Nov. 1, 1966 R. P. McCLELLAND 3,283,189

TIMER AND DISTRIBUTOR FOR IGNITION SYSTEMS AND THE LIKE

Filed Aug. 13, 1963

Fig. 1

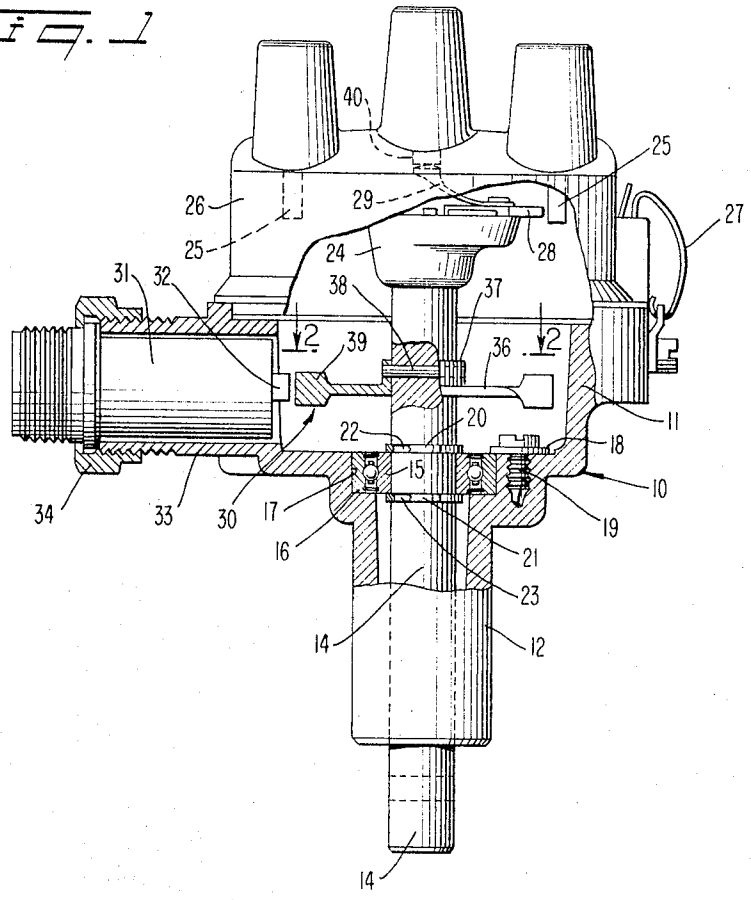
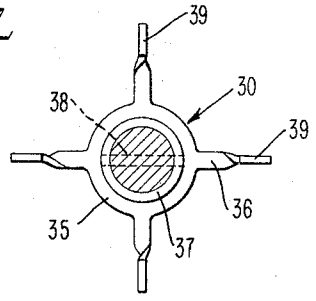


Fig. 2



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United States Patent Office 3,283,189 Patented Nov. 1, 1966

3,283,189

TIMER AND DISTRIBUTOR FOR IGNITION SYSTEMS AND THE LIKE

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Filed Aug. 13, 1963, Ser. No. 301,844
6 Claims. (Cl. 310—155)

This invention relates to ignition systems and more particularly to current distributing and timing apparatus for use in such systems.

One of the objects of the present invention is to provide novel apparatus for generating electrical pulses in timed relation with means for distributing electrical energy to a plurality of ignition sparking plugs in sequence.

Another object is to provide novel apparatus of the above character which is of light-weight, simplified construction embodying a minimum number of parts which may be manufactured and assembled at low cost.

A further object is to provide novelly constructed timing apparatus for ignition systems and the like which embodies only rotating movable parts whereby a long, trouble-free operating life is assured.

Still another object is to provide a novel ignition timing and distributing device which may be readily and quickly assembled and disassembled for inspection and repair and embodies only parts of utmost simplicity.

The above and further objects and novel features of the present invention will more fully appear from the following detailed description when the same is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only and are not intended as a definition of the limits of the invention.

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

FIG. 1 is a side elevation view, partly broken away and partly in section, illustrating one form of ignition timing and distributing apparatus embodying the invention; and,

FIG. 2 is a detail plan view of the timing or triggering wheel of the apparatus of FIG. 1, the view being taken in the plane of line 2—2 of FIG. 1.

A single embodiment of the invention is illustrated in the drawings, by way of example, in the form of a combination timer and distributor adapted for use in a breakerless ignition system for a 4-cylinder engine, which system may be of the type disclosed in Loudon et al. U.S. Patent No. 3,240,198. As shown, the novel device of the invention comprises a housing **10**, preferably of a light-weight non-magnetic metal, having a generally inverted cup-shaped upper portion **11** and a reduced cylindrical lower portion **12**.

A simple cylindrical shaft **14** extends through casing **10** and is rotatably supported therein in a novel, simplified manner to facilitate rapid assembly for large-scale, low-cost production. Said shaft is journalled in the lower outer end of housing portion **12** by a plain or other suitable known type of bearing (not shown) and is supported adjacent the upper inner end of casing portion **12** by a combined roller and thrust bearing of any suitable known construction, illustrated as a simple ball bearing comprising an inner race **15** and an outer race **16**. Said outer race has a close fit in a counterbore **17** of casing portion **12** and is simply secured in place by a plurality of circumferentially spaced washers **18** (only one being shown) held in overlapping relation therewith by self-tapping screws **19**.

Before installation in casing **10**, roller bearing **15**, **16** is assembled on shaft **14** by means of a pair of split retaining rings **20** and **21** of suitable metal, such as steel, seated in spaced annular grooves **22** and **23**. Rings **20** and **21** are preferably of square or rectangular section, and at least one of them may be made of a suitable spring metal of less thickness than the width of the groove in which it seats and curved to take up any tolerances and thereby hold the shaft firmly against axial movement relative to the bearing. The axial length of bearing race **15** may be, and preferably is, slightly in excess of the distance between grooves **22** and **23**.

Removably mounted on the upper end of shaft **14**, for rotation therewith in any manner well known to the art, is a distributor rotor or finger comprising an insulating block **24** and a metal contact plate **28** radially adjustable thereon to rotate in jump gap relation to a plurality of circumferentially arranged outlet terminals **25** mounted in an insulating cap **26**. The latter may be removably held in position on casing **10** by a plurality of spring clips **27**, only one being shown.

A spring contact **29** is mounted on and electrically connected to contact **28**, and the free end thereof resiliently engages a centrally disposed input terminal **40** in cover **26**. Thus, in a known manner pulses of electrical energy may be periodically supplied through input terminal **40**, spring contact **29**, contact plate **28** and spaced outlet terminals **25** to the spark plugs of an engine in sequence.

The proper timing of the discharge pulses of energy for firing the spark plugs in an engine has heretofore been accomplished by employing a conventionally cam operated contact for periodically opening or closing a circuit at the moment a power or discharge pulse is desired. The apparatus of the present invention is novelly constructed and adapted for use in a system wherein the discharge or power pulses for firing the spark plugs are timed and released by triggering pulses of electrical energy. To this end, a novelly constructed triggering wheel **30** (FIG. 2) is mounted on shaft **14** between distributor finger **24** and bearing **15**, **16** for cooperation with an electromagnetic generator or pick-up coil unit **31**. The latter may be of any suitable known type and is preferably of the type disclosed in Loudon U.S. Patent No. 3,252,024 for "Electric Pulse Generating Means," and comprising a winding around a permanent magnet core with a pole shoe **32** in position for cooperation with triggering wheel **30**. Pulse generator unit **31** comprises a cylindrical outer casing slidably received in a hollow boss **33** projecting radially from casing member **10** and held in assembled position by a ring nut **34**. The clearance between pole piece **32** and vanes **39** of trigger wheel **30** may be adjusted with shims inserted between the outer end of boss **33** and a collar on unit **31**.

Triggering wheel **30** is of novel simplified construction adapted for mass production at minimum cost. In the form shown, this wheel is made from a sheet metal stamping having a central opening in a hub portion **35** from which four pick-off arms **36** extend radially in circumferentially spaced locations. The hub portion around the central opening is drawn or pressed axially to form an annular axially extending flange **37** to provide ample bearing surface for the wheel on shaft **14**. A pin **38** may be used to secure wheel **30** to shaft **14**. In order that the pick-off arms or blades will be relatively thin in the direction of rotary movement thereof for desirable cooperation with the magnetic field in the region of pole shoe **32**, the outer end portions **39** of radial arms **36** are twisted through 90°. The blades or vanes **36**, **39** and in particular the twisted sections provide a fan blade effect which aerates the space within housing **10**, **26**.

Although only a single embodiment of the invention has been illustrated in the accompanying drawing and described in the foregoing specification, it is to be expressly understood that the invention is not limited thereto. Various changes may be made, such as in the design and arrangement of the parts illustrated as well as in the materials suggested, without departing from the spirit and scope of the invention as the same will now be apparent to those skilled in the art.

What is claimed is:

1. Apparatus of the class described comprising a rotatable shaft, a triggering wheel punched and formed from a unitary sheet metal blank, said wheel comprising a hub portion having an uninterrupted cylindrical wall of appreciable axial length for slidably receiving said shaft and a plurality of radially extending fingers, and means for securing the hub portion to the shaft for rotation therewith.

2. Apparatus as defined in claim 1, wherein the radially inner end portions of said fingers are of reduced width and are twisted through 90°, whereby the broad extents of the other ends of the fingers are in planes substantially perpendicular to the plane of the broad surface of said blank.

3. Apparatus of the class described comprising a rotatable shaft, a triggering wheel punched and formed from a unitary sheet metal blank, said wheel comprising a hub portion having appreciable axial length for receiving said shaft and a plurality of radially extending fingers, means for securing the hub portion to the shaft for rotation therewith, and a magneto-electric pulse generator unit having a magnetic pole thereof adjacent the path of travel of the radially outer ends of said fingers, whereby passage of a said finger through the magnetic field adjacent said pole causes said unit to generate a pulse of electrical energy.

4. Apparatus as defined in claim 3, wherein said generator unit comprises a coil wound about an axially magnetized permanent magnet and a pole shoe of magnetic material between said magnet and the path of the outer extremeties of said fingers.

5. A magneto-electric pulse generator comprising a rotatable shaft, a triggering wheel and means for securing the wheel to the shaft, said wheel being punched and shaped from a single blank of magnetic sheet metal to provide a central cylindrical hub portion of substantial axial length and fingers extending radially from an end of said hub portion, said fingers initially having a circumferential width substantially greater than the thickness of the blank and being twisted intermediate the ends thereof through 90° relative to the plane of the broad surface of the blank, whereby the broad extents of the outer ends of the fingers are in planes substantially parallel to the axis of said hub portion, and a pulse generating unit having a magnetic pole thereof adjacent the path of travel of the radially outer ends of said fingers, whereby passage of a said finger through the magnetic field adjacent said pole causes said unit to generate a pulse of electrical energy.

6. A rotor as defined in claim 5, wherein the twisted radially inner end portions of said fingers are of less width than the radially outer end portions thereof.

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