

[54] **ROCKER ARM STUD SUPPORT DEVICE**
[76] Inventor: **Ralph H. Ridgeway**, 17 Pine Dr.,
North Wilbraham, Mass. 01067
[22] Filed: **Jan. 21, 1974**
[21] Appl. No.: **435,287**
[52] **U.S. Cl.**..... **123/90.41, 74/519, 123/90.42**
[51] **Int. Cl.**..... **F01I 1/18**
[58] **Field of Search** **123/90.41, 90.42; 74/519,**
74/522

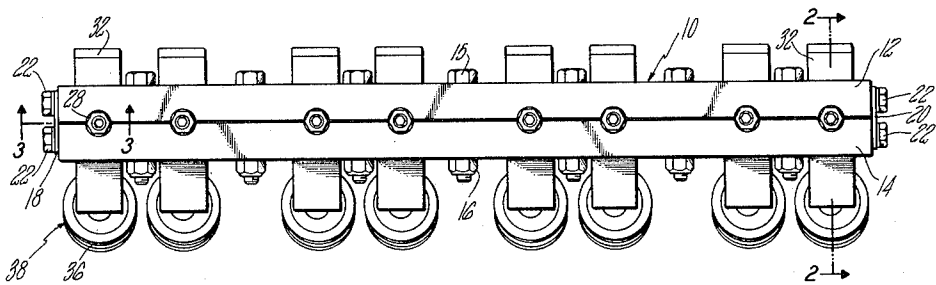
[56] **References Cited**

UNITED STATES PATENTS			
3,198,183	8/1965	Ball.....	123/90.42
3,251,350	5/1966	Thompson	123/90.41
3,430,612	3/1969	Ansteth.....	123/90.41

3,621,823 11/1971 Lombardi 123/90.42
Primary Examiner—**Manuel A. Antonakas**
Assistant Examiner—**Daniel J. O'Connor**

[57] **ABSTRACT**
The flexing of the rocker arm studs of an internal combustion engine is prevented by use of an apertured restraint bar rigidly mounted on the cylinder head casting by means of brackets. The apertures in the restraint bar circumscribe but do not rigidly structurally interconnect the rocker arm stud nuts which define extensions of the studs. The position of the stud nuts on the studs may be varied to adjust valve clearance without removing or repositioning the restraint bar.

7 Claims, 3 Drawing Figures



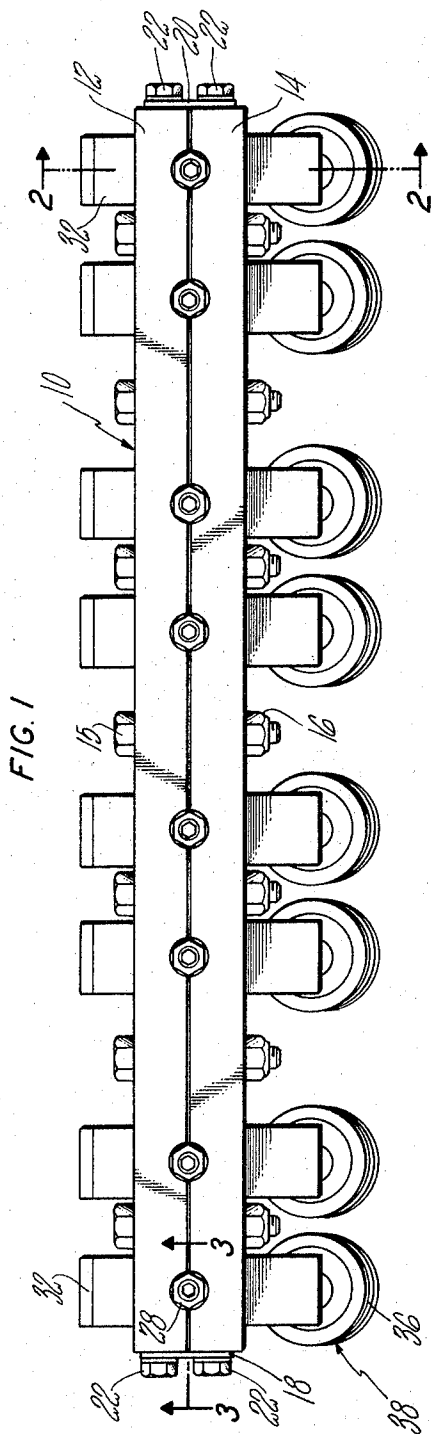


FIG. 1

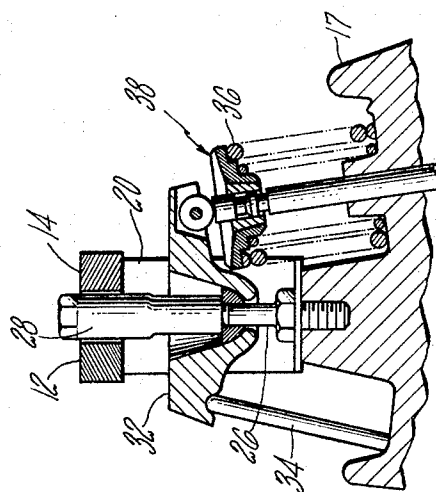


FIG. 2

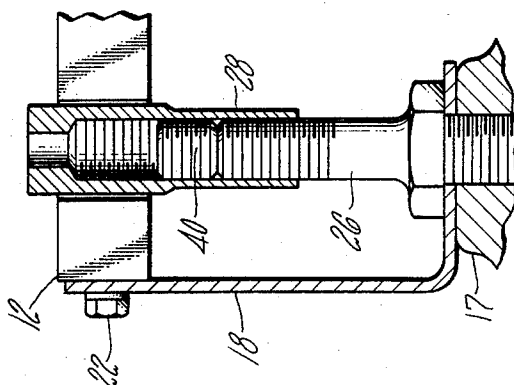


FIG. 3

ROCKER ARM STUD SUPPORT DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to enhancement of the structural integrity of internal combustion engines and particularly high performance engines. More specifically, this invention is directed to apparatus which minimizes the deflection of engine valve operating members without impeding valve clearance adjustments. Accordingly, the general objects of the present invention are to provide novel and improved methods and apparatus of such character.

2. Description of the Prior Art

Internal combustion engines characterized by push rod operated valve rocker arms pivotally carried by linearly oriented upstanding studs, the studs being mounted on the engine cylinder head, are well known. Due to stresses and vibrations, which are particularly prevalent during high speed operation, the rocker arm studs are known to undergo deflection. Rocker arm stud deflection causes inefficient engine operation and often results in metal fatigue leading to stud breakage or the pulling of the studs from the cylinder head with concomitant damage to both the head and studs.

Various techniques for eliminating the problems resulting from the stresses imposed on rocker arm studs have been suggested in the prior art. Thus, by way of example, U.S. Pat. No. 3,198,183 discloses apparatus intended to prevent the rocker arm from rotating about its stud. The technique of U.S. Pat. No. 3,198,183, however, was found to be of minimal value since it did not prevent rocker arm stud deflection. U.S. Pat. No. 3,430,612 discloses apparatus for rigidly structurally interconnecting all of the rocker arm studs of a cylinder bank in the interest of eliminating stud deflection and dampening harmonic vibrations in an engine valve train. However, the rigid interconnection of engine studs for mutual restraint as disclosed in U.S. Pat. No. 3,430,612 precipitates difficult engine adjustment problems. Thus, although the technique and apparatus of U.S. Pat. No. 3,430,612 reduces rocker arm stud deflection, this desirable result is achieved only at the expense of greatly impeding the adjustment of valve clearance since the entire rigidizing structure interconnecting a plurality of studs must be released from its operative position in order to permit the adjustment of one or more of the associated valves. Also, as a consequence of the rigid interconnection, as suggested in U.S. Pat. No. 3,430,612, the adjustment of each valve has an effect on the adjustment of every other valve and therefore an entire engine tuning procedure can become a very time consuming and difficult task.

SUMMARY OF THE INVENTION

The present invention overcomes the above briefly discussed and other deficiencies and disadvantages of the prior art by providing novel and improved methods and apparatus for eliminating the flexing of the rocker arm studs of an internal combustion engine. Apparatus in accordance with the present invention includes elongated bar means which, with the engine in the off condition, surrounds but does not physically restrain each of the nut extensions of an array of rocker arm studs. The bar means is rigidly mounted, at its opposite ends, above the cylinder head casting by means of brackets. The nut extensions of the rocker arm studs receive set

screws which butt against the top of the rocker arm studs. Through cooperative action between the nut extensions and the set screws, the nut extensions may be adjusted without removal of or otherwise acting on the bar means to reposition the rocker arms and thereby adjust valve clearance. The clearance between the rocker arm stud nut extensions and the bar means is sufficiently small such that, during engine operation, any tendency toward stud deflection will be transmitted by the stud nut extensions to the bar means which will prevent the deflection. The desirable result of essentially eliminating rocker arm stud deflection is accomplished without the necessity of rigidly interconnecting all of the rocker arm studs of a cylinder bank.

BRIEF DESCRIPTION OF THE DRAWING

The present invention may be better understood and its numerous objects and advantages will become apparent to those skilled in the art by reference to the accompanying drawing wherein like reference numerals refer to like elements in the several figures and in which:

FIG. 1 is a top view of a preferred embodiment of the present invention, the invention being shown installed on a bank of cylinders of an eight cylinder internal combustion engine with the cylinder head cover removed;

FIG. 2 is a cross-sectional side elevation view, partly in section, taken along line 2—2 of FIG. 1; and

FIG. 3 is a partial cross-sectional view taken along line 3—3 of FIG. 1, FIG. 3 depicting the means for mounting the present invention on an engine and having certain engine components deleted therefrom in the interest of facilitating understanding of the drawing.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing, a preferred embodiment of applicant's invention is shown associated with the rocker arm studs of a cylinder bank of a conventional 8-cylinder engine. The invention comprises bar means indicated generally at 10. The bar means comprises two elongated bars 12 and 14 having semi-circular cut-outs in the facing sides thereof; the cut-outs cooperating to define apertures which receive but normally do not contact the rocker arm stud nuts. The bars 12 and 14 are preferably comprised of aluminum and are provided with a plurality of transversely extending apertures which receive bolts such as bolt 15. Bolts 15, and their cooperating nuts 16, serve to retain the proper positioning of the bars 12 and 14 with respect to one another and it will be understood that, if necessary, spacers can be provided between the bars in the vicinity of bolts 15. It will, of course, be understood that bar means 10 may be comprised of a single bar with holes drilled therethrough at the appropriate places so as to register with the rocker arm studs.

The bar means 10 is supported from the cylinder head casting 17 by means of brackets and bolts in the manner which may be seen from joint consideration of FIGS. 1 and 3. The bars 12 and 14 are connected to the L-shaped supporting brackets 18 and 20 by bolts 22 and the brackets are in turn mounted on the cylinder head casting 17 by the end rocker arm studs such as stud 26 of FIG. 3.

As may be seen from joint consideration of FIGS. 2 and 3, the rocker arm studs, such as stud 26 of FIG. 3

have exterior threads. The threads on the stud are engaged by elongated rocker arm stud nuts such as nut 28. The rocker arm stud nuts effectively function as extensions of the rocker arm studs and are of sufficient length to project above bar means 10 regardless of the relative position of the stud nuts on the studs. The ends of the stud nuts which project above the bar means are formed into a hexagonal shape, as may be seen from joint consideration of FIGS. 1 and 2, for the reasons which will become apparent from the discussion below. As may be seen from FIG. 3, the internal bore of the rocker arm stud nuts is of reduced diameter in the vicinity of the hexagonal portions thereof; these reduced diameter portions being unthreaded whereas the stud nuts are internally threaded for the remainder of their length.

Referring briefly to FIG. 2, the environment in which the present invention is utilized is clearly shown. A rocker arm mounted on stud 26 is indicated at 32. The rocker arm is actuated in a first direction by means of a push rod 34 and is returned to its original position by means of a compression valve spring 36; the spring being positioned between the cylinder head casting 17 and pressure disc means indicated generally at 38. Valve clearance adjustments are, in the manner well known in the art, effected by adjusting the relative position of the stud nuts, such as nut 28 of FIG. 2, on the rocker arm studs.

Referring again to FIG. 3, it may be seen that each of the rocker arm stud nuts includes an adjustable set screw, such as screw 40 in nut 28, disposed therein. The set screws, such as screw 40, are provided with axially aligned tool receiving sockets. Access to these sockets is available through the bore in the hexagonal heads of the stud nuts. The set screws 40 insure, during operation of the engine, that the positioning of the stud nuts relative to the rocker arm studs will not change as a result of vibration.

As noted above, and as may be clearly seen from FIGS. 2 and 3, clearance is provided between the rocker arm stud nuts and the sides of the apertures jointly defined by bars 12 and 14. However, any flexing or deflection of the rocker arm studs will result in the establishment of contact between the stud nuts and the bar means 10 and thus the present invention substantially eliminates stud deflection and erratic valve train operation. As will be obvious, deflection induced contact of a stud nut with the bar means will not result in movement of the bar means due to the presence of the end brackets and also as a result of the mutual effect on the bar means of all of the rocker arm studs of a valve train assembly.

It is also to be noted that valve clearance adjustments are possible without disassembling or repositioning of the bar means which prevents stud deflection. In the disclosed embodiment, if a valve clearance adjustment is to be made, the mechanic will engage the projecting hexagonal upper end of the rocker arm stud nut associated with the valve to be adjusted with a box wrench while simultaneously engaging the internal set screw by means of an Allen wrench. Using the Allen wrench, the set screw will be backed off from contact with the end of the rocker arm stud thus permitting adjustment of the stud nut by means of the box wrench.

While a preferred embodiment has been shown and described, various modifications and substitutions may be made thereto without departing from the spirit and

scope of the invention. Accordingly, it is to be understood that the present invention has been described by way of illustration and not limitation.

What is claimed is:

1. Apparatus for preventing undesired movements of internal combustion engine valve operating members comprising: rocker arm stud extension means, said extension means adjustably engaging each of a plurality of linearly aligned rocker arm studs, engine valve clearance adjustments resulting from movement of said extension means on the studs;
- locking means for preventing vibration induced rotational movement of said extension means on the studs;
- elongated bar means, said bar means defining a plurality of spaced apertures, said bar means apertures circumscribing each of said stud extension means of a linearly aligned array of rocker arm studs for preventing deflectional motion of the studs, said bar means apertures being sized so as to define a clearance between said stud extension means and the walls of said apertures whereby rotational movement of said extension means is not impeded by said bar means; and
- bracket means, said bracket means comprising a pair of opposed brackets adapted to respectively engage opposite ends of and solely support said bar means on an engine.
2. The apparatus of claim 1 wherein said extension means each comprise:
 - an elongated rocker arm stud nut.
3. The apparatus of claim 2 wherein said locking means comprises:
 - set screws associated with each of said stud nuts, each of said set screws being provided with a tool engaging socket in one end thereof, said set screws having an external thread complementary to said stud nut internal thread whereby said set screws may be located within said stud nuts and adjustably positioned with respect to the ends of the rocker arm studs by means of a tool inserted into said stud nuts.
4. The apparatus of claim 1 wherein said bar means apertures have a minimum diameter which exceeds the outer diameter of said extension means.
5. The apparatus of claim 4 wherein said extension means each comprise:
 - an elongated rocker arm stud nut.
6. The apparatus of claim 5 wherein said locking means comprises:
 - set screws associated with each of said stud nuts, each of said set screws being provided with a tool engaging socket in one end thereof, said set screws having an external thread complementary to said stud nut internal thread whereby said set screws may be located within said stud nuts and adjustably positioned with respect to the ends of the rocker arm studs by means of a tool inserted into said stud nuts.
7. The apparatus of claim 6 wherein said bar means comprises:
 - a pair of bars, each of said bars having a plurality of generally semi-circular recesses formed in a side thereof; and
 - fastener means for assembling said bars with said recesses facing one another to define an array of aligned apertures.

* * * * *