July 23, 1940.

C. F. REIS

2,209,036

DISTRIBUTOR

Filed Nov. 19, 1937

2 Sheets-Sheet 1

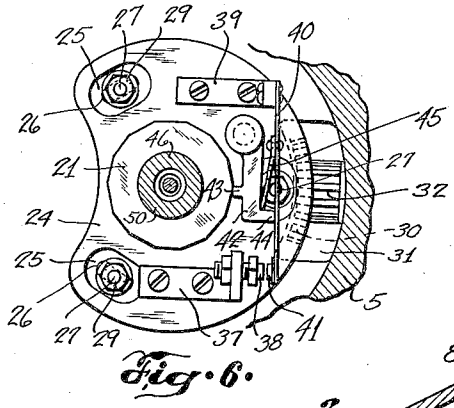


Fig. 6.

Fig. 1.

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2 Sheets-Sheet 2

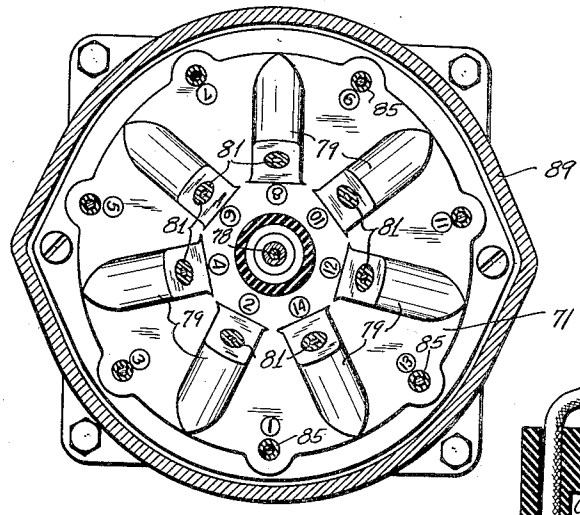


Fig. 2.

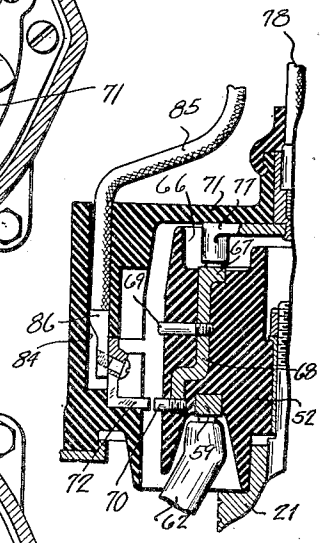


Fig. 5.

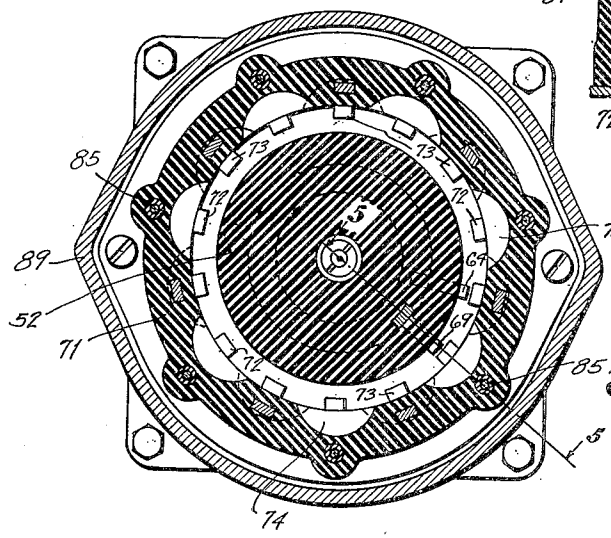


Fig. 3.

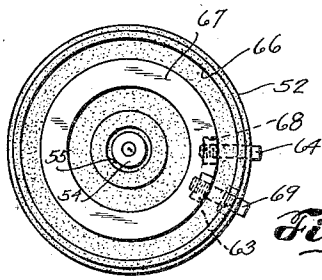


Fig. 4.

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Application November 19, 1937, Serial No. 175,384

6 Claims. (Cl. 200—21)

This invention relates to an improved magneto distributor adapted for use on multi-cylinder engines, as a fourteen cylinder aircraft engine, and in which the distributor is so designed as to be of a relatively small size and still function efficiently.

An object is to provide a distributor mechanism which, while having fourteen ignition wires leading therefrom, is compact and not much larger than a distributor for an engine having fewer cylinders.

A further object is to provide a distributor mechanism adapted particularly to a fourteen cylinder engine, the distributor having fourteen contact points which are so arranged that there is a relatively large air gap between adjacent points, so that the high tension current will not jump to two points at one time. Otherwise stated, the contact points are so spaced that the firing of two spark plugs simultaneously is prevented, and at the same time the diameter of the distributor is substantially the same that would be required for an engine of a less number of cylinders.

In the drawings, Fig. 1 is a central vertical section of a magneto and my improved distributor, with the magneto rotor and coil shown in elevation; Fig. 2 is a horizontal section taken on the line 2—2 of Fig. 1; Fig. 3 is a horizontal section taken on the line 3—3 of Fig. 1; Fig. 4 is a top plan view of the distributor rotor; Fig. 5 is a section taken on the line 5—5 of Fig. 3, and Fig. 6 is a top plan view of the breaker mechanism and its operating cam as viewed along line 6—6 of Fig. 1.

Referring to the drawings in detail, 1 represents a magneto or rotor housing, 2 the magneto rotor and 3 the magneto coil. The rotor housing is provided with end walls 4 and 5 and with an intermediate wall 6 of less height than the walls 4 and 5. Extending horizontally from the top of the wall 6 and integral with the end wall 5 is a wall 7 which, with the end walls 5 and 6 and the bottom and side walls of the magneto housing, forms a chamber 8. The bottom of the chamber 8 is provided with an opening 9 which is closed by means of a plate 10 removably held in position by screws 11, only one of these being shown in the drawings; however, as many screws as are necessary are used. The rotor shaft 12 is supported in suitable bearings 13 carried by the walls 4 and 6. The end 14 of the rotor shaft 12 is provided with a coupling (not shown), by means of which it is directly connected in driven relation to an engine shaft (not shown). The opposite end 15 of the shaft 12 projects beyond the wall 6 and has secured thereon a bevel or miter gear 16 which meshes with a similar gear 17 mounted on the shaft 18. The gears 16 and 17 must mesh tightly so that there will be no play or back lash, as this would permit a change of position between the magneto and distributor rotor, as to the firing position of the latter. Shaft 18 is supported in bearings 19 and 20 carried by the wall 7 and plate 10, respectively. Moreover, the shaft 18 extends vertically and projects through and beyond the upper face of the wall 7 and carries a cam 21 on its upper end. The bearing 19 is provided with an upwardly extending annular flange or collar 22 which projects through and beyond the wall 7 and which extends through an opening 23 formed in the plate 24 so that said plate is rotatably located on the upper face of the wall 7, with the collar 22 as its axis. The plate 24 is provided with depressions 25 in which arcuate slots 26 are formed through which studs 27 seated in the wall 7 extend. The plate 24 is slidably or rotatably held by means of spring washers 28 and nuts 29 carried by the studs 27 which hold the plate in frictional engagement with the wall 7 in such a manner that shifting or rotating of the plate 24 about its axis, due to vibration, cannot take place; in other words, accidental advancing or retarding of the spark is prevented. Depending from the plate 24 is an arcuate rack 30 which projects through an opening 31 in the wall 7, and which meshes with a pinion 32 carried on one end of a stub shaft 33 mounted in a bearing 34 which is carried by the wall 5 of the rotor housing 1. The stub shaft 33 projects beyond the wall 5 and has an arm 35 secured to the projecting end in any well known manner that will prevent any movement between the arm and stub shaft. A rod or link 36 connects the arm 35 to a suitable spark control lever (not shown), by means of which the spark can be advanced or retarded at will by the operator. It is essential in this construction that the teeth of the rack and pinion mesh so that there will be no back lash or play and that there be no play between the arm 35, link 36 and the spark control lever as, since there are fourteen lobes on the cam disclosed, it will readily be seen that, even a slight amount of play or back lash in any of the aforesaid parts will cause quite a change in the spark control. Mounted on the plate 24 is a bracket 37 which carries the adjustable breaker point 38. A bracket 39 is also carried by the plate 24 and to this bracket is attached one end of a spring arm 40,

the opposite end of this arm carrying a breaker point 41. Pivotally mounted on the plate 24 is a lever 42 which is provided with a projection 43 acting as a cam follower and a projection 44 which contacts the spring arm 40. The lever 42 is preferably formed entirely of insulating material and is made as light as possible, thereby reducing its inertia to the lowest possible minimum and in order to overcome even this inertia, an auxiliary spring 45 carried by the spring arm 40 is employed to press against this arm so that the follower 43 will be forced to closely follow the contour of the cam, and not only contact the high points of the cam lobes, as was found to be the case where ordinary heavy breaker arms were used, since the cam lobes follow each other so rapidly that in an ordinary breaker arm the spring would not overcome the inertia of the arm fast enough and the cam follower would ride only on the high points of the cam and thereby prevent the breaker points from closing. The cam is held on the shaft by means of a stud 46 which has one end screw threaded into the shaft and which is provided intermediate its ends with a cylindrical enlargement 47 which seats on a flange 48 formed in the bore 49 in the collar 50 formed on the upper face of the cam 21. The collar 50 extends upwardly into the circular recess 51 formed in the rotor 52 which is formed of insulating material and is preferably a cylindrical body. A bore 53 is formed in the rotor 52 and is concentric with the recess 51 and in which a sleeve 54 is secured, preferably by molding it into place while forming the rotor 52. The sleeve 54 and bore 53 extend upwardly a predetermined distance and terminate in a circular recess or bore 55 which is concentric with the bore 53 and into which the threaded upper end 56 of the stud 46 projects. A nut 57 is secured on this threaded end and when this is tightened, secures the rotor to the cam 21 so that it will rotate simultaneously with and at the same speed as the cam 21. This arrangement permits adjustment between the cam and distributor rotor for timing purposes. The rotor 52 is provided in its lower face with a circular groove 58 which is concentric with the axis of the rotor and in the bottom of this groove is located a conductor ring or collector element 59 which is contacted by a feeder brush 60, this brush being in electrical contact with an electrical conductor leading from the secondary winding of the coil 3. A brush holder 62 is supported on the wall 7, and holds the feeder brush in position, thus assuring contact of the feeder brush with the conductor ring or collector element. The conductor ring 59 is provided with an upwardly extending arm 63 which is embedded in the rotor and which carries the contacts or pins 64 and 65, which project radially from the side of the rotor and which are in spaced vertical alignment with each other. The pins 64 and 65 are placed in position after the rotor has been formed or molded, and are then adjusted, as it is necessary for proper function of the contacts, that they be in vertical alignment with each other. It will be understood readily that if these contacts were not so related, the firing time of one of the points would be advanced or retarded according to the misalignment of the point, and a misalignment might cause the misplaced point to fail firing altogether since, on a multilobe cam as shown, the breaker points are only separated for an extremely short period of time, and it is only during this separating that the high tension current flows.

Formed in the upper face of the rotor 52 is a circular groove 66 concentric with the rotor axis and in the bottom of this groove is located a conductor ring or collector element 67. This ring is provided with a depending arm 68 which is also embedded in the rotor and has pins 69 and 70 secured therein in vertical alignment with each other and in the same horizontal planes as the pins 64 and 65, that is, the pins 69 and 64 are in one horizontal plane and the pins 70 and 65 are in another horizontal plane. The pins 69 and 70 project radially from the rotor exactly the same distance as the pins 64 and 65 and are angularly spaced therefrom, this spacing being about 25 degrees. In any event it must be great enough to prevent any jumping of the spark between the sets of pins 64 and 65 and the sets of pins 68 and 69.

A cap stator element 71 formed of insulating material is supported on the magneto housing 1 and completely encloses the rotor with the exception of its bottom. The cap is substantially cup shaped or of annular form and has molded therein contacts 72 and 73 corresponding in number to the number of cam lobes, there being fourteen in the present instance. The contacts 72 are arranged in the same horizontal plane in the cap and in the same plane as the pins 65 and 70 and the contacts 73 in a horizontal plane positioned above and paralleling the plane of the pins 72 and in the same plane as the pins 64 and 69. The contacts 72 and 73 are not in vertical alignment with each other but are staggered so the contacts in one plane are midway between the contacts in the other plane. By this arrangement and when the engine is to be started, the high tension current conducted through lead 78 from a starting magneto (not shown), will be delivered to the pins 69 and 70, and as the rotor 52 is operated the high tension current will first pass from the pin 70 to one of the contacts 72, then from the pin 69 to one of the contacts 73, then again from pin 70 to another contact 72 and so on. In other words, contact is made first at a lower point, then at a higher point and so on until the engine has gained sufficient speed for the main magneto shown to commence delivering high tension current, then the starting magneto current is discontinued, thereafter, the pins 65 and 64 which receive their current from the main magneto, deliver this current to the contacts 72 and 73 respectively and alternately in the same sequence as above described for the starting magneto. The cap 71 is provided with recesses 74 and 75 located respectively above and below the contacts 72 and 73. The recesses act as air chambers, providing air gaps for preventing any current from jumping from a working to a non-working contact either by a direct jump or conduction along the wall of the cap 71 to a contact in the plane of the non-working pin and thus cause firing of two spark plugs at the same time.

A feeder brush 76 is mounted in a brush holder 77, carried by the cap 71, and is in constant contact with the conductor ring collector element 67. An electric conductor 78 leads from the high tension winding of the coil of a starting magneto (not shown) to the brush 76 for supplying high tension current to the ring 67. This constitutes the starting means for the engine, as the running current is delivered by the conductor 61. The contacts 73 extend upwardly in the cap 71 and

have their upper ends bent so as to extend upwardly and inwardly and terminate in projections 79 formed integral with the top of the cap 71. These projections 79 are provided with openings or passages 80 into which the ends of conductors 81 extend. These conductors are provided with terminals 81a which are provided with screw threaded openings to receive screws 82 for securing the contacts and conductors together; these screws are inserted through openings 83 formed on the inside of the cap 71. The cap 71 is also provided with openings or passages 84 in which the ends of conductors 85 extend. The ends of these conductors are provided with terminals 86 having screw threaded openings to receive screws 87 which are also inserted through openings 88 formed in the inside of the cap, the conductors 85 also lead to certain spark plugs of the engine and by connecting the conductors 81 and 85 to selected spark plugs the proper firing order is readily obtained. Care however must be taken that the conductors leading to successively firing plugs lead from different planes of contacts, as otherwise the firing order will be broken up and confused and the engine would not run properly, if at all.

Completely enclosing the side wall and top of the distributor cap 71 is a shield 89 of non-conducting material which carries a conduit 90 of similar material, both being provided to eliminate electrical leakage and prevent interference with adjacent electrical apparatus, such as the various radio instruments carried by aircraft and the like.

Having fully described my invention, what I claim is:

1. In a rotor for distributors, a cylindrical body formed of insulating material, a groove formed in the lower face of said rotor, a conductor ring located in said groove, an arm projecting upwardly from said conductor ring and embedded in said cylindrical body and pins secured to said arm, said pins projecting from the side of said cylindrical body and being in vertical alignment with each other.

2. In a rotor for distributors comprising a cylindrical body formed of insulating material, a groove formed in one end of said body, a conductor ring located in said groove, an arm projecting from said ring and embedded in said cylindrical body, pins carried by said arm, said pins projecting radially from the side of said cylindrical body and being in vertical alignment with each other, a groove formed in the other end of said cylindrical body, a conductor ring located in said groove, an arm projecting from said ring and embedded in said cylindrical body, pins carried by said arm, said pins projecting radially from the side of said cylindrical body and being in vertical alignment with each other, said last mentioned pins being angularly spaced from said first mentioned pins, the lowermost and uppermost of said first and last mentioned pins being arranged respectively, in a common horizontal plane.

3. A distributor comprising a rotor, means for rotating said rotor, a pair of pins projecting radially from said rotor, said pins being in spaced vertical alignment with each other, means for supplying high tension current to said pins, a second pair of pins projecting radially from said rotor and in spaced vertical alignment with each other, said second pair of pins being angularly spaced from said first pair of pins and arranged in parallel horizontal planes therewith, means for supplying high tension current to said second set of pins, a cap surrounding and spaced from said rotor, contacts carried by said rotor and arranged in parallel horizontal planes and adjacent the path of travel of the ends of said pins, and means for attaching electric conductors to said contacts.

4. A distributor for a magneto, comprising a distributor rotor operatively supporting a high tension current collector element and a plurality of vertically spaced, projecting contacts electrically connected to said collector element, means in contact with said collector element for delivering thereto, high tension current generated by the magneto, a stator member of annular form, arranged about said rotor, a series of contacts embedded in and projecting inwardly of the stator, for cooperation with one of said rotor contacts, a second series of contacts also embedded in and projecting inwardly of the stator, said second series of contacts being vertically spaced from said first series of contacts, for cooperation with another of said rotor contacts, and conductors leading from the contacts of said series, to points of current discharge.

5. A distributor for magnetos comprising a distributor rotor operatively supporting a high tension collector element on one of its ends, a plurality of vertically spaced projecting contacts electrically connected to said collector element, a brush in contact with said collector ring for delivering thereto high tension current, a stator element of annular form arranged about said rotor, a series of contacts embedded in and projecting inwardly of the stator for cooperation with one of said contacts, a second series of contacts also embedded in and projecting inwardly of the stator, said second series of contacts being vertically spaced from said first series of contacts for cooperation with another of said rotor contacts, conductors leading from the contacts of the stator series to points of current discharge, a second high tension collector element operatively supported on the opposite end of said distributor rotor, a plurality of vertically spaced projecting contacts electrically connected to said second collector element and spaced angularly from the first mentioned projecting contacts and in the same horizontal planes therewith and cooperating with the stator contacts, and a second brush for delivering high tension current to said second high tension collector element.

6. A distributor comprising a rotor, a pair of discharge pins projecting radially from said rotor, said pins being spaced apart and in vertical alignment with each other, a conductor interconnecting said pins, embedded in said rotor, means for supplying high tension current to said pins, a stator member of annular form arranged about said rotor, a series of terminals spaced about the inner surface of said stator member in the plane of one of said discharge pins, a second series of terminals spaced about the inner surface of said stator member in the plane of the other of said discharge pins, the terminals of said second series being staggered with respect to the terminals of the first said series, said discharge pins being adapted to operate alternately to transmit current to the stator terminals during operation of the distributor.

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