June 16, 1936. D. A. WALLACE 2,044,598

TAPPET

Filed June 18, 1932

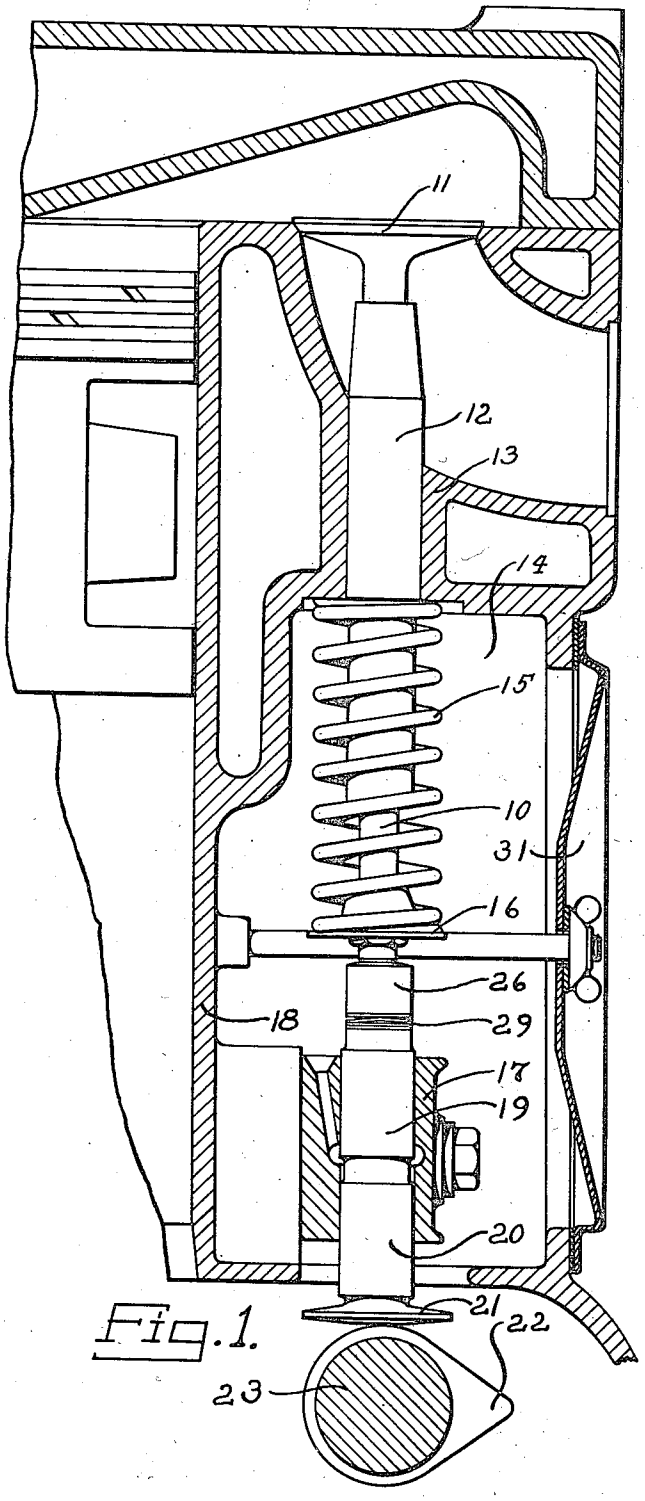


Fig. 1.

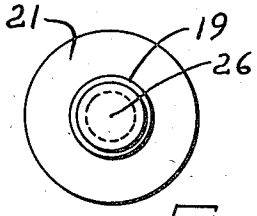


Fig. 3.

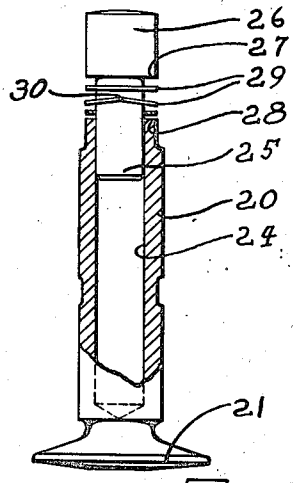


Fig. 2.

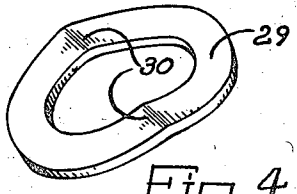


Fig. 4.

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TAPPET

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2 Claims. (Cl. 123—90)

This invention relates to improved tappets of the character used in operating the valves of an internal combustion engine.

One of the main objects of the invention is to provide an improved tappet of this kind which may be conveniently adjusted in length to bring about the desired coaction between the valve with which it is associated and a valve actuating cam.

Other objects of the invention are to provide valve and cam engaging parts in a tappet which are adapted to move relative to each other throughout the thermal expansion clearance required in the valve actuating apparatus so as to maintain contact between the valve and valve engaging part of the tappet and between the cam and cam engaging part of the tappet during operation; to provide resilient means for spreading the relatively movable parts of the tappet apart when compression of the latter between the valve and cam is discontinued so as to hold the parts of the tappet in continuous contact with the valve and cam; to provide means of this character which cushion the movement of the tappet parts toward each other and which prevent the creation of tappet noises; to provide means of this kind which serve as shims in predetermining the effective length of the tappet; and to provide a tappet in which various numbers of shims of diverse thicknesses can be inserted so as to take up definite amounts of the lost motion between the valve and valve actuating mechanism.

Further objects of the invention are to provide means in a tappet of this character for holding the shims between opposed faces of the cam and valve engaging parts; to provide means of this character from which the shims can be readily removed and replaced without disassembling the structure of the engine; to provide bowed ring-shaped shims between opposed faces of the valve and cam engaging parts which permit the accumulation of lubricant between such parts; to provide shims of this kind which flex repeatedly during operation of the tappet, thereby producing a breathing action for feeding lubricant to the sliding contacting surfaces of the parts of the tappet; and to provide an oil cushion between the relatively movable parts of the tappet which prevent such parts from coming together with severe impact during compression of the tappet between the valve and valve actuating cam and which thereby deaden tappet noises.

An illustrative embodiment of the invention is shown in the accompanying drawing, in which:

Fig. 1 is a vertical transverse sectional view of a valve chamber showing a valve, a valve cam, and my improved tappet.

Fig. 2 is a side elevational view, partly in section, of my improved tappet.

Fig. 3 is a plan view of the tappet shown in Fig. 2.

Fig. 4 is a perspective view of a resilient bowed shim of the type used in my improved tappet.

In the form shown, a valve stem 10 having a valve 11 at its upper end is slidably mounted in a guide 12 which is held in the supporting structure 13 of a valve chamber 14. A spring 15 bears between the supporting structure 13 and a washer 16 on the lower end of the valve stem 10 for normally holding the valve 11 in a closed position. Slidably mounted in a collar 17 which is rigidly secured to the wall 18 of the valve chamber is a tappet 19.

The tappet 19 includes a cam engaging portion having a tubular stem 20 on which is integrally formed a head 21. The head 21 rides upon the periphery of a cam 22 mounted on a camshaft 23 which is disposed substantially in vertical alignment with the tappet 19 and valve 11. The stem 20 of the cam engaging portion is provided with a cylindrical bore or passage 24 having an open end opposite from the head portion 21 in which is slidably mounted a neck 25 of a valve engaging element 26. The outer end of the valve engaging element 26 is preferably hardened to resist wear and a shoulder or face 27 is provided at the junction of the neck 25 and outer end portion of the valve engaging element. The shoulder 27 registers with the extremity or face 28 of the stem 20 of the cam engaging portion.

Concentrically mounted on the neck 25 of the valve engaging element 26 are a plurality of ring-shaped shims 29 which are preferably formed of resilient metal and bowed at one or more locations throughout their circumference, as indicated at 30. The number and thicknesses of the shims 29 may vary in diverse tappets depending upon the amount of thermal expansion clearance that is desired to be taken up by the shims.

In operation of a valve and valve actuating apparatus of the character used in internal combustion engines, provision is generally made for the expansion of the metal parts as the temperature of the engine rises. This is conveniently accomplished by allowing a clearance space between the chain of moving parts. The valve and valve seat, as well as other portions of the members of the apparatus, wear, and from time to time an adjustment must be made in order to

bring the thermal expansion clearance to a desired value. With my improved tappet it is merely necessary to remove the cover plate 31 of the valve casing and to compress the spring 15 upwardly sufficiently to permit removal of the valve engaging element 26 of the tappet. Then one or more shims 29 may be added or removed, as is required to effect the desired adjustment. The neck 25 of the valve engaging element is merely inserted through the central opening in the shims and it is then replaced in the bore 24 of the stem 20. Shims of diverse known definite thicknesses are preferably used so as to vary the thermal expansion clearance by definite known amounts.

When my improved tappet is placed under compression between the cam 22 and the end of the valve stem 10 during opening of the valve, the bowed shims 29 are flattened out to substantially parallel relationship. In this state the shims provide a positive stop for limiting movement of the relatively movable parts of the tappet toward each other. By providing a proper number of shims of correct thicknesses, a desired degree of valve opening is obtainable.

When the crown of the cam 22 rotates away from the head 21 of the tappet the latter moves downwardly, permitting the spring 15 to close the valve 11. The valve 11 reaches its seat somewhat before the tappet 19 reaches the end of its downward movement. During downward movement of the tappet after the valve 11 is seated, the resilient shims 29 bear between the opposed faces 27 and 28 of the valve and cam engaging elements of the tappet, respectively, and spread the elements apart so as to maintain continuous contact between the valve engaging element 26 and the end of the valve stem 10 and between the cam 22 and the head 21 of the cam engaging element. This continuous contact between the relatively movable parts of the valve and valve actuating apparatus eliminates the engagement together of the parts thereof under impact and thereby prevents the creation of tappet noises.

Expansion and contraction of the bowed portions of the shims causes a breathing action which feeds the lubricant, constantly flowing over the surfaces of the parts during operation, to the neck 25 of the valve engaging element 26 and to the inner peripheral surface of the bore 24 on which the neck slides. The entrapment of lubricant between the shims provides an oil cushion which also prevents the faces 27 and 28 and the shims 9 from forcefully striking together in a noisy manner.

Although but one specific embodiment of the invention is herein shown and described, it will be understood that various changes in the size, shape and arrangement of parts may be made without departing from the spirit of my invention, and it is not my intention to limit its scope other than by the terms of the appended claims.

What I claim is:

1. A tappet including a body part having a cam engaging portion at one end and having a passage formed in its opposite end, a valve engaging element having a neck slidably mounted in and freely removable from said passage and having a shoulder registering with the adjacent extremity of said body part, and removable washer-like shims mounted on the neck of said valve engaging element having openings for receiving said neck and disposed between said shoulder and said body portion comprising bowed resilient rings adapted to urge said valve engaging element in one direction and being contractible to their maximum extent within the range of movement of said element relative to said body part in the other direction so as to positively limit movement thereof in the latter direction.

2. In a machine including a supporting structure having a valve seat, a valve slidably mounted on said supporting structure, a spring bearing between said supporting structure and said valve normally holding the latter in engagement with said valve seat, a valve actuating cam spaced from said valve, a tappet slidably mounted on said supporting structure between said cam and valve including relatively shiftable cam and valve engaging portions in telescopic engagement and having registering opposed faces, and removable washer-like shims between said faces and encircling one of said portions comprising bowed resilient members for maintaining contact between said cam and said cam engaging portion and between said valve and said valve engaging portion when said valve is closed and adapted to positively limit relative movement of the cam and valve engaging portions of said tappet toward each other during opening of the valve.

DAVID A. WALLACE.