May 27, 1930. A. A. KENT 1,760,145

IGNITION TIMING APPARATUS

Filed Jan. 19, 1922 2 Sheets-Sheet 1

Fig. 1.

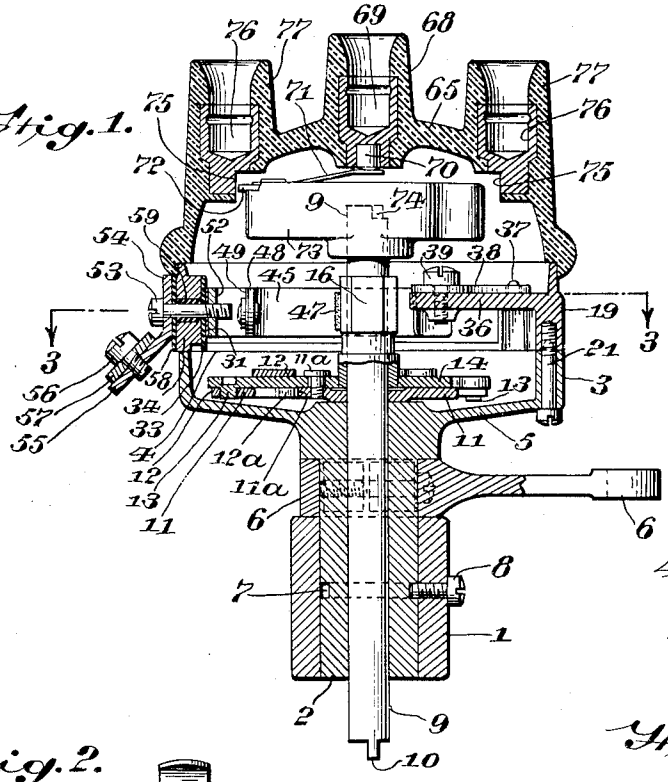


Fig. 8.

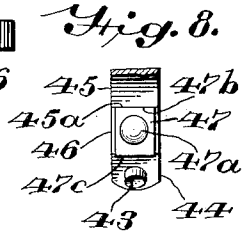


Fig. 2.

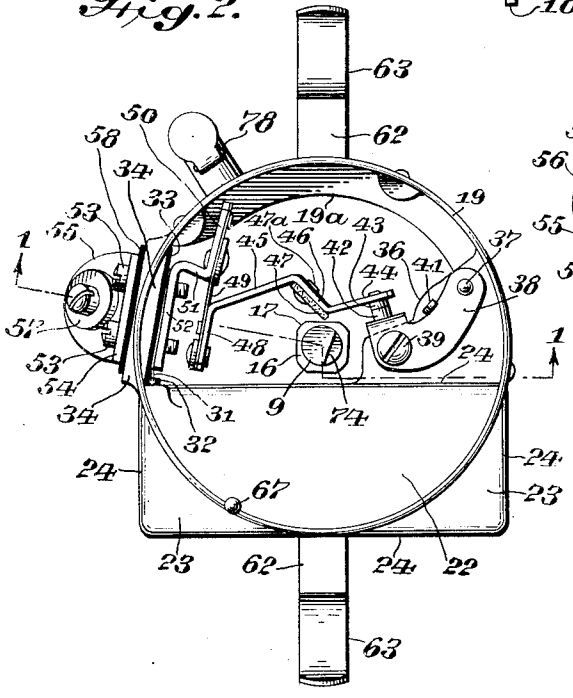
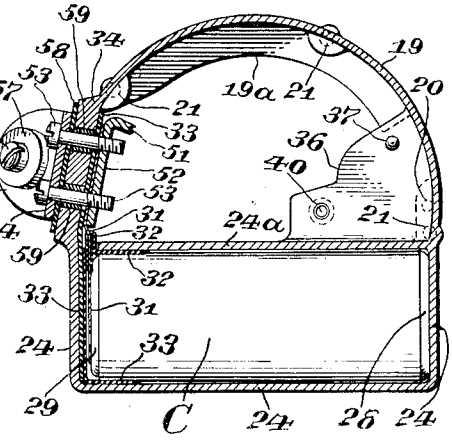


Fig. 3.



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IGNITION TIMING APPARATUS

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Fig. 4.

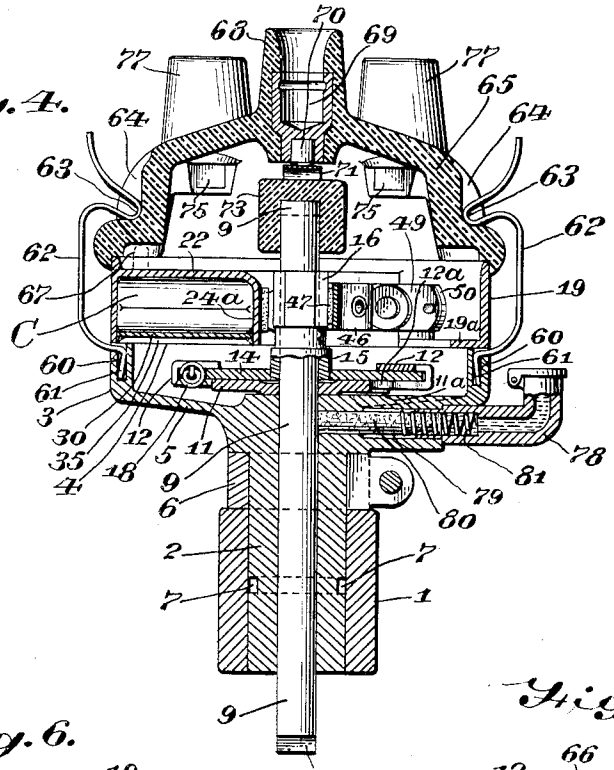


Fig. 6.

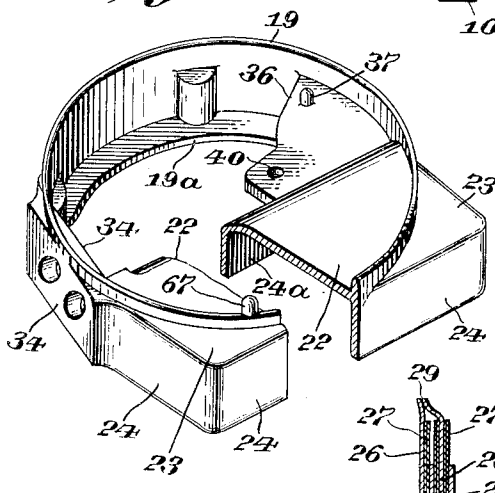


Fig. 5.

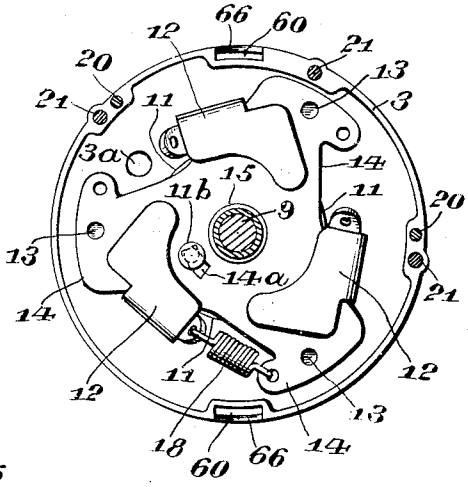
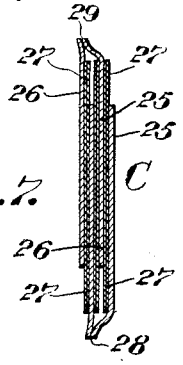


Fig. 7.



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UNITED STATES PATENT OFFICE

ARTHUR ATWATER KENT, OF ARDMORE, PENNSYLVANIA

IGNITION-TIMING APPARATUS

Application filed January 19, 1922. Serial No. 530,265.

My invention relates to means for controlling or timing the electrical ignition for the charges of internal combustion engines.

A feature of my invention comprises a casing, or an element or member of a casing, enclosing the ignition controlling or timing means, provided with an externally protruding structure for receiving, holding or enclosing the condenser.

A further feature of my invention comprises a casing, or an element or member of a casing, preferably consisting of a die casting, enclosing the ignition controlling or timing means, which supports the timer or interrupter contacts and serving also to house or enclose the condenser.

A further feature of my invention comprises a casing or housing member, for enclosing ignition controlling or timing means, of circular or other similar regular form and having an externally protruding portion.

A further feature of my invention comprises casing or housing members for a governor and circuit controlling elements superposed one upon the other, one enclosing the governor and the other the circuit controlling elements, the latter provided with structure for holding or housing the condenser.

A further feature of my invention comprises provision between the aforesaid superposed casing or housing members of a space for ventilating purposes.

A further feature of my invention resides in the positioning of the condenser with respect to one of the housing or casing members for providing a ventilating space or passage.

Further features of my invention reside in terminal structure and the structure of the movable contact arm and its supporting means.

A further feature of my invention resides in means for clamping or hooking a distributor cap to a housing or casing member, the hook or clamp being held or retained, without pivotal structure, between housing or casing members.

My invention resides in features of structure and combination hereinafter described and claimed.

For an illustration of one of the various forms my invention may take, reference is to be had to the accompanying drawings, in which:

Fig. 1 is a vertical sectional view taken on the line 1—1 of Fig. 2.

Fig. 2 is a top plan view of part of the structure shown in Fig. 1, with the distributor cap and distributor removed.

Fig. 3 is a fragmentary sectional view taken on the line 3—3 of Fig. 1.

Fig. 4 is a vertical sectional view taken substantially at right angles to Fig. 1.

Fig. 5 is a top plan view, partly in section, of the governor and its housing member.

Fig. 6 is a perspective view of the upper housing or casing member.

Fig. 7 is a fragmentary sectional view illustrating one form of condenser which is utilizable in my apparatus.

Fig. 8 is a side view of part of the movable contact arm.

Referring to the drawings, 1 is any suitable support in which is rotatable the hub 2 secured to or integral with the lower casing or housing member 3, preferably of circular or other regular form or contour, open at its top at 4 and having the bottom wall 5. Clamped to the hub 2 is the lever 6 for rotating the casing 3 and parts movable therewith for advancing or retarding ignition. The hub or neck 2 has a circumferentially extending groove 7 in which engages the end of a screw 8 threaded through the support 1, for preventing longitudinal movement of the hub 2 and the parts movable therewith.

Extending through the hub 2 and having a bearing therein is the rotatable shaft 9 driven in any suitable way by the engine whose ignition is to be controlled; in the

example illustrated, the shaft is provided with the tongue 10, which engages with suitable driving means rotating in definite relation with respect to the crank shaft of the engine, as for example, at half crank shaft speed.

This shaft is preferably, as indicated, of constant diameter throughout its length, and may be made of a blank of round bar stock the shaft preferably being of blank diameter throughout its length, as distinguished from a shaft machined or turned from a blank and as distinguished from a shaft of less diameter than the blank from which formed.

Within the housing member 4 there is secured upon the shaft 9, as by frictional engagement, pressing or shrinking, the lower governor plate 11 having recesses 11^a in which engage lugs 12^a on weight members 12 pivoted at 13 to the upper governor plate 14 shrunk or otherwise secured upon the cam sleeve 15, upon or integral with which is the cam 16 having as many points or surfaces 17 of maximum diameter as there are cylinders or combustion chambers in the engine. The plate 14, member 15 and cam 16 are freely rotatable or angularly movable with respect to or upon the shaft 9 under centrifugal force exerted by the weights 12 in opposition to one or more springs 18. The angular movement of the cam about the shaft 9 is limited by the headed pin 11^b or equivalent, secured to the governor plate 11 and extending through a slot 14^a in the plate 14.

The cam 16 is disposed above the lower housing or casing member 3 within the upper or intermediate casing or housing member 19, preferably a die casting, which is in part at least of circular or other form corresponding with the outline or form of the lower housing or casing member 3, and having an inwardly extending flange 19^a. The member 19 has integral therewith on its lower edge one or more dowels 20, Fig. 5, registering in holes in the upper edge of the casing member 3, for properly positioning the casing members 19 and 3 with respect to each other. The casing members 3 and 19 are secured or held to each other by screws 21 extending upwardly through the member 3 and threading into the lower side of the member 19.

Formed preferably integral with the member 19 is the condenser housing or holder 22, disposed in part or mainly within the circular or other contour of the member 19 and having the externally protruding portions 23, the portions 22 and 23 being of generally rectangular or oblong shape and forming one wall of a similarly shaped condenser receptacle having the downwardly extending walls 24, 24^a, preferably terminating at the same level with the lower edge of casing 19 whose upper edge rises above the top wall 22, 23 of the condenser housing. The condenser holder is in effect a cup or box-shaped structure open on the lower side and adapted to receive a condenser of stacked, rolled or other type. In the example illustrated, the condenser C is a rolled condenser, and preferably that type of rolled condenser illustrated in Fig. 7 as comprising a roll of separated tin foil ribbons 25 and 26 separated by dielectric material, such as waxed paper 27 or equivalent. In the example illustrated, and as preferred, the ribbons of foil extend laterally beyond the edges of the dielectric ribbons and are brought together at 28 and 29 by folding, rolling or otherwise working or soldering the foil edges together, thereby forming the condenser terminals, one of which, as 28, Fig. 3, makes electrical connection with the condenser housing by mere contact therewith or by soldering thereto, or by contacting with or soldering to the cover plate 30, Fig. 4, which is applied after placing the condenser C in its housing. Preferably pressure is applied to the cover plate 30 to compress the condenser C, and while compressed the cover plate is secured in position, as by soldering around its edges to the condenser housing. The other condenser terminal, as 29, Fig. 3, is insulated from the housing and connected to a conducting strip 31, which extends through a slit in and at the left end of the inner housing wall 24^a, Fig. 3. There also extends through the slit a piece of insulation 32, which is disposed between the condenser and the inner side of the wall 24^a. On the opposite side of the strip 31 is disposed a strip of insulating material 33, which also extends through the slit and lies against the flat boss 34 of the side wall of the casing member 19 and between it and the conducting strip 31.

The condenser C is disposed flatwise, that is, its thickness, measured in a direction parallel with the shaft 9, is relatively small, less than its width as viewed in Fig. 4, thereby economizing space in a direction longitudinally of the shaft 9.

As indicated in Fig. 4, the cover or plate 30 is disposed above the joint between the casing members 3 and 19, thereby forming a passage or gap 35 where the plate 30 extends over the upper edge of the member 3, this gap affording ventilation for the interior of the casing structure as a whole, allowing escape of nitrous oxide or other gas and preventing accumulation of such gas as might induce corrosion or other undesired effect. The ventilation may be increased by provision of an aperture, as 3^a, Fig. 5, in the bottom 5 of the casing 3, it being understood, however, that such aperture may be dispensed with.

Inside of the casing member 19 is a web or plate 36, serving as a support for the stationary contact 42, and preferably cast in-

tegral with the casing 19 or the wall 24ª of the condenser housing, or, as illustrated, integral with both. Upon the member 36, preferably cast integral therewith, is the pivot 37, upon which is pivoted the arm 38 having a slot through which extends the screw 39 threaded into the member 36 at 40 for clamping the arm 38 to the web 36 in any suitable position to which it is adjusted about the pivot 37. On the lever 38 is a lug 41 serving as a handle or means for imparting adjusting movement to the lever 38. Carried by the lever 38 is the stationary timer or interrupter contact 42, with which co-acts the movable interrupter contact 43 carried adjacent the end of the portion 44 of the movable contact arm 45, the portion 44 being offset from and substantially parallel with the arm 45, the connecting portion 46 extending at a substantial angle to the arm 45 and having secured flatwise to it the cam follower shoe 47, of any suitable material, as fibre or fabric, threads or groups of fibres impregnated with condensite, bakelite or equivalent material. Offset from the arm 45 at a relatively great angle thereto and integral therewith is the projection or abutment 48, secured to the leaf spring 49, which at its other end is secured to the bracket abutment 50, offset by the portion 51 integral with the supporting or bracket member 52 contacting with the condenser lead 31 and held in position by the screws 53 passing through the terminal plate 54, having the outwardly inclined extension 55, into which is threaded the binding screw 56 which is adapted to hold to the member 55 under the washer 57 a conductor forming part of the primary circuit of the ignition producing induction coil. The binding plate 54 is insulated from the casing 19 by a strip 58, and the screws 53 are insulated from the casing 19 by insulating bushings 59 disposed in the holes through the member 34.

In slots or narrow pockets 60 in the upper edge of the casing member 3 are disposed the loosely fitting lower ends 61, seen edgewise in Fig. 4, of the spring clamping or hook members 62 of flat strip steel of suitable width having the hooks or projections 63 engaging in depressions 64 in the distributor cap 65, held by the hook members upon the casing member 19. At the upper ends of the pockets 60 the outer wall of the casing member 3 is recessed or cut away at 66 to provide space for the hook members beneath the lower edge of the casing 19. By this construction the hook members may move laterally, as viewed in Fig. 4, away from the cap 65, the movement being equivalent to a pivotal movement, without need, however, for pivotal structure. The width of the pocket 60 measured circumferentially of the casing 3 is somewhat greater than the width of the end 61, as viewed from the right or left of Fig. 4, of the hook member 62, whereby such hook member is prevented from dropping or moving in a direction normal to the sheet of the drawing, that is, is prevented from moving any material distance toward the right or the left when viewed from either side of Fig. 4. The end 61, as above described, when in the pocket 60, is in effect disposed in a space between two members, the inner and outer walls of the pocket 60, which engage on opposite sides of the hook member, allowing freedom of movement to move the projection 63 toward or away from the cap 65.

The cap 65 is preferably molded of condensite, bakelite or equivalent material, and has its lower edge formed to abut against the upper edge of the casing member 19 and to partially embrace the casing 19. The cap 65 is properly positioned upon the casing 19 by the lug 67, preferably wholly within the outer surface of casing 19 and of a thickness greater than the thickness of casing 19, and preferably molded integral with condenser housing wall 22 and the casing 19 and engaging in an aperture in the lower edge of the cap 65.

The cap is provided with a central boss 68 within which is disposed a metallic insert 69 provided with a contact 70, with which engages the contact spring 71 contacting with the distributor terminal 72, both secured to and rotating with the distributor block 73, preferably of molded insulating material, having an aperture in which is received the upper end of the shaft 9, which is suitably formed at 74 to positively rotate the arm 73.

The terminal 72 rotates past terminals 75 integral with the metallic inserts 76 in the bosses 77 on the cap 65.

As well understood in the art, the cam 16 operates the movable contact arm 45 to effect periodic engagement and separation of the contacts 43 and 42, there being produced in the induction coil secondary a high tension impulse at each separation of the contacts, and the resultant high tension current is conducted by cable, not shown, to the insert 69, and thence passes to the spring 71 and terminal 72 to that one of the terminals 75 to which it is opposite at the moment, the inserts 76 being connected by cables, not shown, with the spark plugs of the several cylinders of the engine.

Lubrication for the shaft 9 in its bearing may be provided in any suitable way. In the example illustrated, there is provided an oil cup 78 communicating with a bore 79 in the casing structure 3, a wick or the like 80 delivering oil to the shaft bearing, a spring 81 being provided to hold the wick against the shaft.

From the foregoing description it will be apparent that the stationary interrupter contact 42 is in electrical communication with the metallic parts of the casing structure and

its support, and may be grounded through said parts. The movable interrupter contact 43 is in electrical communication with the binding post 56 and through it with the primary circuit of the induction coil including generally the source of energy and the primary winding of the induction coil. However, it will be understood that my invention is not limited to this mode of connecting the contacts, except where so expressly stated in the appended claims. The condenser C is by the connections described disposed in shunt to the interrupter contacts 42 and 43.

As shown in Figs. 2 and 8, the cam follower shoe 47, preferably in the form of a sheet or plate, is secured to the portion 46 of the movable contact arm 45 by a single rivet or screw 47^a, the shoe 47 being prevented from turning upon the rivet or screw 47^a by having its one edge, as 47^b, disposed at the angle or juncture 45^a between the arm 45 and its portion 46, whereby the cam-engaging edge 47^c of the shoe 47 is always maintained in correct position.

What I claim is:

1. In ignition timing apparatus, the combination with a casing, of a condenser housing integral therewith, an interrupter contact supported on the inner side wall of said casing, a member integral with said housing, and a second contact co-acting with said contact and carried by said member.

2. Ignition timing structure comprising a governor casing, a second separate casing superposed thereon, ignition timing contacts controlled by said governor and carried by and within said second casing, a distributor cap superposed upon said second casing, and cap-holding structure engaging said governor casing and extending across said superposed casing into holding engagement with said cap.

3. Ignition timing apparatus comprising a circular casing a portion of whose side wall is flat, a condenser housing in said casing, a wall of said housing having a slot adjacent said flat portion of said casing wall, a condenser connection extending through said slot, and a support for a timer contact secured to said flat portion of said wall and there engaging said condenser connection.

4. Ignition timing apparatus comprising superposed casing members, one of them having a pocket, a clamping member having its end disposed and freely movable in said pocket, the other of said casing members confining said clamping member in said pocket.

5. Ignition timing apparatus comprising superposed casing members, one of them having a pocket, a clamping member having its end disposed and freely movable in said pocket, the other of said casing members confining said clamping member in said pocket, and a distributor cap surmounting said other casing member and held thereto by said clamping member.

6. Ignition timing apparatus comprising a distributor cap, a support therefor, a clamping member for holding said cap, and members on said support spaced apart from each other and disposed on opposite sides of said clamping member for permitting movement of said clamping member toward and away from said cap.

7. Ignition timing apparatus comprising a distributor cap, a support therefor, a clamping member for holding said cap, and members on said support spaced apart from each other and disposed on opposite sides of said clamping member for permitting movement of said clamping member toward and away from said cap and confining said clamping member to said movement toward and away from said cap.

8. Ignition timing structure comprising a lever arm, an interrupter contact carried thereby, said arm having at one end a lateral projection, a supporting member having an offset portion extending substantially parallel thereto, and a leaf spring secured flatwise to said lateral projection and to said offset portion.

9. Ignition timing structure, comprising an arm, a cam engaging shoe in the form of a plate, a single fastening device holding said shoe flatwise to said arm, and means preventing rotation of said shoe about said fastening device.

10. Ignition timing structure comprising an arm, a member extending at an angle thereto, a cam-engaging shoe, and a single fastening device holding said shoe to said member, said shoe having an edge adjacent said arm, whereby said shoe is prevented from rotating with respect to said fastening device.

11. Ignition timing structure comprising a flat arm having a flat portion extending at an angle thereto, a cam-engaging shoe in the form of a plate, and a single rivet securing said shoe flatwise to said portion of said arm, said shoe having an edge adjacent the intersection of the planes of said arm and its said portion, whereby said shoe is prevented from rotating upon said rivet.

12. Ignition timing structure comprising an arm having a contact-carrying portion, a second portion joining said contact-carrying portion to said arm and disposed at an angle with respect to said arm and said first named portion, a cam-engaging shoe, and a single fastening device securing said shoe flatwise to said second portion, said shoe adapted to engage a cam at its edge adjacent the juncture of said first and second named portions, said shoe having an edge adjacent the juncture of said arm and said second named portion, whereby said shoe is prevented from rotation upon said fastening device.

13. Ignition timing apparatus comprising a casing, a governor therein, a second casing detachably secured to said governor casing, co-acting timer contacts in said second casing, the movable interrupter contact secured upon a side wall of said second casing, and a distributor cap superimposed upon said second casing.

In testimony whereof I have hereunto affixed my signature this 18th day of January, 1922.

ARTHUR ATWATER KENT.