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㉙ **Motor-vehicle internal combustion engine with differentially opened valves.**

㉚ A motor-vehicle internal combustion engine in which each cylinder has an associated pair of intake and/or exhaust valves (2, 3) controlled by respective rocker fingers (7, 8) which are identical and have respective fulcra (14, 15) disposed on opposite sides of a camshaft (4). The two rockers are operated by a single, common cam (13).

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This technical drawing illustrates a mechanical assembly in a cross-sectional view. The assembly features a central vertical shaft (3) that supports a handle (2) at its base. A spring (10) is positioned around the shaft, and a rotating disc (4) is mounted at the top. The disc (4) is shown in a tilted position, with a curved arrow indicating its rotation. The disc is connected to a piston (14) and a valve (13). A seal (15) is located at the top of the shaft. The entire assembly is housed within a housing (9). Other components labeled include a piston (16), a valve (17), and a seal (12). The drawing uses hatching to indicate different materials and cross-sections.

The present invention relates to motor-vehicle internal combustion engines having at least one cylinder with an associated pair of intake and/or exhaust valves and a camshaft for controlling the opening and closing of both valves of the pair by means of two respective pivoted rocker fingers.

In this type of engine, in order to obtain optimum performance, it is desirable to effect the sequential cycle of the opening/closing of the two valves in a differentiated manner so that the full opening of one of the two valves follows the full opening of the other valve after a predetermined delay.

Conventionally this is achieved with the aid of two separate cams with different profiles for controlling the two valves and/or with different shaped cam-follower profiles for the rockers of one valve and the other.

Both solutions are structurally complex in that they require the manufacture of different components.

The object of the present invention is to avoid this disadvantage by providing an internal combustion engine of the type defined above in which the differentiated opening of the two valves is achieved without the need to provide two separate cams or two rockers with different profiles.

According to the invention, this object is achieved by virtue of the fact the rockers of the two valves are identical to each other and have respective centres of pivoting disposed on opposite sides of the camshaft, and in that the two rockers are operated by a single common cam.

By virtue of this arrangement, the common cam operates the two valves differently due to the different interactions of the two rockers resulting exclusively from their opposed positioning. This effect is achieved with a number of essential components (a single cam and two identical rockers) which eliminates almost all structural complication in the engine.

The invention will now be described in detail with reference to the appended drawings, provided purely by way of non-limiting example, in which:

Figure 1 is a partially-sectioned, schematic, vertical view of a motor-vehicle internal combustion engine according to the invention,

Figure 2 is a perspective view of the distributor group of the engine shown in Figure 1, and

Figure 3 is a graph showing the opening/closing of the two valves of the unit shown in Figure 2.

With reference to the drawings, part of the head of a multi-cylinder internal combustion engine for motor vehicles is generally indicated 1 and is provided in correspondence with each cylinder with a pair of intake (or exhaust) valves 2, 3 controlled by a distributor shaft 4 supported for rotation by the head 1. Each valve 2, 3 has a rod 5, 6 the top of which is operatively associated with a respective rocker 7, 8. The two rods 5, 6 also have respective associated biasing springs 9, 10, in conventional manner.

The two rockers 7, 8 are of the finger type and are formed with respective cam-follower surfaces 11, 12 which, according to the invention, cooperate with a single, common cam 13 of the distributor shaft 4. This cam 13 has an axial extent such as to ensure contact between its own outer profile and the two cam-follower surfaces 11, 12.

The two rocker fingers 7, 8 are pivotably supported at respective ends opposite the rods 2, 3 by means of articulation heads 14, 15 supported at the tops of respective hydraulic tappets 16, 17 of known type with automatic play recovery.

In accordance with the invention, the two rocker fingers 7, 8 are identical to each other and are disposed symmetrically, in mutually opposite positions with respect to the distributor shaft 4: the fulcra 14, 15 with the respective hydraulic tappets 16, 17 are in fact situated on opposite sides of the shaft 4.

Thanks to this arrangement, the interaction between the cam 13 and the two cam-follower surfaces 11, 12 of the two rockers 7, 8 effects a differentiated opening/closing cycle for the two valves 2, 3, in use. This cycle is shown schematically in the graph of Figure 3 as a function of time and of the angular position of the cam 13 during one complete revolution. The curve A represents the opening/closing graph of the valve 2 while the curve B represents the valve 3: as can be seen, the opening/closing cycle of the second is delayed relative to that of the first so that, when the valve 2 starts its reclosure travel, the valve 3 has yet to reach its fully-open position. The condition in which both valves are completely closed, is, however, reached at the same instant.

Naturally, the constructional details and forms of embodiment of the invention may be varied widely with respect to that described and illustrated, without thereby departing from the scope of the present invention.

Claims

1. A motor vehicle internal combustion engine having at least one cylinder with an associated pair of intake and/or exhaust valves and a camshaft for controlling the opening and closing of both valves of the pair by means of two respective pivoted rocker fingers, and in which means are provided for effecting the differentiated opening of the two valves, characterised in that the rockers (7, 8) of the two valves (2, 3) are identical to each other and have respective fulcra (14, 15) disposed on opposite sides of the camshaft (4), and in that the two rockers (7, 8) are operated by a single common cam (13).

FIG. 1

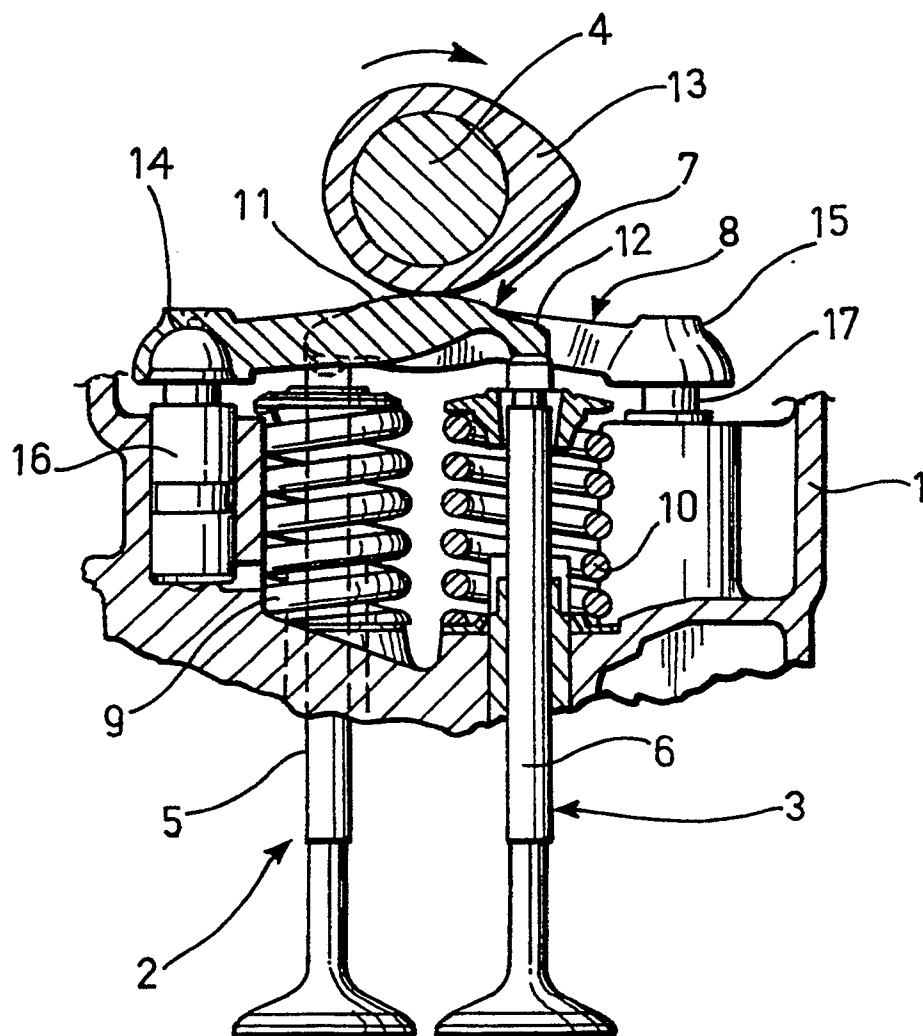


FIG. 2

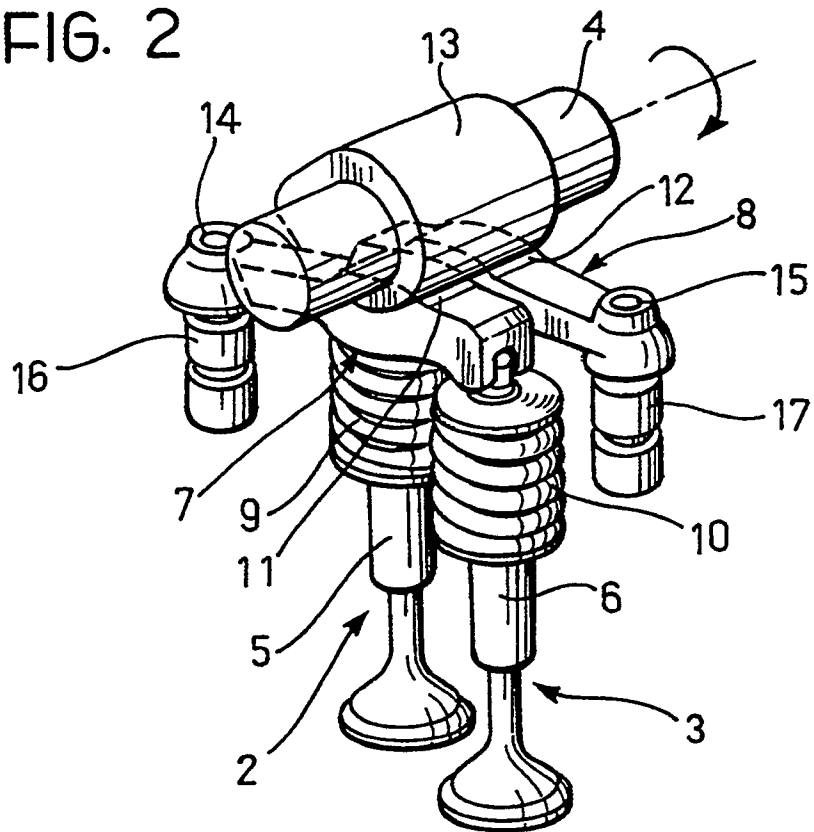
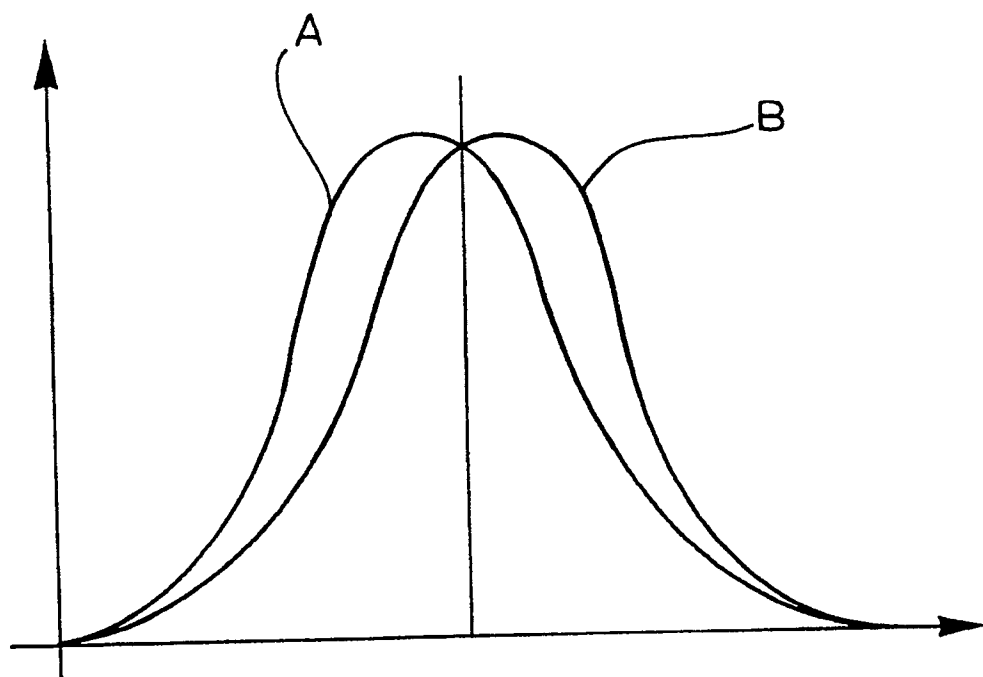


FIG. 3





European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 91 83 0144

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. CLS)
A	EP-A-319956 (NISSAN) * column 1, lines 20 - 44; figure 20 * ----	1	F01L1/26
A	DE-A-1751401 (KLAUE) * page 2, line 26 - page 3, line 5; figures 1-4 *	1	
A	EP-A-159249 (PEUGEOT) * page 3, lines 21 - 26; figures 1-3 * -----	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. CLS)
			F01L
Place of search THE HAGUE		Date of completion of the search 25 JUNE 1991	Examiner LEFEBVRE L.J.F.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	

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