July 24, 1962 I. A. DE KRAMER ETAL 3,046,364

TOKEN OPERATED ELECTRICAL SWITCHES

Filed Sept. 28, 1959

FIG. 1.

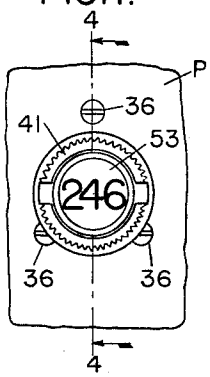


FIG. 2.

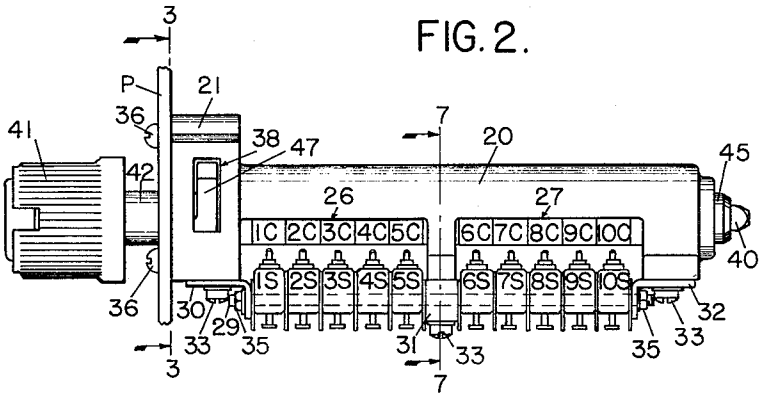


FIG. 3.

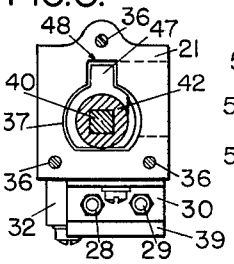


FIG. 4.

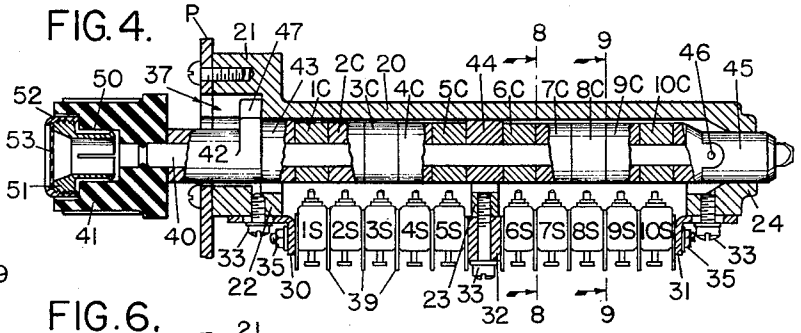


FIG. 5.

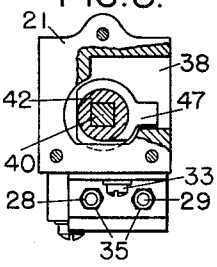


FIG. 6.

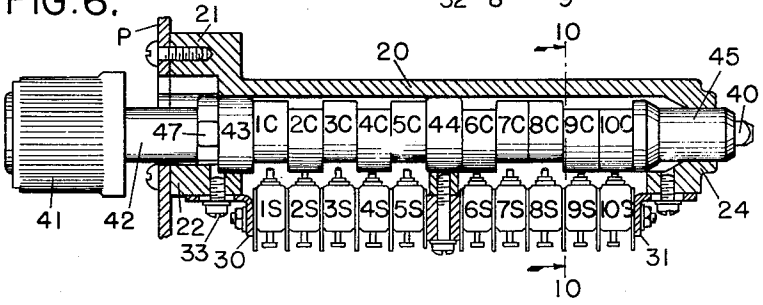


FIG. 7.

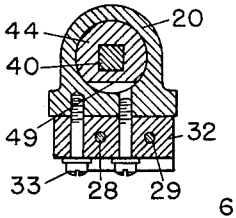


FIG. 8.

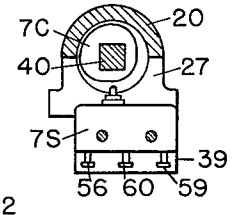


FIG. 9.

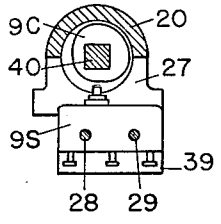


FIG. 10.

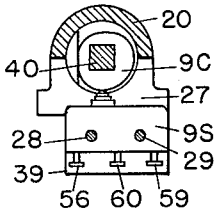
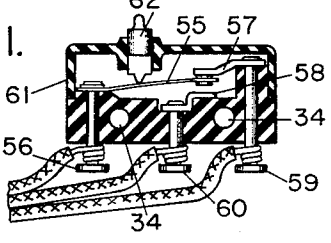


FIG. 11.



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TOKEN OPERATED ELECTRICAL SWITCHES

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7 Claims. (Cl. 200—42)

This invention relates to token operated electrical switches, and more particularly pertains to the type wherein a token key having a certain identity may be inserted into any one of a plurality of multiple contact switches for operation thereof to remotely indicate its identity.

In vehicle apparatus dispatching systems for dispatching fire trucks, police cars, taxi cabs and the like, the dispatcher may be provided with a control machine having a panel thereon which contains several token operated electrical switches of the present invention located withing various station areas. When a vehicle is displatched from one area to another area, the token key which identifies such vehicle is removed from one switch and inserted into another switch, wherein operation thereof indicates the identity of the vehicle being moved, the area from which it is being moved and the area to which it is being moved.

More specifically, the token operated electrical switches of the present invention each comprise a plurality of token keys which are each provided with a plurality of contact operating cams, and a plurality of switch assemblies which are each provided with a plurality of contact units, such as micro-switches or the like. Each token key is assembled with its operating cams in a certain combination in accordance with its identity so that, when inserted into any one of the switch assemblies and rotated, its identity is immediately established through the operation of certain of the multiple contact units as caused by its specific cam setting.

In structure, the switch housing is of general tubular shape having flanges at its front end to facilitate mounting on the back of a panel and having an opening in its bottom half which extends substantially throughout its length. A rack for supporting a plurality of micro-switches or the like is mounted on the bottom of the switch housing adjacent the opening in a manner whereby the contact operating plungers of the micro-switches extend into the tubular housing. The switch housing is also provided with suitable bearing surfaces to guide and support the token key when inserted therein.

The token key is substantially cylindrical in shape and is provided with an enlarged control or grip knob on its front end. Suitable stop blocks, bearing blocks and cam blocks are mounted thereon in proper order on its squared shaft section in a manner whereby certain of the cam blocks as desired will cooperate with certain of the micro-switch contact operating plungers when a token key is inserted into a switch housing. A key shaped opening is provided in the flanged front end of the switch housing which permits insertion of the token key in one position only. A clockwise rotary movement of ninety degrees will operate certain of the micro-switch contacts in accordance with the token key identity by means of its particular cam setting. The token key will be locked in its operated position until it is manually reversed to its normal position, whereupon the token key may be removed through the key hole opening.

In practice, every switch assembly is similar in structure; whereas, every token key is assembled with its contact operating cams in a different position in accordance with its particular identity. Thus, every token key will establish its own identity by operating a particular combination of micro-switches regardless of which switch it may be inserted into and rotated.

Other objects, purposes and characteristic features of the present invention will be obvious or pointed out as the description progresses with reference to the accompanying drawings in which:

FIG. 1 is a front view of a typical panel having a token operated electrical switch of the present invention mounted thereon;

FIG. 2 is a side elevational view of the apparatus shown in FIG. 1 and ilustrates the manner of mounting the token operated electrical switch of the present invention to the panel and also the rack type of mounting for the micro-switch contactors as well as the normal unoperated position of the token key;

FIG. 3 is a front sectional view of the apparatus shown in FIG. 2 as taken on the line 3—3 directly behind the panel and illustrates the key hole opening in the front of the switch with the token key in position therein;

FIG. 4 is a view similar to FIG. 2 except that it is shown in sectional elevation as taken substantially on the line 4—4 of FIG. 1;

FIGS. 5 and 6 are sectional views similar to FIGS. 3 and 4 except that the token key is shown operated to its active ninety degree position wherein certain of the micro-switch contactors are operated to their depressed back contact positions;

FIGS. 7, 8, 9 and 10 are cross sectional front views through different areas of the token operated electrical switch of the present invention as illustrated in FIGS. 2, 4 and 6 to more clearly show the token key bearings and different cam positions; and

FIG. 11 is a sectional view of a typical micro-switch contactor of the type wherein the contacts have a normal spring biased position and are forceably operated and held in their other position.

Referring now more particularly to the detailed structure of the token operated electrical switch of the present invention as shown in the single sheet of drawing, the switch housing **20** is preferably an aluminum casting of general tubular shape having an enlarged flanged front end **21** substantially square in shape and inner bearing surfaces **22**, **23** and **24** to receive and support the token key when in position therein. The lower half of the tubular housing **20** is cut away between the bearing surfaces **22—23** and **23—24** to provide openings **26** and **27** into the tubular housing as shown in FIGS. 2 and 8.

Directly under and extending into the openings **26** and **27** are a plurality of micro-switch contactors **1S** to **10S** inclusive. These micro-switch contactors are mounted on a rack which comprises two rods **28** and **29** extending between and through a pair of angle brackets **30** and **31** and a center bearing block **32** which are attached to the bottom of the tubular housing **20** at locations adjacent to the bearing surfaces **22**, **23** and **24** and near the ends of the openings **26** and **27** by means of suitable screws **33**. The two rods **28** and **29** are threaded on each end and pass through lateral holes **34** (see FIG. 11) in the micro-switch housings and are held in place by means of nuts **35** which are threaded onto the ends of the rods and bear against the angle brackets **30** and **31**. In assembly, suitable insulation spacers **39** are placed between each micro-switch to prevent short circuits between wiring connections.

The front squared end portion **21** of the switch housing **20** bears against and is fastened to the back of a panel P by means of screws **36**. Both the panel P and the front portion **21** of the housing **21** are provided with key hole openings **37** therein to permit the insertion of a token key therein. The front portion **21** of the switch housing **20** is also provided with a rectangular shaped slot or opening **38** which extends from the key hole opening **37** through the right hand side wall of the squared portion **21**. This opening **38** cooperates with a lug on the

token key to guide, lock and restrict the movement of the token key when it is operated from one position to another as will be explained hereinafter.

The token key comprises a shaft 40 of square cross section having a plastic grip or control knob 41 molded on the front end thereof. Slidable mounted on the square shaft 40 are a series of bushings having square holes therethrough and consisting of a guide bushing 42, three bearing bushings 43, 44 and 45 and ten cam bushings 1C to 10C inclusive. These various bushings are placed end to end along the shaft with the guide bushing 42 next to the knob 41, next the front bearing bushing 43, next five cam bushings 1C to 5C inclusive, next a center bearing bushing 44, next five cam bushings 6C to 10C inclusive, and finally the rear bearing bushing 45. After assembly, the rear bearing bushing 45 is pinned or otherwise suitably fastened to the square shaft 40 as indicated at 46, thus holding all cams intact thereon.

The rear bearing bushing 45 is partially tapered to a smaller diameter which acts as a guide or feeler member when the token key is inserted into the switch assembly. The guide bushing 42 is provided with an extending lug 47 which acts as a limiting stop when the token key is inserted into the switch assembly, the back of the lug 47 bearing against the back surface of the key hole opening 37. This lug 47 is also positioned to cooperate with the opening 38 in the squared portion 21 of the switch housing 20 when the token key is rotated. The key hole opening is substantially round and has a notched out portion 48 at its upper periphery to permit passage of the lug 47 when the token key is inserted therein, thus demanding that the token key be inserted in its upright position only. When the token key is rotated clockwise to its ninety degree operative position, the lug 47 moves into the confines of the opening 38 which acts as a limit to the rotary movement of the token key and also prevents the token key from being removed while it is in its operated active position.

The three bearing bushings 43, 44 and 45 are round in cross section with the exception of a flat portion 49 on the bottom periphery thereof. This flat portion 49 is provided so that these bearing bushings will not strike the plungers of the micro-switch contactors 1C to 10C inclusive. When the token key is being inserted into the switch housing 20. With the token key in position within the switch housing 20 as shown, it can be seen that the three bearing bushings 43, 44 and 45 are seated in their respective bearing surfaces 22, 23 and 24 and the lug 47 is located adjacent the opening 38 and against the back surface of the key hole 37. Thus, the token key is in position for rotation to its operative position.

It can also be seen that when the token key is in its operative position as shown and just described, the ten cam bushings 1C to 10C inclusive are located adjacent the ten micro-switch contactors 1S to 10S inclusive respectively. As shown in FIGS. 8, 9 and 10, these cam bushings 1C to 10C inclusive are all constructed the same with about one-half of their periphery having a shorter radii than the other half of the periphery. In other words, only about one-half of the cam periphery has a radii sufficiently large enough to bear against the micro-switch contactors when rotated to their operative positions. As these cam bushings are provided with a square hole therethrough for mounting on the square shaft 40 of the token key, it can be seen that they may be assembled on the shaft in any one of four ninety degree apart positions. Thus, the token keys may be assembled in a manner whereby, when a token key is rotated ninety degrees to the right, certain of the cam bushings are still ineffective to operate the plungers of their respective micro-switch contactors whereas certain other of the cam bushings will bear against the plungers of their respective micro-switch contactors and reverse their contact positions.

It should now be obvious that the versatility of the structure makes it possible to assemble a great number of token keys each having a different cam setting and a different identity, yet each token key may be operable in any given switch housing which, as previously mentioned, are all alike. As an example, the drawings illustrate a token key identified as "246." When assembled, this token key had its cam bushings 2C, 4C and 6C placed on the square shaft 40 as shown in FIG. 9, such a position being called an operative position because when the token key is rotated ninety degrees to the right (clockwise), these cams 2C, 4C and 6C will operate their respective micro-switch contactors 2S, 4S and 6S as shown in FIG. 10. The cams 1C, 3C, 5C, 7C and 8C were assembled on the square shaft 40 as shown in FIG. 8, such a position being called an inoperative position because when the token key is rotated ninety degrees to the right (clockwise), these cams 1C, 3C, 5C, 7C and 8C will not contact their respective micro-switch contactors 1S, 3S, 5S, 7S and 8S and cause operation thereof. In other words, in the token key identity just described, the inoperative cams 1S, 3S, 5S, 7S and 8S merely act as spacer bushings and make it possible to have a universal assembly.

In this connection, it should be mentioned that only the cam bushings 1C to 8C inclusive are utilized to create the different combinations of token key identities. The cam bushings 9C and 10C are always assembled in their operative positions so that the operation of their respective micro-switch contactors can be used to control power circuits, lamp indicators or other control circuits which may be necessary in a vehicle dispatching system.

It should also be obvious that the other combinations of token key identities are assembled in a like manner as for instance, a token key identity "158" would be assembled with its cams 1C, 5C and 8C in an operative position and its other five cams in an inoperative position. Although in the drawings the token key identity is labeled "246" to correspond to the cams 2C, 4C and 6C which are assembled in the operative positions, it should be understood that the token key identity and the vehicle which it represents could be labeled with any identification such as "Car 1," "Truck 1" or the like, so long as its corresponding code combination called for cams 2C, 4C and 6C to be assembled in their operative position.

The token key identity markers may be placed on the knob 41 in any suitable manner, one such form being illustrated in FIGS. 1 and 4. In this form the knob 41 is molded with a hollowed out portion 50 in its front face and a spring web type plug 51 is pressed into place therein. An open faced cap 52 is threaded onto the plug 51, said cap 52 containing a circular identity marker 53 which is held in place by the cap 52 and shows through its open face thereof.

As previously mentioned, the micro-switch contactors 1S to 10S inclusive may be of any suitable type and one such type is shown in FIG. 11. A spring biased movable contact finger 55 is anchored to one terminal post 56 and the front and back contacts 57 and 58 are anchored to other terminal posts 59 and 60 respectively. The contacts are located within an insulation type sealed housing 61 and a contact operating plunger 62 bears against the movable contact finger 55 and extends through the housing to the outside thereof. An inward movement of the plunger 62 against the bias of the contact finger 55 causes it to break from its front contact 57 and make with its back contact 58. Release of force against the plunger 62 will permit the spring biased movable contact finger 55 to again make up with its front contact 57.

It should be understood, however, that the present invention may incorporate any other suitable type of contactor and mounting as desired rather than the micro-switch contactor described above, this type of contactor and the mounting thereof being used merely to illustrate

the utility of the invention. For example, contactor element 55 may be constructed to be snap acting if desired.

Although no attempt has been made herein to illustrate or describe a vehicle dispatching system which would utilize a token operated electrical switch constructed in accordance with the present invention, it should be sufficient to say that a fire apparatus dispatching system, for example, would comprise two or more panels P as illustrated. Each panel P would represent a fire house or station and would contain a plurality of switch structures. A token key having an identity marker such as "246" described herein would be provided to identify each piece of apparatus under the control of the dispatcher. When the vehicle identified as "246," for example, was dispatched from its home station to a fire scene or another station, the token key would be removed from a switch in one panel and be inserted into a switch in another panel, as shown in FIGS. 3 and 4. When the token key is rotated to a ninety degree clockwise position as shown in FIGS. 5 and 6, the action of the cams 2C, 4C, 6C, 9C and 10C would reverse the contacts of their respective micro-switch contactors 2S, 4S, 6S, 9S and 10S and set upon control circuits and indications which would indicate on the various panels of all those concerned that the vehicle identified as "246" has been dispatched from one location to another. A similar procedure would be followed when said vehicle "246" was dispatched back to its home station.

Having shown and described one form which the present invention may assume, and the mode of operation thereof, it should be understood that various other forms and modifications could be made in the structure and the mode of operation, all without departing from the spirit or scope of the invention as defined in the appending claims.

What we claim is:

1. In combination, a token operated device comprising a housing having a pair of spaced axially aligned openings, a plurality of plungers mounted in said housing between said openings, a token adapted to be removably inserted in operative position in said housing, said token comprising an elongate shank having a pair of axially aligned and spaced bearing surfaces, each bearing surface being of such a size and spaced from one another suffiently to engage rotatably the wall of a respective opening when the token is operatively positioned in the housing, cooperating means on the token and housing to permit the insertion of the token in said openings in one angular position only, a plurality of axially spaced cam means each having a continuous irregularly curved surface, said cam means being positioned on said shank between said bearing surfaces to be in registry with a respective plunger when the token is in operative position, each of said cam means having a working portion and a non-working portion, said working and nonworking portions of said cam means being angularly spaced on said shank to a distinct operating and idle position, said working portions of each cam means occupying a sufficiently small sector of its respective cam means to cause the nonworking portions of each said plurality of cam means to be in registry and spaced from its associated plunger when the token is inserted through said openings in said one angular position and to cause those particular cam means positioned on the shank in an operating position only to engage operatively against corresponding plungers when the said token is rotated in one direction a predetermined distance.

2. A combination as claimed in claim 1 wherein said plungers are reciprocably mounted and aligned in spaced relationship in a plane parallel to said common axis and being movable towards and away from said axis along substantially parallel axes in said plane.

3. A combination as claimed in claim 1 wherein the maximum radius of the working portion of each cam means is greater than the radial distance from said common axis to the wall of one of said openings.

4. A combination as claimed in claim 1 wherein the radius of one of said openings is at least as large as the maximum radius of the working portion of each of said cam means.

5. The combination as claimed in claim 1 wherein said cam means are positioned axially on said shank in intimate contact with its adjacent cam means, said cam means being of such a thickness so as to cause each cam means in an operating angular position of said shank to align operatively with a respective plunger when the token is in operative position in the housing.

6. A token key for operating selected ones of a plurality of depressible contacts mounted in a casing, said token key comprising a shank having spaced bearing portions adjacent opposite ends thereof, and a plurality of cams mounted on said shank between said bearing portions, each of said cams having a working portion and a non-working portion, cooperating means including said shank and an opening in each cam to selectively position said cams angularly on said shank to either an operating or idle position, said working portions of each cam occupying a sufficiently small sector of its respective cam to cause the non-working portions of all of said plurality of cams to be spaced from a corresponding plunger when the token is inserted into said device and to cause those particular cams positioned on the shank in an operating position only to actuate respective plungers when said token is rotated in one direction a predetermined distance.

7. A token key as claimed in claim 6 wherein said cooperating means for selectively positioning said cams angularly on said shank comprises a shank of square cross-sectional configuration and a similarly configured opening in each of said cams, whereby the working portions of each cam are selectively positionable in a distinct sector about said shank.

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