

Nov. 10, 1953

W. G. BOURNE
ELECTRIC SWITCH

2,658,962

Filed Feb. 6, 1950

4 Sheets-Sheet 1

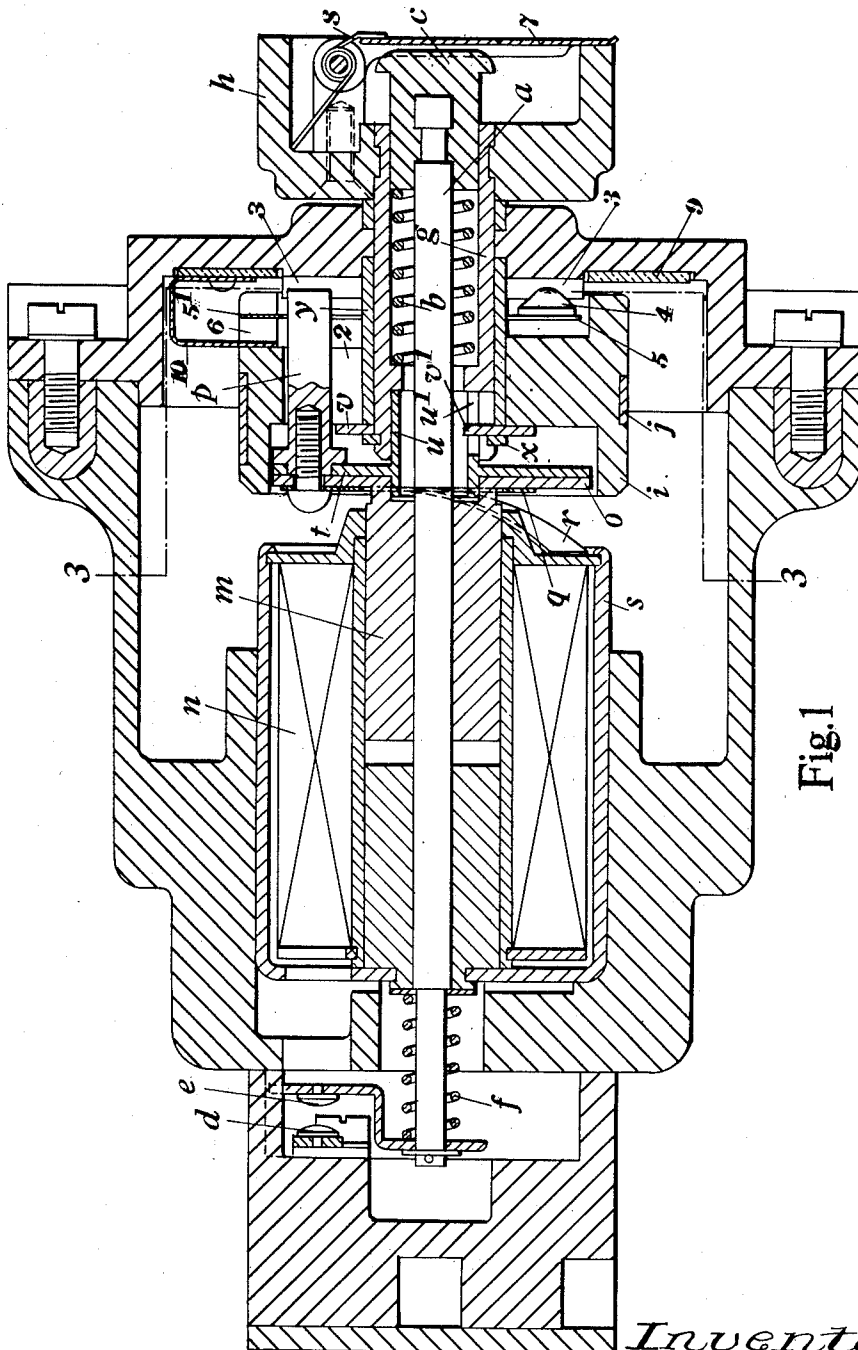


Fig. 1

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4 Sheets-Sheet 2

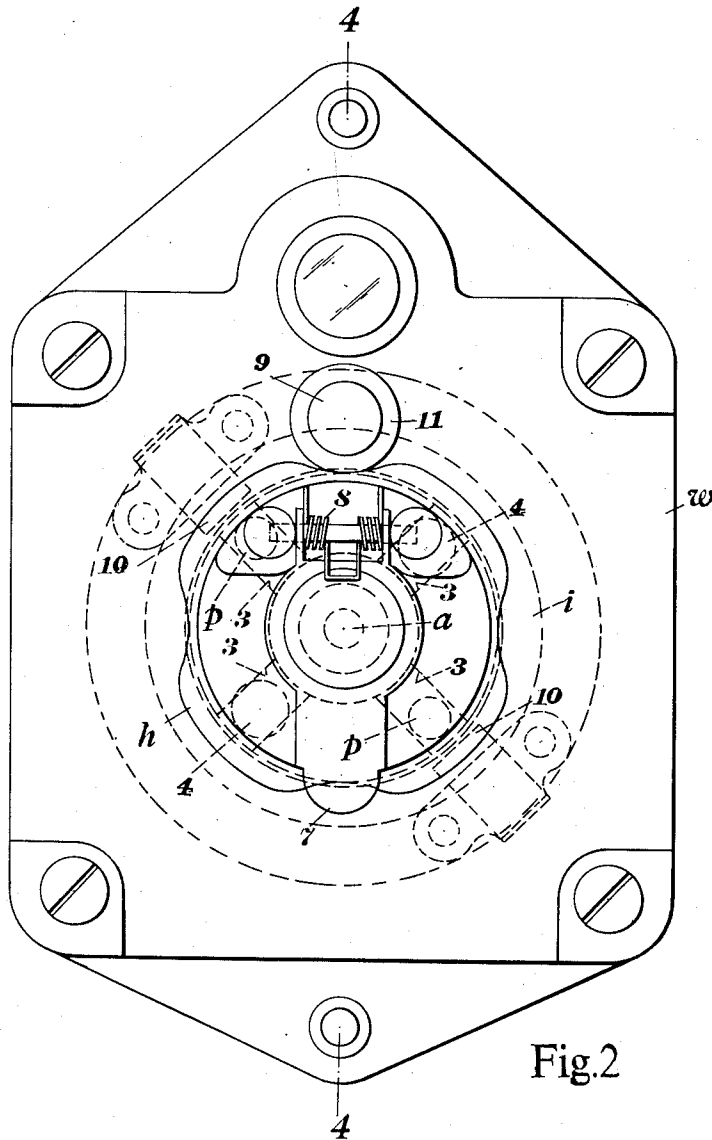


Fig. 2

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4 Sheets-Sheet 3

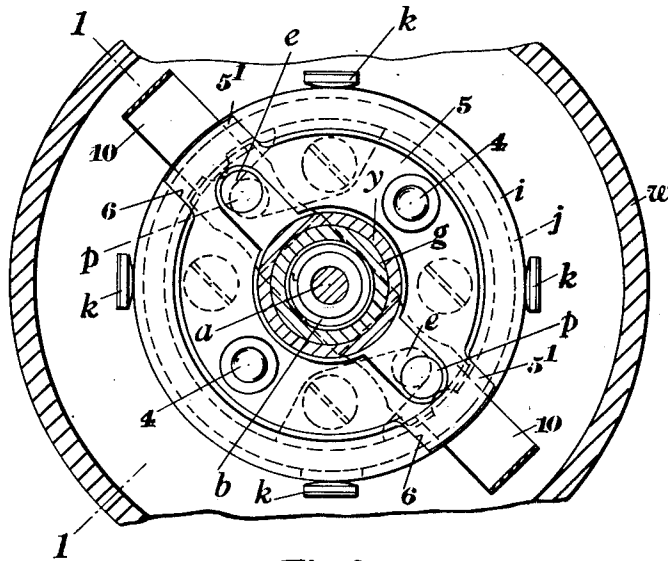


Fig.3

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4 Sheets-Sheet 4

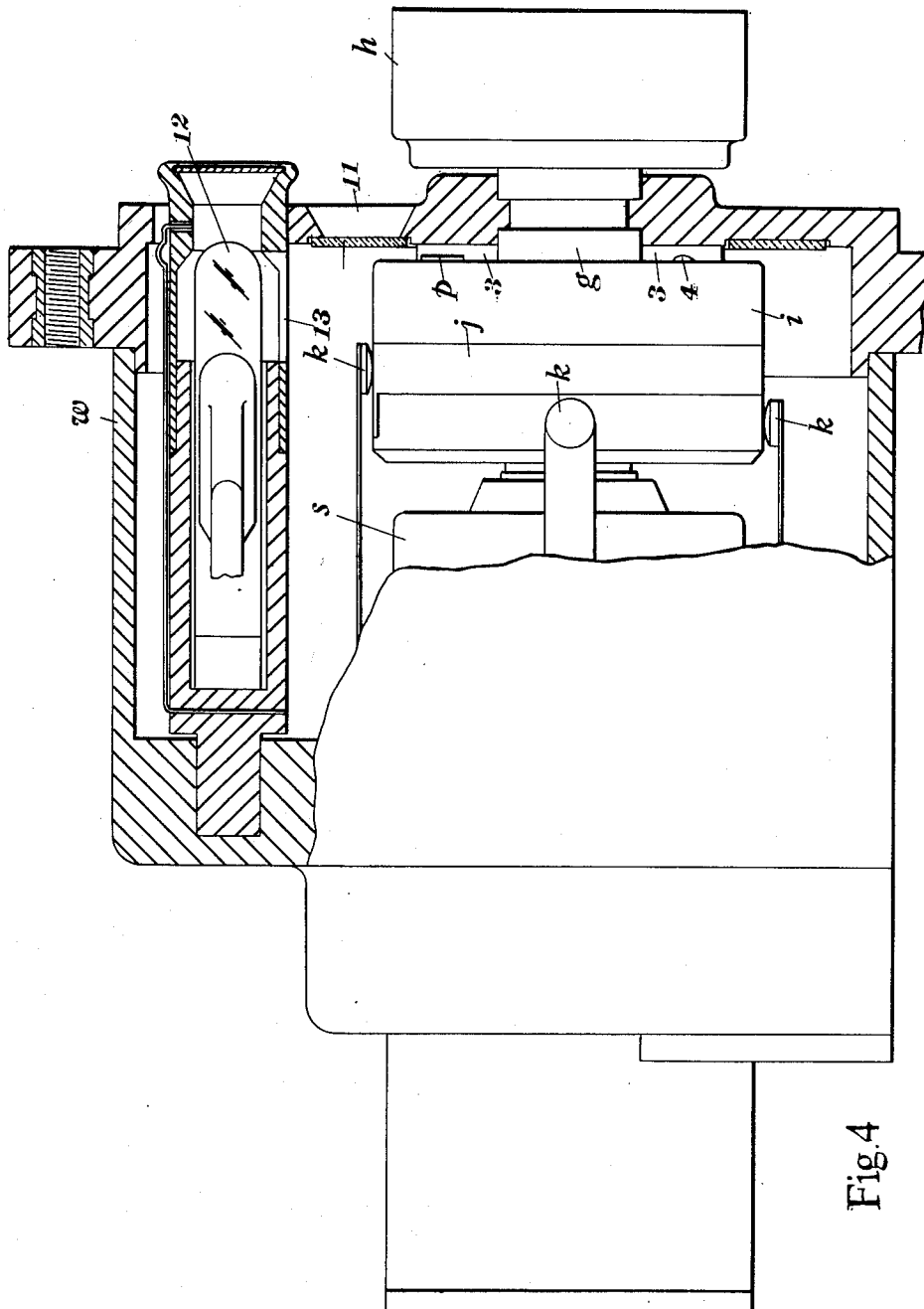


Fig. 4

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UNITED STATES PATENT OFFICE

2,658,962

ELECTRIC SWITCH

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Application February 6, 1950, Serial No. 142,661

Claims priority, application Great Britain
 February 7, 1949

3 Claims. (Cl. 200—4)

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For starting internal combustion engines, there is sometimes employed a turbine driven by gases derived from the explosion of a cartridge, two or more cartridges being provided for firing in succession in the event of a fired cartridge failing to effect the required engine starting action.

For controlling the sequence of events in the starting operation an electrically actuated timing mechanism is employed, this mechanism being under the control of a manually operable switch.

The object of the present invention is to provide an improved switch for use with an engine starting system of the kind above indicated.

In the accompanying sheets of explanatory drawings:

Figure 1 is a sectional side view of a switch constructed in accordance with the invention for the purpose indicated above.

Figure 2 is a view of the right hand end of the switch shown in Figure 1.

Figure 3 is a sectional end view taken on the line 3—3 of Figure 1, the latter being taken on the line 1—1 of Figure 3.

Figure 4 is a fragmentary sectional side view taken on the line 4—4 of Figure 2.

In carrying the invention into effect as shown, I employ a manually slidable spindle *a* which is loaded by a spring *b*, and which is provided at one end with an actuating knob *c*. The spindle *a* is adapted at its opposite end to effect the closing of contact pieces *d*, *e* in a circuit which controls the timing mechanism, the contacts *d* being fixed, and the contacts *e* being resiliently supported on the spindle by a spring *f*. At a position adjacent to the knob *c* there is rotatably mounted around the spindle *a* a sleeve *g* which is supported in a fixed tubular member *y* and which contains the spindle-loading spring *b*, the latter being arranged between a shoulder in the sleeve and the inner end of the knob *c*. Secured to the outer end of the sleeve *g* is a hollow actuating knob *h* which surrounds the knob *c* on the spindle *a*. On the member *y* is freely mounted a rotatable switch member *i* having a peripheral contact piece or pieces *j* adapted to co-operate with resiliently supported stationary contact pieces *k* for selecting the firing circuits associated with the different cartridges.

At the inner end of the switch member *i* is arranged a solenoid having a slidable and rotatable hollow core *m* mounted on the spindle *a* and surrounded by the solenoid winding *n*. On the end of the core *m* adjacent to the sleeve *g* is

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formed or secured a disc *o* carrying locking bolts *p* which extend from the side of the disc remote from the core *m* and are parallel with the axis of the spindle *a*. The core *m* is loaded by a spring in the form of a resilient plate *q* secured to the disc *o* and provided with laterally bent tongue pieces as *r* which bear against the adjacent end of a stationary casing *s* containing the solenoid winding *n*.

Secured to the side of the disc *o* from which the locking bolts *p* extend is another disc *t* having a central hollow boss *u* which is connected to the sleeve *g* by an annular plate *v* having an inwardly projecting tongue piece *v'* passing through a hole in the sleeve and a longitudinal *u'* in the boss, so that rotational movement of the sleeve is accompanied by corresponding movement of the two discs. The annular plate *v* is secured between a split ring *x* engaging a peripheral groove on the sleeve *g* and the inner end of the fixed tubular member *y* by which the sleeve is supported, the outer end of the tubular member being secured in a central hole in the adjacent end of a housing *w* enclosing the greater part of the switch mechanism above described.

The locking bolts *p* pass through slots 2 in the rotatable switch member *i*, and are adapted at their outer ends to engage grooves or other recesses 3 in the adjacent end of the housing *w* under the action of the spring *q*, *r* above mentioned. Four such recesses are arranged at 90 degrees apart around the axis of the rotatable switch member *i*, and the outer ends of the locking bolts *p* can engage either diagonally opposite pair of these recesses. To prevent accidental rotational movement of the switch member *i* when the locking bolts *p* are withdrawn from the adjacent pair of recesses 3, the other pair are engaged by detents 4 on a resilient metal disc 5 of annular form, this disc being formed with outwardly extending projections 5' which extend into and are supported by shoulders in slots 6 formed in the adjacent end of the switch member.

Normally the outer ends of the locking bolts *p* engage a pair of the recesses 3 in the housing *w* as above described, and so prevent movement of the rotatable switch member *i*, by the associated knob *h*. When the winding *n* of the solenoid is energised under the control of the timing mechanism, the core *m* is actuated to retract the locking bolts *p*, and the attendant can then actuate the knob *h* to turn the rotatable switch member *i* through the medium of the locking bolts for

selecting the cartridge to be fired, preparatory to actuating the spindle *a* by pressing on the knob *c* for closing the contacts *d*, *e* and thereby causing the selected cartridge to be fired.

Preferably the outer end of the knob *c* is covered by a pivotal and spring loaded cover piece *7* which is carried by the hollow knob *h* and requires to be lifted against the action of its loading spring *8* to expose the knob *c* for actuation.

For enabling the attendant to determine the positions required to be occupied by the rotatable switch member *i* for selecting the firing circuits, an annular disc *9* of transparent or translucent material is mounted in a recess in the inner side of the end of the housing *w* adjacent to the knob *h*, and is adapted to be rotated by the switch member *i* through the agency of bent resilient metal strips *10* which at one end are secured to the disc and at the other end are situated in the inner ends of the slots *5* in the switch member. Also the disc *9* is provided with markings which indicate the various positions of the switch member *i*, and which are successively visible through an opening *11* in the adjacent end of the housing *w* during rotation of the disc with the switch member. Moreover, there is mounted in one side of the housing *w* a lamp *12* having a side opening *13* through which the part of the disc *9* exposed by the opening *11* can be illuminated.

By this invention a switch for the purpose specified is provided in a simple and compact form.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. An electric switch for the purpose described comprising, in combination, a housing, a first switch member rotatably mounted within the housing and carrying contact means adapted to co-operate with a plurality of fixed contact means in the housing, a manually operable rotatable member located outside the housing coaxial with the first switch member and operatively connected therewith for rotating the said switch member for selecting a desired firing circuit, spring-loaded locking plunger means mounted for movement parallel with the axis of rotation of the first switch member and extending through openings in said switch member to engage recesses in the housing under spring loading to lock the said switch member against rotation, a second switch member longitudinally slidable coaxially with the rotatable switch member and carrying contact means adapted to co-operate with fixed contact means in the housing for controlling a timing mechanism circuit, a manually operable member located in a recess in said manually rotatable member and disposed coaxially therewith for imparting longitudinal displacement to said longitudinally slidable switch member, a solenoid disposed coaxially with respect to the rotatable and slidable switch members, a movable core for said solenoid slidable upon said longitudinally slidable switch member, and an operative connection between said movable core and said locking plunger means for withdrawing the plunger means from locking position when the solenoid is energised under the control of the timing mechanism, whereby operation of the longitudinally slidable switch member after selection of the de-

sired circuit causes the rotatable switch member to be locked against rotation to prevent operation thereof until after the selected firing circuit has been closed.

2. An electric switch for the purpose described comprising, in combination, a housing, a first switch member rotatably mounted within the housing and carrying contact means adapted to co-operate with a plurality of fixed contact means in the housing, a manually operable and rotatable hollow knob located outside the housing coaxial with the first switch member and operatively connected therewith for rotating the said switch member for selecting a desired firing circuit, spring-loaded locking plunger means mounted for movement parallel with the axis of rotation of the first switch member and extending through openings in said switch member to engage recesses in the housing under spring loading to lock the said switch member against rotation, a second switch member longitudinally slidable coaxially with the rotatable switch member and carrying contact means adapted to co-operate with fixed contact means in the housing for controlling a timing mechanism circuit, a manually operable press knob located within the hollow of the manually rotatable knob and disposed coaxially therewith, said press knob being connected to the longitudinally slidable switch member for actuating the latter, a solenoid disposed coaxially with respect to the rotatable and slidable switch members, a movable core for said solenoid slidable upon said longitudinally slidable switch member, an operative connection between said movable core and said locking plunger means for withdrawing the plunger means from locking position when the solenoid is energised under the control of the timing mechanism, and spring-loaded detents carried by the rotatable switch member and engageable in recesses in the housing for preventing accidental rotational movement of said switch member when the locking plunger means are withdrawn, whereby operation of the longitudinally slidable switch member after selection of the desired circuit causes the rotatable switch member to be locked against rotation to prevent operation thereof until after the selected firing circuit has been closed.

3. An electric switch according to claim 2 in which the manually rotatable hollow knob is provided with a pivotally mounted and spring-loaded cover which must be lifted to enable the press knob to be operated.

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