 respectively to cause rotation of tripper bar 18.

So that tripper bar 18 may be rotated when the cover 47 which carries fuses 44, 45 and 46 is removed from the auxiliary housing, extension 81 is provided with a pocket 84 (FIGURE 2) which receives the lower projecting leg 85 of pivotally mounted crank 86 which is pivotally mounted on a pivot 87 carried from trip unit base 16 by support 88.

A spring biasing means (not shown) biases crank 86 in a counterclockwise direction, and its rotation is limited by the under surface of housing 47 which receives arm 89 when the housing is in place. However, when the housing is removed, the spring biasing means causes counterclockwise rotation of crank 86 so that lower projecting portion 85 drives the top of extension 81 to the right to cause clockwise rotation of auxiliary tripper bar 81.

From the foregoing structure, it is clear that each of the phases of the circuit breaker of FIGURE 1 are electrically connected in series with a respective current limiting fuse. Furthermore, latch 17 can be operated in any of several modes. Under relatively low short circuit conditions, the phase or phases carrying the short circuit will cause the magnetic trip plungers such as plunger 70 of FIGURE 1 to move upwardly and into engagement with extensions such as extension 71 to cause clockwise motion of auxiliary tripper bar 18, so that latch 17 is defeated and the circuit breaker is operated.

Under overload conditions the bi-metal of the phase such as bimetal 74 will warp to the left to pick up extension 77 where again tripper bar 18 will rotate in a clockwise direction to again defeat latch 17.

Under high short circuit conditions which cause operation of the current limiting fuse, the current limiting fuse striker pin such as striker pin 83 will be ejected to engage extension 80 whereupon the auxiliary tripper bar 18 is again moved in a counterclockwise direction to defeat latch 15—17.

Finally, when the current limiting fuse housing 47 is removed from the auxiliary housing, crank 86 will rotate in a counterclockwise direction to cause extension 84 to move to the right and thus cause clockwise rotation of auxiliary tripper bar 18, and hence defeat of latch 15—17.

In accordance with the invention, all of this control mechanism is contained in a single removable housing which is connected to the circuit breaker housing by six screws for the case of a three-phase circuit breaker, which screws both electrically and mechanically connect the auxiliary housing to the circuit breaker.

Although this invention has been described with respect to its preferred embodiments it should be understood that many variations and modifications will now be obvious to those skilled in the art, and it is preferred, therefore, that the scope of this invention be limited not by the specific disclosure herein but only by the appended claims.

I claim:

1. A circuit interrupter device; said circuit interrupter device comprising a circuit breaker and a circuit limiting fuse in series therewith; said circuit breaker comprising a pair of cooperable contacts movable between an engaged and disengaged position, a latch means for latching said cooperable contacts in said engaged position when moved thereto and a trip unit for defeating said latch means responsive to predetermined electrical conditions; a circuit breaker housing for said pair of cooperable contacts; said trip unit being contained in a trip unit housing electrically and mechanically removably connected to said circuit breaker housing; said current limiting fuse being contained in a current limiting fuse housing, electrically and mechanically removably connected to said trip unit housing whereby said current limiting fuse and said trip unit housings are removably electrically and mechanically connected to said circuit breaker housing as a subunit for testing and adjustment.

2. A circuit interrupter device; said circuit interrupter device comprising a circuit breaker and a circuit limiting fuse in series therewith; said circuit breaker comprising a pair of cooperable contacts movable between an engaged

and disengaged position, a latch means for latching said cooperable contacts in said engaged position when moved thereto and a trip unit for defeating said latch means responsive to predetermined electrical conditions; a circuit breaker housing for said pair of cooperable contacts; said trip unit being contained in a trip unit housing electrically and mechanically removably connected to said circuit breaker housing; said current limiting fuse being contained in a current limiting fuse housing, electrically and mechanically removably connected to said trip unit housing whereby said current limiting fuse and said trip unit housings are removably electrically and mechanically connected to said circuit breaker housing as a subunit for testing and adjustment; interlock means for said current limiting fuse housing; said interlock means extending from said current limiting housing to said trip unit; removal of said current limiting fuse housing from said trip unit causing operation of said trip unit; a common tripper bar located within said subunit, and directly engageable with said trip unit, current limiting fuse and interlock responsive to operation thereof, for defeating said latch means.

3. In combination; a trip unit housing, a pair of circuit breaker contacts, and a current limiting fuse; said pair of circuit breaker contacts being carried within a circuit breaker housing; said trip unit being carried within a trip unit housing; said current limiting fuse being carried within a current limiting fuse housing; said trip unit housing being removably connected to said circuit breaker housing to electrically connect said trip unit in series with said circuit breaker contacts; said current limiting fuse housing being removably connected to said trip unit housing to electrically connect said current limiting fuses in series with said trip unit.

4. In combination; a trip unit housing, a pair of circuit breaker contacts, and a current limiting fuse; said pair of circuit breaker contacts being carried within a circuit breaker housing; said trip unit being carried within a trip unit housing; said current limiting fuse being carried within a current limiting fuse housing; said trip unit housing being removably connected to said circuit breaker housing to electrically connect said trip unit in series with said circuit breaker contacts; said current limiting fuse housing being removably connected to said trip unit housing to electrically connect said current limiting fuses in series with said trip unit; said trip unit housing and said current limiting fuse housing being removable as a subunit from said circuit breaker housing for testing and adjustment.

5. A multiphase circuit interrupter; said multiphase circuit interrupter comprising a pair of circuit breaker contacts for each of said phases, a trip unit having fault sensing elements for each of said phases for causing automatic operation of said circuit breaker contacts, and a current limiting fuse for each of said phases; each of said circuit contacts, said trip unit, and said current limiting fuses having a respective housing; said trip unit housing being removably connectable to said circuit breaker housing to electrically connect respective fault sensing elements in series with respective circuit breaker contacts; said current limiting fuse housing being removably connected to said trip unit housing to electrically connect respective current limiting fuses with respective fault sensing elements.

6. A multiphase circuit interrupter; said multiphase circuit interrupter comprising a pair of circuit breaker contacts for each of said phases, a trip unit having fault sensing elements for each of said phases for causing automatic operation of said circuit breaker contacts, and a current limiting fuse for each of said phases; each of said circuit contacts, said trip unit, and said current limiting fuses having a respective housing; said trip unit housing being removably connectable to said circuit breaker housing to electrically connect respective fault sensing elements in series with respective circuit breaker contacts; said current limiting fuse housing being removably connected to sail trip unit housing to electrically connect respective current limiting fuses with respective fault sensing elements; said current limiting fuse housing and said trip unit housing being removable from said circuit breaker housing as a subunit for testing and adjustment.

7. A multiphase circuit interrupter; said multiphase circuit interrupter comprising a pair of circuit breaker contacts for each of said phases, a trip unit having fault sensing elements for each of said phases for causing automatic operation of said circuit breaker contacts, and a current limiting fuse for each of said phases; each of said circuit contacts, said trip unit, and said current limiting fuses having a respective housing; said trip unit housing being removably connectable to said circuit breaker housing to electrically connect respective fault sensing elements in series with respective circuit breaker contacts; said current limiting fuse housing being removably connected to said trip unit housing to electrically connect respective current limiting fuses with respective fault sensing elements; said current limiting fuse housing and said trip unit housing rendering said current limiting fuses and said trip unit a subunit for testing and adjustment.

8. A multiphase circuit interrupter; said multiphase circuit interrupter comprising a pair of circuit breaker contacts for each of said phases, a trip unit having fault sensing elements for each of said phases for causing automatic operation of said circuit breaker contacts, and a current limiting fuse for each of said phases; each of said circuit contacts, said trip unit, and said current limiting fuses having a respective housing; said trip unit housing being removably connectable to said circuit breaker housing to electrically connect respective fault sensing elements in series with respective circuit breaker contacts; said current limiting fuse housing being removably connected to said trip unit housing to electrically connect respective current limiting fuses with respective fault sensing elements; said fault sensing elements comprising a thermal and magnetic trip means for each phase.

References Cited in the file of this patent

UNITED STATES PATENTS

2,486,300	Lindstrom et al.	Oct. 25, 1949
2,884,497	Steven et al.	Apr. 28, 1959
2,888,535	Edmunds	May 26, 1959
2,924,688	Edmunds	Feb. 9, 1960
2,939,936	Deans	June 7, 1960
2,982,834	Edmunds	May 2, 1961