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[54] **DUAL-ACTING APPARATUS FOR VARIABLE VALVE TIMING AND THE LIKE**

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[58] Field of Search **123/90.15, 90.17, 90.31; 74/640, 665 K, 665 L, 438, 568 R; 464/2, 160**

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[57] **ABSTRACT**

An apparatus and method effects the cyclical actuation of an actuation member. The apparatus can be driven by a crankshaft and has at least one dual-acting phasing apparatus with at least three rotatable mounted internally splined members and at least a first rotatably mounted, externally splined, flexible member having a portion thereof rotatably disposed within each of at least two of the internally splined members. One inner splined member can be connected nonrotatably to a first rotatable member such as an inner shaft, which is rotatably disposed within an outer shaft of a concentric camshaft. Another internally splined member can be nonrotatably connected to the outer shaft. Yet another internally splined member can be nonrotatably connected to a pulley wheel driven by the crankshaft. A fourth internally splined member can be connected to one of the other three internally splined members. A second externally splined, flexible member can be disposed with a portion thereof rotatably disposed within each of at least two of either the three or four internally splined members. Various configurations of cam members and camlobe members can be disposed as integral portions of the inner shaft and the outer shaft. The cam members can be fixed or variable, full width cam members or splittable cam members. More than one concentric camshaft can be controlled by a single dual-acting phasing mechanism. More than one dual-acting phasing mechanism can be used to control two camshafts, concentric or conventional.

26 Claims, 15 Drawing Sheets

