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(54) A DRIVE ARRANGEMENT FOR AN IGNITION DISTRIBUTOR OF AN INTERNAL COMBUSTION ENGINE

(71) We, ROBERT BOSCH GMBH, a German Company, of Postfach 50, 7 Stuttgart 1, Federal Republic of Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to apparatus comprising an ignition distributor of an internal combustion engine, and a drive arrangement therefor.

It is an object of the present invention to provide such apparatus in which the drive arrangement comprises means to damp vibrations, in particular, torsional vibrations in the distributor shaft and thereby prevent undesired displacement of the ignition firing point.

A damping coupling is already known for an ignition distributor in which the distributor shaft ends in a tongue which engages in a cup-shaped connecting piece of the drive element of the engine, said drive element also being in the form of a shaft. In order to suppress torsional vibrations of the distributor shaft which may cause undesired displacement of the firing point, an oil flow supplied by the oil pump surrounds this coupling. This manner of damping torsional vibrations is recommended where the oil pump is simultaneously driven by the distributor shaft.

To damp such torsional vibrations in the distributor shaft of an ignition distributor it is also known practice to dispose friction discs alternately on the distributor shaft and on a sleeve embracing said shaft. Although this arrangement takes up little room, the power loss incurred through friction creates problems of heat transmission. An ignition distributor is also known whose distributor shaft is supported in a bearing part which, apart from its actual supporting function, is supposed to damp any torsional vibrations in the drive shaft. In order to fulfil both these functions, the bearing must be relatively narrowly tolerated and be given maintenance throughout its life.

According to the present invention there is provided apparatus comprising an ignition distributor of an internal combustion engine and a drive arrangement for transmitting drive from a drive element to the distributor shaft the arrangement comprising a three-piece coupling by means of which the shaft and the drive element are coupled together, the coupling comprising a first rigid coupling part adapted to be made fast with a portion of the distributor shaft, a second rigid coupling part formed as a portion of the drive element or to be secured thereto, and a transmission element of resilient material which couples the two coupling parts.

The drive arrangement according to the present invention has the advantage over the prior art that the three-part coupling may be disposed as a compact damping element both between the engine and the ignition distributor drive and in the drive itself.

In order to transmit the force from the drive element to the distributor shaft uniformly non-abrasively, it is proposed to insert metal caps in the recesses of the transmission element.

The invention will hereinafter be further described by way of example with reference to the accompanying drawings, in which:—

Figure 1 is a partially sectioned side view of part of a first embodiment of an apparatus constructed in accordance with the invention;

Figure 2 is a partially sectioned side view of part of a second embodiment of an apparatus constructed in accordance with the invention;

Figure 3 is a section of the embodiment of Figure 2 taken along the line III-III; and

Figure 4 is a partially sectioned side view of part of a third embodiment of an apparatus constructed in accordance with the invention.

Of the ignition distributor 10 for internal combustion engines shown in Figure 1, its housing 11, boss 12 secured thereto and a distributor shaft 13 rotatably journalled in the boss are shown. A pinion 14 is a drive element which meshes with a helical gear (not shown)

of the camshaft of the engine, is rotatably journalled on the distributor shaft 13 and axially secured by a ring 15.

A three-piece claw coupling 16 basically comprises a first outer coupling part 17, a second outer coupling part 18 and a transmission element 19 which connects these parts. The transmission element is made of resilient material- for example rubber or synthetic material - and is basically sleeve-like with two axial end surfaces 20 and has a bore 21 which accommodates the distributor shaft 13. Two recesses 22 are cut diametrically opposed to one another in each surface 20 of the element 19 and a metallic cap 23 is placed in each recess 22. The first outer coupling part 17 is disposed non-rotatably by means of a pin 24 on the distributor shaft 13 and has two claws 25 which engage in the caps 23 of the recess 22. Similarly, two claws 25 protrude from the second outer coupling part 18 and engage in the caps 23 of the recesses 23 of the opposite surfaces 20 of the element 19.

The force to be transmitted, i.e. the torque, is transmitted by a helical gear (not shown) of the camshaft to the pinion 14 which conveys the force by way of the claws 25, the caps 23, the element 19 onward to the first outer coupling part 17 and from there to the distributor shaft 13.

In Figures 2 and 3, identical reference numerals designate identical or similar parts to those in Figure 1. Here, the claw coupling is designated 36 which has as a drive element an engine shaft 34 which acts as a second outer coupling part and from which similarly two claws 25 protrude. The transmission element 39 made from resilient material has two recesses 22 on each side, of which those facing the first part 17 on the ignition distributor shaft 33 lie centrally relative to the diametral line 37 and those facing the engine shaft 34 are disposed in such a manner that their common centre line 35 is displaced relative to the diametral line 37. The diametral lines 37 and the centre line 35 form an angle of 90° and the centre line 35 is displaced relative to the axis of rotation 38. Moreover, the bases of recesses 22 of one surface 20 of the transmission element 39 are axially displaced from those of the other surface 20, that is, the axial length of the transmission element is greater than the depth of the recesses in one axial end surface plus the depth of the recesses in the other axial end surface. Transmission of the force or of the torque occurs in a similar manner to that already described in Figure 1.

The difference between the claw coupling 46 shown in Figure 4 and those of the previous Figures is that in the coupling of Figure 4 the recesses 22 in the two axial end surfaces 20 are disposed axially closer to one another than in the couplings of the previous Figures so that the bases of the recesses respectively of the two surfaces lie in substantially the same plane i.e. the axial length of the element 49 is substantially equal to the depth of the recesses in one axial end surface plus the depth of the recesses in the other axial end surface any may be reduced as a result.

WHAT WE CLAIM IS:—

1. Apparatus comprising an ignition distributor of an internal combustion engine and a drive arrangement for transmitting drive from a drive element to the distributor shaft, the arrangement comprising a three-piece coupling by means of which the shaft and the drive element are coupled together, the coupling comprising a first rigid coupling part adapted to be made fast with a portion of the distributor shaft, a second rigid coupling part formed as a portion of the drive element or to be secured thereto, and a transmission element of resilient material which couples the two coupling parts.

2. Apparatus as claimed in Claim 1, in which the transmission element has two axial end surfaces, each surface having opposed recesses in which claws of the two coupling parts engage.

3. Apparatus as claimed in Claim 2, in which each of the axial end surfaces of the transmission element has two opposed recesses.

4. Apparatus as claimed in Claim 2 or 3, in which the diametral lines on which the recesses are disposed form an angle of substantially 90°.

5. Apparatus as claimed in Claim 2 or 3, in which at least the recesses in one of the axial end surfaces of the transmission element lie on a diametral line, the common centre line of the other two recesses being offset relative to the axis of rotation.

6. Apparatus as claimed in Claim 4 or 5, wherein the transmission element has an axial length greater than the depth of the recesses in one axial end surface plus the depth of the recesses in the other axial end surface.

7. Apparatus as claimed in Claim 4 or 5, wherein the transmission element has an axial length substantially equal to the depth of the recesses on one axial end surface plus the depth of the recesses in the other axial end surface.

8. Apparatus as claimed in any preceding claim in which the drive element is a pinion which is rotatably journalled on the distributor shaft.

9. Apparatus as claimed in any preceding claim in which the transmission element is sleeve-like and has a bore which accommodates the distributor shaft.

10. Apparatus as claimed in any of Claims 1 to 7 in which the drive element is an engine shaft.

11. Apparatus as claimed in Claim 2 or in any of the preceding Claims 3 to 10 as dependant on Claim 2, in which a cap made of metal is disposed in each recess of the transmission element and each claw engages in a cap.

12. Apparatus constructed and adapted to operate substantially as hereinbefore

particularly described with reference to and as illustrated in Figure 1 of the accompanying drawings.

13. Apparatus constructed and adapted to operate substantially as hereinbefore particularly described with reference to and as illustrated in Figures 2 and 3 of the accompanying drawings.

14. Apparatus constructed and adapted to operate substantially as hereinbefore particularly described with reference to and as illustrated in Figure 4 of the accompanying drawings.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

Fig. 1

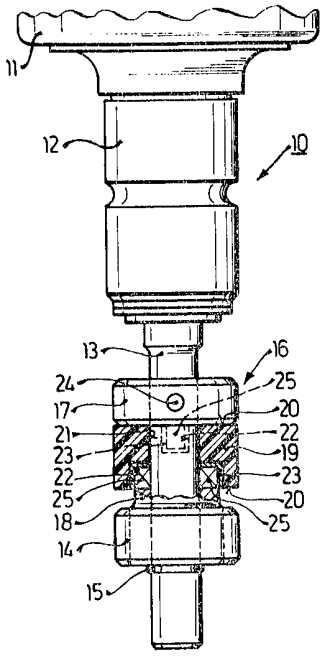

Fig. 2

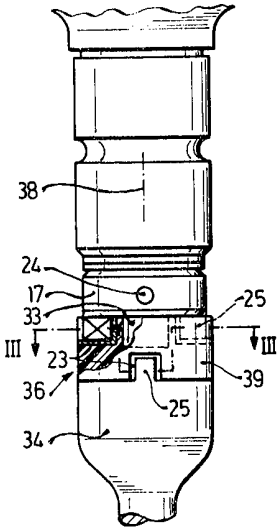

Fig. 3

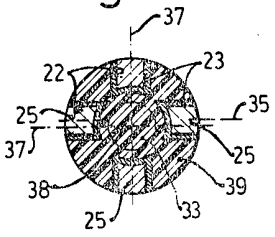

Fig. 4