J. F. CAVANAGH.

ELECTRIC SWITCH.

APPLICATION FILED MAR. 30, 1918.

1,288,381.

Patented Dec. 17, 1918.

2 SHEETS—SHEET 1.

Fig. 1.

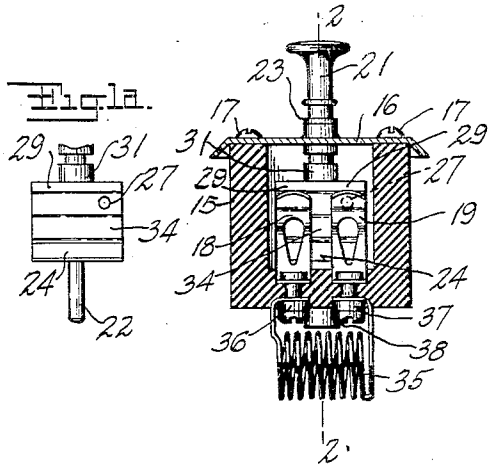


Fig. 2.

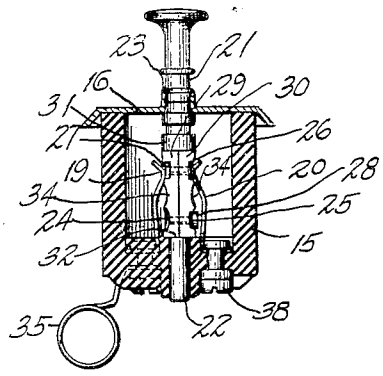
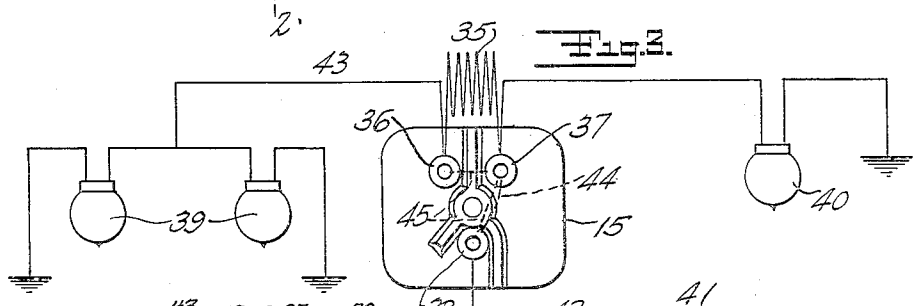


Fig. 1a.

Fig. 3.



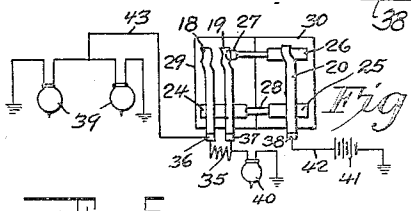


Fig 3a

Fig. 5.

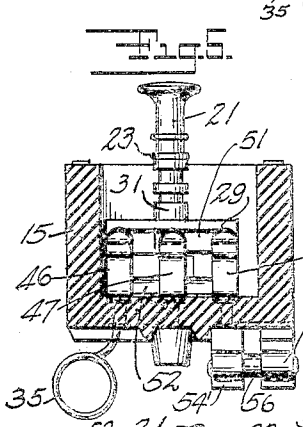


Fig. 4.

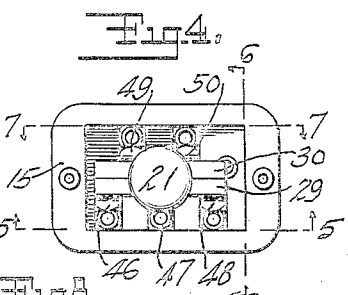


Fig. 6.

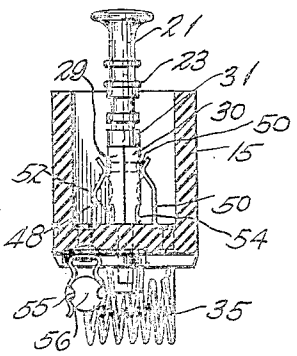


Fig. 8.

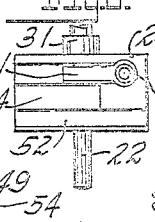
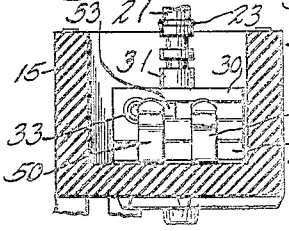


Fig. 9.



Fig. 7.



Inventor

John F. Cavanagh

By his Attorneys

Whitehead & Allyn

J. F. CAVANAGH.

ELECTRIC SWITCH.

APPLICATION FILED MAR. 30, 1918.

1,288,381.

Patented Dec. 17, 1918.

2 SHEETS—SHEET 2.

Fig. 10.

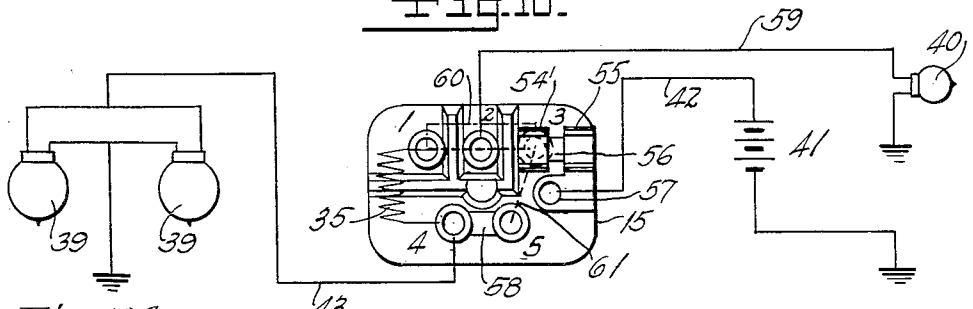


Fig 10a

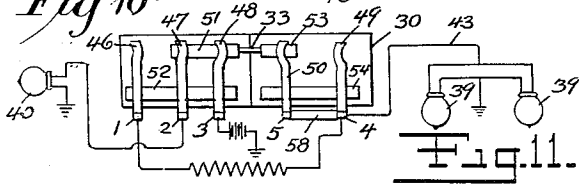


Fig. 11.

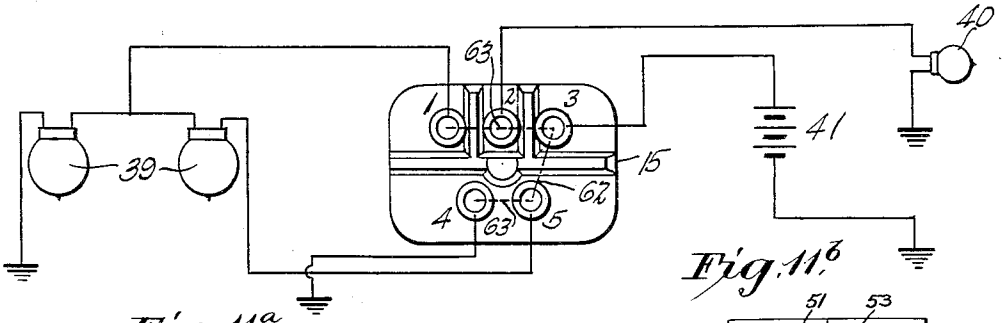


Fig. 11a.

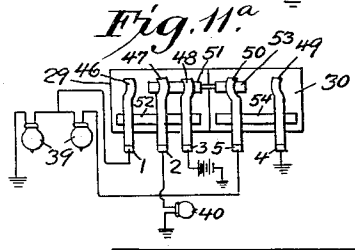


Fig. 11b.

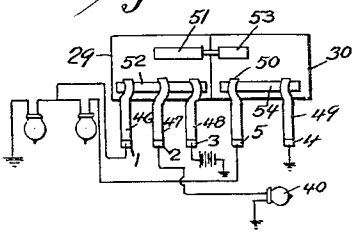


Fig. 12.

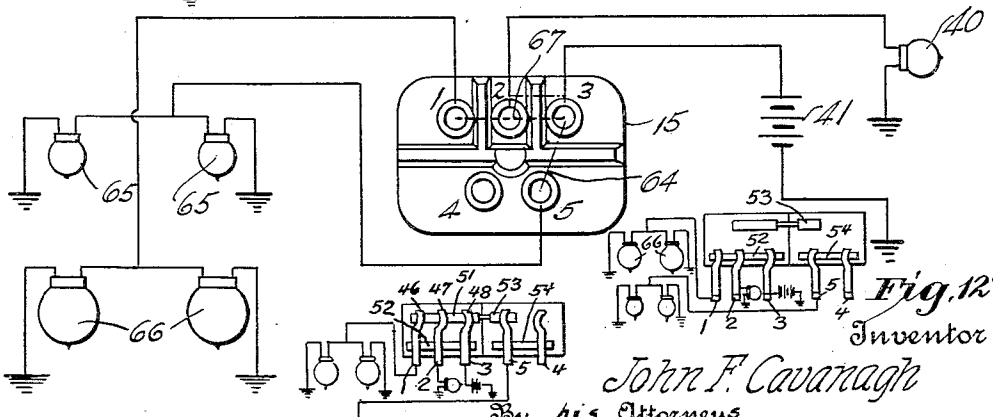


Fig. 12a

Fig. 12b.

Inventor

John F. Cavanagh

By his Attorneys

Mitchell & Allyn

UNITED STATES PATENT OFFICE.

JOHN F. CAVANAGH, OF MERIDEN, CONNECTICUT, ASSIGNOR TO CONNECTICUT TELEPHONE & ELECTRIC COMPANY, OF MERIDEN, CONNECTICUT, A CORPORATION OF CONNECTICUT.

ELECTRIC SWITCH.

1,288,381. Specification of Letters Patent. Patented Dec. 17, 1918.

Application filed March 30, 1918. Serial No. 225,650.

To all whom it may concern:

Be it known that I, JOHN F. CAVANAGH, a citizen of the United States of America, residing at Meriden, Connecticut, have invented a new and useful Electric Switch, of which the following is a specification.

My present invention relates particularly to switches such as are employed for controlling the lighting circuits of automobiles.

Important objects of the invention are to provide a simple, rugged and inexpensive construction of switch especially adapted for varying the circuit conditions to change the lights from "bright" to "dim" and vice versa. In this connection one of the special objects of my invention is to provide such a switch which in addition to changing the lamps from "bright" to "dim" may be used also to cut the lamps entirely out of circuit.

Other objects of the invention are to provide a switch which may be adapted to the various systems now in common use and known for instance as "resistance-dimming", "series-parallel dimming" and "selective control".

Further objects are to simplify and improve the switch structure generally, to simplify the manufacture of the switch and to protect the switch against "over-load".

Briefly stated. the switch of my invention comprises a hollow insulating base within which are mounted a number of spring contacts adapted to be engaged by contact elements carried by a reciprocating plunger. This plunger, which forms the movable element of the switch, is of novel construction, carrying a pair of insulating plates placed back to back between abutments on the plunger and which on their opposite exposed faces are provided with contact elements for engagement with the contacts in the base. A further novel feature of this plunger is that between the contact elements thereon there are provided insulating portions which when brought into registry with the spring contacts entirely interrupt the circuit through the switch. The plunger thus has three positions, such as "bright", "dim" and "off" whereby the lamps may be entirely controlled from the single switch.

Other features of the invention and details of construction will be made clear as the specification proceeds.

In the accompanying drawings I have illustrated the invention embodied in practical commercial forms, it being understood however, that changes and modifications may be indulged in without departing from the true spirit and scope of the invention.

Figure 1, is a vertical longitudinal sectional view of a simple form of switch constructed in accordance with and embodying the invention.

Fig. 1^a is a detached view of the circuit-controlling plunger.

Fig. 2, is a transverse sectional view thereof taken substantially on the plane of the line 2—2 of Fig. 1.

Fig. 3, is a "resistance-dimming" wiring diagram for a switch of this character.

Fig. 3^a is a diagrammatic illustration showing the complete electrical connections of this particular arrangement of circuit.

Fig. 4, is a top plan view of a modified form of the switch, the face plate being omitted.

Figs. 5 and 6 are longitudinal and transverse sectional views respectively of the same taken substantially on the planes of the lines 5—5 and 6—6 of Fig. 4.

Fig. 7, is a longitudinal sectional view taken substantially on the plane of the line 7—7 of Fig. 4.

Fig. 8, is a detached detail view of the switch operating plunger.

Fig. 9, is a cross sectional view of the same taken substantially on the central plane of Fig. 8.

Figs. 10, 10^a, 11, 11^a, 11^b and 12, 12^a, 12^b are more or less diagrammatic views illustrating the use of the invention in different types of lighting systems.

The body of the switch consists in the preferred form of my invention, of a hollow base 15 of insulating material adapted to contain all the switch contacts and normally closed at the front by a suitable cover or face plate 16 which may be secured in place by screws 17.

In the first form of the switch illustrated in Figs. 1 to 3, there are two contacts, indicated at 18—19 disposed alongside each other and to one side of a common median plane, and a single contact 20 disposed to the other side of the common median plane (Fig. 2). The switch operating plunger indicated generally at 21 operates in this common plane between the opposed sets of

contacts, it having a sliding fit in the bottom of the base at 22 and a corresponding sliding engagement at 23 in the face plate.

The switch plunger carries a contact supporting element which is of substantially flat construction and carries on its opposite faces contact elements for engagement by the relatively stationary spring contacts. The plunger contacts consist in this first illustrated form of the invention, of longitudinally extending strips 24 and 25 on the opposite faces of the relatively flat contact suppport substantially at the lower edges of the same, a longitudinal extending contact strip 26 adjacent the upper edge of the support at the side where the single spring contact finger 20 is located and a contact 27 on the opposite face of the support in position for engagement by the spring contact 19. This latter contact, 27, may simply be in the form of a rivet or pin extending through the insulating block or support and connected with the strip 26 at the opposite face of the block, and the two contact strips along the lower opposite edge portions of the contact block are shown electrically connected together by means of a rivet or pin 28. These cross connections perform a double function as will later appear.

The contact supporting block which is carried by the plunger is of novel construction, being made up of two plates 29 and 30 of suitable insulating material placed back to back at opposite sides of the plunger and engaged between upper and lower shoulders 31 and 32 provided on the plunger. The rivets or pins 27—28 extending through the two insulating plates serve to fasten said plates together into a unitary insulating contact support and serve in addition as means of electrical connection between the contacts on the opposite faces thereof.

This feature will perhaps be better understood from Figs. 8 and 9 which clearly show how the two insulating plates are engaged back to back on a reduced portion of the spindle between the shoulders 31 and 32, and are held together by a conducting rivet or fastening, the latter being designated 33 in these views.

The contacts on the opposite faces of the contact supporting base are shown as concaved so that the relatively stationary spring contacts will exert a gripping force tending to hold the plunger in the position to which it is shifted, and between these opposed sets of contacts at the upper and lower edge portions of the insulating supporting block, said block is shown as formed with concavities or grooves 34 by which the plunger is held in an intermediate "off" position.

A resistance coil 35 is shown mounted on the back of the insulating base as by having its ends engaged beneath the heads of the external terminals 36—37 of the contact springs 18 and 19. The external terminal for the other contact spring 20 is indicated at 38.

When the switch is used in a "resistance-dimming" system the connections may be made as indicated in Fig. 3. In this view the headlights are indicated at 39, the tail-light at 40 and the battery or source of current supply at 41. When the switch plunger is in the intermediate or neutral condition with the contact springs bearing in the insulating recesses 34, there will be no current flow to the lamps. One side of the battery being grounded, when the switch is pushed inward, as indicated in Figs. 1 and 2, the current flow will be from the battery 41 through a conductor 42 to the terminal 38 and contact finger 20 and by way of contact strip 26, rivet 27, spring contact 19, terminal 37, resistance coil 35, terminal 36 and conductor 43 to the headlights, which are grounded to form a common return. The course through the switch is, in this instance, indicated by the dotted line 44 in Fig. 3 and is shown in detail in Fig. 3a. When the plunger is drawn all the way out, the contact spring 20 will engage with the contact strip 25 from which current will flow across through the rivet 28 to the contact strip 24 at the opposite side, said contact strip 24 at such time connecting the spring contacts 18—19 so as to shunt the resistance coil and thus permit the full strength of current to flow to the headlights. The course of current through the switch, in this instance, is illustrated by the dotted lines 45 in Fig. 3 and will be understood from Fig. 3a, it being clear that when the plunger is drawn outwardly, the spring contacts 18 and 19 bear on the contact strip 24 which is connected by rivet 28 with contact strip 25 which at such time is engaged by the spring contact 20, the current flow being then from contact 20 by way of contact strip 25, rivet 28, contact strip 24 and spring contact 18 through the wire 43 to the headlights. The tail-light 40 is simply connected to the terminal 37 and is in circuit therefore when the switch is in either the bright or the dim positions.

The switch illustrated particularly in Figs. 4 to 7 is of the three-position type like that first disclosed, but is constructed so as to serve a greater variety of purposes than the first construction. This switch is provided at one side of the relatively flat contact carrying block with three spring contact fingers 46, 47 and 48, and at the opposite side with two spring contacts 49 and 50, the contact carrier having on one face at its upper edge portion a contact strip 51 for connecting spring contacts 47—48 in the depressed position of the plunger and a contact strip 52 at its lower edge for connecting all three of the contacts 46, 47 and 48. On its opposite face

the contact block carries a single contact 53 adjacent its upper edge for engaging spring contact 50 in the depressed position of the plunger and a contact strip 54 near the lower edge of the block for connecting contacts 49—50 when the plunger is drawn to its outermost position. The rivet 33 in this case serves to connect the contact strips 51—53 on the opposite faces adjacent the upper edge of the insulating block and also serves to fasten the two sections of the block together on the stem of the plunger. A resistance coil 35 may also be employed with this type of switch, the same being shown connected with the terminals for the contacts 46 and 49, said terminals being designated by the numbers 1 and 4, in Fig. 10.

Fuse clips 54′ and 55 may be provided on the back of the switch base, adapted to receive a suitable fuse 56, the first being shown connected with the spring contact 48, and the second being shown in Fig. 10 as provided with a circuit terminal 57.

For resistance-dimming, the switch just described may be connected as indicated in Figs. 10 and 10^a, the battery 41 being connected by a lead 42 with the fuse terminal 57, the resistance being connected across the terminals 1—4 of the contacts 46 and 49, the headlights being connected with the terminal 4, the tail-light being connected with the terminal 2 of the spring contact 47 and the terminal 5 of the spring contact 50 being shown connected with the terminal 4 by an auxiliary connecting strap 58.

In this case, as before, when the switch plunger is in the intermediate position, the spring contact fingers will rest on insulating material and the circuit will be interrupted. When the switch plunger is pushed all the way in, the current flow as fully indicated in Fig. 10^a, will be through the fuse to the contact finger 48, through the transverse connection 33, to the contact strip 53 at the opposite side of the insulating block to spring contact 50 and from the terminal 5 of said contact, connecting strap 58, terminal 4 and connection 43 to the headlights, the headlights having a grounded return to the battery. The headlights in this case burn with full force and the tail-light also receives current by way of the contact strip 51, spring contact 47, terminal 2 and connection 59. When the switch plunger is drawn all the way out, the lights will be dimmed through the resistance being cut into circuit as follows. The current flow, as will be clear from Fig. 10^a, will now be from spring contact 48, along the contact strip 52 to the spring contact 46, and from the terminal 1 of this contact through the resistance coil 35, terminal 4 and conductor 43 to the headlights, a circuit to the tail-light being also completed from the spring contact 47 which in this case also contacts the strip 52. The circuit in this instance is indicated in Fig. 10 by the dot and dash line 60, and the circuit just previously described through the switch is indicated generally by the dotted line 61.

A circuit arrangement by which the switch may be used for "series-dimming" is illustrated in Figs. 11, 11^a and 11^b. In this case when the switch plunger is pushed all the way in, circuit will be established through the switch such as indicated in detail in Fig. 11^a and by the dotted line 62 in Fig. 11, which will cause the lamps to burn in series and hence relatively dimly. When the plunger is pulled all the way out a circuit through the switch will be established substantially as indicated in Fig. 11^b and as shown by the dotted lines 63 in Fig. 11 which will place the lamps in parallel and hence give the greatest lighting effect.

For a selective lighting system the switch may be connected in circuit as indicated in Fig. 12. Under these conditions when the switch is pushed inward connections will be established through the switch substantially as indicated in Fig. 12^a and by the dotted line 64 in Fig. 12 causing the smaller set of headlights 65 to burn, and when the switch plunger is drawn outward to its fullest extent, the larger headlights 66 will be cut into circuit through the connections shown in detail in Fig. 12^b indicated generally by the dotted line 67 in Fig. 12.

The switch is relatively small and compact and it can be made up relatively inexpensively and by reason of its adaptability to widely varying conditions, it will be seen to be of great value in the art.

Another feature about the plunger construction to which attention may be called, is that the pressure of the spring fingers against the opposite sides of the plunger block tends to hold the two sections of the block together, thus taking the strain off the rivet connecting the contact strips on opposite faces of the block and enabling a single rivet to suffice.

An important advantage of my improved switch is that it enables a complete control of the lamps from a single controlling element, which, if left in an intermediate position, cuts the lamps out of circuit and which can be either pushed in, or drawn outward, from said intermediate position to cause the lamps to burn either dimly or with full force, as the case may be. This it will be seen does away with the necessity for separate "dimming" and "on" and "off" switches as have heretofore been used.

I claim:

1. In a switch of the character described, an insulating base, spring pressed contacts mounted on said base, a 3-position plunger reciprocably mounted on the base and provided with three different areas of conduct-

ing and non-conducting material for engagement with the spring pressed contacts in different positions of the plunger and means for retaining the plunger in each of the three positions aforesaid.

2. In a switch of the character described, a reciprocating switch controlling plunger having spaced shoulders thereon, plates of insulating material applied to opposite sides of said plunger between the shoulders thereon, means securing said insulating plates in back to back relation, contacts mounted on said plates, and relatively stationary contacts for engagement by the contacts mounted on the insulating plates.

3. In a switch of the character described, a reciprocating switch operating plunger having spaced shoulders, plates of insulating material applied to opposite sides of said plunger between the shoulders thereon, contacts on the outer faces of said insulating plates, metallic securing means extending between said contacts on the outer faces of the insulating plates fastening the insulating plates in back to back relation and providing electrical connection between the contacts on the opposite faces thereof, and yielding contacts mounted to engage said contacts on the opposite faces of the insulating plates.

4. In a switch of the character described, an insulating base, a switch controlling plunger mounted for reciprocation on said base, contacts carried by said plunger on opposite sides thereof disposed in substantial parallelism, a pair of alined contacts on the base at one side of the plunger for engagement with one of the plunger contacts, and a contact mounted on the base at the opposite side of the plunger and disposed substantially parallel to the first pair of contacts to thereby engage the substantially parallel contacts on the opposite side of the plunger.

5. In a switch of the character described, a supporting base, a reciprocating plunger mounted thereon and comprising a stem slidably guided on the base and plates of insulating material mounted back to back at opposite sides of said plunger, contacts on the exposed outer faces of said insulating plates, and contact springs mounted on the base at opposite sides of the plunger and bearing on said exposed faces of the insulating plates and the contacts carried thereby to thereby tend to hold said insulating plates in such back to back relation on the plunger stem.

6. In a switch of the character described, the combination of an insulating base having a longitudinally extending chamber therein, a plunger reciprocatingly mounted on said base having a longitudinally extending flattened insulating contact support received within the chamber, longitudinally extending contact strips on the opposite faces of said insulating support, and contact springs mounted in the chamber in the base at opposite sides of the longitudinally extending contact support on the plunger and bearing against the opposite faces of said support.

7. In combination with an insulating base, a switch operating plunger slidably mounted on said base, a block of insulating material carried by said plunger and having substantially parallel opposite faces, contact members on the opposite parallel faces of said insulating block adjacent the upper and lower edges thereof, and contact springs mounted on the base for engaging said contact members at the upper and lower edge portions of the insulating block, said insulating block having grooves therein intermediate the contacts adjacent the upper and lower edges of the block to be frictionally engaged by the spring contacts aforesaid.

8. In a switch of the character described, an insulating base, spring pressed contacts mounted on said base, a 3-position plunger reciprocably mounted on the base and provided with three different areas of conducting and non-conducting material for engagement with the spring pressed contacts in different positions of the plunger, said plunger being grooved at the points where it is engaged by the spring pressed contacts to be thereby yieldingly retained in each of the three positions aforesaid.

9. In a switch of the character described, an insulating base, contact springs mounted on said base and a three-position plunger reciprocably mounted on the base and provided with conducting and non-conducting areas for engagement with the contact springs aforesaid.

10. In a switch of the character described, an insulating base, contact springs mounted on said base, a three-position plunger reciprocably mounted on the base and provided on opposite faces thereof with an intermediate non-conducting area and conducting areas at opposite sides of said intermediate non-conducting area for engagement with the contact springs aforesaid.

JOHN F. CAVANAGH.