Dec. 20, 1966 R. F. LEWANDOWSKI ETAL 3,293,382

MULTI-SECTION ROTARY SWITCH UNITARY INDEX MECHANISM WITH IMPROVED SPRING BIASED DETENT BALL AND ADJUSTABLE STOP LIMIT STRUCTURE

Filed Feb. 26, 1965 3 Sheets-Sheet 1

Fig. 1.

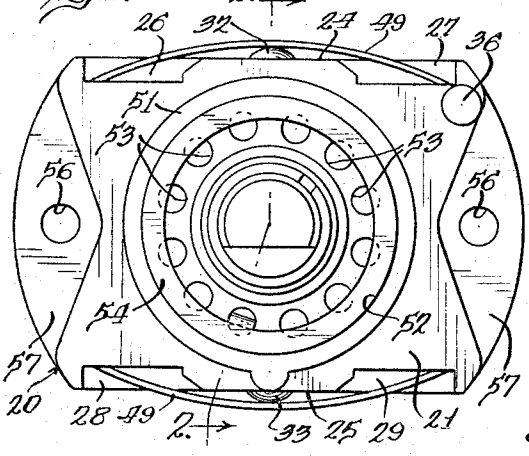


Fig. 2.

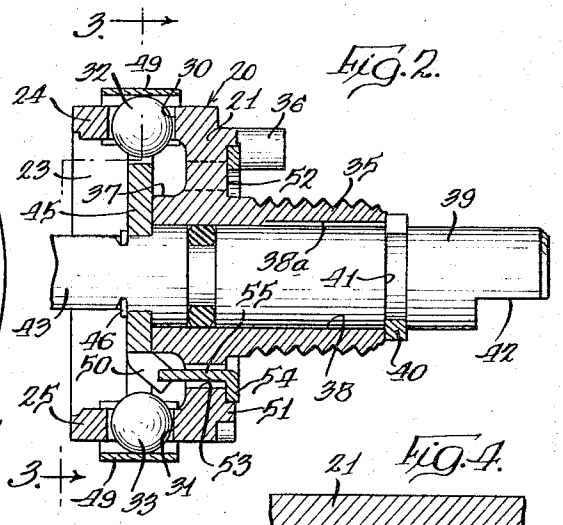


Fig. 3.

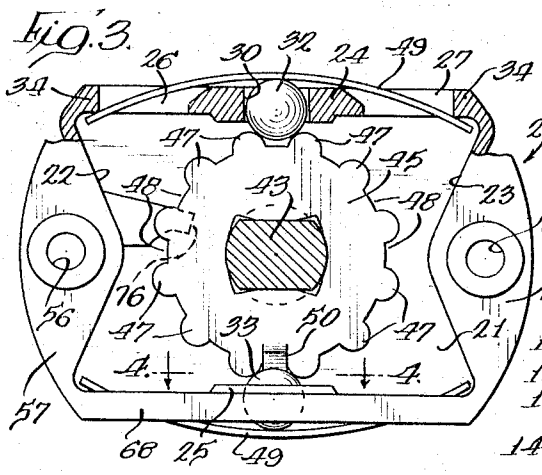


Fig. 4.

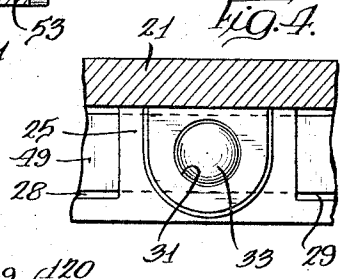


Fig. 5.

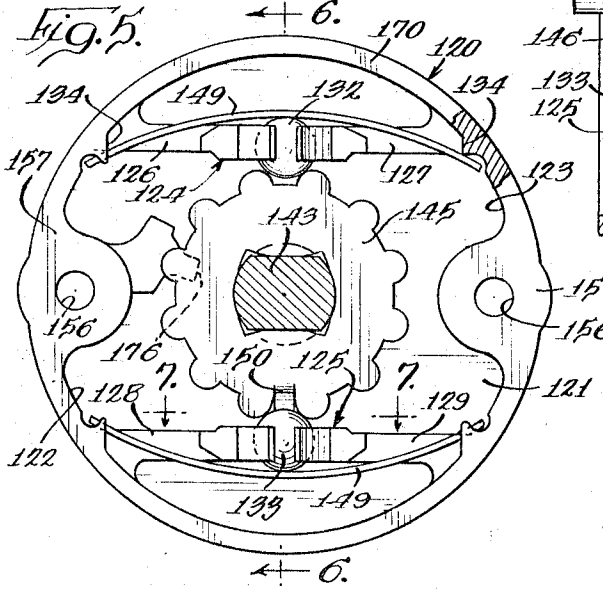


Fig. 6.

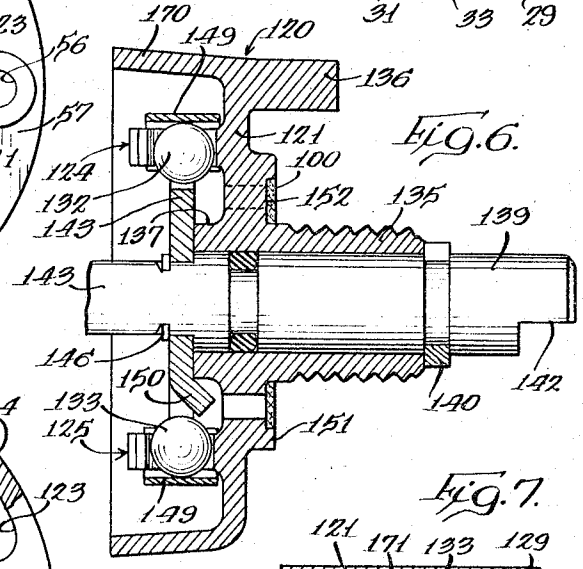
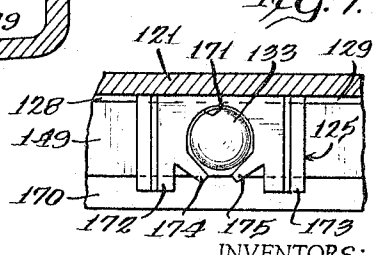


Fig. 7.



INVENTORS:
Raymond F. Lewandowski
Bernard J. Bolbeck
Henry F. Barn

By Hofgren, Wegner, Allen, Stellman & McCord Atty's

Dec. 20, 1966 R. F. LEWANDOWSKI ETAL 3,293,382

MULTI-SECTION ROTARY SWITCH UNITARY INDEX MECHANISM WITH IMPROVED SPRING BIASED DETENT BALL AND ADJUSTABLE STOP LIMIT STRUCTURE

Filed Feb. 26, 1965 3 Sheets-Sheet 2

Fig. 8.

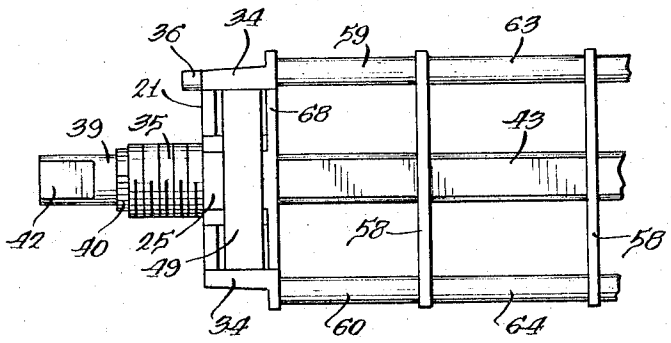


Fig. 9.

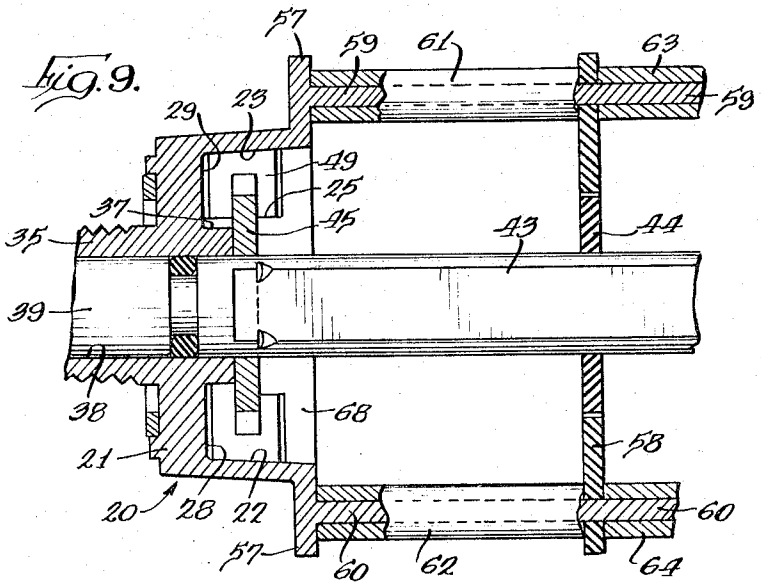


Fig. 10.

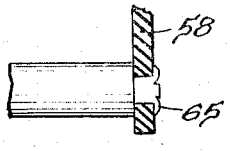


Fig. 11.

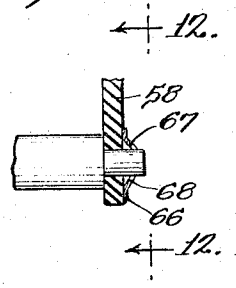
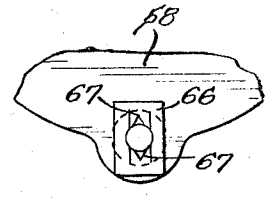


Fig. 12.



Dec. 20, 1966 R. F. LEWANDOWSKI ETAL 3,293,382

MULTI-SECTION ROTARY SWITCH UNITARY INDEX MECHANISM WITH IMPROVED SPRING BIASED DETENT BALL AND ADJUSTABLE STOP LIMIT STRUCTURE

Filed Feb. 26, 1965 3 Sheets-Sheet 3

Fig. 13.

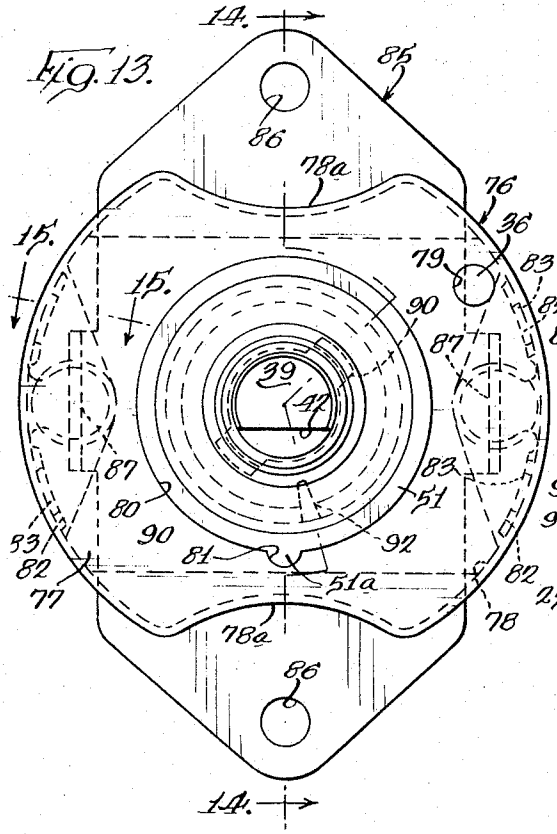


Fig. 14.

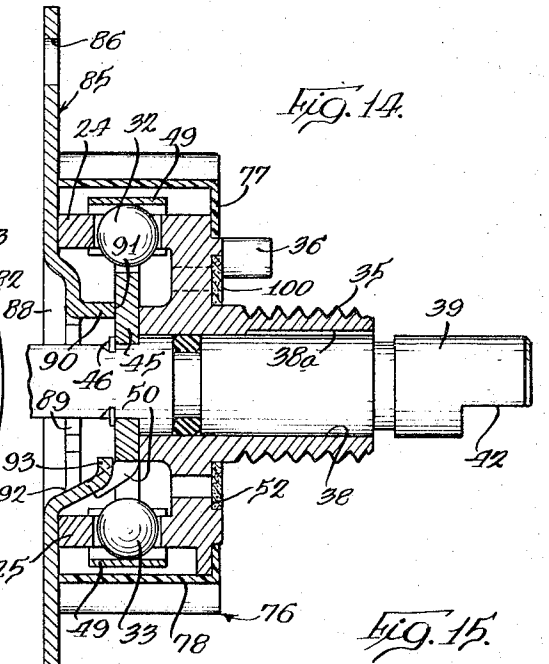


Fig. 15.

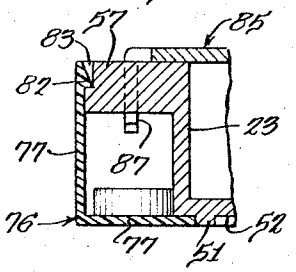


Fig. 16.

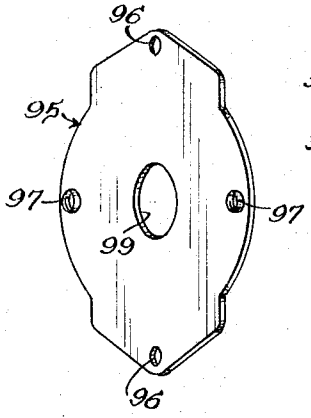


Fig. 17.

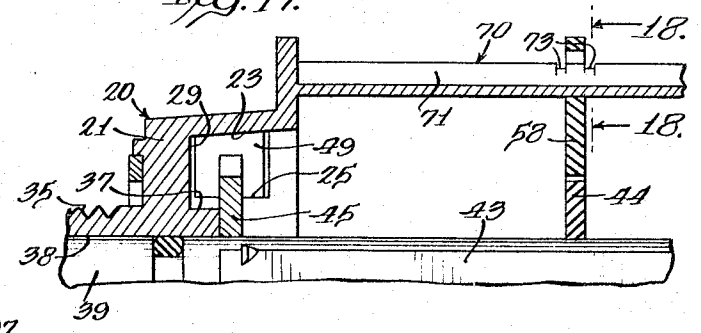
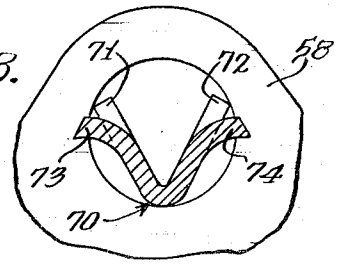


Fig. 18.



United States Patent Office 3,293,382 Patented Dec. 20, 1966

3,293,382

MULTI-SECTION ROTARY SWITCH UNITARY INDEX MECHANISM WITH IMPROVED SPRING BIASED DETENT BALL AND ADJUSTABLE STOP LIMIT STRUCTURE

Raymond F. Lewandowski, Mount Prospect, Bernard J. Golbeck, Crystal Lake, and Henry G. Garn, McHenry, Ill., assignors to Oak Electro/Netics Corp., a corporation of Delaware

Filed Feb. 26, 1965, Ser. No. 435,510
30 Claims. (Cl. 200—14)

This invention relates in general to an index mechanism for use in a rotary electric switch, and more particularly to a unitary index mechanism structure which may be formed by die casting or similar manufacturing methods.

In the past it has been known to provide a rotary electric switch with an index mechanism which included a notched or scalloped index disc, and a spring pressed ball which engaged the notches or scallops in the index disc to retain the index disc and the associated rotor elements in the desired switching position. Such index mechanisms are typified by those shown in the patents to Mabie 1,913,992 and Simpson 2,447,718. Prior art index mechanisms have conventionally included a front plate, and a separate bushing fixed to the front plate and adapted to rotatably support a switch operating shaft. The primary object of the present invention is to provide a unitary housing for an index mechanism as described above having the front plate and the shaft supporting bushing formed integrally together so as to be capable of being readily produced by die casting, investment casting or by powdered metal technology. A more specific object of the present invention is to provide a unitary index mechanism for a rotary switch which is simple in construction, efficient in operation, light in weight, compact in size, and relatively inexpensive to manufacture.

A feature of the present invention is to provide a new and improved housing means for the index mechanism of a rotary electric switch.

Another feature of the present invention is to provide an index mechanism as set forth in the preceding paragraph with improved means for retaining the detent members against undesirable movement.

Yet another feature of the invention is to provide an index mechanism for a rotary electric switch wherein the feel of the switch to the user can be readily changed.

A further feature of the present invention is to provide an index mechanism for a rotary electric switch as described above with strut screws which are formed integrally with the index mechanism housing.

A still further feature of the invention is to provide an index machanism for a rotary electric switch that provides a balanced load on the switch operating shaft.

Still another feature of the present invention is to provide adjustable stop means for the index disc of an index mechanism as described above.

An additional feature of the present invention is to provide an index mechanism as described above with a protective cover.

Still another feature of the present invention is to provide an adaptor plate for an index mechanism as described above, so that a basic size index mechanism can be used in switches of different size.

Still further objects and features of the present invention will hereinafter become more fully apparent from the following description, taken in connection with the annexed drawings, wherein:

FIGURE 1 is an end view of a first embodiment of the present invention;

FIGURE 2 is a central sectional view taken substantially along line 2—2 of FIGURE 1;

FIGURE 3 is a view taken generally along line 3—3 of FIGURE 2, with certain parts being broken away for clarity of illustration;

FIGURE 4 is an enlarged fragmentary view taken generally along line 4—4 of FIGURE 3;

FIGURE 5 is an end view of a second embodiment of the present invention;

FIGURE 6 is a central sectional view taken generally along line 6—6 of FIGURE 5;

FIGURE 7 is an enlarged fragmentary view taken generally along line 7—7 of FIGURE 5;

FIGURE 8 is a fragmentary side elevational view of a rotary electric switch including the index mechanism illustrated in FIGURES 1 to 4;

FIGURE 9 is a fragmentary, enlarged central sectional view through the rotary switch illustrated in FIGURE 8;

FIGURES 10 and 11 are fragmentary detail views of various means for retaining the last rotor section on the integrally die cast strut screws;

FIGURE 12 is a view taken generally along line 12—12 of FIGURE 11;

FIGURE 13 is an end view of a further modification of the invention including an adaptor plate;

FIGURE 14 is a central sectional view taken generally along line 14—14 of FIGURE 13;

FIGURE 15 is a fragmentary sectional view taken generally along line 15—15 of FIGURE 13;

FIGURE 16 is a perspective view of a modified form of adaptor plate;

FIGURE 17 is a fragmentary sectional view, similar to FIGURE 9, and showing a modified form of stator retention means; and

FIGURE 18 is an enlarged sectional view taken generally along line 18—18 of FIGURE 17.

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail various specific embodiments and modifications thereof, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiments illustrated. The scope of the invention will be pointed out in the appended claims.

Referring now to the drawings, wherein like reference numerals represent like or corresponding parts throughout the several views, the index mechanism illustrated in FIGURES 1 to 4 includes a housing 20, which is formed of a suitable material, such as zinc or an aluminum alloy. Housing 20 is generally rectangular in cross section, as can be best seen in FIGURES 1 and 3, and includes a base 21. A pair of walls 22 and 23 are provided at opposite sides of base 21, and define therebetween a rearwardly open chamber having generally open sides between walls 22 and 23. A pair of upright wall sections 24 and 25 extend rearwardly from base 21 at opposite sides thereof. Upright wall sections 24 and 25 are each spaced a substantial distance from walls 22 and 23, to define open spaces or windows 26–29. Bores 30 and 31 are provided in upright wall sections 24 and 25 respectively, and are adapted to slidably receive therein detent members in the form of balls 32 and 33, respectively. One of the bores is slightly larger that the other bore, for a purpose to hereafter appear. Inwardly directed fingers 34 are provided at each side of walls 22 and 23, and extend a slight distance toward the uprights 24 and 25 for a purpose to be hereafter explained.

A generally cylindrical boss 35 extends forwardly from the front face of base 21, and is adapted to be inserted through an opening in a mounting plate, not shown. Boss 35 is formed integrally with base 21, as by die casting, investment casting or the like. Boss 35 is externally threaded for reception of a nut, not shown, to retain the

index mechanism on the mounting plate. A cylindrical locating stud **36** is provided on the front face of base **21** adjacent one corner thereof, and is adapted to be positioned in a corresponding locating hole in the mounting plate, as is well known in the art. A second boss **37** is formed integrally with and extends rearwardly from base **21**, and terminates within the chamber formed between walls **22** and **23**. An axially extending bore **38** is provided in bosses **35** and **37**, and in base **21**, for rotatable reception of an operating shaft **39**. As can be seen in FIGURE 2, longitudinally extending grooves **38***a* are provided on bore **38**, and are adapted to receive a suitable lubricant therein to facilitate the rotation of shaft **39**. Means are provided for preventing axial movement of the shaft **39** outwardly of the housing **20**, and include a C washer **40** provided in a circumferential groove **41** in the shaft **39**. Shaft **39** includes a flattened portion **42** at the outer end thereof, as is well known in the art, for reception of an operating knob, not shown. The inner end of shaft **39** is provided with a portion **43** of "Double D" cross sectional configuration upon which the rotors **44** of the switch sections are mounted (FIGURE 9).

An index member in the form of a generally circular disc **45** is mounted on the shaft portion **43** in the housing **20**, and is abutted against the end of boss **37** as can be best seen in FIGURE 2. A suitable retention member **46** may be provided in a circumferential groove in the shaft **43** adjacent the rearward face of the index disc **45**, to hold the index disc against the end of boss **37**, and to prevent movement of the shaft **39** outwardly of the housing **20**. It should also be understood that if it is not desired to use a separate retaining member **46**, the shaft portion **43** adjacent index member **45** may be crimped so that a portion thereof will be swaged to engagement with the rearward face of the index member to retain the same against the end of boss **37**. As can be best seen in FIGURE 3, a plurality of circumferentially spaced radial enlargements **47** are provided around the periphery of disc **45**, and define therebetween notches or recesses **48**. As can be best seen in FIGURE 2, the index disc **45** is positioned in alignment with the centers of bores **30** and **31**, and balls **32** and **33**. The balls **32** and **33** are adapted to engage the notch **48** between adjacent enlargements **47** to locate the index disc **45** (and the rotor sections carried by the shaft portion **43**) in a desired angular position. Leaf springs **49** are provided to bias the balls **32** and **33** toward the index disc **45**, and as can be best seen in FIGURE 3, the end portions of the leaf springs **49** are retained under the fingers **34** at the sides of walls **22** and **23**. Thus, it will be appreciated that as shaft **39** is rotated so that the balls ride over an enlargement **47**, the balls will move freely within bores **30** and **31** to flex the springs **49**. The leaf springs **49** are preferably of the same strength so that the force of the diametrically opposed balls **32** and **33** on index disc **45** will be equal. In view of this, the load on shaft **39** will be balanced, so that the shaft can be freely rotated without binding. As is mentioned hereinabove one of bores **30** and **31** (as for example bore **30**) is larger than the other bore. Accordingly, when the same size balls **32** and **33** are used, the ball in the smaller bore (as for example ball **33**) serves to precisely locate the index disc **35** in the selected switching position, while the ball in the larger bore (as for example ball **32**) adds a torque to resist the rotation of the index disc and to balance the loading on the shaft **39**. For purposes of example and not of limitation, it has been found that in an exemplary embodiment of the invention, a housing wherein the diameter of bore **30** is .157 inch and the diameter of bore **31** is .165 inch has functioned extremely satisfactorily when used with balls having a diameter of .156 inch. It should also be noted that the same results can be achieved if bores **30** and **31** are of the same diameter, by using one ball which is larger than the other. It will be understood, of course, that the fingers **34** are sufficiently long to prevent the spring **49** from being disengaged as the index disc **45** is rotated. The provision of the openings or windows **26–29** not only makes the housing **20** light in weight, but also facilitates the assembly of springs **49** into the mechanism. The relatively free accessibility of springs **49** allows them to be readily changed, so that the feel of the switch to the user can be varied. A plurality of spring leaves can be stacked for one or both balls to provide a wide range of pressures.

Cooperating means are provided on the housing **20** and on the index disc **45** to provide a stop to limit the rotational movement of shaft **39**. To this end, an abutment is provided on disc **45**, in the form of a forwardly extending tab **50**. As can be seen in FIGURE 3, tab **50** is provided between adjacent enlargements **47**, and may be conveniently formed during the manufacture of disc **45**, as by stamping, so as to obviate the necessity of adding material to the disc **45** to form the tab. An upraised circular rib **51** is provided on the front face of housing base **21** integrally therewith in concentric relationship with boss **35** to define an annular recess **52** between the rib **51** and the boss **35**. A plurality of holes **53** are provided in the recess **52**, and communicate with the chamber formed at the rearward side of the base **21**. An annular stop member **54** is seated within recess **52**, and includes a rearwardly extending leg **55** which is adapted to be selectively positioned in one of the holes **53**. As can be best seen in FIGURE 2, leg **55** extends rearwardly a sufficient amount to contact the forwardly bent tab **50** on the index disc **45** to provide a stop means therefor. It will be readily appreciated that the leg **55** can be positioned in any of the holes **53**, so that means are provided for adjusting the angular position at which the rotor disc **45** will be stopped.

It should also be understood that a fixed stop **76** may be formed integrally with the housing **20**. The use of such an integral stop provides a switch in which the stop characteristics can be widely varied. For example, two abutments **50** may be struck from index disc **45** to provide two rotary stops engageable with the fixed stop **76**. The stop washer **54** can be used in conjunction with the fixed stop, to provide a still further refinement. If it is desired to provide a switch having no stop position, a flat index disc **45** is provided without projections **50**.

As is shown in FIGURES 1 and 3, holes **56** may be provided in ears **57**, which extend laterally outwardly from the rearward end of walls **22** and **23**, for the reception of conventional tie rods upon which the stator switch sections are mounted. However, in the preferred form, as shown in FIGURES 8 to 12, strut screws **59** and **60** are preferably die cast or otherwise formed integrally with the housing. Spacers **61** and **62** may be provided on strut screws **59** and **60** respectively, between the rearmost end of the housing **20** and the first stator section **58**; and additional spacers **63** and **64** may be provided on strut screws **59** and **60** respectively, between adjacent stator sections **58** to provide a stacked switch construction. In one form the switch sections and the spacers may be held in their assembled relationship by threading the rearmost ends of strut screws and placing nuts thereon. As is shown in FIGURE 10, the endmost stator **58** may also be held in the stacked arrangement by swaging over the end portions of the strut screws into engagement with the rear face of the stator, as is shown at **65**. Alternatively, spring clip members **66**, having tangs **67** and **68**, may be forced over the end portions of the strut screws to retain the rearmost stator. It will be clear that in the forms shown in FIGURES 10 and 11, the use of a conventional screw and nut fastening means has been eliminated.

A still further modified form is shown in FIGURES 17 and 18, and it will be noted that the tie rods **70** (one of which is shown) that are formed integrally with the housing **20** are V-shaped in cross-section. The legs **71** and **72** of the tie rods **70** are bent as shown at **73** and **74**

respectively, in FIGURE 18 into engagement with the opposite faces of the switch stator 58 to positively retain the same. It will be noted that by the use of such V-shaped tie rods, the necessity of using spacers 60 and 61 is obviated.

As can be best seen in FIGURES 3 and 9, connecting straps 68 may be provided between the rearward ends of the uprights 24 and 25 and the facing surfaces of the fingers 34 to add rigidity to the structure. It will be understood, of course, that the connecting straps 68 will be die cast or otherwise formed integrally with the housing 20.

Referring now to FIGURES 13–15, a cover 76 may be provided for the housing 20 to shield the balls 32 and 33 and springs 49 from undesirable environments. The cover 76 includes a generally planar top 77, and a continuous side wall or skirt 78 extends at right angles to the top wall 77 around the periphery thereof. As can be best seen in FIGURE 14, side wall 78 is generally coexistive with walls 24 and 25. Side wall 78 is provided with arcuate recessed portions 78*a* (FIGURE 13) for a purpose to hereafter appear. A hole 79 is provided in top 77 adjacent the upper right-hand corner thereof as viewed in FIGURE 13 for reception of locating stud 36 therethrough. A bore 80 is provided centrally of top 77, and embraces the outer periphery of annular rib 51 when the cover is positioned on the housing. A keyway or locking slot 81 is provided in bore 80, and cooperates with an arcuate key 51*a* on the outer periphery of rib 51 to properly locate the cover 76 on the housing 20. The rear end of side wall 78 is provided with radially inwardly directed tabs or projections 82 (FIGURE 15) which are adapted to be received in notches 83 in the rear surface of housing ears 57 when the cover 76 is in place on the housing. Then cover 76 is preferably formed of a somewhat resilient plastic material, so that when finger pressure is applied to arcuate cover portions 78*a* the cover will become slightly elongated to free projections 82 from notches 83. The inner surfaces of side wall portions 78*a* are spaced sufficiently from springs 49 to allow the side wall portions 78*a* to move toward one another enough to free projections 82 from notches 83. Thus, it will be appreciated that the cover 76 is readily removable from the housing 20 by merely depressing cover portions 78*a* and lifting the cover off of the housing. The cover 76 may be readily positioned on the housing 20 by aligning the hole 79 with the stud 36, and the keyway 81 with the key 51*a*, and manually pressing the cover onto the housing to snap the projections 82 into the notches 83.

Means are also illsutrated in FIGURES 13–16 for standardizing the illustrated switch, so that a single size index mechanism may be used for a plurality of different switch sizes. With particular reference to FIGURES 13–15, a generally planar adaptor plate 85 is mounted against the rear portion of the index mechanism housing 20. As can be best seen in FIGURE 14, the adaptor plate 85 fits flushly against the rear end of walls 24 and 25, and against the rear end of cover side wall 78. The adaptor plate 85 is provided with means for accommodating larger switch sections than would ordinarily be associated with the index mechanism, and in the illustrated embodiment this means includes a pair of holes 86 provided at opposite ends of the adaptor plate 85. Holes 86 are adapted to receive therethrough tie rods or strut screws (not shown) upon which the the switch sections are mounted. The adaptor plate 85 includes means for securing the adaptor plate to the index mechanism housing 20, and in the embodiment of FIGURES 13–15 this means includes a pair of tabs 87 generally perpendicular to the plane of the adaptor plate, and extending forwardly through the openings 56 in the housing ears 57. The forwardmost portion of tabs 87 may be crimped over into engagement with the adjacent faces of housing ears 57 to positively retain the adaptor plate on the housing. It should be understood, of course, that any other suitable means may be provided for securing the adaptor plate to the index mechanism housing, and in this respect the adaptor plate could be provided with a pair of spaced openings aligned with the openings 56 in the housing so that screws or the like could be used to fasten the adaptor plate to the housing.

Adaptor plate 85 includes a recessed central portion 88, which extends forwardly into the chamber defined between housing base 21 and walls 22 and 23. A central opening 89 is provided in the adaptor plate 85 for reception of the shaft 39 therethrough. A pair of diametrically opposed abutment members 90 are struck from opposite sides of the opening 89, and extend forwardly so that the forwardmost abutment surfaces 91 on members 90 engage the rearward face of the index disc 45 to properly position the adaptor plate 85 and to prevent the shaft 39 from moving rearwardly in the housing. The provision of adaptor abutment members 90 eliminates the necessity of ring 40 for preventing axial movement of shaft 39. An additional abutment member 92 is struck from the side of recessed portion 88, and extends toward the index disc. The forwardmost stop portion 93 of abutment 92 is positioned for engagement with the stop 50 on the index disc 45. The circumferential extent of stop portion 93 may be varied as desired to provide specific stop characteristics for a selected switch construction. It should be noted that when the stop means for the index disc is provided on an adaptor plate rather than on an annular ring, such as that shown at 54 FIGURES 1 and 2, the index disc 45 need merely be reversed, and thus an identical index disc can be used in connection with either embodiment.

A modified form of adaptor plate is illustrated in FIGURE 16, and this adaptor plate may be utilized when it is desired to provide a switch having no stop position, or when it is desired to define the stop position with means formed integrally with the housing. This adaptor plate embodiment includes a generally planar member 95 and is illustrated with spaced holes 96 for accommodating large switch sections. The adaptor plate 95 is positioned in flush abutting engagement with the rearward end of the index mechanism housing, and includes means in the form of spaced extruded holes 97 to be aligned with holes 56 in housing ears 57 for securing the same to the housing. The adaptor plate 95 is provided with a central opening 99 which receives the switch shaft 39.

When the switch does not have an adjustable stop washer 54, an annular gasket 100 is provided in recess 52 to prevent dirt and the like from entering the housing through holes 53, FIGUR E14.

Turning now to the embodiment illustrated in FIGURES 5 to 7, it should be noted that certain elements thereof are substantially similar to, or identical with, corresponding elements in the embodiment illustrated in FIGURES 1 to 4, and, accordingly, similar reference numerals have been used to illustrate corresponding parts, and have been increased by the sum 100. Because of the similarity between the two embodiments, it is not deemed necessary to describe in detail the corresponding structure in each embodiment, and accordingly only the distinguishing features in the embodiment of FIGURES 5 to 7 will be described in detail. As can be best seen in FIGURE 5, base 121 is generally circular in plan view, and a generally cylindrical, rearwardly extending flange 170 is provided on the rear face of base 121. The opposed facing walls 122 and 123 of flange 170 define the rearwardly open chamber in which index member 145 is mounted. Flange 170 provides a shield for the leaf springs 149, and it will be understood that the embodiment of FIGURES 5 to 7 has particular utility when it is desired that springs 149 not be exposed, and when miniaturization of the switch is not critical. As can be best seen in FIGURE 7, the upright wall sections 124 and 125 are somewhat different

from the upright wall sections 24 and 25, and include a generally U-shaped slot 171. Uprights 124 and 125 include legs 172 and 173, which may be swaged over, as shown at 174 and 175, to retain the balls 132 and 133 against axial movement within their respective passages 171. It should be understood, of course, that if it is desired, a bore may be provided in upright wall sections 124 and 125, similar to that shown in FIGURES 1 to 4. As can be best seen in FIGURE 5, a fixed stop 176 is provided on the rear face of base 121 integrally therewith, and is positioned for engagement with the forwardly extending tab 150 on the index disc 145, to prevent rotation of the shaft 139 at predetermined angular intervals. It should be noted that a plurality of tabs 150 may be formed with disc 145 to provide the desired stopping action. This allows the design of housing 120 to be standardized with stop 176 being provided at a fixed location. By merely changing the discs 145 having different tabs 150, the stop characteristics of the switch can be varied. While a fixed stop has been shown in connection with the embodiment illustrated in FIGURES 5 to 7, it should be understood that an adjustable stop means similar to that shown in connection with the embodiment of FIGURES 1 to 4 can also be used in connection with the embodiment of FIGURES 5 to 7. Also, stop means may be incorporated in an adaptor plate, such as that shown at 85 in FIGURES 13–15. While holes 156 are shown in ears 157 in the embodiment of FIGURES 5 to 7, it should also be understood that the strut screws may be formed integrally with the housing, if desired.

We claim:

1. An index mechanism for use in a rotary electric switch comprising: a housing including a base, said base having front and rear faces with a central aperture extending therethrough, a pair of spaced walls extending rearwardly from opposite sides of the rearward face of said base and defining a chamber therebetween, a pair of upright wall sections extending rearwardly from the rear face of said base at opposite sides thereof and spaced from said walls, said upright wall sections each having a passageway therethrough opening into said chamber, a circular recess in the front face of said base concentric with said aperture, with a plurality of circumferentially spaced holes being provided in said base in said recess; a shaft rotatably mounted in said base aperture and extending through said chamber; an index member fixed on said shaft in said chamber and aligned with said passageways, said index member having a plurality of radial notches defining a plurality of index stations; detent members, one mounted for radial movement in each of said passageways and adapted to engage different ones of said notches upon rotation of said shaft to locate said shaft in a desired position; means for preventing movement of said detent members axially of said housing; an abutment on said index member extending forwardly toward said base; a flat ring seated within said recess and having a leg extending rearwardly through one of said holes into position for engagement with said index member abutment to provide an adjustable stop to limit the rotation of said shaft; and spring means biased between said walls and said detent members to urge said detent members into engagement with said index member.

2. An index mechanism comprising: an apertured base; a pair of upstanding walls at opposite sides of said base defining a chamber therebetween; a pair of upright wall sections on said base spaced from each of said walls, said upright wall sections each having a passageway therethrough and opening into said chamber; a shaft rotatably mounted in a base aperture and extending through said chamber; an index member fixed on said shaft in said chamber and aligned with said passageways, said index member having means defining a plurality of index stations; a detent member movably mounted in each of said passageways and adapted to engage different ones of said index stations upon rotation of said shaft to locate said shaft in a desired position; and spring means biased between said walls and each of said detent members to urge said detent members into engagement with said index member.

3. An index mechanism as defined in claim 2 wherein each side of each wall is provided with an inwardly directed finger for retaining the ends of said spring means.

4. An index mechanism as defined in claim 2 wherein said housing is die cast and strut screws are die cast integrally with said housing, and extend rearwardly therefrom.

5. An index mechanism as defined in claim 2 wherein means are provided on said housing for restraining said detent member against movement axially of said housing.

6. An index mechanism as defined in claim 2 wherein adjustable stop means are provided on said housing to limit the rotation of said shaft.

7. An index mechanism as defined in claim 2, in which said base is substantially rectangular in cross section, and wherein said walls are provided at the sides of said base having the shortest dimension, with said upright wall sections being provided at one side of said base having the longest dimension, and spaced substantially equidistantly from said walls.

8. An index mechanism as defined in claim 2 in which said base is substantially circular in shape, and wherein an annular flange extends rearwardly from the outer periphery of said base to define said walls, and wherein said upright wall section is spaced inwardly from said flange.

9. An index mechanism for use in a rotary electric switch comprising: a housing; a shaft rotatably mounted in said housing; an index member mounted for rotation with said shaft, and having means definig a plurality of index stations; a detent member mounted for radial movement on said housing and adapted to engage different ones of said index stations upon rotation of said shaft to locate said shaft in a desired position; means for retaining said index member at a fixed position on said shaft; means on said housing for restraining said detent member against movement axially of said housing and confining said detent member for movement radially of said housing in alignment with said index member; and means urging said detent member into engagement with said index member.

10. An index mechanism as defined in claim 9 wherein said housing is provided with a generally axially extending upright wall section having a radial bore therethrough, said detent member being received in said bore for said radial movement, with the sides of said bore restraining said detent member against movement axially of said housing.

11. An index mechanism as defined in claim 9 wherein said housing includes a generally U-shaped, axially extending upright wall section defined by a pair of legs with a radially extending slot therebetween, said detent member being received in said slot for said radial movement, and the ends of said legs being bent over into engagement with said detent member to provide said axial restraint.

12. An index mechanism for use in a rotary electric switch comprising: a housing; a shaft rotatably mounted in said housing; an index member mounted for rotation with said shaft, and having means defining a plurality of index stations; an abutment on said index member; a detent member mounted for limited movement on said housing and adapted to engage different ones of said index stations upon rotation of said shaft to locate said shaft in a desired position; means urging said detent member into engagement with said index member; stop means on said housing adapted to be engaged by said index disc abutment to limit the rotation of said shaft; and means for varying the position of said stop means whereby the extent of rotation of said shaft may be adjusted said last named means including a plurality of equally circumferentially spaced axial holes in said housing, with said stop means being insertable into a selected one of said holes into position for engagement with said index disc abutment.

13. In a multi-section rotary switch, the combination of: a housing; a shaft rotatably mounted in said housing; an index member mounted for rotation with said shaft, and having means defining a plurality of index stations; a detent member mounted for limited movement on said housing and adapted to engage different ones of said index stations upon rotation of said shaft to locate said shaft in a desired position; means urging said detent member into engagement with said index member; and strut screws formed integrally with said housing and extending rearwardly therefrom for carrying the switch sections of said multi-section rotary switch, the rearward end of said strut screws being deformed to retain the rearmost switch section in assembled relation on said strut screws.

14. In a multi-section rotary switch, the combination of: a housing; a shaft rotatably mounted in said housing; an index member mounted for rotation with said shaft, and having means defining a plurality of index stations; a detent member mounted for limited movement on said housing and adapted to engage different ones of said index stations upon rotation of said shaft to locate said shaft in a desired position; means urging said detent member into engagement with said index member; strut screws formed integrally with said housing and extending rearwardly therefrom for carrying the switch sections of said multi-section rotary switch; and spring clip members on the rearmost end of said strut screws to retain the rearmost switch section in assembled relation on said strut screws.

15. In a multi-section rotary switch, the combination of: a housing; a shaft rotatably mounted in said housing; an index member mounted for rotation with said shaft, and having means defining a plurality of index stations; a detent member mounted for limited movement on said housing and adapted to engage different ones of said index stations upon rotation of said shaft to locate said shaft in a desired position; means urging said detent member into engagement with said index member; and strut screws formed integrally with said housing and extending rearwardly therefrom for carrying the switch sections of said multi-section rotary switch, said strut screws being V-shaped in cross section, and defined by diverging legs that are adapted to be deformed in retaining engagement with opposite sides of said switch sections.

16. An index mechanism comprising: a housing having an apertured base, a pair of upstanding walls at opposite sides of said base defining a chamber therebetween, at least one upright wall section on said base spaced from said walls, said upright wall section having a passageway therethrough and opening into said chamber; a shaft rotatably mounted in a base aperture and extending through said chamber; an index member fixed on said shaft in said chamber and aligned with said passageway, said index member having means defining a plurality of index stations; a detent member movably mounted in said passageway and adapted to engage different ones of said index stations upon rotation of said shaft to locate said shaft in a desired position; spring means biased between said walls and said detent member to urge said detent member into engagement with said index member; and a cover removably mounted on said housing and having a continuous skirt portion enclosing said spring means and resiliently embracing said housing.

17. An index mechanism comprising: a housing having an apertured base, a pair of upstanding walls at opposite sides of said base defining a chamber therebetween, a pair of upright wall sections on said base spaced from said walls, said upright wall sections each having a passageway therethrough and opening into said chamber on diametrically opposed sides of one base aperture; a shaft rotatably mounted in said one base aperture and extending through said chamber; an index member fixed on said shaft in said chamber and aligned with said passageways, said index member having means defining a plurality of index stations; a pair of detent members, each movably mounted in one of said passageways and adapted to engage different ones of said index stations upon rotation of said shaft to locate said shaft in a desired position; spring means biased between said walls and said detent members to urge said detent members into engagement with said index member; a cover for said housing, said cover having a generally planar top and a depending continuous side wall adapted to enclose said spring means; and cooperating means on said cover and said housing for releasably mounting said cover on said housing.

18. An index mechanism as defined in claim 17 wherein said last named means includes a plurality of recessed portions in said housing and an extension portion on said cover side wall for each of said recessed portions.

19. An index mechanism comprising: a housing having an apertured base, a pair of upstanding walls at opposite sides of said base defining a chamber therebetween, a pair of upright wall sections on said base spaced from said walls, each of said upright wall sections having a passageway therethrough and opening into said chamber on diametrically opposed sides of one base aperture; a shaft rotatably mounted in said one base aperture and extending through said chamber; an index member fixed on said shaft in said chamber and aligned with said passageways, said index member having means defining a plurality of index stations; a pair of detent members, each movably mounted in one of said passageways and adapted to engage different ones of said index stations upon rotation of said shaft; spring means biased between said walls and said detent members to urge said detent members into engagement with said index member the size relationship between one of said detent members and its passageway being different from the size relationship between the other detent member and its passageway, so that one of said detent members serves to precisely locate said shaft in a desired position while the other of said detent members balances the load on said shaft.

20. An index mechanism as defined in claim 19 wherein said detent members are the same size, and one of said passageways is larger than the other.

21. An index mechanism comprising: a housing having an apertured base, a pair of upstanding walls at opposite sides of the rear of said base defining a chamber therebetween, at least one upright wall section on the rear side of said base spaced from said walls, said upright wall section having a passageway therethrough and opening into said chamber an annular rib on the front of said base in concentric relationship with one base aperture; a shaft rotatably mounted in said one base aperture and extending through said chamber; an annular gasket on the front of said base between said rib on said aperture, said gasket being adapted to sealingly engage a mounting plate; an index member fixed on said shaft in said chamber and aligned with said passageway, said index member having means defining a plurality of index stations; a detent member movably mounted in said passageway and adapted to engage different ones of said index stations upon rotation of said shaft to locate said shaft in a desired position; and spring means biased between said walls and said detent member to urge said detent member into engagement with said index member.

22. An index mechanism for use in a rotary electric switch comprising: a housing; a shaft rotably mounted in said housing; a generally planar index member mounted for rotation with said shaft, and having a plurality of radial notches in the outer periphery thereof defining a plurality of index stations; at least one abutment integral with said index member, said abutment extending away from the plane of said index member and being provided at one of said notches; a detent member mounted for limited movement on said housing and adapted to engage different ones of said notches upon rotation of said shaft to locate said shaft in a desired position; means urging said detent member into engagement with said

index member; stop means adapted to be engaged by said index disc abutment to limit the rotation of said shaft; and means for varying the position of said stop means whereby the extent of rotation of said shaft may be adjusted.

23. An index mechanism for use in a rotary electric switch comprising: a housing; first means on said housing for supporting at least one rotary switch section of one size; a switch operating shaft rotatably mounted in said housing; an index member positioned in said housing and mounted for rotation with said shaft, said index member having means defining a plurality of index stations; a detent member mounted for limited movement on said housing and adapted to engage different ones of said index stations upon rotation of said shaft to locate said shaft in a desired position; means urging said detent member into engagement with said index member; and second means secured to said housing for supporting at least one rotary switch section of different size from said first mentioned rotary switch section.

24. An index mechanism as defined in claim 23 wherein said second means are mounted in said first means.

25. An index mechanism for use in a rotary electric switch comprising: a housing; a pair of spaced openings in said housing defining means for supporting at least one rotary switch section of one size; a switch operating shaft rotatably mounted in said housing; an index member mounted for rotation with said shaft, and having means defining a plurality of index stations; a detent member mounted for limited movement on said housing and adapted to engage different ones of said index stations upon rotation of said shaft to locate said shaft in a desired position; means urging said detent member into engagement with said index member; and an adaptor plate having means alignable with said openings for securing said adaptor plate to said housing, said adaptor plate having further means for supporting at least one rotary switch section of different size than said first mentioned switch section.

26. An index mechanism for use in a rotary electric switch comprising: a housing; a pair of spaced openings in said housing defining means for supporting at least one switch section of given size; a switch operating shaft rotatably mounted in said housing; an index member mounted for rotation with said shaft, and having means defining a plurality of index stations; an abutment on said index member; a detent member mounted for limited movement on said housing and adapted to engage different ones of said index stations upon rotation of said shaft to locate said shaft in a desired position; means urging said detent member into engagement with said index member; an adaptor plate having means alignable with said openings for securing said adaptor plate to said housing, said adaptor plate having further means for supporting at least one switch section of different size than said first mentioned switch sections; and stop means on said adaptor plate adapted to be engaged by said index disc abutment to limit the rotation of said shaft.

27. An index mechanism for use in a rotary electric switch comprising: a housing; a shaft rotatably mounted in said housing; a generally planar index member mounted for rotation with said shaft, and having a plurality or radial notches in the outer periphery thereof defining a plurality of index stations; at least one abutment integral with said index member, said abutment extending away from the plane of said index member and being provided at one of said notches at the periphery of said index member; a detent member mounted for limited movement on said housing and adapted to engage different ones of said notches upon rotation of said shaft to locate said shaft in a desired position; means urging said detent member into engagement with said index member; and stop means on said housing and adapted to be engaged by said index disc abutment to limit the rotation of said shaft.

28. The index mechanism of claim 27 wherein the periphery of the index disc has a series of alternate enlargements and recesses and said index disc abutment extends from and is composed of the material of said disc at the bottom of one of said recesses.

29. An index mechanism for use in a rotary electric switch comprising: a base member having an opening therein; a shaft rotatably mounted in said opening and having a portion extending from said base member; an index member mounted on said shaft portion for rotation with said shaft, said index member having a plurality of notches around the periphery thereof defining a plurality of index stations; first and second pairs of spaced legs extending from said base member, one pair of legs being positioned at an opposite side of said index member from the other pair of legs, each pair of legs defining a radially extending slot therebetween, and the ends of the legs of each pair of legs extending toward one another to provide retention means at the end of each slot; a detent ball mounted for radial movement in each of said slots and adapted to engage different ones of said notches upon rotation of said shaft to locate said shaft in a desired index station, said retention means serving to retain said balls in said slots against axial movement relative to said base member and to align said balls with said index member; first and second pairs of surfaces extending from said base member, each surface being spaced outwardly of one leg of each pair of legs; and a pair of leaf springs, each having its opposite ends held under one of said surfaces and its central portion engaging one of said detent balls to urge the same radially inwardly into engagement with said index member.

30. An index mechanism as defined in claim 29 wherein a stop is provided on said base member, and an abutment is provided on said index member for engagement with said stop to limit the rotation to said shaft.

References Cited by the Examiner

UNITED STATES PATENTS

2,439,559	4/1948	Buffington	317—99 X
2,447,718	8/1948	Simpson	200—11
2,558,276	6/1951	Simpson et al.	174—527
2,576,836	11/1951	Hilsinger	200—14 X
2,590,601	3/1952	Filzer	317—99
2,869,395	1/1959	Allison et al.	74—527
3,180,948	4/1965	McCarty.	
3,196,237	7/1965	Westgate	200—168 X

ROBERT K. SCHAEFER, *Primary Examiner.*

KATHLEEN H. CLAFFY, ROBERT S. MACON, *Examiners.*

J. R. SCOTT, *Assistant Examiner.*