Dec. 10, 1935. W. H. LEINENWEBER 2,023,894

KEYLESS LOCKING SWITCH

Filed Sept. 23, 1932

Fig. 2

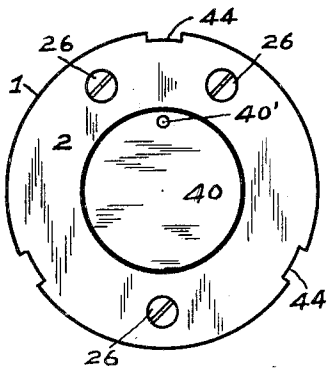


Fig. 1

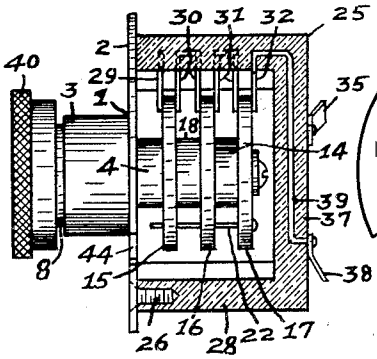


Fig. 3

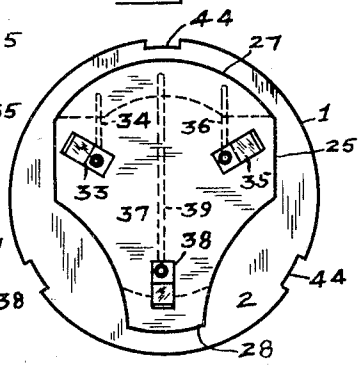


Fig. 4

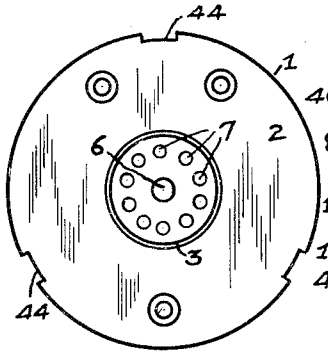


Fig. 5

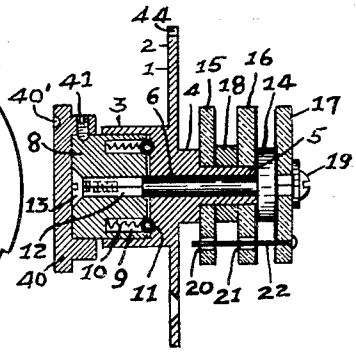


Fig. 6

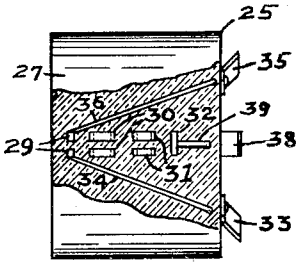


Fig. 7

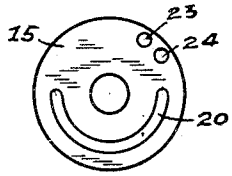


Fig. 8

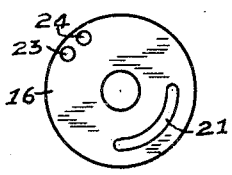


Fig. 9

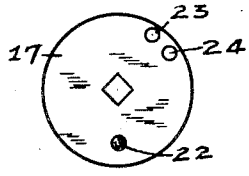
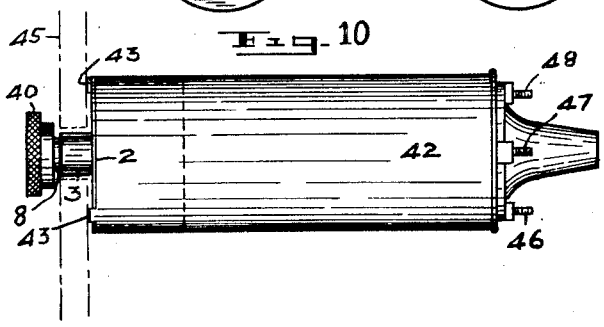


Fig. 10



INVENTOR

William H. Leinenweber

By Jas. R. Snyder

Attorney

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KEYLESS LOCKING SWITCH

William H. Leinenweber, Pittsburgh, Pa.

Application September 23, 1932, Serial No. 634,517

1 Claim. (Cl. 200—43)

My invention relates to a keyless locking switch, and while primarily designed for use as an ignition switch in the ignition system of a motor vehicle, it is obvious that the device may be employed for any other purposes wherein it is found to be applicable.

The primary object of the invention is to provide a keyless ignition switch of the character described, which embodies a combination locking mechanism rendering same inoperable by unauthorized persons not acquainted with the combination involved, and under such conditions, greatly reducing the theft of motor vehicles.

Further objects of the invention are to provide a device of the class stated, which is simple in its construction and arrangement, durable and efficient in its use, conveniently operable, compact, positive in its action, and comparatively inexpensive to manufacture and install.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the novel construction, combination and arrangement of parts herein specifically described and illustrated in the accompanying drawing, but it is to be understood that the latter is merely illustrative of an embodiment of the invention, and that the actual needs of practice and manufacture may require certain mechanical variations from the embodiment shown. It is, therefore, not intended to limit the invention to the disclosure thereof herein illustrated but rather to define such limitations to the scope of the claim hereunto appended.

In the drawing wherein like numerals of reference designate corresponding parts throughout the several views:—

Figure 1 is a side view, partly in cross section, of a locking switch constructed in accordance with the invention.

Figures 2 and 3 are, respectively front and rear views thereof.

Figure 4 is a front view of the supporting frame.

Figure 5 is a longitudinal cross sectional view of the device with the contact holder removed therefrom.

Figure 6 is a top view of the contact holder partially in cross section.

Figures 7, 8 and 9 are rear end views of the contact disks embodied in the present invention.

Figure 10 is a reduced side view of an ignition coil embodying my improved ignition switch.

Referring in detail to the drawing 1 denotes an integrally formed supporting frame comprising a large circular end plate 2 provided with a centrally disposed, cylindrical and forwardly projecting bearing sleeve 3. The end plate 2 further carries a spacing collar 4, which is centrally disposed on the rear side of the former. A reduced stem 5 is formed integral with the spacing collar 4 and extends rearwardly from the latter. The supporting frame 1 is provided with a bore 6, which extends through the axial centers of the bearing sleeve 3, end plate 2, spacing collar 4 and stem 5.

The bottom of the bearing sleeve 3 is formed with a plurality of cavities 7, which are arranged in a circular row and regularly spaced relatively to each other. A cylindrical adjusting plug 8 is revolubly mounted in the bearing sleeve 3 and projects from the latter. The adjusting plug 8 is formed with a pair of diametrically opposed pockets 9 having their open ends disposed toward the bottom of the bearing sleeve 3. A spiral spring 10 is mounted in each of the pockets 9, and a ball 11 is mounted at the open end of each of the latter, against the ends of respective springs 10, for engaging in the cavities 7 in the bottom of the bearing sleeve 3, for the purpose to be described.

A shaft 12, having squared ends, is revolubly mounted in the bore 6. The front squared end of the shaft 12 extends through a corresponding shaped aperture in the adjusting plug 8, and the latter is fixed thereto by means of a screw 13. A spacing collar 14 is formed integral with the shaft 12 and abuts against the free rear end of the stem 5.

My improved locking switch embodies three contact disks, respectively indicated at 15, 16 and 17, which are constructed from any suitable insulation material. The front disk 15 is revolubly mounted on the stem 5 and disposed against the spacing collar 4 carried by the end plate 2. The intermediate disk 16 is likewise revolubly mounted on the stem 5 and disposed against the spacing collar 14 on the shaft 12. The front and intermediate disks 15 and 16 are spaced from each other by a spacing collar 18, which is interposed therebetween on the stem 5.

The squared rear end of the shaft 12 engages in a correspondingly shaped aperture in the rear disk 17, and the latter is secured thereto, to turn with a shaft 12, by means of a screw 19. The spacing collars 4, 14 and 18 are of uniform thickness and consequently the contact disks 15, 16 and 17 are uniformly spaced relatively to each other.

The front disk 15 is provided with a regular, comparatively long arcuate slot 20. The inter-

mediate disk 16 is likewise provided with a regular, relatively short arcuate slot 21. A shifting rod 22 is fixed in the rear disk 17 and projects forwardly through the slots 20 and 21 in respective disks 15 and 16, as clearly illustrated in Figure 5.

A pair of closely spaced contact pins 23 and 24 is embedded in each of the disks 15, 16 and 17. The contact pins 23 and 24 extend transversely through respective disks and are disposed adjacent to the peripheral edges of the latter.

A contact holder 25 preferably constructed from molded insulation material, is secured to the rear side of the end plate 2 by means of screws 26, which engage in the top 27 and bottom bar 28 of said contact holder.

A pair of single contact fingers 29, two pairs of double contact fingers indicated at 30 and 31, and a single contact finger 32, are molded or otherwise embedded in the top 27 of the contact holder 25. All of the contact fingers are flat and resilient, and depend below the holder top 27 to frictionally engage respective peripheral edge margins of respective disks 15, 16 and 17 in the arrangement to be described. Each associated pair of contact fingers is spaced a distance commensurate to the distance between the contact pins 23 and 24, and contact with the latter to establish the operating circuit of a motor vehicle ignition system.

The single pair of contact fingers 29 engage the front side of the front disk 15. One of said pair of contact fingers 29 is joined with a resilient contact plate 33 by means of a conductor 34, and the other of said pair of contact fingers 29 is joined with a resilient contact plate 35 by means of a conductor 36. The conductors 34 and 36 are preferably embedded in the holder top 27. The contact plates 33 and 35 are fixedly mounted against the rear side of the back 37 of the holder 25.

The front legs of the pair of double contact fingers 30 engage the rear side of the front disk 15, and the rear legs thereof engage the front side of the intermediate disk 16. In like manner, the front legs of the pair of double contact fingers 31 engage the rear side of the intermediate disk 16, and the rear legs thereof engage the front side of the rear disk 17.

The single contact finger 32 engages the rear side of the rear disk 17, and is of a width commensurate to the combined widths of each pair of double contact fingers 30 and 31. The contact finger 32 is joined with a resilient contact plate 38 by means of a conductor 39, which is embedded in the holder back 37. The contact plate 38 is fixed in position on the rear side of the latter.

A knurled operating knob 40 is secured to the outer end of the adjusting plug 8, by means of a set screw 41 or in any other suitable manner, for facilitating the operation of the device. The knob 30 is provided with an indent 40' which is disposed adjacent to the periphery thereof.

My improved locking switch is designed to adapt same for insertion into the front end of an ignition coil casing 42, as clearly illustrated in Figure 10. To secure the locking switch in position in the ignition coil casing 42, the front end of the latter is provided with a plurality of ears 43, which extend in notches 44, formed in the peripheral edge of the end plate 2, and are bent over to engage the front side of the latter.

The casing 42 and the coil contained therein, are of the usual type commonly employed in connection with the ignition system of a motor vehicle. The ignition coil is positioned directly rearward of the motor vehicle instrument panel 45 as shown in dot and dash lines in Figure 10. The panel 45 is provided with an aperture to permit the extension of the operating knob 40 forwardly of the former.

The usual ignition coil is provided with the embodied leads 46, 47 and 48, adapted for connection with the battery, gas gauge, and interrupter, respectively. When the locking switch is incorporated with the ignition coil, the contact plate 33 in connected with the battery lead 46 through the interposed primary of the ignition coil, the contact plate 33 is connected with the gas gauge lead 47, and the contact plate 35 is connected with the interrupter lead 48.

In operating my improved locking switch, the adjusting plug 8 is partially rotated in alternate directions by the manipulation of the operating knob 40. When the adjusting plug 8 is shifting in its bearing sleeve 3, the balls 11 carried thereby will engage in respective cavities 7 and impart a most pronounced and unmistakable feeling to the fingers of the operator to operate the locking switch without employing his vision in daytime or during the night-time without light.

It is evident that relative lengths of the slots 20 and 21, in the disks 15 and 16, and the position of the contact pins 23 and 24 of one of said disks with respect to contact pins of the others of said disks and relatively to the associated slots in the latter, are all factors in determining the disk adjustments required to effect the switch operation, and may be widely varied to provide a multiplicity of different operating actions. Further, the number of disks employed may obviously be increased to permit a still greater variety of operating actions.

In practice, the operation of my improved locking switch is as follows:—Assuming that the disks 15, 16 and 17 are constructed and arranged to function on the known sequential movements of four, seven and three, the knob 40 is first given one complete or more turns in the clockwise direction so that the shifting pin 22 will be at an end of the slots 20 and 21 in the disks 15 and 16, and the indent 40' will be disposed upwardly, as shown in Figure 4.

The knob 40 is now turned in the clockwise direction until the balls 11 have engaged in four consecutive cavities 7. Such engagement of the balls 11 will be readily determined by the distinct feeling in the fingers of the operator. Upon turning the knob 40, in the clockwise direction a distance of four cavities, as stated, all of the disks 15, 16 and 17 will have turned a similar distance and in the same direction, and the contact pins 23 and 24 of the front disk 15 will have been engaged by the pair of single contact fingers 29 and the front legs of the pair of double contact fingers 30.

The knob 40 is then turned in the counter clockwise direction until the balls 11 have engaged seven consecutive cavities 7. While rotating the knob 40 in such counter clockwise direction, the front disk 15 will not move, but will be held in the contacting position by the engaging contact fingers. The shifting rod 22 will shift idly in the long slot 20 in the disk 15 but will shift the intermediate disk 16, with the shorter slot 21, until the contacts 23 and 24 of said disk 16 will have been engaged by the adjacent legs of the two pairs of double contact fingers 30 and 31. The knob 40 is now again turned in the clockwise di-

rection a distance of three cavities and the contact pins **23** and **24** carried by the rear disk **17** will have been engaged by the rear legs of the pair of double contacts **31** and by the single contact finger **32**. The front and intermediate disks **15** and **16** will not move while adjusting the rear disk **17**, as same are held in their contacting positions by their engagement by respective contact fingers, and the shifting rod **22** will move idly in their slots **20** and **21**.

The locking switch is now set to complete the operating circuit, and will remain so until it is broken by the movement of the knob **40**. By turning the knob **40** to shift either of the disks **15** and **16** out of its contacting engagement, the circuit is opened and the entire process as set forth, must be repeated to again close the switch mechanism. However, by turning the knob **40** in the counter clockwise direction a distance to only disengage the contact pins **23** and **24** of the rear disk **17** from its contact fingers, the circuit may be broken, and again closed by returning the rear disk **17** to the contacting position, provided, however, that either the disks **15** and **16** has not been shifted out of contacting engagement.

Unless the combination of the required predetermined movements of the disks **15**, **16** and **17**, is known to the operator, it is impossible to operate the locking switch, and in consequence, motor vehicles equipped with my improved locking switch cannot be operated by unauthorized persons. By providing the single contact fingers **29** and the two double contact fingers **30** and **31** in pairs, it is impossible to set the switch in operative contacting engagement by wiring across the gas gauge and interrupter leads **47** and **48**, instead of adjusting the disks **15** and **16** as required.

It will here be noted that, if the gas gauge control were not embodied in the switch structure, the pairs of single and double contact fingers would not be necessary, and a corresponding series of single bridging members could be employed instead. However, as the single contact fingers **29** are not joined, it is necessary to use the arrangement disclosed to complete the circuit between the battery and the interrupter and gas gauge control elements by the use of a switch embodying the features of the present invention.

The present invention provides a most efficient device of its kind, which is conveniently operable without the use of a key, and which is most effective in preventing the unauthorized use of motor vehicles equipped therewith.

What I claim is:

In a locking switch of the character described, the combination of a supporting element; a front, intermediate and rear insulating disk revolubly supported by said element; a pair of closely spaced contact pins extending transversely through the peripheral edge margin of each of said disks; a contact holder carried by said element; a pair of single contact fingers depending from said holder and resiliently engaging the front edge margin of said front disk to contact with the contact pins carried by the latter; a pair of double contact fingers depending from said holder and resiliently engaging the edge margins of respective adjacent disks to contact with respective contact pins carried by the latter; a single contact finger depending from said holder and resiliently engaging the rear edge margin of said rear disk to contact with the contact pin carried by the latter; a plurality of contact plates carried by said holder; a pair of conductors respectively joining a pair of said contact plates with said pair of single contact fingers; and a conductor joining said single contact finger with another of said contact plates.

WILLIAM H. LEINENWEBER.