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MECHANICAL LINKAGE

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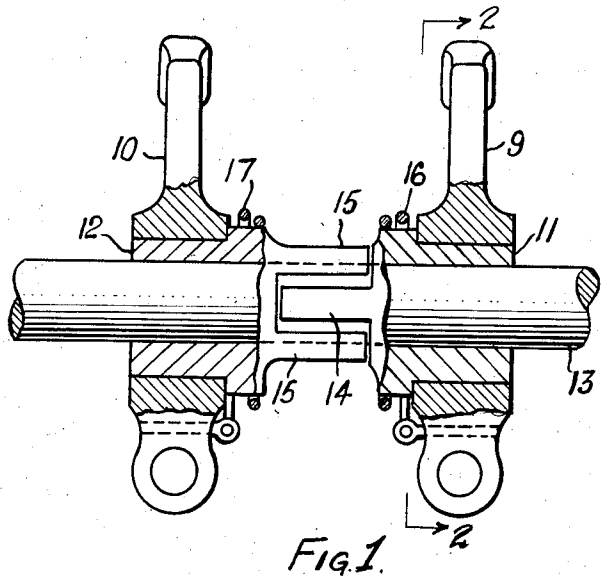

FIG. 1.

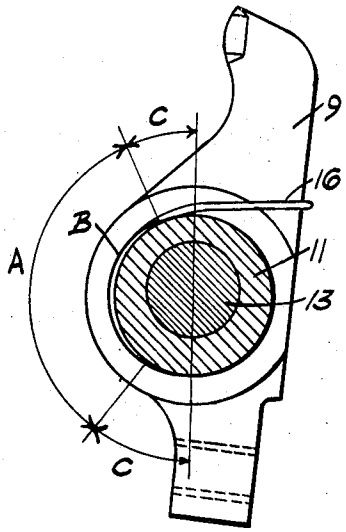

FIG. 2.

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MECHANICAL LINKAGE

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4 Claims. (Cl. 123—90)

This invention relates to mechanical linkages of the type which are intermittently stressed in operation, for example, the valve gears of internal combustion engines having poppet valves.

It is essential that allowance should be made for wear of such a linkage when wear would cause a permanent stress in the linkage. For example, as the valve face of an internal combustion engine and its seat wear, the valve sinks in the seat. Also when an internal combustion engine heats, the cylinder block expands, and the stem of each valve lengthens. If no clearance is allowed initially in the operating linkage, as wear proceeds and also as the temperature of the engine changes, the operating linkage of each valve may become continuously stressed and the valve be permanently held off its seat, or the clearance become greater. It is an object of the present invention to provide means for compensating for changes of the dimensions of component parts of a linkage while entirely eliminating clearance between component parts of the linkage.

According to the invention, the mechanical linkage to be interposed between a poppet valve and an operating cam of an internal combustion engine, comprises a fixed pin member, an eccentric bush member mounted on the pin member, and a rocker arm mounted on the bush member. In this construction the bush member, the pin member and the rocker arm present cylindrical surfaces, at least one of which is relieved over a portion extending over less than half of its circumference, and a spring means is provided for urging the bush to rotate in one direction relatively to the pin member.

A practical embodiment of the invention is illustrated in the accompanying drawings, in which Fig. 1 illustrates an application of the invention to the rocker-operated inlet and exhaust valves of an internal combustion engine cylinder, and Fig. 2 is a sectional view through the line 2—2 of Fig. 1, the illustrated embodiment being directed to a construction in which an artificial clearance is produced in the linkage.

In the drawings, 9 and 10 denote the inlet and the exhaust valve rockers of a cylinder of an internal combustion engine. 11 and 12 denote bushes carrying the rockers 9 and 10, respectively, and journalled eccentrically on a common pin 13. The bushes 11 and 12 present extensions 14 and 15, respectively, engageable with one another. 16 and 17 denote springs connecting the bush 11 to the rocker 9 and the bush 12 to the rocker 10, respectively, the springs 16 and 17 being so arranged that they tend to rotate the rockers 9 and 10, respectively, in the direction towards the respective valve and its operating cam.

In practice, when an engine is running there is always a period during which one valve is open when the other valve is closed even where considerable valve overlap exists. As an example it will be considered that the inlet valve is on the point of opening. As the associated rocker 9 is rotated by its cam to open the valve, the load is concentrated on the portion of the bore extending over the arcs C. The high loading over the arcs C causes the rocker 9 to grip the bush 11 which latter thereupon rotates about the pin 13 along the rocker 9. The extension 14 of the bush 11 ultimately comes into contact with the extension 15 of the bush 12 and causes the bush 12 to rotate about the pin 13 in opposition to the spring 17 in the direction to lift the rocker 10 away from its associated valve and tappet. The clearance thus artifically produced in the mechanism associated with the rocker 10 permits all components of the associated gear to assume their unstressed positions. When the rocker 9 rotates in the opposite direction to permit its valve to close, the bush 11 also rotates in the opposite direction, and its extension 14 is moved out of engagement with the extension 15 of the bush 12. The spring 17 thereupon rotates the bush 12 and causes the rocker 10 to approach its valve and tappet and to rest against them, thereby reducing the clearance to zero ready for the next exhaust valve-opening operation. At the same time the load on the arcs C of the rocker 9 is removed or reduced to such an extent that the bush 11 is free to be rotated relatively to the rocker 9 by the extension 14 of the rocker 10 as the exhaust valve opens, the operation of providing a clearance in the inlet valve linkage and reducing said clearance to zero being performed in the same manner as for the exhaust valve.

The portion of the bore of the rocker 9 or 10 extending over the arc A is formed to a radius B less than the radius of the rest of the bore. Said portion of the bore is thus out of contact with the bush 11 or 12.

What I claim is:

1. A mechanical linkage to be interposed between a poppet valve and an operating cam, comprising a fixed pin member, an eccentric bush member rotatably mounted on said fixed pin member, a rocker arm member rotatably mounted on said eccentric bush member, the eccentric bush member and the pin member having engaging cylindrical surfaces, the rocker arm member and the eccentric bush member also having cylindrical engaging surfaces, an engaging cylindrical surface of one of said members comprising a cylindrical arc of engagement less than that of the cylindrical surface of the other of said members engaged thereby but which is somewhat greater than 180°, said one member having a surface connecting the ends of said cylindrical arc in spaced relation to the cylindrical surface of said other member, and spring means urging said eccentric bush member to rotate in one direction relatively to the pin member.

2. A mechanical linkage to be interposed between a poppet valve and an operating cam, comprising a fixed pin member, an eccentric bush member rotatably mounted on said fixed pin member, a rocker arm member rotatably mounted on said eccentric bush member, one of said members having an engagement surface in the form of a cylinder, another of said members having a first surface in the form of a cylindrical arc in bearing engagement with said engagement surface and having a second surface in the form of a cylindrical arc, the ends of said cylindrical arcs being connected and said second cylindrical arc being shorter than the first cylindrical arc and spaced from said engagement surface, and spring means urging said eccentric bush member to rotate in one direction relatively to the pin member.

3. A mechanical linkage to be interposed between a poppet valve and an operating cam, comprising a fixed pin member, an eccentric bush member rotatably mounted on said fixed pin member, a rocker arm member rotatably mounted on said eccentric bush member, and spring means urging said eccentric bush member to rotate in one direction relatively to the pin member, said eccentric bush member having an outer bearing surface in the

form of a cylinder, said rocker arm member having a bore in which the eccentric bush member extends, said bore having a first surface in the form of a cylindrical arc in bearing engagement with the outer bearing surface of the eccentric bush member and having a second surface extending around a portion of said outer bearing surface in spaced relation thereto and connected into the ends of the cylindrical arc of said first surface, said second surface extending around somewhat less than one-half the circumference of said outer bearing surface, whereby the load applied to the eccentric bush member when the rocker arm member is rotated is concentrated at the end portions of the cylindrical arc.

4. A mechanical linkage as claimed in claim 3, in which said second surface of the bore in the rocker arm member is in the form of a cylindrical arc having a radius less than that of said first surface.

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