May 12, 1953 F. NELSON 2,638,515

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Filed Sept. 15, 1951 2 Sheets-Sheet 1

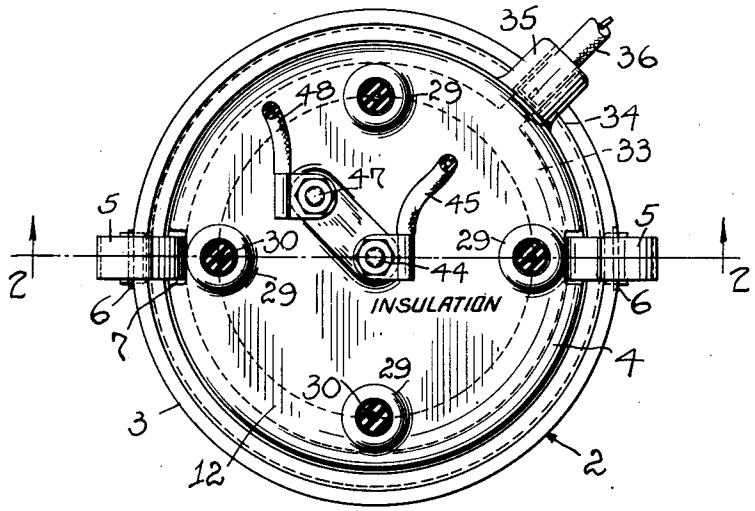


FIG. 1

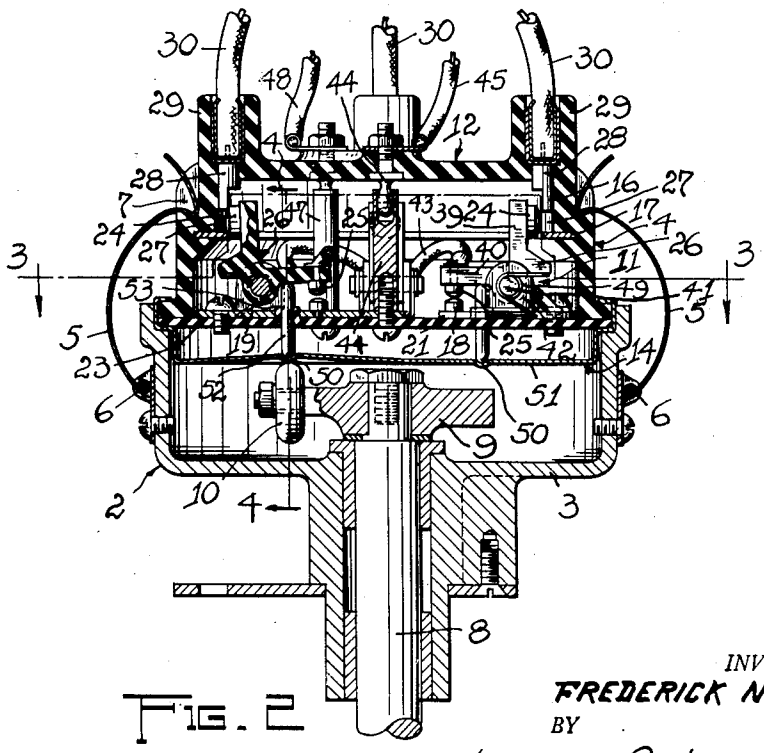


FIG. 2

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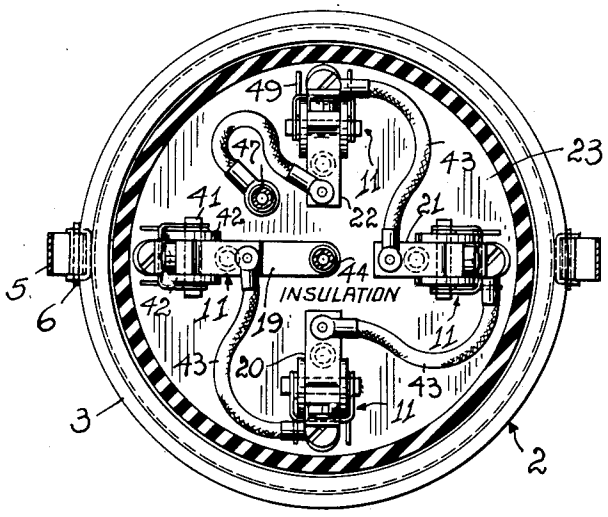


FIG. 3

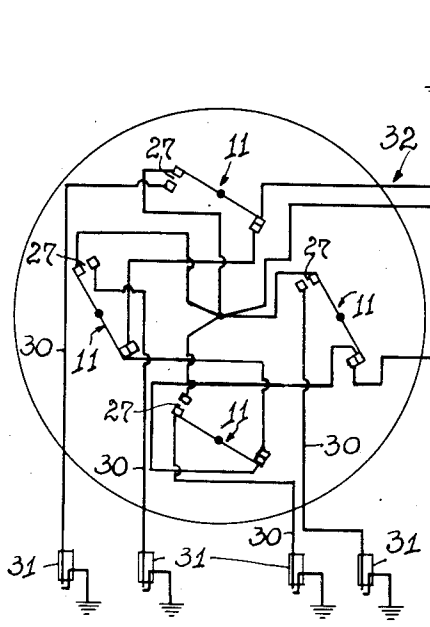


FIG. 5

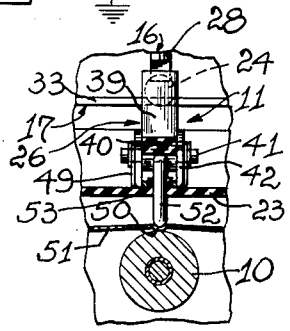


FIG. 4

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Application September 15, 1951, Serial No. 246,793

8 Claims. (Cl. 200—27)

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This invention relates to circuit-controlling mechanism of the type used to control the circuits of ignition distributing systems for internal combustion engines and various other forms of electrical apparatus.

The primary object of the invention is the provision of a circuit-controlling mechanism constructed to include mechanically-operable switch means arranged in a fluid-tightly sealed chamber, and shiftable, mechanical operating means for said switch means arranged outside of said chamber in contact with the outside of a resilient wall thereof, the wall to actuate, in cooperation with said mechanical operating means, the switch means when said mechanical operating means are shifted to predetermined positions.

Another object of the invention is the provision of a circuit-controlling mechanism constructed to include mechanically operable switch means for controlling a plurality of circuits which are arranged in a fluid-tightly sealed chamber, and shiftable, mechanical operating means for said switch means located outside of said chamber and shiftably mounted with respect thereto while in contact with a resilient wall thereof, the wall being formed on its outer surface with protuberances positioned to cooperate with the mechanical operating means in actuating the switch means when the mechanical operating means are shifted to predetermined positions.

A further object of the invention is the provision of a circuit-controlling mechanism of the type described above in which the fluid-tightly sealed chamber has substantially cylindrical shape and a bottom wall in the form of a flexible diaphragm including in predetermined areas protuberances, and in which the switch means by shiftable means are coupled with the predetermined areas of the diaphragm to effect by inward shifting of such predetermined areas actuation of the switch means when the mechanical operating means are shifted to predetermined positions.

Still other objects and novel features of construction, combination and relation of parts by which the objects in view have been attained will appear and are set forth in detail in the course of the following specification. The drawings accompanying and forming part of the specification illustrate a certain practical embodiment of the invention, but it will be apparent as the specification proceeds that the structure may be modified and changed in various ways without departure from the true spirit and broad scope of the invention.

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In the drawings:

Fig. 1 is a plan view of an ignition distributor for a four-cylinder internal combustion engine, which distributor embodies a mechanical, circuit-controlling mechanism constructed in accordance with the invention;

Fig. 2 is a vertical sectional view through the distributor shown in Fig. 1, the section being taken on line 2—2 of Fig. 1;

Fig. 3 is a horizontal sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is a vertical sectional view taken on line 4—4 of Fig. 2; and

Fig. 5 is a diagram showing the hook-up of the distributor with the four cylinder internal combustion engine.

Referring now more particularly to the exemplified form of the invention shown in the drawings, reference numeral 2 denotes a distributor for a four-cylinder internal combustion engine. Distributor 2 includes a cup-shaped metal base 3 and a fluid-tightly sealed head or chamber portion 4 removably seated on base 3 and securely held thereon by spring clips 5 hinged to base 3 at 6 and resiliently engaged with recessed seats 7 on chamber portion 4. The cup-shaped metal base 3 has freely rotatably extended therethrough a timer drive shaft 8 which has secured to its inner end a counter-balanced crank arm 9 mounting at one end a roller 10 contacting the bottom wall of chamber portion 4 adapted to be shifted by rotation of timer drive shaft 8 toward and away from proximity to four double switches 11 which are arranged in chamber portion 4 and fluid-tightly sealed therein, all as will be described hereinafter.

Chamber portion 4 is designed for use with a four-cylinder engine and embodies a cup-shaped upper portion 12 of insulating material and a recessed diaphragm-like metal portion 14 opposite the open end thereof. The chamber portion 4 mounts fluid-tightly sealed therein, in equiangular relation with respect to each other, the four double switches 11, each of which includes two stationary contact members 16, 17 mounted in the insulated upper portion 12 of chamber portion 4, a single contact member 18 mounted on the respective one of individual metal brackets 19, 20, 21 and 22, all of which are seated on a disk 23 of insulating material, and two shiftable contact members 24, 25 supported by a tiltably mounted bridge member 26 of the respective switch 11.

There are four stationary contact members 16, one for each of the four double switches 11 and a single stationary contact member 17 spaced from contact members 16 to form therewith spark gaps 27. Each of contact members 16 consists of a connecting post 28 extended into the respective one of four tubular extensions 29 of chamber portion 4, which extensions seat high tension wires 30 connecting the respective spark plugs 31 of the ignition circuit 32 with contact members 16. The contact member 17 consists of a metal ring 33 including an angularly offset arm 34 extended into a tubular extension 35 of chamber portion 4, which extension seats a high tension wire 36 connecting the secondary winding 37 of ignition coil 38 with contact member 17.

There are four single stationary contact members 18, one for each switch 11, and these contact members are individually supported on the four metal brackets 19, 20, 21 and 22 mounted in insulated relation with respect to each other on disk 23.

There are also four shiftable contact members 24 and four shiftable contact members 25, each switch 11 including one contact member 24 and one contact member 25 and has these contact members mounted on tiltable bridge member 26 which is of angular shape and made of insulating material. The bridge members have mounted on their one arms 39 contact members 24 to bridge the respective spark gap 27 when these bridge members are in predetermined position and on their other arms 40 contact members 25 aligned for engagement with the respective stationary contact members 18 when bridge members 26 are in other predetermined positions. Each bridge member is supported on a shaft 41 which is freely rotatably mounted in perforated ear portions 42 of the respective brackets 19, 20, 21 and 22. These brackets have the contact members 18, which are mounted thereon, electrically connected with the respective shiftable contact members 25 of adjoining switches 11, wires 43 effecting the connection in such a manner that in predetermined positions of bridge members 26 the shiftable contact members 25 thereof are connected in series with the stationary contact members 18 to form a connection readily interruptable by shifting of any one of bridge members 26 from one position to another position. Bracket member 19 is electrically connected to a contact post 44 extended outside of chamber portion 4 and connected by a wire 45 with the primary winding 46 of ignition coil 38, and bracket member 22 is electrically connected to a contact post 47 extended outside of chamber portion 4 and connected by a wire 48 to ground (see Fig. 5).

The switches 11 have their bridge members 26 yieldably tilted inwardly by coil springs 49 so that shiftable contact members 25 engage stationary contacts 18 and close the primary winding 46 of ignition coil 38. Tilting of bridge members 26 in an opposite direction to open the primary winding 46 of ignition coil 38 is effected when roller 10 engages protuberances 50 outwardly extended from the yielding bottom wall 51 of chamber portion 4. These protuberances are arranged in equiangular relation with respect to each other in alignment and opposite to the arms 40 of bridge members 26, which arms are mechanically coupled with protuberances 50 by elongated pins 52 slidably extended through bores 53 in disk 23 and brackets 19, 20, 21 and 22, respectively, the pins engaging with their opposite ends the bottom wall 51 and arms 40.

In operation the distributor is connected to the ignition circuit by connecting the high tension wires 30 to the spark plugs 31, the high tension wire 36 to the secondary winding 37 of the ignition coil 38, the wire 45 to the primary winding 46 of the ignition coil and the wire 48 to the ground, all as diagrammatically shown in Fig. 5. When thus connected, rotation of timer drive shaft 8 successively places roller 10 into engagement with the protuberances 50, effects successive inward shifting of local areas of yielding bottom wall 51, and therewith successive tilting of bridge members 26. Tilting of these bridge members in opposite directions in the manner described and by coil springs 49 effects successive opening and closing of the primary winding 46 of the ignition coil circuit and successive opening and closing of the secondary winding 37 of the ignition circuit for proper timed firing of spark plugs 31 connected therewith.

Having thus described my invention, what I claim is:

1. In a mechanically operated switching device a fluid-tightly sealed housing including a yielding wall portion, a plurality of groups of stationary contact means arranged in said housing and embodying electrical connecting means extended outside of said housing, tiltable bridge-like contact means in said housing arranged to electrically connect in predetermined tilting positions stationary contact means of one of said groups and in other tilting positions stationary contact means of another one of said groups, means in said housing coupling its yielding wall portion with said tiltable, bridge-like contact means, and shiftable means outside of said housing arranged adjacent to the yielding wall portion thereof and adapted to shift a local area of said wall portion inwardly to effect by said coupling means tilting of said bridge-like contact means for changing the electrical connections between said bridge-like contact means and said stationary contact means in a predetermined position of said shiftable means.

2. A mechanically operated switching device as described in claim 1, wherein spring means yieldingly tilt said bridge-like contact means into electrical contact with the stationary contact means of one of said groups and wherein said shiftable means when shifted to said predetermined position effect tilting of the bridge-like contact means into electrical contact with the stationary contact means of the said other one of said groups.

3. A mechanically operated switching device as described in claim 1, wherein the yielding wall portion of said fluid-tightly sealed housing includes in said local area an outwardly extended protuberance to facilitate inward shifting of such local area by said shiftable means.

4. A mechanically operated switching device as described in claim 1, wherein the yielding wall portion of said fluid-tightly sealed housing includes in said local area an outwardly extended protuberance to facilitate inward shifting of such local area by said shiftable means, and wherein said coupling means connecting said tiltable bridge-like contact means with said yielding wall portion embodies a pin member slidably mounted in said housing for rectangular movement with respect to said wall portion.

5. In a mechanically operated switching device a fluid-tightly sealed housing including a yielding wall, a double-acting switch member in said housing including stationary contact members,

and a tiltable, bridge-like shiftable contact member adapted to selectively electrically connect the stationary contact members with each other, contact posts electrically connected with said stationary contact members and said shiftable contact member and fluid-tightly extended through the wall of said housing outside thereof, coupling means in said housing connecting said shiftable, bridge-like contact member with said yielding wall, and, shiftable means arranged outside of said housing in proximity to the yielding wall thereto adapted to effect inward shifting of said yielding wall and shifting of said shiftable bridge-like member to selectively connect the stationary contact members with each other when said shiftable means are shifted to predetermined positions.

6. In a mechanically operated switching device a fluid-tightly sealed housing including a yielding wall portion, a plurality of double-acting equiangularly related switching members within said housing including coordinated stationary contact members and tiltable, bridge-like contact members adapted to selectively electrically connect the stationary contact members with each other, a coupling member for each of said tiltable contact members individually coupling such member with the yielding wall of said housing, and a single shiftable means rotatably arranged outside of said housing opposite and in proximity to the yielding wall thereof in coordinated relation with respect to the said coupling means, said single shiftable means adapted to effect successive tilting of said bridge-like members when rotated to effect successive localized

inward bulgings of the coupling areas of the yielding wall with said tiltable contact members.

7. A mechanically operated switching device as described in claim 6, wherein the yielding wall of the housing includes in the areas coupled with the shiftable contact members outwardly extended protuberances adapted to facilitate inward bulging of these areas when said single shiftable means, while contacting said yielding wall, is rotated with respect thereto.

8. In a distributor a fluid-tightly sealed housing including a yielding wall, a plurality of pairs of groups of contact means arranged in said housing embodying electrical connecting means extended outside of said housing, a tiltable bridge-like contact member for each of said pairs of groups of contact means including spring means tilting said contact member to electrically connect the contact means of one group of said pairs of groups coupled with the yielding wall and shiftable means outside of said housing arranged adjacent to the yielding wall thereof adapted to shift localized areas of said wall inwardly to effect tilting of said contact means in the opposite direction for electrically disconnecting the contact means of said one group of a pair of groups of contact means and electrically connect the contact means of the other group of such pairs.

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