April 4, 1950 E. N. JACOBI 2,502,952

ELECTRICAL SWITCH

Filed March 7, 1947 6 Sheets-Sheet 1

Fig. 1

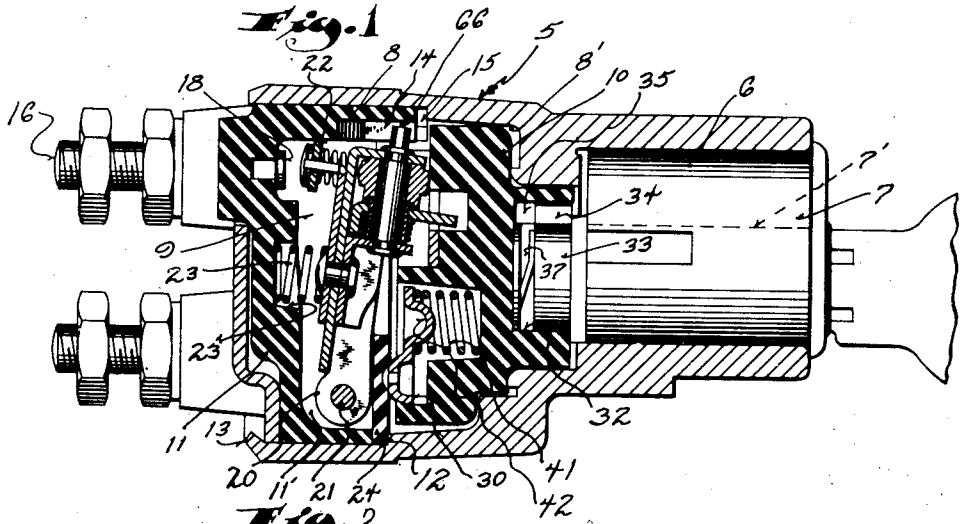


Fig. 2

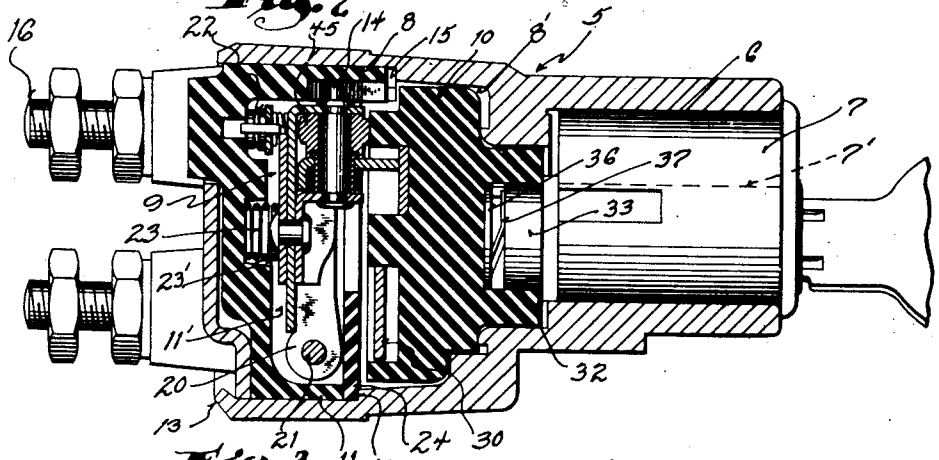
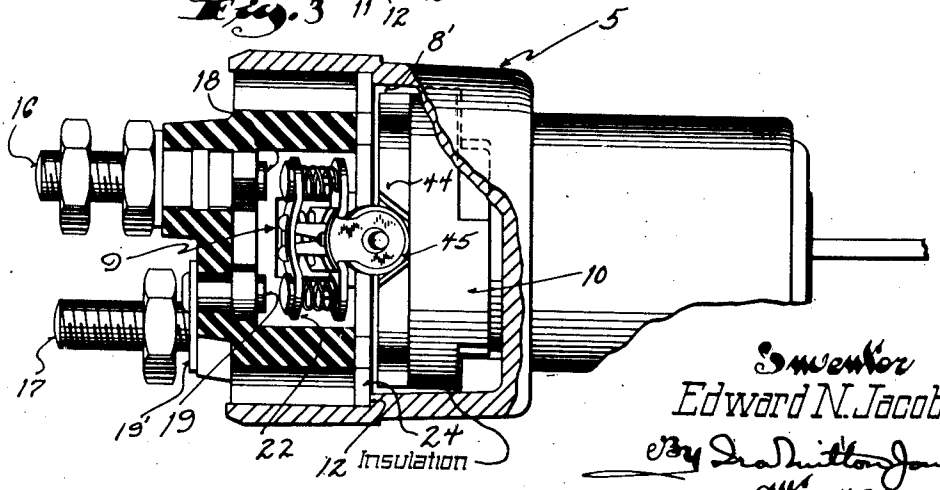


Fig. 3



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April 4, 1950 E. N. JACOBI 2,502,952

ELECTRICAL SWITCH

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Fig. 4.

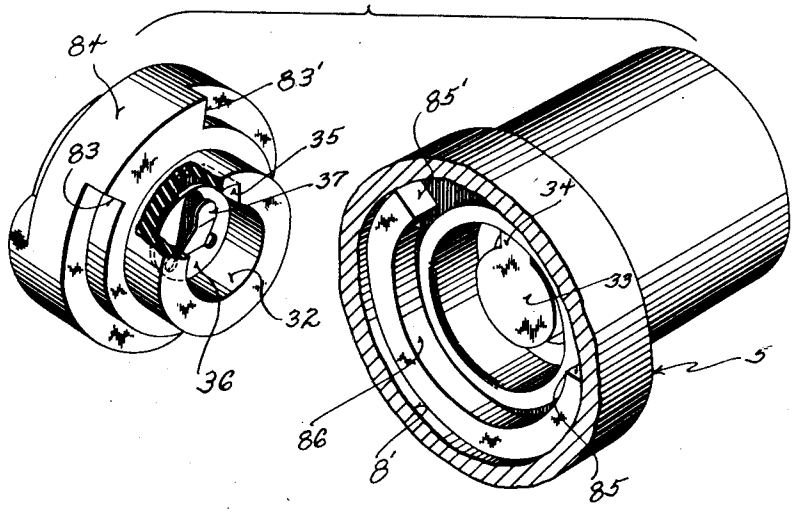


Fig. 12.

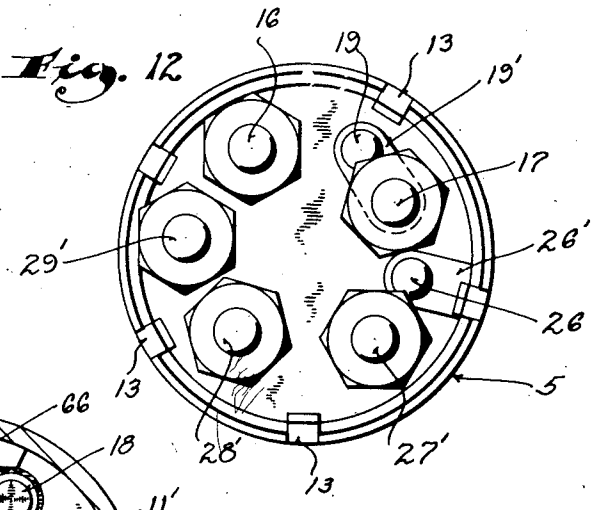
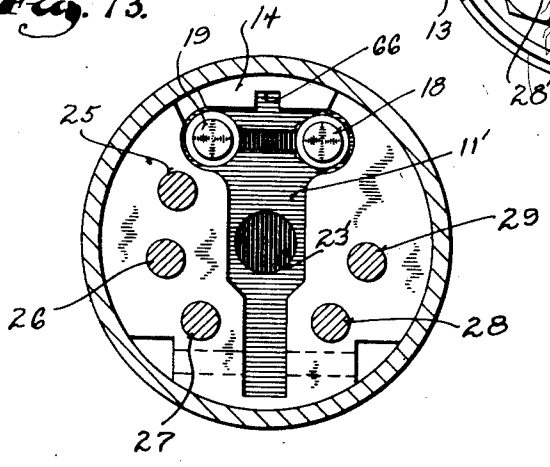


Fig. 13.



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ELECTRICAL SWITCH

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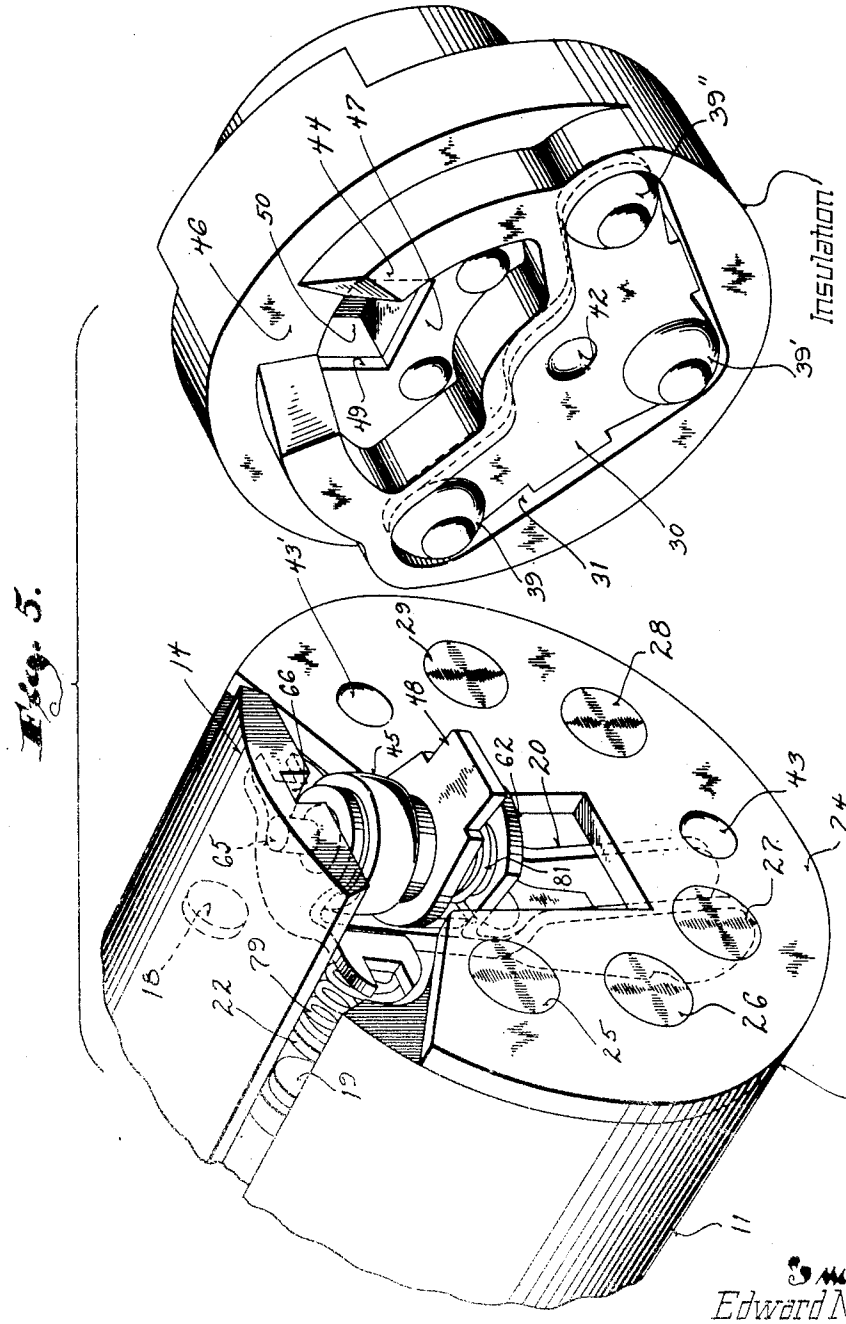


Fig. 5.

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ELECTRICAL SWITCH

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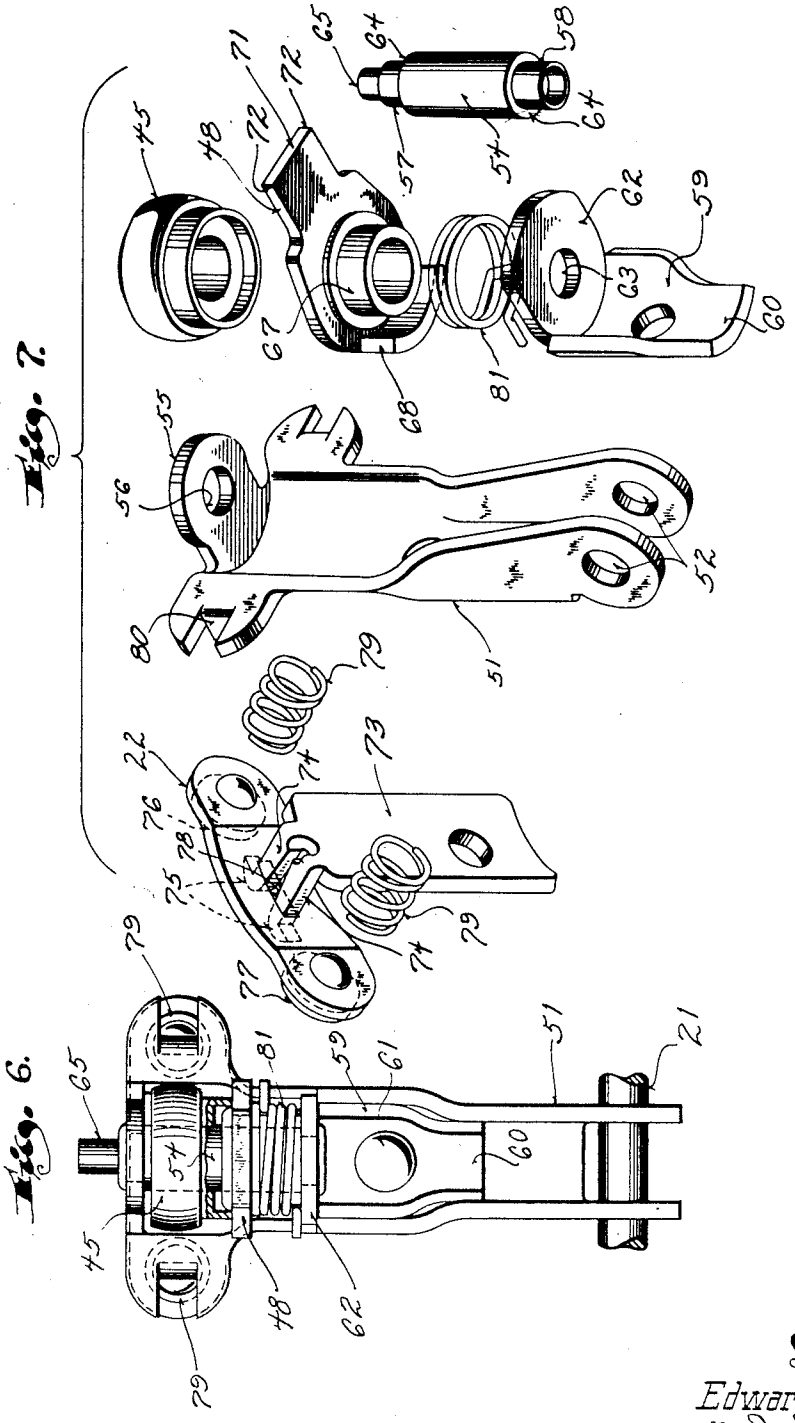


Fig. 7.

Fig. 6.

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ELECTRICAL SWITCH

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Fig. 8.

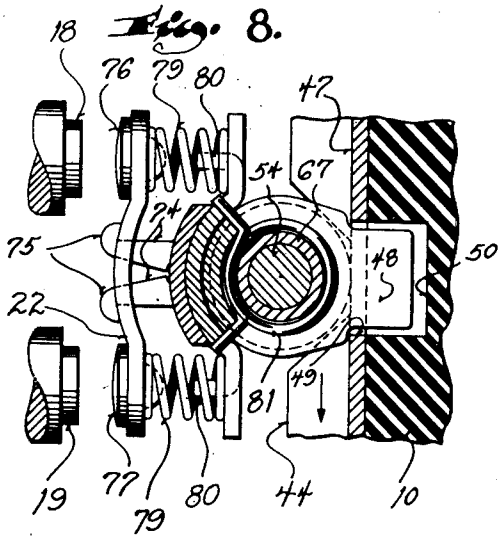


Fig. 9.

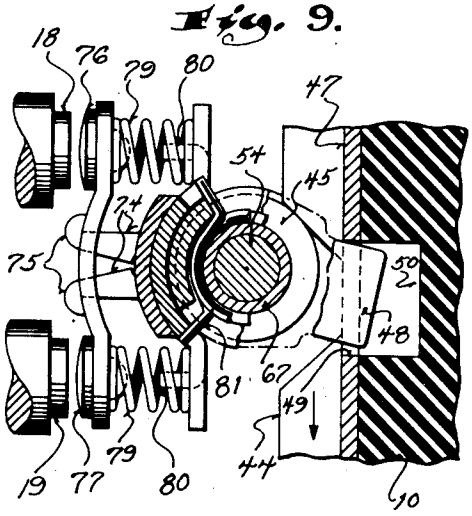


Fig. 10.

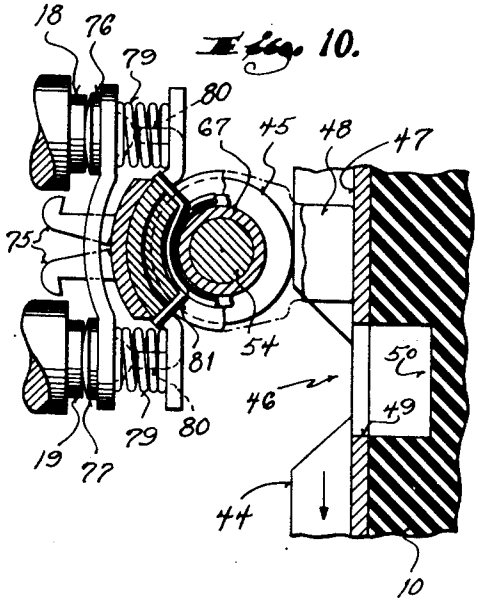
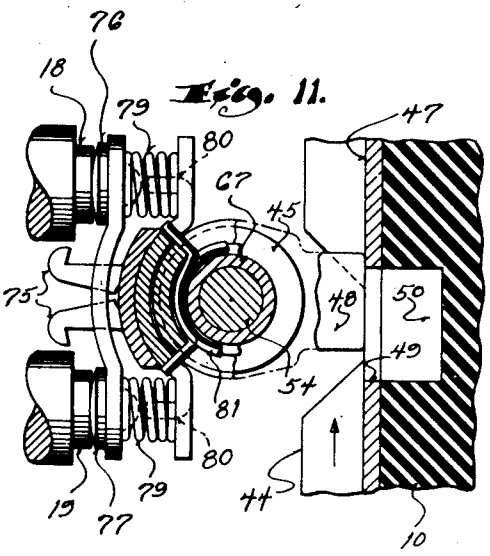


Fig. 11.



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ELECTRICAL SWITCH

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Fig. 14a.

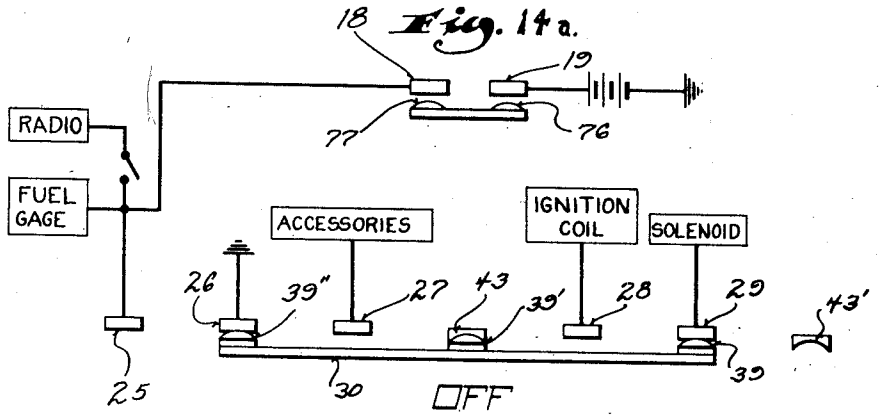


Fig. 14b.

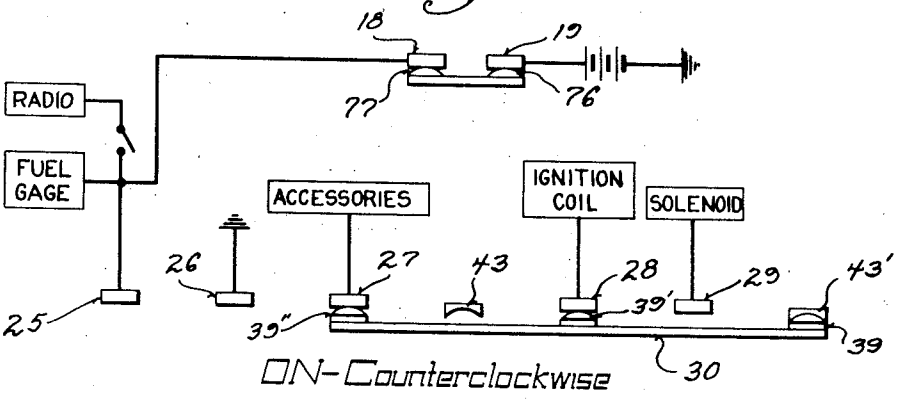
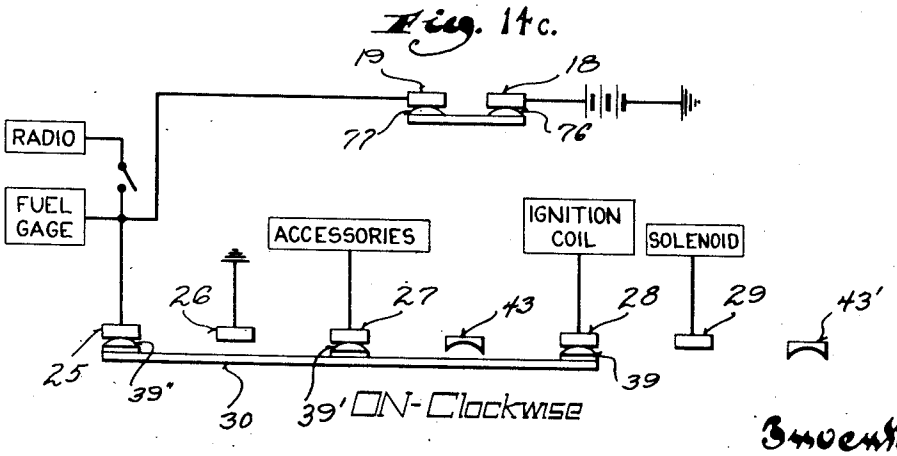


Fig. 14c.



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Patented Apr. 4, 1950

2,502,952

UNITED STATES PATENT OFFICE

2,502,952

ELECTRICAL SWITCH

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Application March 7, 1947, Serial No. 732,973

18 Claims. (Cl. 200—4)

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This invention relates to electrical switches, and refers more particularly to low voltage switches for automotive vehicles and the like.

Automotive vehicles are being equipped with an ever increasing number of accessories, and the electrical systems of these vehicles thus are being loaded more and more. Moreover, it is desirable to control most of the accessory circuits through a single switch instrumentality operable also to control the ignition circuit of the vehicle.

As a result, the automotive ignition switch is no longer a simple control for ignition but has evolved into a more or less complicated selector switch for ignition, electric gages, radio, heater, fan motor, fuel pump, and in some instances, lights.

In this manner, the auxiliary circuits are protected by the ignition switch lock, since they are arranged to be opened automatically by rotation of the ignition key to a key withdrawing position. Thus the battery will not be drained should an absent minded motorist forget to turn off the switch controlling one of the accessories when he leaves the car.

It is desirable, moreover, to provide for some degree of selection among the accessories, such as a radio, by which the same may be operated with the ignition off.

Former switch instrumentalities employed to control several circuits in addition to the ignition circuit incorporated a simple rotary contactor carrying movable contacts arranged to sweep across one face of a fixed terminal head for selective bridging engagement with fixed contacts embedded in said face of the terminal head.

However, there are practical limits to the current load which a switch of this type can interrupt without excessive arcing at the contact points. Since some of the accessories mentioned draw a relatively high current, the usual type of rotary control or selector switch is unsatisfactory for installations of this kind unless the contact surfaces are made objectionably large and spaced quite far apart.

It is therefore an object of this invention to provide a compact switch instrumentality of the type adapted to selectively control a plurality of circuits and which will be capable of controlling relatively heavy load circuits without excessive contact arcing.

Another object of this invention resides in the provision of a switch instrumentality of the character described wherein all of the auxiliary circuits are led through a quick break supply switch in series therewith. This overcomes the disadvantages of the old type switches described above, since the quick break supply switch disconnects all of the auxiliary or accessory circuit contacts from their load. Hence, the contacts for the accessory circuits may have small surfaces and close spacing, enabling a single very compact switch instrumentality to control a relatively large number of circuits with complete safety.

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However, it is essential that the main or supply switch open rapidly, even though the ignition key is rotated very slowly in its lock, since a slow separation of contact points carrying a high current will result in destructive arcing.

It is therefore another object of this invention to provide a switch instrumentality of the character described with a main supply switch which will open with a snap action regardless of the rate at which the switch actuator is moved.

Still another object of this invention resides in the provision of a switch instrumentality of the character described which is adaptable to a wide variety of circuit connections in the sense that it may be provided with more than one "off" position as well as more than one "on" position.

A further object of this invention is to provide a versatile switch of the character described which is capable of controlling a number of relatively large load circuits in any of several preselected combinations. It is thus possible to use the switch of this invention as a combined starting and ignition switch for a small engine, using the quick break supply switch as the starter motor control. This produces an advantageous switch assembly for small low priced automobiles, in that the starting switch may be operated by the ignition key.

A further object of this invention resides in the provision of a switch instrumentality of the character described, which is particularly suited for the control of the electrical circuits of aircraft in that it embodies a selector switch for a number of auxiliary circuits together with a master switch by which all of the auxiliary circuits are controlled.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate one complete example of the physical embodiment of

the invention constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a longitudinal section of the switch instrumentality of this invention, as seen from the side thereof, showing the switch mechanism in the "switch off" position;

Figure 2 is a view similar to Figure 1, but showing the switch in an "on" position;

Figure 3 is a top view of the switch shown in Figure 1 with portions thereof broken away and shown in section to illustrate the interior construction of the switch;

Figure 4 is a group perspective view illustrating the elements of the driving connection between the lock cylinder or actuator and the driver of the switch;

Figure 5 is a group perspective view showing the relationship between the main and auxiliary switch elements;

Figure 6 is an elevational view of the movable contact carrier shown detached from the switch and partially in section;

Figure 7 is an exploded perspective view of the component parts of the movable contact carrier;

Figures 8, 9, 10, and 11 are fragmentary sectional views more or less diagrammatically illustrating the manner in which the main supply switch is actuated by the driver of the switch;

Figure 12 is a back view of the switch instrumentality of this invention showing the terminal arrangement;

Figure 13 is an elevational view looking at the front face of the terminal block; and

Figures 14*a*, 14*b*, and 14*c* comprise a group of electrical diagrams showing how a number of typical circuits may be controlled by the switch of this invention.

Referring now more particularly to the accompanying drawings, in which like numerals designate like parts throughout the several views, the numeral **5** designates the case of a lock type switch embodying the principles of this invention. This case has a substantially circular cross section throughout its length, and has a bore **6** at the front thereof to mount a lock casing **7** in which a key controlled lock cylinder **7'** of a known type is rotatably received.

A counterbore **8** at the rear of the case accommodates a master switch mechanism **9**, while a smaller counterbore **8'** leading forwardly toward the front of the case from the bottom of the counterbore **8** but communicating therewith rotatably receives the driver **10** of the switch.

The master switch **9** includes a terminal block **11** of insulative material received in the counterbore **8** at the rear of the case and secured in place against the shoulder **12** at the bottom of the counterbore **8** by clinching the rear edge of the case over the rear face of the block at a number of positions, as indicated at **13**.

To guard against rotation of the terminal block in its counterbore, a tongue **14** projects from the rim of the block and enters a correspondingly shaped notch **15** in the wall of the counterbore **8'**.

The terminal block mounts a pair of supply terminals **16** and **17**. These terminals are suitably anchored in the block to have threaded portions exposed at the rear of the switch for the connection of circuit leads thereto. The inner ends of these terminals connect with stationary supply contacts **18** and **19**, respectively, located in the bottom of a T-shaped recess **11'** opening to the front face of the block, the supply contacts being situated near the ends of the cross slot of the T.

A substantially T-shaped movable contact carrier arm **20** is received in the recess **11'** and is pivotally mounted therein by means of a pin **21** passing through the lower portion of the stem of the carrier arm T. This pin has its ends anchored in the terminal block, straddling the stem slot of the recess **11'**, so that its axis is normal to the axis of the counterbore and parallel to a plane common to the axis of the stationary contacts.

The free end of the carrier arm **20** carries a contactor **22**, so that pivotal motion of the arm about the pin will swing the contactor into and out of bridging engagement with the stationary supply contacts **18** and **19** to close and open the supply circuits.

A compression spring **23** received in a small well **23'** in the bottom wall of the recess **11'** bears against the medial portion of the carrier arm **20** to bias the carrier forwardly toward the driver **10**, thus urging the bridging contactor **22** away from engagement with the supply contacts **18** and **19** toward a switch open position.

The recess **11'** in the front of the disk-like auxiliary terminal block is substantially closed by a plate **24** of insulative material fixed to the terminal block **11** and having its exposed side facing the driver **10** provided with a number of auxiliary or accessories contacts **25**, **26**, **27**, **28** and **29**, adapted to be connected with the various accessories which the switch is intended to control. The auxiliary contacts are spaced along an arc concentric with the axis of rotation of the driver **10**, and although five auxiliary contacts are shown, it will be understood that more or less than that number may be used without departing from the principles of this invention.

The accessories circuits are adapted to be completed selectively through these contacts by means of a substantially crescent-shaped bridging contactor **30** fitting in a correspondingly shaped well **31** in the rear of the driver **10** so as to be driven thereby.

A shallow bore **32** in the front of the driver receives an extension **33** on the rear of the lock cylinder, and a longitudinal rib **34** on this extension fits in a keyway **35** in the bore **32** to provide a driving connection between the driver and lock cylinder whereby the actuator is rotated with the cylinder when the same is turned by means of a proper key.

A disk **36** of thin resilient metal disposed in the bottom of the bore **32** so as to be confined between the driver and the extension on the rear of the lock cylinder has a flap **37** struck forwardly from the central portion thereof to engage the rear of the extension **33** under tension and thereby urge the driver axially rearwardly toward its terminal plate **24**.

The rotational limits of the driver **10** and consequently those of the lock cylinder to either side of a neutral switch off position are defined by shoulders **83** and **83'** on a circumferential lug **84** at the front of the actuator, which are adapted to abut cooperating shoulders **85** and **85'** at the opposite ends of a mating ridge **86** extending about the inner periphery of the counterbore **8'** in the switch case.

The bridging contactor **30** is a somewhat flat stamping of conductive material having spaced apart contact surfaces or teats **39**, **39'** and **39''** struck rearwardly from its surface for engagement with certain of the stationary contacts on

the terminal head in different positions of rotation of the driver. Dimples 43 and 43' may be provided in the terminal plate 24 to cooperate with the teats in forming detents to define certain "off" and "on" positions of the switch.

The contactor 30 for the auxiliary switch is free to slide axially in its well 31 while constrained to rotate with the driver, and a compression spring 41 received in a small recess in the bottom of the well 31 bears against the contactor to yieldingly force the contact portions thereof against the adjacent front face of the terminal plate 24. The spring 41 may be centered over a dimple 42 struck forwardly in the face of the contactor to enter the coils of the spring at the adjacent end thereof.

A raised axial cam track 44 is formed on the rear of the driver 10, and is adapted to cooperate with a cam follower 45 on the carrier arm 20 to force the carrier arm rearwardly to carry its contactor 22 rearwardly toward and into bridging engagement with the stationary supply contacts 18 and 19 as the driver is rotated in either direction from a central predetermined "switch off" position. This "switch off" position is defined by a declivity or recess 46 in the cam track into which the cam follower is urged by the force of the spring 23 upon alignment of the recess with the follower.

Inwardly of the cam track the rear face of the actuator is reinforced with a wear plate 47 of hard material to withstand the sliding friction of a pilot 48 carried by the contactor arm 20. A cutout 49 in this plate aligns with a pilot hole or well 50 in the rear of the driver to define the rim of said pilot hole, and it is to be noted that the pilot hole is radially aligned with the recess 46 in the cam track, and cooperates therewith to define the "switch off" position of the actuator.

The construction of the carrier arm 20 is best understood by reference to Figure 7. The arm comprises a unitary substantially T-shaped stamping, the stem 51 of which is substantially channel-shaped in cross section. A pair of aligned holes 52 in the side flanges of the channel at the bottom of the stem receive the pivot pin 21.

The cam follower 45 and the pilot 48 are journaled on a pintle 54. A lug 55 bent forwardly at right angles to the carrier arm from the top thereof has a hole 56 therein in which the upper end 57 of the pintle is received. The lower end 58 of the pintle is supported by a separate stamping 59, the base 60 of which overlies the front side of the stem of the arm and is secured thereto by means of a rivet 61. A lug 62 struck forwardly toward the driver 10 from the stamping 59 so as to be in spaced parallel relationship beneath the lug 55 on the top of the carrier arm has a hole 63 in which the lower end of the pintle is received.

The ends 57 and 58 of the pintle are reduced in diameter to provide shoulders 64 on the pintle which abut the inner surfaces of the two lugs 55 and 62 to restrain the pintle against axial motion. An extension 65 of the upper end 57 of the pintle serves as a pilot or guide for the arm, being received in a slot 66 extending longitudinally into the front face of the terminal block 10 to guide the carrier arm during its pivotal motion and restrain it against sidewise play.

The cam follower 45 is journalled on the upper portion of the pintle but beneath the uppermost pintle supporting lug 55, while the pilot 48 is journalled slightly beneath the cam follower by means of a hub 67 on the pilot arm so as to mount

the pilot arm for rotary movement on the axis of the pintle with the arm 48 projecting flatwise forwardly toward the driver 10 substantially at right angles to the axis of the pintle. A spring 81 of the double action, torque centering type is coiled about the hub 67 of the pilot arm and has its ends lying across the end extremities of an arcuate lug 68 on the back of the pilot arm and the edges of the side flanges on the carrier arm, so that the pilot will be yieldingly held by the centering spring with the axis of the pilot arm substantially perpendicular to the body of the carrier and extending lengthwise of the switch.

The pilot arm 48 has a substantially square forward end as shown, terminating in a straight edge 71 which is adapted to abut squarely against and slide along the exposed rear face of the wear plate 47. The corners on the forward end of the arm are relatively sharp and square as at 72, but without burr, so that the pilot 48 will be propelled forcefully into the pilot hole 50 through the aperture 49 in the wear plate 47 with an abrupt action by the force of the spring 23 when the actuator is rotated to the "switch off" position. It will be understood, of course, that the double action spring 81 holds the pilot arm against pivotal motion at the time the pilot hole approaches alignment with the pilot 48 so as to assure the desired abrupt action of the pilot in entering the pilot hole 50, and consequently a snap action of the master switch in the disengagement of the bridging contactor 22 from its cooperating stationary contacts 18 and 19.

A contact carrier stamping 73 is mounted on the rear face of the stem of the carrier arm, preferably by means of the same rivet 61 which secures the lower pintle support 59 to the carrier arm. The head of this rivet aligns with the well for the spring 23 to receive and center the spring.

A pair of legs 74 bent rearwardly from the upper extremity of the stamping 73 terminate in outwardly struck feet 75, and serve to hold the supply contactor 22 assembled with the carrier arm. The contactor 22 is made from a strip of conductive material, such as hard brass, and has suitable contact points 76 and 77 fixed thereto near its opposite ends and arranged for engagement with the stationary supply contacts 18 and 19. A slot 78 in the medial portion of the contactor, having its longer dimension crosswise to the stem of the carrier arm and parallel to the length of the contactor slidably receives the legs 74, so that the contactor is free to move bodily between the inner surfaces of the feet 75 and the body of the contactor carrier stamping 73 toward and from the stationary contacts 18 and 19.

A pair of compression springs 79, centered on tangs 80 (see Figures 8 and 9) struck rearwardly from the cross arm of the carrier 20 and on the rear of the contact points 76 and 77 react between the carrier arm and the contactor to yieldingly urge the latter toward the feet 75 and are placed under compression in the switch closed position shown in Figures 2, 10 and 11 to insure that the contact points 76 and 77 will be held firmly engaged with the stationary supply contacts 18 and 19.

Operation of the switch of this invention is best understood by reference to Figure 5 and Figures 8 to 11, inclusive, while the circuits which may be controlled by the switch in its various positions are diagrammatically illustrated in Figures 14*a*, 14*b*, and 14*c*. Before describing the operation, however, it should be

noted that the stationary contact 18 of the master switch 9 is adapted to have its terminal 16 connected to the current supply or battery, while the other stationary contact 19 of the master switch is electrically connected by means of a jumper strap 19' on the back of the terminal block with the supply terminal 17 of the auxiliary or selector switch, this latter terminal being electrically joined with the stationary contact 25 of the selector switch by a connection (not shown) inside the terminal block.

Terminals 27', 28' and 29' similarly connect with the stationary contacts 27, 28 and 29 of the auxiliary or selector switch and project from the back of the terminal block for the connection of circuit leads thereto.

The contact 26 of the selector switch, however, is preferably "grounded" to the switch case 5 as by means of a ground strap 26' at the back of the switch.

One manner of employing the switch instrumentality of this invention for the selective control of ignition as well as a number of auxiliary circuits is seen in the diagrams, Figures 14*a*, 14*b*, and 14*c*. As here shown, a radio and fuel gage are connected with the terminal 17 and consequently contact 25 of the selector switch; one or more additional accessories connect with the terminal 27' and its contact 27; the ungrounded side of the ignition coil connects with terminal 28' and its contact 28; while one end of a solenoid, such as a starter solenoid, is shown connected with terminal 29' and its contact 29.

The "off" position of the driver 10 (see Figure 8) corresponds to the key inserting and withdrawing position of the lock cylinder, and in this position the pilot 48 is in the pilot hole 50 and the cam follower 45 is bottomed in the recess 46 in the cam track on the actuator. Thus the contact carrier 20 is retained in a forward inoperative position by pressure of the spring 23 against the arm, with the bridging contactor 20 out of engagement with the supply contacts 18 and 19, and all of the electrical circuits controlled by the switch are open.

In the "off" position described, the teat 39 on the auxiliary bridging contactor 30 is in engagement with the stationary contact 29 on the terminal plate, teat 39'' is in engagement with contact 26, and teat 39' is received in the dimple 43 to cooperate therewith in providing a detent to define the "off" position of the driver.

In this "off" position the contactor 30 "grounds" the hot side of the solenoid as shown in Figure 14*a*, making it impossible to operate the starter motor by jumpering the switch.

When the driver is rotated by the switch key in a counterclockwise direction, as viewed from the front of the switch, to the "on" position diagrammatically illustrated in Figure 14*b*, the cam follower is first forced up the incline of the declivity in the cam track (see Figure 9) and at the same time the pilot arm swings on the axis of the pintle 54 against the action of the torque centering spring 81 along with withdrawal of the pilot 48 out of the pilot hole 50. At the "on" position (see Figure 10), the cam follower bears against the "high" part of the cam track, and the arm is thereby urged rearward, against pressure of the spring 23, to bring the supply contactor 27 into bridging engagement with the stationary contacts 18 and 19 thus closing the master switch. Note that at this point the pilot 48 has been completely withdrawn from its pilot hole 50 and has its straight end 70 abutting edgewise against the wear plate 47.

Closure of the master switch 9 in this manner connects the stationary contact 25 with the current supply and brings the contactor 30 into bridging relationship with contacts 27 and 28 of the selector switch to thus remove the "ground" from the solenoid and thereby allow operation of the solenoid at the dictation of other control instrumentalities provided for this purpose. The radio and fuel gage, of course, are now operable. The teat 39 on the contactor 30, meanwhile, engages dimple 43' to define a detent at this "on" position, but rotation of the driver in the counterclockwise direction is positively limited by the engagement of the shoulder 83 on the driver with the abutment 85 on the switch case.

Clockwise rotation of the driver from the "switch off" position likewise effects closure of the master switch 9, and in addition brings the teats 39, 39' and 39'' into engagement with contacts 28, 27, and 25, respectively, to enable energization of the radio, fuel gage, accessories and ignition circuits. It will be understood, of course, that during clockwise rotation of the actuator from the "off" position the supply contactor 20 is cammed into bridging engagement with the stationary supply contacts in the same manner as during counterclockwise rotation thereof, and the action of the pilot is the same.

The clockwise "on" position of the switch is defined by engagement of the shoulder 83' on the front of the driver 10 with the abutment 85' on the switch case. During rotation of the actuator from either "on" position to the "off" position, the supply switch breaks with a snap action, its velocity of separation being independent of the rate of rotation of the driver, so that there will be no possibility of a destructive protracted arc being drawn across the supply switch contacts in the event the driver is very slowly rotated to the "off" position.

This snap action is assured by the pilot 48. As the driver is rotated toward the "switch off" position, the straight forward edge 70 of the pilot arm 48 remains in engagement with the flat surface 47 on the driver (see Figure 11), thereby holding the contact carrier arm in the contact engaged position and preventing the cam from following the downward angle of the cam track. As the actuator is further rotated to the "off" position, the pilot hole 50 is brought into complete alignment with the pilot arm, and the latter drops into the hole under pressure of the carrier arm bias spring 23, thereby opening the supply contacts with a rapid snap action.

It is to be understood that the connections between the various contacts, and between the contacts and various load and supply sources, may be varied to suit the requirements of the particular installation in which the switch of this invention is used. It will be appreciated that both the supply and load contacts, and their corresponding contactors, may be disposed in a large number of arrangements, and that the arrangement herein described is merely illustrative.

For example, by the provision of additional auxiliary contacts for the selector switch, two or more adjacent "on" positions of the selector switch may be established by rotation of the driver in a single direction. While this would probably involve the interruption of some accessories circuits during rotation of the actuator from one to the other of these "on" positions,

without a corresponding opening of the master or supply switch, this would not be objectionable if the circuits involved were not heavily loaded. Similarly, by the provision of more than one declivity in the cam track, with corresponding radially aligned pilot holes, a plurality of "off" positions of the master switch may be provided to afford a greater variety of switching arrangements.

A highly important feature of the switch instrumentality of this invention resides in the fact that the selector switch contacts on the terminal plate may be disposed in such a manner that the master switch will snap open before the accessories circuits are broken, thereby preventing any possibility of arcing across the contacts; or if desired, some of the selector switch contacts which carry small loads may be disposed in a manner such that the circuits controlled by them will be broken before the master switch snaps open, thereby reducing the load through the master switch contacts.

From the foregoing description, together with the accompanying drawings, it will be apparent that this invention provides a compact switch instrumentality of the rotatable ignition controlling type, capable of selectively connecting a number of load circuits with a single supply circuit and providing means for substantially precluding arcing across the contact points as the various circuits are broken.

I claim:

1. A switch comprising: a driver member movable along a fixed path in opposite directions from a predetermined "switch off" position; a carrier member mounted alongside the path of motion of said driver member for motion in a direction substantially normal to the path of movement of the driver member, said carrier member having a contact mounted thereon for movement therewith; means yieldingly biasing the carrier member against the driver member; means on said members for translating motion of the driver member in either direction from said predetermined "switch off" position into motion of the carrier member away from the driver to effect engagement of said contact with a cooperating stationary contact, said means including cam surfaces on one of said members cooperable with a cam follower on the other of said members; and a pilot on one of said members engaging in a substantially close fitting pilot hole in the other of said members in the "switch off" position of the driver member but moved out of said pilot hole by motion of the carrier member away from the driver member in consequence to movement of the driver member in either direction from said "switch off" position, said pilot engaging with a portion of said other member to hold the carrier against switch opening motion during movement of the driver member toward the "switch off" position until the pilot is brought into alignment with the pilot hole, thereby causing separation of the contacts with a snap action in response to the biasing force on the carrier member when the driver member is returned to said predetermined "switch off" position.

2. A quick break switch instrumentality comprising: cooperating stationary and movable contacts; a carrier on which said movable contact is mounted; means mounting said carrier for motion in opposite directions along a predetermined path to enable the movable contact thereon to be carried into and out of engagement with its cooperating stationary contact; a spring

biasing the carrier in a direction tending to separate the contacts; a rotatable driver for imparting contact engaging motion to the carrier against said bias upon rotation of the driver about its axis away from a "switch off" position; and latch mechanism including an arm pivotally mounted on the carrier and extending therefrom toward the driver, the end of said arm adjacent to the driver terminating in a substantially square cornered straight edge which abuts a flat surface on the driver during rotation thereof toward the "switch off" position to preclude contact separation, said driver having a well opening to said surface thereon of a size to accommodate the latch arm and so located that the latch arm drops sharply into said well at a predetermined "switch off" rotational position of the driver to separate the contacts with a snap action, and a spring yieldingly biasing said latch arm against pivotal motion but permitting the arm to rotate momentarily sufficiently to clear the corner of said well in the driver during rotation of the driver from said predetermined "switch off" position.

3. A switch instrumentality of the character described comprising: a stationary contact; an actuator having one end facing the stationary contact and mounted for rotation toward and from a predetermined "switch off" position on an axis fixed with respect to the stationary contact; a movable contactor positioned between the stationary contact and said end of the actuator and constrained to motion toward and from engagement with the stationary contact substantially in the direction of the actuator axis; a spring acting on the movable contactor to yieldingly urge the same toward said end of the actuator and from the stationary contact; cooperating cam surfaces on the movable contactor and said end of the actuator for translating rotation of the actuator away from said predetermined "switch off" position into movement of the contactor into engagement with the stationary contact; and cooperating means on the movable contactor and the actuator for precluding separation of the contacts during rotation of the actuator toward its predetermined "switch off" position, regardless of the relationship between said cam surfaces on the actuator and movable contactor, until said predetermined "switch off" position of the actuator is reached so as to effect separation of the contacts with a snap action under the influence of said spring.

4. An ignition switch of the character described, comprising: a terminal block; a pair of stationary contacts on the terminal block; a contactor for bridging said stationary contacts; means mounting said contactor from the terminal block for swinging motion about an axis remote from the stationary contacts toward and from bridging engagement with the stationary contacts; a spring reacting between the terminal block and the contactor for yieldingly holding the contactor separated from the stationary contacts; an actuator rotatable on an axis normal to the pivot about which the contactor swings; a cam follower on the contactor; cam surfaces on the actuator engaged by said cam follower through the action of said spring and arranged to translate rotation of the actuator in either direction from a predetermined "switch off" position into swinging of the contactor on its pivot axis in a direction to bridge the stationary contacts; a pilot projecting from the contactor toward the actuator and received in a substantially

close fitting pilot hole in the actuator in said predetermined "switch off" position thereof to be withdrawn from the pilot hole by cam produced motion of the contactor toward its bridging position; and means on the actuator engaged by the pilot upon rotation of the actuator to a "switch on" position for precluding separation of the contacts regardless of partial separation of the cam follower from said cam surfaces, until the pilot aligns with its pilot hole whereby the contactor spring effects disengagement of the contacts with a snap action at the time the actuator reaches said predetermined "switch off" position thereof.

5. A switch instrumentality of the character described comprising: a terminal block; a pair of main switch contacts stationarily mounted on the terminal block; a plurality of sets of auxiliary contacts stationarily carried by the terminal block; a bridging contactor for said main switch contacts guided by the terminal block for motion into and out of bridging relationship with said main switch contacts in a path substantially normal to the contact faces of said main switch contacts; an actuator rotatable on an axis fixed with respect to the terminal block and having one end facing the terminal block so that said contactor is positioned between the actuator and the main switch contacts; a motion transmitting connection between the actuator and said contactor by which rotation of the actuator away from a predetermined "switch off" position imparts switch closing motion to the contactor; and a second bridging contactor carried by the actuator for rotation therewith and for cooperation with said sets of auxiliary contacts on the terminal block.

6. A switch instrumentality of the character described comprising: a terminal block; a plurality of sets of auxiliary contacts carried by and exposed at one face of the terminal block; an actuator rotatable on an axis normal to said face of the terminal block and having one end portion thereof disposed along side said face of the terminal block; a bridging contactor on the actuator carried thereby into selective bridging engagement with said sets of auxiliary contacts by rotation of the actuator away from a predetermined "switch off" position; a pair of main switch contacts stationarily mounted on the terminal block and so related with respect to the auxiliary contacts as to render circuits controlled by said auxiliary contacts effective only upon bridging of the main switch contacts; a second contactor pivotally supported from the terminal block to swing substantially in the direction of the actuator axis toward and from bridging engagement with the main switch contacts; spring means for yieldingly urging said second contactor out of bridging engagement with respect to said main switch contacts and toward said end of the actuator; a motion transmitting connection between the actuator and said second contactor for effecting bridging engagement thereof with the main switch contacts by rotation of the actuator out of its predetermined "switch off" position; and cooperating means on said second contactor and the actuator for delaying disengagement of said second contactor from the main switch contacts under the influence of said spring means during rotation of the actuator toward its predetermined "switch off" position until the actuator has been rotated to a predetermined position with respect to said auxiliary contacts.

7. The switch set forth in claim 6 further characterized by the arrangement of said sets of auxiliary contacts in a manner such that the same are selectively bridged by rotation of the actuator in opposite directions from a predetermined "switch off" position; and said motion transmitting connection between the actuator and said second contactor including cooperating cam surfaces on the actuator and said second contactor whereby rotation of the actuator in either direction from its predetermined "switch off" position effects motion of said contactor in a direction to bridge the main switch contacts.

8. In a switch instrumentality of the character described: a selector switch for controlling a number of auxiliary circuits and including an actuator movable from a predetermined "off" position to a number of different "on" positions for selectively rendering said circuits operative; a master switch connectable between said selector switch and a source of E. M. F. so that said auxiliary circuits are operative only in the closed position of the master switch, said master switch including a movable contactor biased to a switch open position; cooperating cam elements on said actuator and contactor for translating motion of the actuator from said predetermined "off" position thereof to one of its "on" positions into switch closing motion of the master switch contactor against the biasing force acting thereon; means on said actuator and contactor providing a latch rendered operative to hold the contactor of the master switch in its operative switch closing position upon motion of the actuator away from said predetermined "off" position thereof; and means rendered operative by motion of the actuator to said predetermined "off" position thereof for suddenly tripping the latch to thereby release the contactor for switch opening motion with a snap action in response to the biasing force on the contactor.

9. A switch of the character described, comprising: a plurality of stationary contacts; a contactor movable in a path substantially normal to the contact faces of said stationary contacts for bridging the same; a driver for imparting switch closing motion to said contactor and rotatable from a predetermined "switch off" position on an axis fixed with relation to the stationary contacts; spring means yieldingly urging the contactor away from the stationary contacts; a cam track on the driver having a recess which aligns with the contactor in said predetermined "switch off" position of the driver; a cam follower on the contactor engaged with said cam track by the force of said spring means and received in said recess when the driver is in the "switch off" position, rotation of the driver from said predetermined "switch off" position camming the contactor toward the stationary contacts to effect bridging thereof; a pivoted latch projecting from the carrier toward the driver and received in a hole in the driver in the "switch off" position thereof, said latch having a square end terminating in sharp corners and being adapted to engage a surface on the driver adjacent to said hole during rotation of the driver toward said "switch off" position to prevent separation of the contacts under the influence of said spring until said latch is in complete alignment with the hole in the driver, whereby contact separation to open the switch takes place with a snap action when the driver is brought to said predetermined "switch off" position; and a spring reacting against the latch to hold it against rotation away from sliding engagement with said surface on the driver.

10. In a switch of the character described: a rotatable driver; a contact carrier mounted adjacent to the driver for motion from an inoperative switch open position to an operative switch closed position; means biasing the contact carrier to its switch open position; cooperating cam means on the contact carrier and the driver for effecting motion of the contactor against the force of said biasing means to its switch closed position in consequence to rotation of the driver out of a predetermined switch off position; and means for assuring movement of said contact carrier to its switch open position with a snap action upon rotation of the driver to said predetermined off position thereof, said means including a surface on the driver adjacent to said contact carrier, a latch arm pivotally supported by the contact carrier and having an end portion brought into engagement with said surface on the driver by rotation of the driver away from its switch off position so that said latch arm blocks switch opening motion of the contact carrier in the switch on position of the driver, the end portion of said arm being adapted to align with a recess in the driver opening to said surface of the driver to allow the biasing means to propel the contact carrier to switch open position with a snap action as the driver is returned to switch off position, said latch arm tilting on its pivotal support to permit it to be withdrawn from said recess during initial rotation of the driver, and spring means acting on the latch arm to yieldingly hold the arm against tilting during rotation of the driver back to its predetermined switch off position.

11. In a switch instrumentality of the character described: cooperating stationary and movable auxiliary contacts; cooperating stationary and movable supply contacts biased away from one another; a switch actuator movable back and forth from a predetermined switch off position; connections between said movable contacts and the actuator whereby the supply contacts are engaged with each other and the movable auxiliary contacts are selectively engaged with their stationary contacts in consequence to movement of the actuator from said predetermined switch off position; a latch for holding the supply contacts engaged and rendered operative by motion of the actuator from said switch off position thereof; and means for disabling said latch during motion of the actuator to said switch off position thereof and before disengagement is effected between the auxiliary contacts.

12. In a switch instrumentality of the character described: a set of cooperating stationary and movable auxiliary contacts; a set of cooperating stationary and movable supply contacts biased away from one another; a switch actuator movable back and forth from a predetermined switch off position; connections between said movable contacts and the actuator whereby the supply contacts are brought into engagement with each other and the movable auxiliary contacts are selectively engaged with their stationary contacts in consequence to movement of the actuator from said predetermined switch off position thereof, said connections including a latch rendered operative by motion of the actuator from said switch off position thereof for holding the supply contacts engaged; and means on the actuator for suddenly disabling said latch during motion of the actuator toward switch off position and before disengagement is effected between one of said sets of contacts.

13. In a quick break switch instrumentality of the character described: a driver rotatable back and forth from switch off to switch on positions; a contact carrier alongside the driver constrained to back and forth motion relative to the driver toward and from the same and adapted to engage a cooperating stationary contact when moved away from the driver; means biasing the carrier toward the driver and away from its stationary contact; cooperating means on the driver and carrier for translating rotation of the driver toward a switch on position into motion of the carrier away from the driver to effect engagement of the carrier with its stationary contact; cooperating latch means on the carrier and driver including an arm mounted on and movable with the carrier, and a surface on the driver engaged by said arm in the switch on position of the carrier to block motion of the carrier toward the driver and away from its stationary contact; and means on the driver for effecting sudden tripping of the latch at the switch off position of the driver to thereby cause switch opening motion of the carrier with a snap action.

14. In a switch instrumentality, the combination of: a first switch including a driver rotatable back and forth between switch on and switch off positions, and a contactor constrained to rotate with said driver; a second switch including a contactor constrained to back and forth switch opening and switch closing motion relative to the driver, and means biasing said contactor in the switch open direction; means for translating rotation of the driver toward switch on position from its switch off position into switch closing motion of the contactor of said second switch, relative to the driver; a latch rendered operative as a consequence to such actuation of the contactor of the second switch by the driver for blocking switch opening motion of the contactor; and means on the driver for effecting sudden tripping of said latch as a consequence to rotation of the driver to switch off position to thereby cause switch opening motion of the contactor of said second switch with a snap action.

15. In a switch instrumentality, the combination of: a first switch including a driver restrained against all but back and forth rotative motion between switch on and switch off positions, and a contactor constrained to rotate with said driver; a second switch including a contactor, means mounting said contactor for motion relative to the driver and constraining the contactor for switch opening and closing motion in directions toward and from the driver, and means biasing said contactor toward the driver in the switch open direction; means for translating rotation of the driver toward switch on position from its switch off position into switch closing motion of the contactor of said second switch; a latch rendered operative by the driver in consequence to rotation of the driver away from its switch off position to block switch opening motion of the contactor of said second switch; and means on the driver for effecting sudden tripping of said latch as a consequence to rotation of the driver to switch off position to thereby cause switch opening motion of the contactor of said second switch with a snap action.

16. In a quick break switch instrumentality: a first switch including a driver rotatable back and forth between switch on and switch off posi-

tions, and a contactor constrained to rotate with said driver; a second switch including a contactor movable back and forth relative to the driver between switch open and switch closed positions, and means biasing said contactor to its switch open position; cooperating cam means on the driver and the contactor of said second switch for translating rotation of the driver away from its switch off position into motion of the contactor of said second switch relative to the driver toward its switch closed position; latch means rendered operative by rotation of the driver out of its switch off position to block motion of the contactor of said second switch to its switch open position; and means for suddenly disabling said latch means in consequence to rotation of the driver back to its switch off position.

17. In a quick break switch instrumentality: a first switch including a driver rotatable back and forth between switch on and switch off positions, and a contactor constrained to rotate with said driver; a second switch including a contactor movable back and forth relative to the driver between switch open and switch closed positions, and means biasing said contactor to its switch open position; cooperating cam means on the driver and the contactor of said second switch for translating rotation of the driver away from its switch off position into motion of the contactor of said second switch relative to the driver toward its switch closed position; latch means rendered operative by rotation of the driver away from its switch off position to block motion of the contactor of said second switch to its switch open position independently of said cam means during rotation of the driver back toward its switch off position; and latch tripping means rendered operative by rotation of the driver to its switch off position for quickly releasing said latch to cause the contactor of said second switch to be propelled to its switch open position with a snap action in response to the biasing means acting thereon.

18. In a switch instrumentality of the type adapted to selectively control a number of circuits supplied from a common source of current: a first switch for controlling a plurality of said circuits, said switch including a driver rotatable back and forth between switch on and switch off positions, and a contactor constrained to rotate with said driver; a master switch so connected with the first designated switch that the circuits governed by said first designated switch are operative only upon closure of the master switch, said master switch including a contactor constrained to back and forth switch opening and switch closing motion relative to the driver, and means biasing said contactor in the switch open direction; cooperating means on the driver and the contactor of said master switch for translating rotation of the driver out of its switch off position into switch closing motion of the master switch contactor, relative to the driver; cooperating latch means on the driver and the master switch contactor rendered operative by rotation of the driver out of its switch off position to hold the master switch contactor against switch opening motion; and latch tripping means on the driver for tripping the latch upon rotation of the driver to said switch off position thereof so as to assure rapid switch opening motion of the master switch contactor by the biasing force acting thereon.

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