Oct. 7, 1941. J. BOHLI 2,257,781

DISTRIBUTOR

Filed Oct. 27, 1938

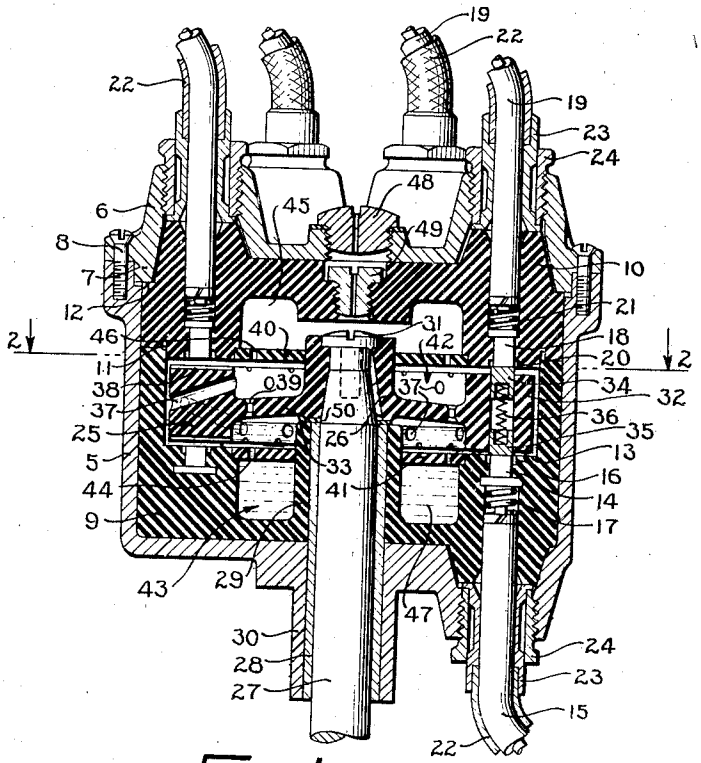


Fig 1

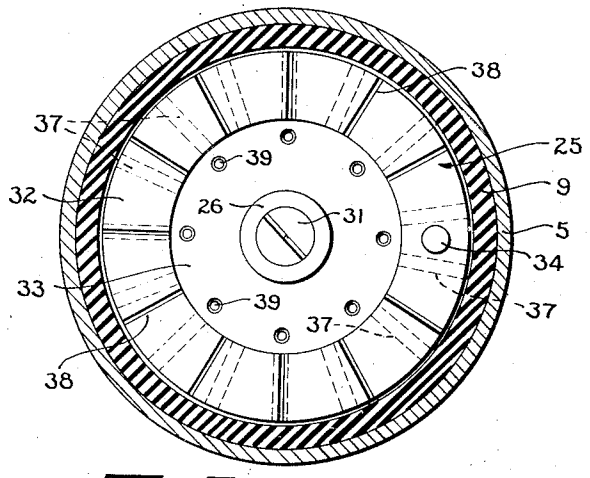


Fig 2

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DISTRIBUTOR

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4 Claims. (Cl. 200—24)

This invention relates to electrical apparatus and more particularly to ignition distributors adapted for use in internal combustion engines.

In high tension ignition distributors heretofore provided considerable difficulty has been encountered in preventing flash-overs from one contact to another within the distributors thereby causing pre-ignition in the engine cylinders with which the affected circuits are associated. This is particularly true in distributors used in modern, multi-cylinder engines wherein the contacts must be comparatively closely spaced in order to keep the size and weight of the distributor within reasonable limits. The above difficulty is enhanced in distributors used on aircraft engines since the rarefied air and the low atmospheric pressure in which aircraft fly greatly facilitate and increase the probability of flash-overs. Although various methods have been developed to insure dependable operation of ignition distributors, especially during high altitude flying, these efforts have resulted in structures having prohibitive dimensions and weights for aircraft use.

It is accordingly one of the objects of the present invention to provide a novel ignition distributor wherein the foregoing difficulties and disadvantages are obviated.

Another object of the invention is to provide a novel ignition distributor for use on internal combustion engines which is so constructed that the electrical contacts therein are maintained in a liquid dielectric bath at all times during operation irrespective of the position of the distributor.

Still another object is to provide a device of the above character wherein a liquid dielectric is maintained under pressure around the electrodes during operation of the device.

A further object is to provide an oil insulated distributor for internal combustion engines which is so constructed that foaming of the oil and the creation of air bubbles therein about the immersed contacts is substantially eliminated.

A still further object is to provide a novel ignition distributor which is smaller and more compact and weighs less than similar devices of equal capacity heretofore produced.

Another object is to provide a distributor which is simply constructed and yet durable and efficient in operation at all altitudes and in all positions of operation.

The above and further objects and novel features of the invention will more fully appear from the following detailed description when the same is read in connection with the accompanying drawing. It is to be expressly understood, however, that the drawing is for the purpose of illustration only and is not intended as a definition of the limits of the invention, reference being primarily had for this latter purpose to the appended claims.

In the drawing wherein like reference characters refer to like parts throughout the several views,

Fig. 1 is an elevation view, partly in section and with parts broken away, of one form of the novel apparatus comprehended by the present invention; and,

Fig. 2 is a sectional view taken substantially on line 2—2 of Fig. 1, showing the rotatable contact carrying element in plan view.

A single embodiment of the present invention is illustrated in the drawing, by way of example, in the form of a radio shielded distributor comprising a light metallic cup-shaped housing 5 and a metallic cover 6 therefor. Said cover is preferably piloted in housing member 5 by an annular portion 7 and is secured in place by a plurality of screws 8 which threadedly engage tapped recesses in the upper edge of said housing.

The distributor proper is removably fitted within metallic housing 5, 6 and, in the illustrated embodiment, includes a cuplike lower portion 9 made of any suitable insulating material and a cap on upper portion 10 made of similar material. An annular gasket 11 is preferably provided between the engaging surfaces of parts 9 and 10. Cap 9 is provided with a shoulder 12 adapted to be engaged by portions 7 of cover 6, whereby above-described parts may be firmly held in assembled relation by screws 8.

Insulating member 9 has an internal shoulder or ledge 13 in which are embedded a plurality of equally spaced, circularly-disposed contacts 14 which are electrically connected to each other by any suitable means and connected by an insulated cable 15 to a suitable source or high tension current, such as a magneto (not shown). The exposed ends of contacts 14 are flush with the surface of shoulder 13 and are surrounded by recesses 16 in said surface. Cable 15 extends through registering openings in housing 5 and insulating cup 9 and is electrically connected to one of the contacts 14 by a small coil spring 17 or other suitable means.

Distributor cap 10 is provided with a plurality of circularly arranged axially extending contacts 18 each of which is removably mounted in said

cap directly opposite one of the high tension contacts 14 and is connected by an insulated cable 19 to an ignition device, such as a spark plug (not shown) in the cylinder of an engine with which the distributor is associated. The inner ends of contacts 18, which may be made of copper or other suitable material are surrounded by annular recesses 20 and have the faces thereof flush with the inner surface of cap 10. Cables 19 extend through registering openings in cover 6 and cap 10 and are electrically connected to contacts 18 by means of coil springs 21. In order to shield the ignition system and thus prevent radio interference thereby, each of the cables 15 and 19 is preferably surrounded by a flexible metallic tube 22, the inner end of which has a metallic spool 23 secured thereto. The inner flanged ends of spools 23 are held in engagement with distributor parts 9, 10 and in assembled relation by suitable gland nuts 24 that threadedly engage the openings in housing 5, 6 through which the cables extend.

The two insulating elements 9 and 10 which support stationary contacts 14 and 18 define an enclosed space in which a novel rotatable distributor element 25 operates. As shown, said element is in the form of a wheel which is keyed at its hub 26 to the inner conical end of a shaft 27 that is rotatably journalled in a bearing 28 which has a tight fit in aligned tubular bosses 29 and 30 which extend interiorly and exteriorly of and integral with cup 9 and housing 5, respectively. Element 25 may be held against axial movement on shaft 27 by a screw 31 and the shaft may be rotatably driven in any well-known manner by some suitable part of the engine to which the distributor is attached.

The periphery or rim portion 32 of rotatable element 25 is connected by a thin disc portion 33 to hub 26 and has an axially extending opening therethrough in line with the two sets of stationary contacts 14 and 18. Slidably mounted in said opening are a pair of contact members 34, 35 which are adapted to be yieldingly pressed against said sets of stationary contacts by any suitable means, such as a spring 36 interposed therebetween. Said spring also serves as an electrical conductor to successively complete the electrical circuit between the various pairs of oppositely disposed contacts 14 and 18 during the rotation of element 25 with shaft 27.

For a purpose to more fully appear hereafter, rim 32 has bored therein a plurality of openings 37 which extend in a radial direction between the inner and outer peripheral faces thereof and a plurality of radial extending grooves 38 are cut in the upper and lower faces thereof, as viewed in the drawing. Connecting disc portion 33 is also provided with a plurality of axially extending openings or perforations 39 to permit the passage of a liquid dielectric to be hereinafter discussed.

The space between members 9 and 10 is preferably subdivided into three compartments by a pair of perforated plates 40 and 41 which surround and engage hub 26 and boss 29, respectively. The center chamber 42 in which distributor rotor 25 operates is connected to annular chamber 43 by perforations 44 in plate 40 and to upper chamber 45 by perforations 46 in plate 40.

For the purpose of providing insulating means between the spaced contacts to prevent flashovers or sparking therebetween, a quantity of liquid dielectric 47, such as oil for example, is provided in the chambers referred to above, said liquid being introduced into said chambers through central openings in cover 6 and cap 10 which openings are normally plugged by threaded screws 48 and 49, respectively. As shown, said screws are provided with small ventilating holes which connect the interior of chamber 45 with the atmosphere. The quantity of liquid dielectric employed may vary between quite wide limits, but preferably the quantity should be such that oil sealing means 50 will not be covered by the liquid, irrespective of the position of the distributor. As will be more fully pointed out hereinafter, liquid 47 will be forced during the rotation of rotor 25 through passages 37 and maintained under pressure due to centrifugal force in the clearance space between rim 32 and the adjacent surfaces of insulating members 9 and 10.

In the operation of the embodiment above described, distributor rotor 25 together with contacts or brushes 34 and 35 are rotated in synchronism with the crankshaft, for example, of an internal combustion engine to thereby periodically and successively complete circuits between a source of high tension current connected to input brush or contacts 14 and a plurality of ignition devices connected to contacts or brushes 18 in a manner and for a purpose well-known and understood in the art. Rotor 25, when rotatably driven by shaft 27 constitutes in effect a centrifugal pump which is effective to force liquid 47 outwardly through passages 37 into the clearance space between rim 32 and the adjacent walls of members 9 and 10. Thus, during operation of the distributor the liquid dielectric is maintained under pressure in said clearance space and in recesses 16 and 20 surrounding the points of contacts 14 and 18, thereby preventing the formation of air bubbles on or around said contacts and providing an insulator to obviate flash-overs between the various contacts. Grooves 38 may be provided on both sides of the rotor to insure positive circulation of the oil or other liquid dielectric and thus obviate the formation of any air bubbles behind or in front of the moving brushes 34 and 35. Openings 39 in the disc portion of rotor 25 are provided to insure the equalization of oil pressure on both sides of the rotor during operation thereof.

If the liquid in excess of that which is necessary to completely immerse the contacts and insulate the same from one another during rotation of rotor 25, i. e., the reserve liquid, were permitted to rotate with the rotor the same would become mixed with air and foaming would result. This would in turn materially reduce the efficiency of the liquid as a dielectric or insulator. Accordingly, the reserve supply of oil in the distributor of the present invention is permitted to circulate through reservoir chambers 43 and 45. The perforations in separator plates 40 and 41 are comparatively small in order to permit only a small amount of oil to circulate thereby preventing the mixture of any liquid with air.

By maintaining the oil or other liquid dielectric around all of the distributor contacts under pressure, during the operation of the distributor, and free of air bubbles, the possibility of flashovers or sparks between spaced contacts immersed therein is substantially eliminated. It may also be noted that the supply of oil under pressure in recesses 16 and 20 prevents any burning of the insulation 9 and 10 in which contacts 14 and 18 are mounted by sparks which might occur upon engagement and disengagement of said contacts by rotating brushes 34 and 35.

There is thus provided a novel ignition distributor for internal combustion engines which is small and compact, yet efficient and dependable in operation at all altitudes and in all positions. The contact points of the novel distributor hereby provided may be immersed at all times and in all positions during operation in a liquid dielectric which is maintaned under pressure and free of air bubbles by the operation of the distributor rotor. Only a comparatively small quantity of liquid dielectric need be employed in the novel distributor thus provided thereby materially reducing the weight of the distributor in relation to similar devices heretofore provided. Furthermore, churning and consequent foaming of the liquid dielectric are prevented in the apparatus hereby provided. It will also be apparent that the immersed contacts of the present distributor may be placed comparatively close together without danger of flash overs and, hence, the same may be appreciably smaller and lighter than distributors of equal capacity heretofore provided.

Although only a single embodiment of the invention has been illustrated and described in detail, it is to be expressly understood that the invention is not limited thereto, as will now be apparent to those skilled in the art. Various changes may be readily made, such as in the size, composition, design and arrangement of parts illustrated without departing from the spirit and scope of the invention. For a definition of the limits of the invention reference is had primarily to the appended claims.

What is claimed is:

1. A high tension distributor comprising insulating means forming a fluid chamber, a liquid dielectric in said chamber, an input brush, a plurality of output brushes, rotatable means in said chamber for maintaining said liquid under pressure around said brushes, said rotatable means having a plurality of passages therein connecting the central portion of said chamber and the peripheral portion thereof and means carried by said rotatable means for electrically connecting said input brush successively with said output brushes.

2. In a distributor for internal combustion engines an annularly extending input brush, a plurality of circularly arranged output brushes, a rotatable insulator interposed between said input and output brushes, means carried by said insulator for successively electrically connecting said output brushes with said input brush, and a liquid dielectric in the space between said brushes and said insulator, said rotatable insulator having a plurality of radially directed passages therein for the circulation of said liquid.

3. In apparatus of the class described, a housing having a circular chamber therein, an annularly extending conductor in said housing adjacent the periphery of said chamber, a plurality of circularly arranged contacts in said housing adjacent the periphery of said chamber, a disc-like dielectric rotor having an enlarged peripheral portion interposed between said conductor and contacts, said enlarged peripheral portion having a plurality of passages extending in a radial direction therethrough, means carried by said rotor for successively electrically connecting said contacts and said conductor, and a quantity of liquid dielectric partially filling said chamber.

4. In apparatus of the class described, a housing having a chamber therein, an elongated conductor in said housing adjacent the periphery of said chamber, a plurality of contacts in said housing adjacent the periphery of said chamber, a dielectric rotor having a portion thereof interposed between said conductor and contacts, means carried by said rotor for successively electrically connecting said contacts and said conductor, and a quantity of liquid dielectric partially filling said chamber, said rotor having passages therein for conducting said liquid from the central portion of said chamber to the periphery thereof during rotation of the rotor.

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