United States Patent

Helton

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[54] **REMOVABLE PUSH ROD GUIDE FOR ENGINE ASSEMBLY**

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[52] **U.S. Cl.** ..... **29/200 P**

[51] **Int. Cl.** **B23p 19/00**

[58] **Field of Search** ...29/200 P, 200 J, 200 R, 200 D

[56] **References Cited**

UNITED STATES PATENTS

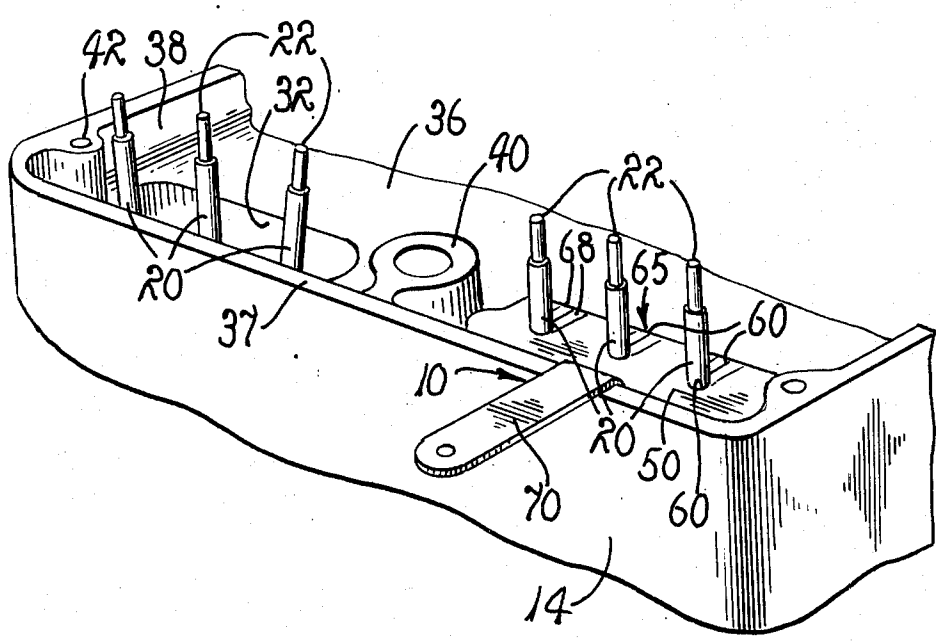
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[57] **ABSTRACT**

A removable push rod guide for facilitating the assembly of the rocker arm head on the cylinder head of an engine with the guide providing a plurality of apertures therethrough in correspondingly spaced relation to the spacing of the rocker arm seats for individually receiving the push rods in order temporarily to hold the push rods in precise alignment with their respective rocker arms during such assembly of the rocker arm head onto the cylinder head of the engine. The push rod guide is adapted readily to be removed without disturbing the seated push rods prior to complete assembly of the heads.

10 Claims, 4 Drawing Figures



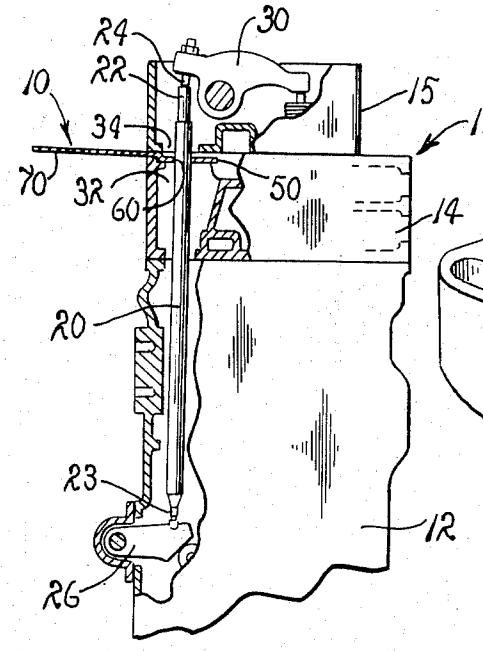


FIG. 1.

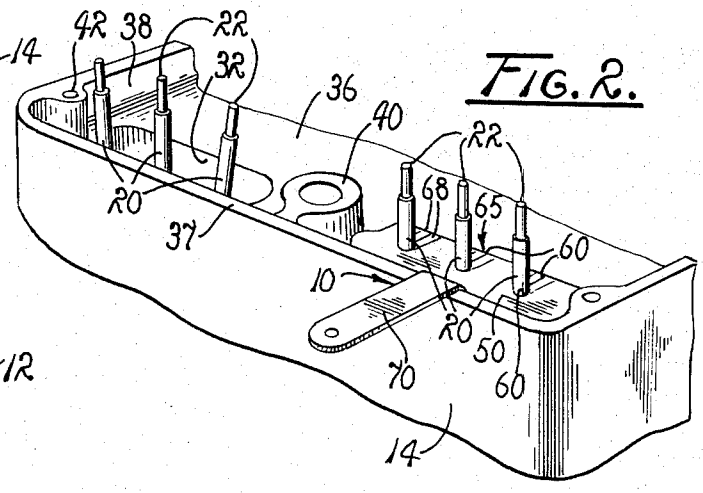


FIG. 2.

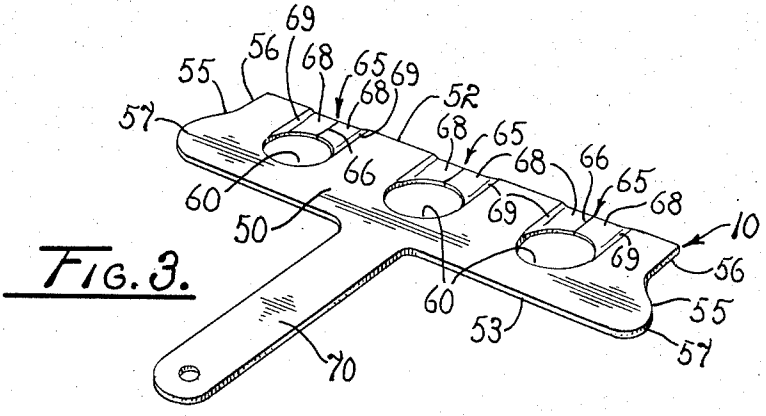


FIG. 3.

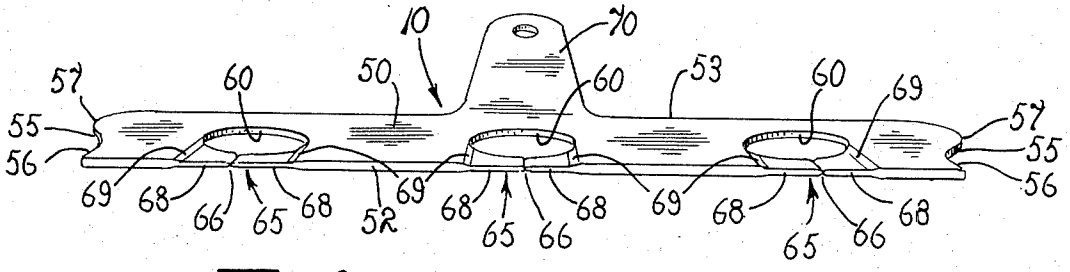


FIG. 4.

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REMOVABLE PUSH ROD GUIDE FOR ENGINE ASSEMBLY

BACKGROUND OF THE INVENTION

The assembly of the rocker arm head on the cylinder head of an engine has long been an arduous task, particularly on relatively large diesel engines because of the difficulty in aligning the push rods with their respective rocker arms as the rocker arm head is lowered onto the cylinder head. The rounded lower ends of the push rods are individually rested within a recess in their respective cam followers within the block and their opposite upper cupped ends are upwardly extended through relatively large openings provided for the unrestricted flow of oil around and past the push rods. Accordingly, prior to assembly of the upper rocker arm head onto the cylinder head, the upper ends of the push rods are merely loosely disposed within their respective openings in the block and cylinder head. In such relatively unconstrained condition, the push rods are permitted indiscriminately to assume some position rested against one of the sides of their respective openings angularly displaced from their substantially upright assembled positions with the rocker arms. Consequently, it has been necessary for the mechanic to reach into the restricted space between the heads as the upper rocker arm head is lowered and tediously align each of the push rods with its respective rocker arm in order to insure proper seating of the upper cupped end thereof in the mating protuberance provided on the rocker arms. It will be understood that this is a very difficult task in view of the need substantially to have all the push rods engage their respective protuberances on the rocker arms at the same time. It is apparent that if a number of push rods are not properly seated, the head is required to be raised sufficiently to effect such seating which must be carefully accomplished in order not to cause the unseating of those push rods previously seated. In the past, such assembly operation has required several mechanics to accomplish in view of the previously described necessity of having all the push rods simultaneously aligned and seated with their respective rocker arms.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a removable guide for precisely pre-aligning the push rods in the cylinder head of an engine prior to assembly of the rocker arm head thereon.

Another object is to provide such a push rod guide which is easily and conveniently installed in the cylinder head.

Another object is to provide a push rod guide which is effective precisely to position the push rods in correspondingly spaced relation to the spacing of the rocker arms.

Another object is to provide a push rod guide which is effective substantially to facilitate the assembly of the rocker arm head on the cylinder head of an engine.

Another object is to provide a push rod guide which permits the assembly of the rocker arm head on the cylinder head of an engine by a single mechanic in a minimum of time.

Another object is to provide a push rod guide which is easily installed prior to assembly of the rocker arm head onto the cylinder head and is readily removable therefrom without disturbing the push rod and rocker arm assembly prior to complete assembly of the heads.

Another object is to provide a push rod guide which insures the simultaneous precise seating of the push rods with their respective rocker arms.

Another object is to provide a push rod guide which may be conveniently employed and economically produced.

Other objects and advantages of the present invention will subsequently become more clearly apparent upon reference to the following description and accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary end elevation and partial transverse cross section through an engine showing a push rod and rocker arm assembly with the push rod guide of the present invention disposed in operating position between the upper rocker arm head and the cylinder head.

FIG. 2 is a somewhat enlarged fragmentary perspective of the cylinder head with the push rod guide of the present invention disposed in an operating position maintaining the push rods in their desired substantially upright precisely spaced assembly positions.

FIG. 3 is a further enlarged perspective of the guide of the present invention removed from the cylinder head of FIG. 2.

FIG. 4 is a further enlarged perspective of the guide of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawing, a push rod guide embodying the principles of the present invention is generally indicated by the reference numeral **10**. As best shown in FIG. 1, the guide is adapted to be used to facilitate the assembly of an engine **11** having a block **12**, a cylinder head **14**, and an upper rocker arm head **15**. The engine depicted is of the diesel type and is merely illustrative of the wide variety of engines with which the guide of the present invention may be employed.

A plurality of push rods **20** are upwardly extended through suitable openings in the block **12** and individually provide opposite upper and lower ends **22** and **23**, respectively. The lower end of each of the push rods is rounded for receipt within a swivel mounting recess within a cam follower **26** pivotally mounted within the block. The upper end of each push rod is cupped in order to receive a protuberance **24** on its associated rocker arm **30** disposed within the rocker arm head **15**.

The cylinder head **14** has a plurality of elongated upper openings **32** adapted to register with a plurality of similar openings **34** in the rocker arm head **15**. As best shown in FIG. 2, the openings **32** in the cylinder head **14** are formed in an upper wall **36** which is recessed somewhat below the upper mounting face **37** of the head to form a flanged side wall **38**. A bored boss **40** is disposed adjacent to one side wall substantially centrally of the head and a bolting protuberance **42** is located on the inner surface of each of the adjacent side walls which are utilized for precisely locating the

push rod guide **10** of the present invention with respect to the push rod opening **32** in the cylinder head.

The push rod guide **10** of the present invention is constructed of a suitable lightweight substantially rigid but somewhat flexible relatively thin sheet material similar to that from which conventional head gaskets are made. Alternatively, the guide might also be formed from lightweight sheet metal material or even one of the relatively tough plastic materials. The guide is generally T-shaped providing an elongated main body portion **50** having opposite spaced substantially parallel predetermined inner and outer edges **52** and **53**, respectively. The body portion further includes opposite contoured ends **55** providing substantially straight segments **56** adjacent to the inner edge **52** and arcuate outwardly extending tabs **57** adjacent to the outer edge of the body.

A plurality of circular apertures **60** are formed through the body portion **50** of the guide **10** in predetermined equally spaced relation corresponding in number to the number of push rods extending through the upper opening **32** in the cylinder head **14**. The spacing between the apertures also precisely corresponds to the spacing of the associated rocker arms **30** in the rocker arm head **15** above the openings **32** and **34**. The apertures are of a diameter to provide a sliding fit in circumscribing relation about the push rods which are freely slidable therethrough without distorting the body portion of the guide.

An expandable passage, generally indicated by the reference numeral **65**, is disposed between each of the apertures **60** and the adjacent inner edge **52** of the main body portion **50** of the guide **10**. Each of the expandable passages is formed by a slit **66** through the body portion in diametrically radially outwardly extended relation from its respective aperture and the inner edge of the body. A pair of gate members **68** of somewhat reduced thickness from the thickness of the body portion are formed on opposite sides of the slit **66** which are normally disposed in their aperture closing positions shown in the drawing. The gates oppositely terminate from the slit **66** along a pivot line **69** substantially tangentially related to the adjacent periphery of the apertures.

An elongated handle **70** is formed integral with the main body portion **50** of the guide **10** in outward extension from the outer edge **53** intermediate the ends **55** thereof. The handle is employed for conveniently handling the guide when sliding the body portion **50** thereof over the push rods **20** and for removing the guide after partial assembly of the heads **14** and **15**.

OPERATION

The operation of the described embodiment of the subject invention is believed to be readily apparent and is briefly summarized at this point. Prior to assembly of the rocker arm head **15** onto the upper mounting face **37** of the cylinder head **14**, the upper ends **22** of the several push rods **30** are loosely indiscriminately disposed in their respective openings **32** in various positions angularly deviating from the desired substantially upright assembly positions. The push rod guide **10** is held above the upper ends **22** of the push rods **20** which are extended through the apertures **60** therein and the guide slid downwardly until rested upon the upper wall **36** of the cylinder head **14**. As best shown in FIG. **2**, the outer edge **53** of the main body portion **50** of the guide is disposed in engagement with the inner surface of the flanged side wall **38** of the head and the contoured ends **55** engage the arcuate corner and contoured surface adjacent to the boss **40** so as precisely to locate and position the guide with respect to the upper opening **32** in the cylinder head and to constrain the upper ends of the push rods in their substantially upright precisely spaced assembly positions.

A number of the push rod guides **10** are similarly installed in the openings **32** in the cylinder head **14** corresponding to the number of cylinders of the particular engine being rebuilt. Accordingly, all the push rods **20** are disposed in their substantially upright assembly positions and the upper rocker arm head **15** is lowered downwardly upon the cylinder heads so that all the upper ends of the push rods simultaneously receive the aligned protuberances **24** of the rocker arms **30** with a minimum of individual attention. The handle **70** of the guide is outwardly extended from the heads and is relatively thin to permit the rocker arm head to be lowered in closely spaced relation to the upper mounting face **37** of the cylinder head which insures full seating of the rocker arm protuberances **24** with the upper ends **22** of the push rods **20**.

The push rod guide **10** is easily removed from between the closely spaced cylinder head **14** and rocker arm head **15** by grasping the handle **70** and exerting an outward pulling force thereon. This causes the expandable passages **65** adjacent to the apertures **60** to open by flexing movement of the gates **68** to permit the push rods to slide through the passages during outward removal of the guide. After removal of all the guides adjacent to each cylinder of the engine, the upper rocker arm head is further lowered to rest upon the upper mounting face **37** of the cylinder head and tightly bolted thereto in the usual manner to complete the assembly. While the guide **10** of the present invention has been shown having only three apertures **60** for use adjacent to each of the cylinders of the engine, it is apparent that the guide can be made larger in order to extend between two or more sets of push rods. This would minimize the individual handling and positioning of a plurality of guides individually employed for each cylinder, as described.

In view of the foregoing, it is readily apparent that the structure of the present invention provides a guide for dependably holding the upper ends of the push rods in precise correspondingly spaced relation with respect to the rocker arms in order greatly to facilitate assembly of the rocker arm head on the engine. The guide enables such assembly operation to be accomplished by a single mechanic with a minimum of individual manipulation of the push rods during the assembly operation with the guide being thereafter easily removable from the heads without disturbing the push rod and rocker arm assembly just prior to complete assembly of the heads.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the illustrative details disclosed.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A guide for use with an engine having a cylinder head providing an elongated opening therethrough, a plurality of cam driven push rods having lower swivel mounted ends and opposite upper cupped ends loosely extended through said opening in the head, and a rocker arm head adapted to be mounted on the cylinder head having a plurality of rocker arms disposed in predetermined spaced relation therein providing protuberances individually receivable within said cupped upper ends of the push rods; comprising a flat body adapted to be removably fitted within said opening in the cylinder head and having a plurality of apertures in correspondingly spaced relation to the spacing of said rocker arms for individually receiving said push rods therethrough temporarily to hold them in alignment with said rocker arms during assembly of the rocker arm head onto said cylinder head.

2. The guide of claim 1 including gate means in said guide communicating with said apertures to permit removal of the guide from between the heads after seating of said rocker arm protuberances within said upper ends of the push rods prior to complete assembly of the heads.

3. The guide of claim 2 in which said guide is of a substantially rigid relatively thin sheet material in order dependably temporarily to hold said push rods in substantially upright precisely spaced positions and readily to slide between said heads during said removal therefrom.

4. The guide of claim 3 in which the guide includes an elongated integral handle extending laterally of said elongated flat body for grasping to impose an outward pulling force upon said guide during its removal from the heads.

5. The guide of claim 4 in which said gate means includes a plurality of slits through the guide with said material being sufficiently flexible adjacent to the slits to provide expandable passages through which the push rods are permitted to pass in escaping said apertures during said removal of the guide from the heads.

6. The guide of claim 5 in which the guide has a body portion providing predetermined inner and outer edges and contoured end edges adapted substantially to conform to the cylinder head adjacent to the opening therethrough, and a plurality of integral sections of reduced thickness from that of the body portion adjacent to said slits and said apertures along said inner edge of the body portion to afford said flexibility in the expandable passages.

7. The guide of claim 6 in which said handle is extended from said outer edge of the body in outwardly extended relation from the heads when the body portion is disposed within the cylinder head in supporting relation to said push rods in order to pull the guide outwardly from the heads with sufficient force to cause the push rods to slide through their respective expandable passages.

8. A push rod guide for engines having an opening through which a plurality of push rods are extended comprising a substantially flat plate releasably fitted to said opening in precisely predetermined relation to the engine and having apertures therethrough individual to the push rods in fixed positions in the plate and fitted to their respective push rods, said plate being slotted from each aperture to an edge of the plate, said slots being substantially parallel and narrower than their respective push rods so that the rods are effectively captured in their respective apertures in predetermined positions, and the plate adjacent to the slots being sufficiently flexible to flex and permit withdrawal of the plate from the push rods when removed from the opening by being drawn in a direction opposite to the direction of extension of the slots from the apertures.

9. The guide of claim 8 having a flat handle integral with the plate and extended therefrom in a direction opposite to the direction of extension of the slots from the apertures.

10. The guide of claim 9 for use with an engine having a head and a block separable along a plane, the opening being in the block offset from said plane, and the push rods extending from said block into the head; in which the plate is of flat flexible sheet material, and a handle of flat flexible sheet material integral with the plate is extended therefrom in a plane parallel and spaced from the plate in a direction opposite to the direction of extension of the slots from the apertures.

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