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TAPPET WITH PRESSED FIT PUSH ROD SEAT

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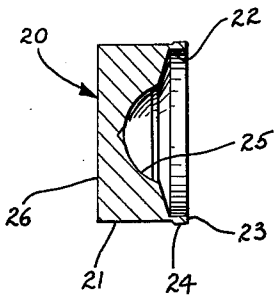


FIG. 3

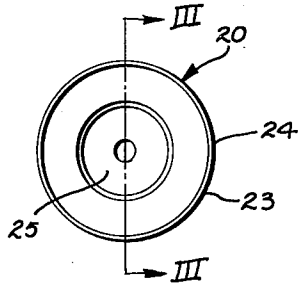


FIG. 2

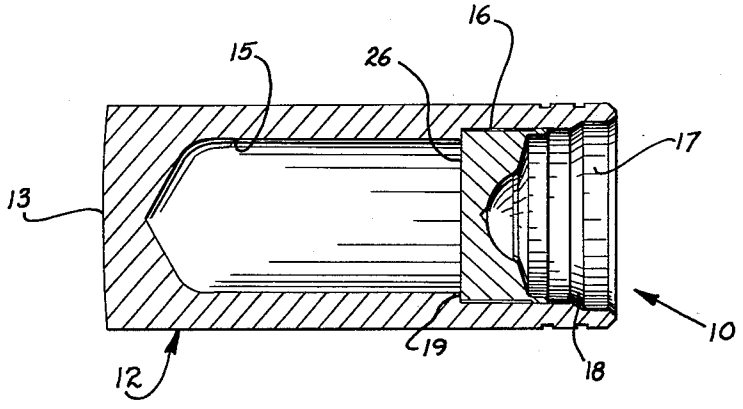


FIG. 1

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TAPPET WITH PRESSED FIT PUSH ROD SEAT

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This invention relates to a tappet, and more particularly to a press fitted push rod seat operative therewith.

Many mechanical tappets, especially those used in high speed engines, have to be designed as light as possible to allow proper valve train action at the upper end of the speed range. The weight criterion necessarily demands that the tappet be hollow. However, rigidity of the valve train cannot be sacrificed for weight since it also is a necessary design feature for high speed internal combustion engines. Short push rods increase valve train rigidity, therefore, the design of many engines demand that the push rod seat be in the upper portion of the valve tappet casing.

If the valve tappet is to be hollow and the push rod seat is to be in the upper portion of the tappet it has previously been necessary to form the valve tappet from three components which include the casing, the push rod seat and the retaining ring which maintains the push rod seat in position in the casing. When the casing is made of brittle materials, such as cast iron or hard steel, the three parts avoid damage to the brittle casting by allowing the push rod seat to be loose in the casing. If only two parts are used, the brittle casting is often damaged due to a press or interference fit between the body and the push rod seat which is necessary to hold the push rod seat in position. The slip fit in the three part arrangement allows engine oil to enter the hollow cavity in the tappet casing and adds to the weight of the tappet. To eliminate this additional weight it generally becomes necessary to add a drain hole in the bottom of the tappet body.

The invention described herein is designed to overcome the disadvantages of the prior three piece valve tappet. This is accomplished by forming a neck portion which is flexible on the push rod seat. Also formed integral with the neck portion is a collar which is of greater diameter than the opening in the valve tappet casing in which the push rod seat is received. The neck and collar portions of the valve tappet seat will flex sufficiently to allow the collar to pass into the opening formed in the valve tappet casing. A press fit results between the opening in the valve tappet casing and the collar formed on the push rod seat. This press fit retains the push rod seat within the valve tappet opening eliminating the necessity of a retainer ring and also operates as a seal to prevent engine oil from filling the tappet casing thus eliminating the necessity of a drain hole in the bottom of the valve tappet.

It is therefore an object of this invention to provide a valve tappet which is of light weight two piece construction.

Still another object of this invention is to provide a valve tappet and push rod seat wherein the push rod seat has a flexible neck portion to which is secured an oversized collar, both portions flexing sufficiently to allow

the collar to enter the opening in the valve tappet casing and form a press fit.

Yet another object of this invention is to provide a valve tappet and push rod seat therefor which eliminates the necessity for a retainer ring to maintain the push rod seat in position in the valve tappet casing.

Another object of this invention is to provide a valve tappet and push rod seat wherein the push rod seat operates as a seal preventing oil entering the cavity of the valve tappet casing thus eliminating the necessity of providing the casing with an oil drain hole.

Still another object of this invention is to provide a valve tappet and push rod seat which is composed of a minimum number of simply designed component parts resulting in an article which is economical to manufacture and maintain.

A still further object of this invention is to provide a push rod seat which can be press-fitted into a brittle tappet casting without fear of cracking it.

These and other objects and advantages of this invention will become more apparent upon reading the specification in conjunction with the accompanying drawings.

In the drawings:

FIG. 1 is a cross sectional view of the valve tappet and push rod seat therefor.

FIG. 2 is a plan view of the push rod seat;

FIG. 3 is a cross sectional view taken along the section lines III—III of FIG. 2.

Basically, this invention relates to a mechanical valve tappet and the push rod seat disposed therein. The mechanical valve tappet is a sleeve like member having a closed end and an open end formed by a bore and counterbore. The push rod seat is a disc like member having a body portion of lesser diameter than the diameter of the counterbore. Formed integral with the body portion of the push rod seat is a flexible neck portion which extends thereabove. Also formed integral with the neck portion is a ring-like collar which has an outside diameter which is greater than the diameter of the counterbore. The body portion of the push rod seat is easily inserted within the counterbore. The entrance to the counterbore is tapered to assist in the insertion of the collar. The flexible neck and collar portions will contract somewhat to allow passage of the collar into the counterbore. The push rod seat is forced into the counterbore until the bottom of the push rod seat engages a shoulder at the bottom of the counterbore. The flexible neck and collar portions attempt to expand forcing the collar into engagement with the counterbore. Thus, a force fit or interference fit results between the collar and the counterbore retaining the push rod seat in the tappet, yet cracking of the brittle casing is avoided due to the easy flexibility resulting from the thin wall thickness of the push rod seat at its neck. The engagement of the collar with the counterbore also operates as a seal to prevent lubricant from by-passing the push rod seat and filling the cavity in the valve tappet casing.

The tappet assembly is designated generally as **10**. The assembly **10** includes the valve tappet casing designated generally as **12** and the push rod seat designated generally as **20**.

Referring now more specifically to the details of the in-

vention, FIG. 1 best illustrates the valve tappet casing **12** now to be described.

The valve tappet casing **12** is an elongated, generally cylindrical member having a closed end **13**. An opening is formed in the opposite end of the valve tappet casing and extends substantially throughout the length thereof. The opening includes the bore **15** and the counterbore **16** which is of greater diameter than the bore **15**. The mouth **17** of the tappet is of still greater diameter than the counterbore **16**. A tapered surface **18** is formed between the mouth **17** and the counterbore **16** to facilitate insertion of the push rod seat **20** in a manner which will be explained more fully hereinafter. A shoulder **19** is formed at the bottom of the counterbore **16** as a result of the difference in diameter size between the bore and counterbore.

The push rod seat **20** is generally disc shaped and of sufficient thickness so as to support the pressure applied thereto by the push rod (not shown). The push rod seat **20** has a body portion **21** which is of lesser outside diameter than the diameter of the counterbore **16**. For purposes of illustration, the body portion of the push rod seat may range from between .678 and .675 inch whereas the diameter of the counterbore **16** may range between .6800 and .6815.

Formed integral with the body portion **21** is a neck portion **22**. The neck portion **22** extends above the body portion and is reduced substantially with respect thereto so as to render this portion significantly resilient. The outside diameter of the neck portion **22** remains the same as the outside diameter of the body portion **21**, however, the interior of the push rod seat **20** is relieved of material to form the thin neck portion.

Formed integral with the neck portion **22** is a ring-like collar **23** which is of thicker cross-section than the neck portion **22**, yet somewhat resilient. The outside diameter or surface **24** of the collar **23** is greater than the diameter of the counterbore **16**. For purposes of illustration, the outside diameter of the collar may range from between .6825 and .6835 inch.

The bottom **26** of the push rod seat **20** is a flat surface. However, the top of the push rod seat **20** is recessed and a semispherical pocket **25** formed therein to provide a bearing surface for a push rod (not shown).

Assembly and Operation

The tappet assembly **10** is designed to operate between a push rod and valve train operating cam of a conventional internal combustion engine.

The valve tappet is assembled by providing the valve tappet casing **12** with a push rod seat **20**. The body portion **21** of the push rod seat **20** is started into the opening formed in the valve tappet casing. Since the body portion **21** is of less diameter than the mouth **17** and counterbore **16** it will pass easily into the counterbore. However, since the collar **23** is of greater diameter than the counterbore **16** it is necessary to apply pressure to the pocket **25** of the push rod seat to force the collar into the counterbore. This can be accomplished by various mechanisms. The tapered surface **18** facilitates the insertion of the collar into the counterbore. As pressure is applied to the push rod seat the tapered surface **18** will cause the neck portion **22** of the push rod seat to flex gradually allowing the collar to pass into the counterbore. The pressure on the push rod seat **20** is continued until the bottom **26** thereof seats against the shoulder **19**.

The push rod seat is made of such material that in the hardened or semi-hardened condition, it will be capable of flexing diametrically in the neck and collar portions without fracturing. The amount of necessary diametrical flex is generally less than five thousandths of an inch.

The push rod seat is so designed that when it is pressed into the valve tappet casing, the neck portion of the push rod seat flexes easily enough so that the valve tappet casing **12** is not damaged. Generally the neck portion **22** and collar portion **23** flex in the neighborhood of 90% of the original interference fit. Thus the body portion expansion is reduced to approximately 10% of the original press fit, which does not damage the brittle material.

The remaining 10% press fit between the body and push rod seat, subsequent to assembly, keeps the parts together and seals out engine oil. Thus, the collar **23** operates as a retainer ring and also as a seal eliminating the necessity of a separate retaining ring and of providing the valve tappet casing with an oil drain hole.

The general percentage figures used above are illustrative only, and it is to be understood that within the broadest aspect of the invention any suitable percentages could be used without altering the basic concept.

From the above description it can be seen that the invention disclosed herein provides several advantages over prior mechanical valve tappets. The valve tappet can now be constructed from two pieces where it was previously necessary to use three. This has been done without sacrificing the weight of the valve tappet or the positioning of the push rod seat. It is no longer necessary to provide the casing of the valve tappet with an oil drain hole which eliminates a previously necessary machine operation. The necessity of a workman inserting a retainer ring has also been eliminated as well as machining a groove within the bore of the tappet to receive the retainer ring.

While a preferred embodiment of this invention has been described, it will be understood that modifications and improvements may be made thereto. Such of these modifications and improvements as incorporate the principles of this invention are to be considered as included in the hereinafter appended claims unless these cliams by their language expressly state otherwise.

I claim:

1. A valve tappet with push rod seat therefor comprising: a valve tappet casing having a bore and a counterbore, a push rod seat disposed in said counterbore, said push rod seat having a body with an outside diameter slightly less than the diameter of said counterbore, said push rod seat also having a reduced neck portion having an enlarged collar, the outside diameter of said collar being slightly greater than the diameter of said counterbore, said neck and collar portions being flexible to allow passage of said collar into said counterbore to form a press fit between said push rod seat and said counterbore.

2. A valve tappet and push rod seat comprising: a valve tappet casing formed of relatively brittle material, said casing having an opening in one end thereof to receive a push rod seat, said push rod seat having secured thereto a thin neck portion and a collar of greater diameter than said opening, said neck and collar portions flexing to allow passage of said push rod seat into said opening and forming a press fit between said tappet and said push rod seat.

3. A push rod seat adapted to be positioned within a tappet comprising: a disk-like body having a diameter less than the opening of a tappet into which it is adapted to fit, a thin neck portion formed integral with said body and having a collar of greater diameter than the disk-like body and the opening of said tappet, said neck and collar portions being somewhat flexible and the collar thereof adapted to form a press fit with said valve tappet opening when inserted therein.

4. A valve tappet and push rod seat therefor comprising: a valve tappet casing formed of relatively brittle material, said casing having an opening formed in one end thereof including a counterbore, a disk-like push rod seat having a body portion of less diameter than said counterbore being placed in said counterbore, a thin neck portion formed integral with said push rod seat body portion and projecting thereabove, a ring-like collar formed integral with said neck and having a greater diameter than said counterbore, said neck portion being flexible to allow passage of said collar into said counterbore forming a press fit, said collar operating to retain said push

rod seat in said counterbore and as a seal to prevent lubricant from bypassing said push rod seat.

5. A valve tappet and push rod seat therefor comprising: an open ended valve tappet casing formed of relatively brittle material and having a counterbore, a push rod seat disposed within said bore and having a flexible portion bearing a surface which is of slightly greater diameter than the counterbore, said portion flexing to allow passage of said push rod seat into said counterbore and said surface engaging said counterbore forming a press fit.

6. A valve tappet and push rod seat therefor as in claim 4 wherein the entrance to said counterbore is tapered to facilitate insertion of said push rod seat.

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