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(12) # EUROPEAN PATENT APPLICATION

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(54) **Rotor arm assembly for use in an ignition distributor incorporating a contactless signal generator for an electronic ignition system.**

(57) Rotor arm assembly for use in an ignition distributor of the kind which incorporates a contactless signal generator, and further relates to a method of manufacturing such an assembly. The assembly includes an existing rotor arm (18) which was manufactured without the provision of a vane (23) and which was intended for use in a conventional mechanical ignition distributor, a vane (23) for a contactless signal generator being secured to the existing rotor arm (18) by being engaged therewith as a press fit such that the vane occupies predetermined angular and axial positions in relation to the rotor arm.

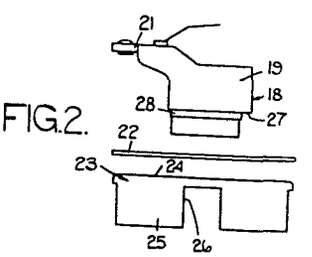

FIG.2.

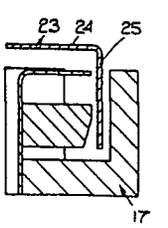

FIG.4.

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This invention relates to a rotor arm assembly, and to a method of manufacturing such an assembly, for use in an ignition distributor of the kind which incorporates a contactless signal generator, for example a Hall effect transducer, the signals from which are used to effect operation of an electronic ignition system. It is known for an ignition distributor to incorporate a contactless signal generator. Ignition distributors are of course produced in a very wide variety of different forms and sizes, and the different forms and sizes all have in common the need for a fixed sensor and a part which is rotated in accordance with engine speed, the rotation of the moving part being sensed by the sensor to produce the output signals controlling the operation of the electronic ignition system. The moving part is generally known as a vane and is commonly in the form of a disc having a peripheral flange, the flange extending at right angles to the plane of the disc and being slotted. It is known to construct an ignition distributor as original equipment including such a contactless signal generator. In the known arrangements the vane is carried by the rotor arm of the distributor, and thus rotates with the rotor arm and the rotor shaft of the distributor. During manufacture of the rotor arm the vane, which may be metallic, is incorporated into the moulding of the rotor arm so that the rotor arm and vane are of unitary construction.

It is now desirable to be able to convert existing mechanical ignition distributors to include a contactless signal generator. Such conversion entails the removal of the normal mechanical contact breaker assembly, and substitution therefore of a fixed sensor and a rotating vane. Clearly when producing kits for a very wide variety of conventional mechanical ignition distributors there is a severe problem in providing unitary rotor arms including vanes. The reason for this is that by no means all ignition distributors utilize the same form of rotor arm, and in order to provide kits for a wide variety of ignition distributors then it would be necessary to produce and store mould-

ing each of a variety of rotor arms including vanes. It is considered that this would be prohibitively expensive, and it is an object of the present invention to overcome this problem.

A rotor arm assembly according to the present invention includes an existing rotor arm manufactured without the provision of a vane, and intended for a conventional mechanical ignition distributor, and a vane for a contactless signal generator, the vane having therein a centrally disposed aperture within which a cylindrical region of the rotor arm is received as a press fit whereby the vane is attached to the rotor arm to rotate therewith, the vane being positioned on the rotor arm with its intended axis of rotation coextensive with the axis of rotation of the rotor arm, in an angular position which is determined in relation to the rotor arm such that the vane will have the desired angular relationship to the rotor shaft of the distributor when the rotor arm is engaged in the conventional manner with the rotor shaft of the distributor, and in an axial position in relation to the axis of rotation of the rotor arm such that the vane will occupy a desired axial position in relation to the sensor fitted within the distributor, again when the rotor arm is engaged in the normal manner with the rotor shaft of the distributor.

Preferably an adhesive is utilized to augment the press fit between the rotor arm and the vane in securing the vane to the rotor arm.

Desirably the assembly includes a disc-like synthetic resin flash shield secured to the rotor arm and extending between the vane and the conductive element of the rotor arm.

The invention further resides in a method of manufacturing a rotor arm assembly comprising selecting a rotor arm

from a stock of existing rotor arms, and securing thereto, in a predetermined angular and axial position, a vane for a contactless signal generator, the vane being secured to the rotor arm by press fitting the vane onto the rotor arm.

Preferably the step of securing the vane to the rotor arm includes the application to the rotor arm and/or the vane of an adhesive to augment the press fit between the vane and the rotor arm in securing the vane to the rotor arm.

Desirably the method includes the step of machining the existing rotor arm to provide thereon a cylindrical region having its axis coextensive with the intended axis of rotation of the rotor arm, and of a diameter so related to the diameter of a centrally disposed aperture in the vane, that the vane can be engaged as a tight press fit with said cylindrical region, the machining step further providing a peripheral shoulder on the rotor arm, the shoulder extending in a plane at right angles to the axis of rotation of the rotor arm, and being at an axial location such that engagement of the vane with the shoulder ensures the correct subsequent axial location of the vane relative to the sensor of the ignition distributor when the rotor arm is engaged normally with the rotor shaft of the distributor.

It will be recognised that since there is a very wide variety of existing rotor arms it may well be that certain rotor arms will inherently possess a cylindrical region of the correct diameter terminating in a shoulder at a correct axial location, and when such rotor arms are selected, then the machining steps specified in the preceding paragraph will not be necessary.

Preferably the method includes the further step of securing a disc-like synthetic resin flash shield to the rotor arm, the flash shield lying between the vane and the

conductive element of the rotor arm.

One example of the invention is illustrated in the accompanying drawings, wherein;

Figure 1 is an extremely diagrammatic sketch of an ignition distributor incorporating a contactless signal generator,

Figure 2 is an exploded side elevational view of the rotor assembly of the distributor shown in Figure 1,

Figure 3 is a sectional view of the assembly shown in Figure 2 with the parts inter-engaged, and

Figure 4 is an enlarged sectional view of part of the contactless signal generator of Figure 1.

Referring to the drawings, an ignition distributor including a contactless signal generator includes a hollow cup-shaped casing 11, supporting a rotor shaft 12 for rotation therein. An open end of the casing 11 is closed by a moulded synthetic resin cap 13 the cap 13 having a high voltage input terminal 14 disposed on the axis of rotation of the rotor shaft 12. Positioned around the terminal 14 are a number of high tension output terminals 15 equal in number to the number of spark plugs of an internal combustion engine to be served by the distributor. Within the casing 11 of the distributor is a fixed base plate 16 upon which is mounted the fixed sensor 17 of the contactless signal generator. At the end of the rotor shaft 12 is mounted a rotor arm 18, the rotor arm 18 being secured to the end of the shaft 12 in a predetermined angular relation to the shaft 12. The rotor arm 18 includes a moulded synthetic resin body 19 carrying a conductive element 21. The element 21 co-operates permanently with the input terminal 14, and during its rotation with the shaft 12 relative to the casing 11 and cap 13 it co-operates in turn with the output terminals 15 so as to distribute high voltage sparking pulses supplied by way of the terminal 14 to the appropriate sparking plugs in turn by way of the

output terminals 15. The rotor arm 18 carries a moulded synthetic resin flash shield 22 in the form of a disc, the flash shield 22 minimising the risk of "flash-over" from the element 21 to the conductive casing 11 of the distributor, or to any of the conductive parts secured to the casing 11. The rotor arm 18 also carries a vane 23 of the contactless signal generator. The vane is in the form of a disc 24 having a peripheral flange 25, the flange 25 extending at right angles to the plane of the disc 24 and being formed with a plurality of equiangularly spaced slots 26 equal in number to the number of cylinders of the engine to be served by the ignition distributor. In the example shown in the drawings the distributor is to serve a four cylinder engine, and thus the flange 25 of the vane 23 has four equiangularly spaced slots 26.

The nature of the contactless signal generator is not of particular importance to the present invention, and may for example be of the electromagnetic type known as a "Hall effect" transducer. In such an arrangement the vane is formed from mild steel, and the passage of alternately slots and solid parts of the flange 25 adjacent electromagnetic poles of the sensor 17 causes generation of appropriate output signals. The generator may however be of the optical type, wherein the material of the vane is not critical, so long as it is opaque, and the sensor includes a light source and a photosensitive oevice, the vane alterately exposing, and obscuring the photosensitive device which thus produces a sequence of output signals again dependent upon the speed of rotation of the vane.

It will be recognised that Figure 1 and the foregoing description thereof are somewhat simplified, and, for example, the distributor may include both or either of centrifugal, and vacuum advance systems for varying the timing of the production of the signals in relation to the speed of rotation of the rotor shaft 12.

It will be recognised that there are numerous different types, and sizes of ignition distributors, and equally therefore there are numerous different types and sizes of rotor arm. Clearly, where it is desired to provide a kit whereby an existing mechanical distributor can be converted to a distributor including a contactless signal generator, then it is desirable to provide within the kit a replacement rotor arm assembly to be substituted for the conventional rotor arm which of course does not carry a flash shield or or a vane. In original equipment ignition distributors incorporating contactless signal generators the vane and flash shield are part of the rotor arm, in that the rotor arm is moulded around the flash shield and vane thus resulting in a unitary construction. Clearly to provide such a unitary rotor arm assembly in kits for converting existing mechanical distributors would be prohibitively expensive, since it would necessitate the provision of specific moulding tools for each of the different rotor arm assembly configurations which is necessary. In order therefore to provide kits for converting existing mechanical distributors without such prohibitive expense we acquire a stock of existing rotor arms for conventional mechanical ignition distributors, and attach thereto flash shield and vanes. It will be recognised that the rotor arm is internally shaped to locate on the rotor shaft 12 in a particular angular relationship to the shaft 12, and at a particular axial position relative to the terminals 14, 15 of the distributor cap. Since we utilize an existing rotor arm in our construction then this relationship is not disturbed. However, the vane 23 must also be mounted in a particular angular orientation relative to the rotor shaft, and in a particular axial location relative to the base plate 16 so as to co-operate correctly with the sensor 17. In some instances within a very wide variety of different rotor arms there may be rotor arms which have a peripheral shoulder in such an axial position as to provide the correct location for the vane. However, in the majority of cases we prefer

to machine the existing rotor arm to provide a peripheral shoulder 27 at an axial position on the rotor arm such that it can be used as an axial location for the vane, and to produce also a cylindrical region 28 having its axis co-incident with the axis of rotation of the rotor arm, and having a predetermined diameter. It will be recognised that the machining of each rotor arm in this manner provides a certain standardisation of rotor arms in that in the vast majority of cases we can utilize an identical flash shield and vane for each rotor arm. Thus the diameter of the machined region 28 of the existing rotor arm is chosen in relation to the diameters of apertures in the flash shield 22 and disc portion 24 of the vane 23.

The manufacture of a rotor arm assembly is thus as follows. A conventional rotor arm 18 is selected from stock, and if necessary is machined to provide the shoulder 27 and cylindrical region 28. The moulded synthetic resin disc constituting the flash shield 22 is then fitted onto the region 28 in abutment with the shoulder 27. The previously manufactured vane 23 is then press fitted onto the region 28 so as to abut the flash shield 22 firmly. In this manner, since the thickness of the flash shield 22 is known, the shoulder 27 serves to locate the axial position of the vane 23 relative to the rotor arm, and thus in use relative to the rotor shaft 12 and the base plate 16 of the distributor. The apertures of the flash shield 22 and the disc 24 of the vane 23 are of course centrally disposed, and are of a diameter such that the press fitting of the vane 23 on the cylindrical region 28 entails sufficient friction to retain the vane and flash shield in engagement with the rotor arm. However, for added security a low viscosity adhesive is then applied to the mating surfaces of the parts permanently to bond the vane and flash shield to the rotor arm. During the step of press fitting the vane 23 to the rotor arm 18 the angular position of the vane in relation to the rotor arm is controlled such that in the final assembly engagement of the rotor arm onto

the rotor shaft 12 will not only locate the rotor arm in the desired angular relationship to the rotor shaft, but will also locate the vane 23 in the desired angular relationship to the rotor shaft. As is conventional, the rotor arm and rotor shaft are formed with inter-engaging keys to provide the appropriate angular location. A spire washer or similar clip may, if desired, by engaged with the rotor arm within the cup-shape of vane 23 adjacent the region 28 and bearing upon the vane 23 to assist the securing of the vane 23 and shield 22 in position on the rotor arm.

It is desirable for the vane 23 to be electrically earthed in use, that is to say to be at the same voltage as the casing 11 of the ignition distributor. An electrical connection is made between the vane and the rotor shaft 12 and thus the casing 11 by means of conductive paint applied to the rotor arm either before or after assembly thereto of the vane 23. The paint layer extends from the region 28 into the interior of the bore of the rotor arm and thus makes electrical connection between the vane 23 and the shaft 12 either directly or through the metal clip 30 carried within the rotor arm bore which grips the rotor shaft 12.

The kit for converting a conventional mechanical ignition distributor to an ignition distributor including a contactless signal generator thus comprises a rotor arm assembly incorporating a rotor arm, a flash shield, and a vane, and a sensor arrangement together with an electronic module for processing the signals produced in use by the sensor. The existing mechanical distributor is then partially disembled, the contact breaker assembly being replaced by the sensor 17, and the existing rotor arm being replaced by the rotor arm assembly which will of course include a rotor arm very similar to the one which is being removed, but which carries the vane 23 and flash shield 22.

CLAIMS:

1. A rotor arm assembly, for use in an ignition distributor of the kind which incorporates a contactless signal generator, the assembly including an existing rotor arm manufactured without the provision of a vane, and intended for a conventional mechanical ignition distributor, and characterized by the provision of a vane 23 for a contactless signal generator, the vane 23 having therein a centrally disposed aperture within which a cylindrical region 28 of the rotor arm 18 is received as a press fit whereby the vane 23 is attached to the rotor arm 18 to rotate therewith, the vane 23 being positioned on the rotor arm 18 with its intended axis of rotation coextensive with the axis of rotation with the rotor arm 18, in an angular position which is determined in relation to the rotor arm 18 such that the vane 23 will have the desired angular relationship to the rotor shaft 12 of the distributor when the rotor arm 18 is engaged in the conventional manner with the rotor shaft 12 of the distributor, and in an axial position in relation to the axis of rotation of the rotor arm 18 such that the vane 23 will occupy a desired axial position in relation to the sensor 17 fitted within the distributor, again when the rotor arm 18 is engaged in the normal manner with the rotor shaft 12 of the distributor.

2. A rotor arm assembly as claimed in claim 1 characterized in that an adhesive is utilized to augment the press fit between the rotor arm 18 and the vane 23 in securing the vane 23 to the rotor arm 18.

3. A rotor arm assembly as claimed in claim 1 or claim 2 characterized by including a disc-like synthetic resin flash shield 22 secured to the rotor arm 18 and extending between the vane 23 and the conductive element 21 of the rotor arm 18.

4. A method of manufacturing a rotor arm assembly characterized by the steps of, selecting a rotor arm 18 from a stock of existing rotor arms, and, securing thereto in a predetermined angular and axial position, a vane 23 for a contactless signal generator, the vane 23 being secured to the rotor arm 18 by press fitting the vane 23 onto the rotor arm 18.

5. A method as claimed in claim 4 characterized in that the step of securing the vane 23 to the rotor arm 18 includes the application to the rotor arm 18 and/or the vane 23 of an adhesive to augment the press fit between the vane 23 and the rotor arm 18 in securing the vane to the rotor arm.

6. A method as claimed in claim 4 or claim 5 characterized by including the step of machining the existing rotor arm 18 to provide thereon a cylindrical region 28 having its axis coextensive with the intended axis of rotation of the rotor arm 18, and of a diameter so related to the diameter of a centrally disposed aperture in the vane 23 that the vane 23 can be engaged as a tight press fit with said cylindrical region 28, the machining step further providing a peripheral shoulder 27 on the rotor arm 18, the shoulder 27 extending in a plane at right angles to the axis of rotation of the rotor arm 18, and being at an axial location such that engagement of the vane 23 with the shoulder 27 ensures the correct subsequent axial location of the vane 23 relative to the sensor 17 of the ignition distributor when the rotor arm 18 is engaged normally with the rotor shaft 12 of the distributor.

7. A method as claimed in any one of claims 4 to 6 characterized by including the further step of securing a disc-like synthetic resin flash shield 22 to the rotor arm 18, the flash shield 22 lying between the vane 23 and the conductive element 21 of the rotor arm 18.

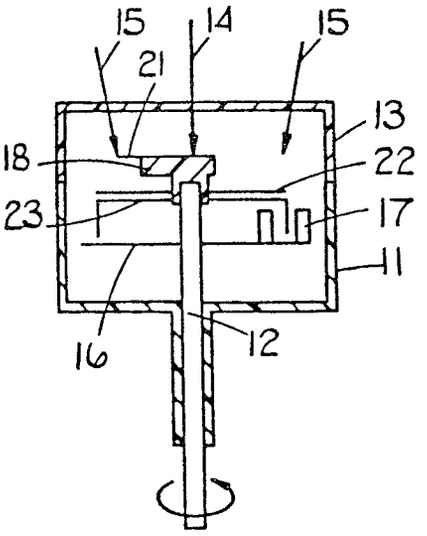

FIG.1.

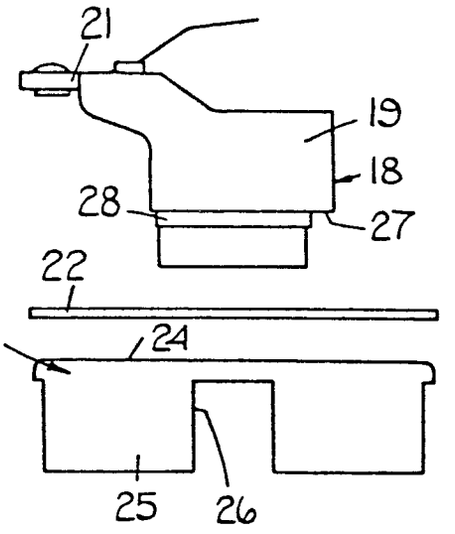

FIG.2.

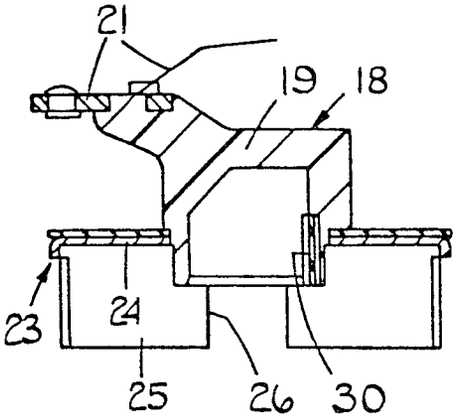

FIG.3.

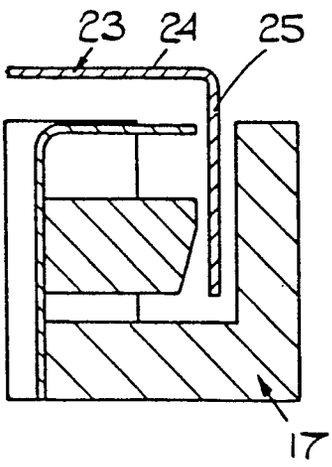

FIG.4.

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 80 30 3800.9

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
A	DE - A - 2 716 510 (R. BOSCH GMBH) --	1
A	US - A - 3 875 920 (M. WILLIAMS) --	1
A	WO - A - 79/00495 (R.J. VINCE et al.) ----	1

CLASSIFICATION OF THE APPLICATION (Int Cl.³)

F 02 P 7/06

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

F 02 P 7/00

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Berlin	04-02-1981	BORRELLY