Nov. 6, 1923.

1,473,463

E. W. CHANDLER

COMBINATION SWITCH

Filed Aug. 23, 1919

2 Sheets-Sheet 1

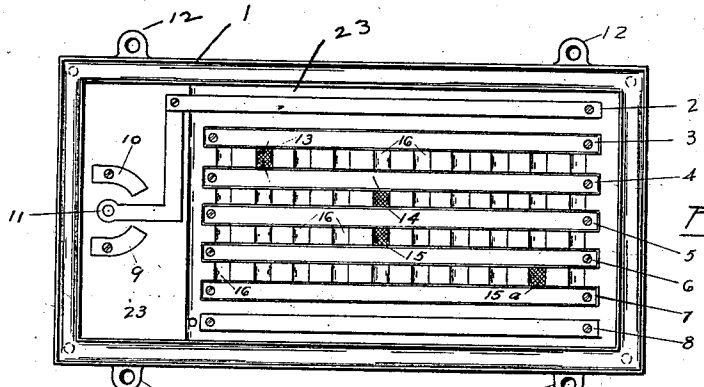


FIG. 1

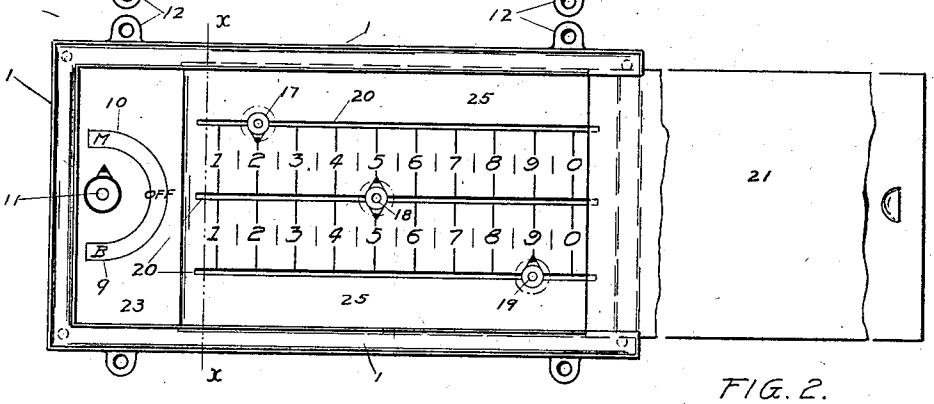


FIG. 2.

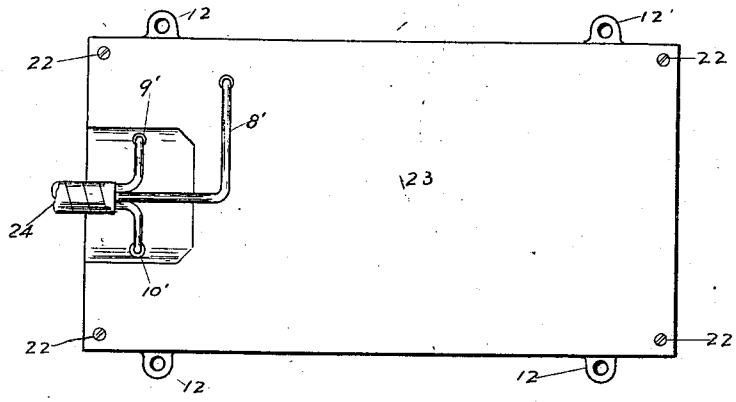


FIG. 3.

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2 Sheets-Sheet 2

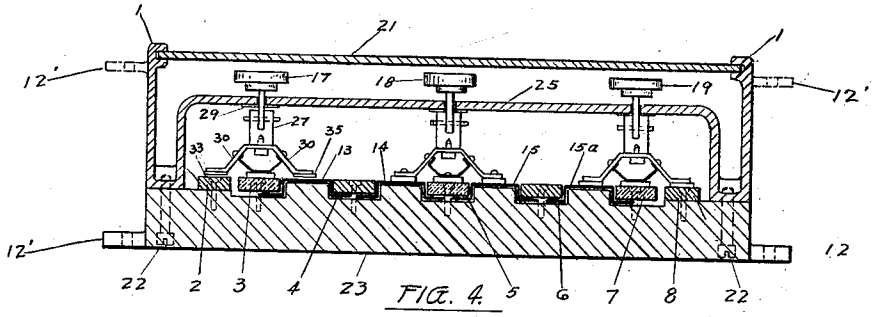


FIG. 4.

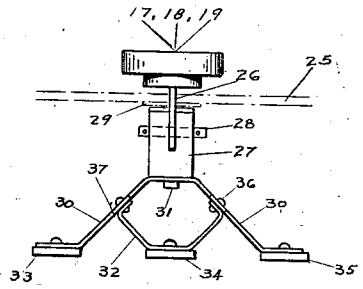


FIG. 5.

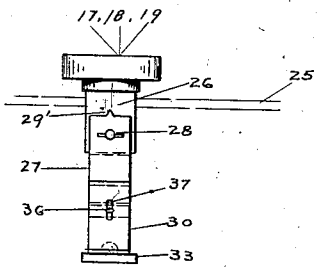


FIG. 6

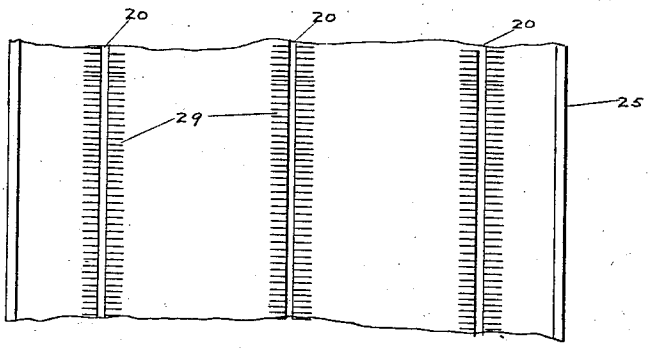


FIG. 7.

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UNITED STATES PATENT OFFICE.

ETHELBERT W. CHANDLER, OF PORTLAND, OREGON.

COMBINATION SWITCH.

Application filed August 23, 1919. Serial No. 319,486.

To all whom it may concern:

Be it known that I, ETHELBERT W. CHANDLER, a citizen of the United States, residing at Portland, in the county of Multnomah and State of Oregon, have invented certain new and useful Improvements in Combination Switches, of which the following is a specification.

This invention relates to combination switches on an electrical circuit and has reference to its use on the ignition systems of internal combustion engines, especially on automobiles and power vehicles. The invention consists of an attractive and compact switch mechanism that can only be properly operated by those who are familiar with the combination and will prevent unauthorized persons from closing the electric circuit and starting the engine. Also when the combination is set and the circuit closed, means are provided to keep others from reading the combination. Also the construction of the switch is such that the combination can be easily changed from time to time if it be deemed advisable. The parts are all enclosed and cannot be tampered with unless the switch is removed and taken apart. It is realized that all such switches can be "wired around," but undoubtedly the time it would take to do this or work out the combination will tend to discourage any unauthorized use of the motor.

Referring to the drawings, Figure 1 is a plan, with the cover 21 and the guard part 25 (Figure 4) removed. Figure 2 is a plan showing the slotted guard part 25, with the index knobs of the sliding contacts 17, 18 and 19 pointing respectively to their appropriate row of figures, which are permanently marked on the top of the guard part. Figure 3 is a plan of the bottom of the base part 23 (shown in section in Figure 4). Figure 4 is a section of Figure 2, along the line *xx*, the cover 21 being in closed position. Figure 5 is a side elevation of one of the sliding contacts 17, 18 and 19. Figure 6 is an end elevation of same. Figure 7 is a plan of the underneath side of the guard part 25 showing the corrugations 29, adapted to engage the sliding contacts 17, 18 and 19 respectively.

Figures 1 and 4 show the structure of the switch quite plainly. The base part 23 has five parallel grooves running lengthwise of the switch. In the central and outer grooves are placed smooth bars or strips of non-conducting material 3, 5 and 7 and in the other two grooves are placed the metal bars or strips 4 and 6. Next to the outer groove on each side are placed the metal bars 2 and 8. Bar 2 is connected by a metal strip to the key 11, Figure 1. Bent pieces of conducting material, 13, 14, 15 and 15ª, adapted to fit over the ridges between the five grooves are placed so that their ends are clamped by the bars 3, 4, 5, 6 and 7 respectively. These ridges between the grooves are each notched according to the number of numerals to be used in the combinations, in this instance ten, as shown in the drawings, and the bent conducting pieces are set in the notches corresponding to the number chosen to be one of the combination, in this case, two, five, nine. There is only one bent conductor piece for each ridge and all the notches in each ridge have non-conducting fillers except the notch occupied by the bent metal conductor, so that the top of each ridge is smooth and anyone disposed to tamper with the switch could not discover by feeling with a wire which was the metal filled notch. The bars and bent conductors are so arranged that their top surfaces all lie in the same plane. The bars are fastened down firmly by screws at each end, the metal bars thus making a good contact with the ends of the bent conductor pieces.

The sliding contacts 17, 18 and 19 are shown in detail in Figures 5 and 6. A metallic conductor 30, with the contact pieces 33, 35, affixed to the bottom of each leg respectively, is fastened to an insulating block 27. The spreader part 32, with sliding block 34 attached, is placed between the arms 30, 30, and acts to lift them up when a downward pressure is exerted upon them. The end of each spreader arm 36 is free to move in a slot 37. The bottom surfaces of the sliding

pieces 33, 34 and 35 are all in the same plane. Contact parts 33 and 35 must be metallic conductors; the sliding block 34 may be of non-conducting material. Fastened to the top of the insulating block 27 by a thin and comparatively wide piece of metal 26 is a knob, 17, 18 and 19, by which the sliding contacts are moved along the slots 20, Figure 2, until the index pointer on each knob or key, shown in Figure 2, is opposite the number selected as one of the combination. The top of the insulating block 27 has a V shaped rib or projection 29′, adapted to engage the corrugations 29, Figure 7, on the underneath side of the guard part 25, Figure 4, on each side of the slots 20. When one of the keys 17, 18 and 19 is pressed downward, the spreader 32 causes the arms 30, 30, to rise slightly, throwing all the pressure on the smooth sliding block 34 and the projections 29′ are out of engagement with the corrugations 29. This position is plainly shown in the left hand sliding contact in Figure 4, which can now be readily moved along the bar 3 on which it rests. In Figure 2 the contacts have been moved to the numbers two, five, nine, the operative combination. The metal bar 2, Figure 1, is connected as shown to the switch key 11, which is of any preferred type and by turning the key, contact is made with either the magneto through terminal 10 and wire 10′, Figure 3, or with the battery, through terminal 9 and the wire 9′, Figure 3, or can be left out of connection with either when shifted to "off" position. The bar 8 is connected to the ground wire 8′.

The operation of the switch is now easily understood. The key 11 connects bar 2 with 10, the magneto terminal. The sliding contact 17, at index number 2, through contact piece 33, conductor 30 and contact piece 35, connects the metal bar 2 with the bent conductor piece 13, metal bar 4 and bent conductor piece 14. Sliding contact 18, at index number 5, furnishes a metal connection from 14 to conductor piece 15, to metal bar 6 and bent conductor piece 15ª. Sliding contact 19, at index number 9, connects 15ª and metal bar 8, which completes the circuit through ground wire 8′ and the ignition system to which the switch is connected in series is in electrical condition to operate and run the motor. The combination can be changed by placing the bent conductor pieces 13, 14, 15 and 15ª in different notches, the middle conductors 14 and 15 being at the same numbers. Obviously the permutations may be increased by adding another row of figures and groove, with their accompanying sliding contacts and bent conductor piece. When the combination has been set, it is advisable to slide the cover 21, Figure 2, over the keys so that an observer cannot detect the combination. Or the cover may be hinged as desired. After shutting down the motor, all the keys should be shifted to the right to zero, or to the left to one, so no indication is given of the combination.

Many changes and alterations can of course be made in the construction and arrangement of parts herein disclosed, all within the scope of my invention and therefore I do not limit myself to the exact and particular forms set forth.

I claim,—

1. In a combination switch of the class described, a grooved base part, with the ridges between the grooves notched to correspond to the number of figures used in the combination, alternate longitudinal strips of non-conducting and conducting material fastened to said base part so that their top surfaces lie in the same plane, a bent metallic conductor bridging each ridge, adapted to fit in a notch thereof and whose ends contact with the strips on either side, a longitudinally slotted guard plate attached to the said base part, with the index numbers of the combination on its upper surface, sliding contacts adapted to complete the circuit between the metallic strips and bent conductor pieces, when moved to predetermined positions as indicated by their index numbers, and means for covering the exposed keys of said sliding contacts.

2. In an electric switch of the class described, an electric conductor adapted to be connected with a source of electric supply, a second electric conductor adapted to be electrically connected with an ignition device, a pair of movable electrically conductive switch members mounted in detached relation and normally insulated from each other and each in slidable metallic engagement with a corresponding one of said electric conductors, an intermediate contact member adapted to be fixed in any desired one of a series of predetermined positions and in such position electrically connected with a corresponding one of said movable switch members, and an intermediate movable switch contact member movable into and out of electrical contact with said fixed intermediate electric conductor and adapted to be electrically connected in series with said pair of movable switch members in any position in which said intermediate fixed electric conductor is mounted.

3. In an electric switch of the class described, an electric conductor adapted to be connected with a source of electric supply, a second electric conductor adapted to be electrically connected with an ignition device, a pair of movable electrically conductive switch members mounted in detached relation and normally insulated from each other and each adapted to be electrically connected with a corresponding one of said

electric conductors, an intermediate contact member adapted to be set in any desired one of a series of serially marked positions and in such position electrically connected with a corresponding one of said pair of movable switch members, and an intermediate movable switch contact member adapted to be connected in series with said pair of movable switch members and said last-mentioned intermediate contact member in a circuit embracing all of said elements.

4. In an electric switch of the class described, the combination of an electric conductor adapted to be connected with a source of electric supply, a second electric conductor adapted to be electrically connected with an ignition device, a pair of movable electrically conductive switch members mounted in detached relation and normally insulated from each other, and each adapted to be electrically connected in any desired one of a series of marked positions with a corresponding one of said electric conductors, an intermediate contact member adapted to be set in any desired predetermined marked position of a series of such marked positions, and electrically conductive means adapted to be electrically connected with said intermediate contact member and acting to electrically connect the same in series with said pair of movable switch members.

5. In an electric switch of the class described, the combination of an electric conductor adapted to be connected with a source of electric supply, a second electric conductor adapted to be electrically connected with an ignition device, a pair of movable electrically conductive switch members mounted in detached relation and normally insulated from each other and each adapted to be electrically connected in any desired predetermined position of a series of marked positions with a corresponding one of said electric conductors, a plurality of intermediate contact members each adapted to be set in any desired predetermined serially marked position of a series of marked positions, and an intermediate movable contact member adapted to be moved to any desired predetermined position of a series of serially marked positions and acting in one such position to connect said intermediate contact members and said pair of movable switch members in series in a circuit in which all of said elements are connected in series.

6. In an electric switch of the class described, the combination of an electric conductor adapted to be connected with a source of electric supply, a second electric conductor adapted to be electrically connected with an ignition device, a pair of movable electrically conductive switch members normally insulated from each other, each of said movable contact members being in sliding contact with a corresponding one of said electric conductors and movable while in such contact to any desired predetermined marked position of a series of such marked positions, a plurality of intermediate contact members each adapted to be electrically connected with a corresponding one of said slidable switch members, and an intermediate slidable contact member adapted to be moved to any desired predetermined position of a series of serially marked positions and into and out of electrical connection in series with said last mentioned plurality of intermediate contact members and said pair of slidable switch members.

7. In an electric switch of the class described, the combination of a metallic rod adapted to be connected with a source of electric supply, a second metallic rod adapted to be electrically connected with an ignition device, a pair of slidable electrically conductive switch members mounted in detached relation and normally insulated from each other and each having a pair of spring contact arms one of which is in sliding contact with a corresponding one of said metallic rods, each of said spring contact members being slidable to any desired predetermined marked position of a series of such marked positions, a plurality of intermediate contact members each adapted to be set in any desired predetermined serially marked fixed position of a series of such marked positions and in such position electrically connected in series with a spring contact arm of a corresponding one of said sliding switch contact members, and an intermediate slidable contact member having a pair of metallic spring contact arms and adapted to be moved to any desired predetermined position of a series of serially marked positions, said intermediate slidable contact member acting in one of such marked positions to connect said intermediate contact members and said first-mentioned pair of movable switch members in series in a circuit in which all of said electrically conductive elements are connected in series.

8. In an electric switch of the class described, the combination of an electric conductor adapted to be connected with a source of electric supply, a second electric conductor adapted to be electrically connected with an ignition device, a pair of movable electrically conductive switch members mounted in detached relation to each other and each in sliding contact with one of said electric conductors, an intermediate movable contact member slidably mounted and having a pair of metallic spring contact arms, and adapted to be moved to any desired predetermined position of a series of serially marked positions, an insulated sup-

porting track adapted to slidably support said intermediate slidable contact member, spreader mechanism interposed between said track and spring arms and adapted to raise the latter out of circuit-closing position during the movement of said slidable intermediate contact member, electrically conductive means adapted to be electrically connected with said intermediate contact member in one position of such series of marked positions and acting to connect the same in series with said first-mentioned pair of movable switch members, an insulating support for said electrically conductive elements, and an insulated cover provided with slots through which said slidable contact members extend.

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