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Crower

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[54] **ENGINE CONVERSION SYSTEM**

[75] Inventor: **Harry Bruce Crower**, Jamul, Calif.

[73] Assignee: **Crower Cams and Equipment Company**, Chula Vista, Calif.

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[52] **U.S. Cl.** ... **123/198 F**, 123/DIG. 1, 123/DIG. 7, 123/1, 123/192 B

[51] **Int. Cl.** **F02d 13/06**

[58] **Field of Search** .. 123/198 F, 1, DIG. 1, DIG. 7, 123/192 B, 192 R, 55 UF, 55 UE, 55 U, 52 R; 92/59, 72; 417/236

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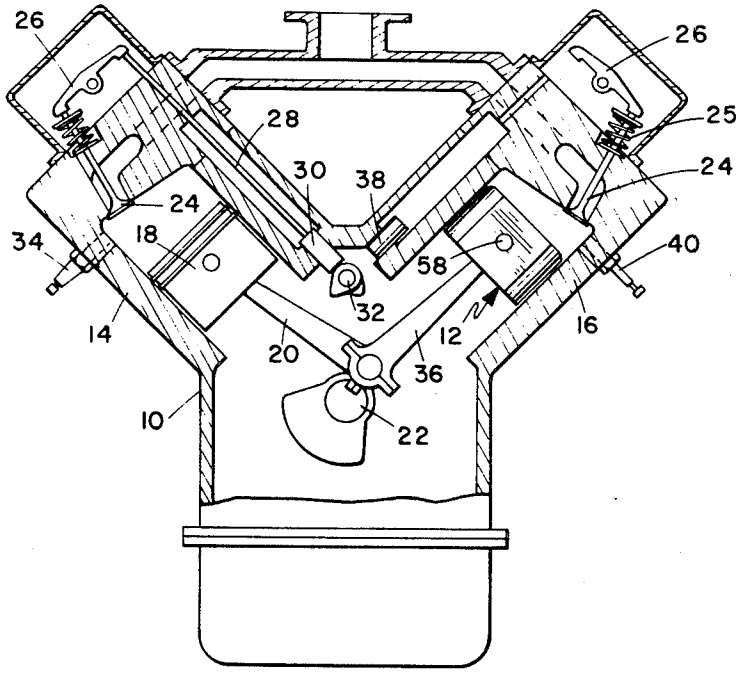
Primary Examiner—Charles J. Myhre
Assistant Examiner—Ira S. Lazarus
Attorney, Agent, or Firm—Brown & Martin

[57] **ABSTRACT**

A system for deactivating half the cylinders of an internal combustion engine to reduce its capacity, as in converting a V–8 engine to a V–4, to reduce fuel consumption and atmospheric pollution and make the engine more economical to operate. The pistons of the deactivated cylinders are replaced by piston substitutes, which are equal in weight to the original pistons and do not affect balance of the engine, the piston substitutes being cut away to allow free air flow and avoid pumping action. Spark plugs in the deactivated cylinders are replaced by dummy conductive plugs, the valve push rods are removed and the tappets replaced by fixed substitutes.

10 Claims, 6 Drawing Figures



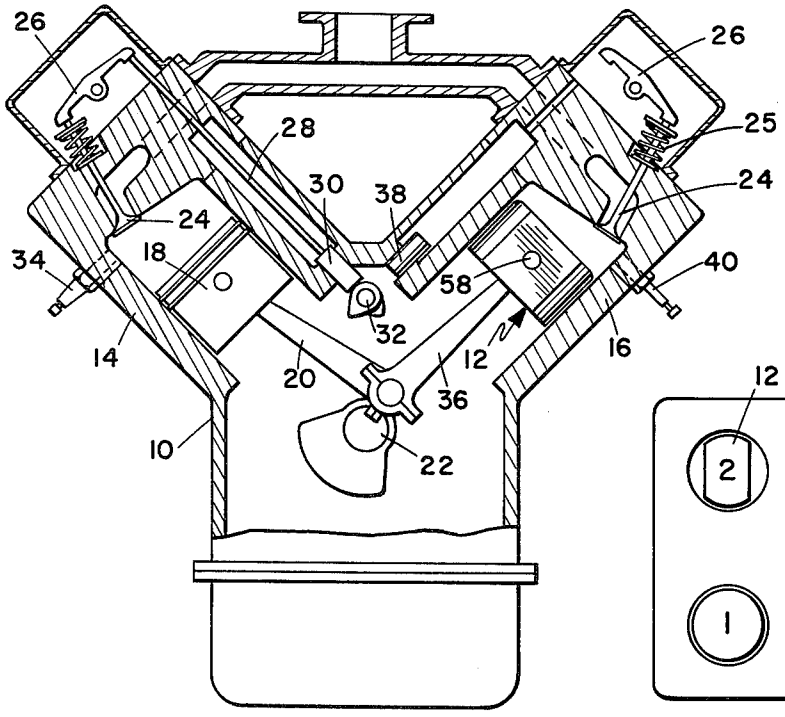


Fig. 1

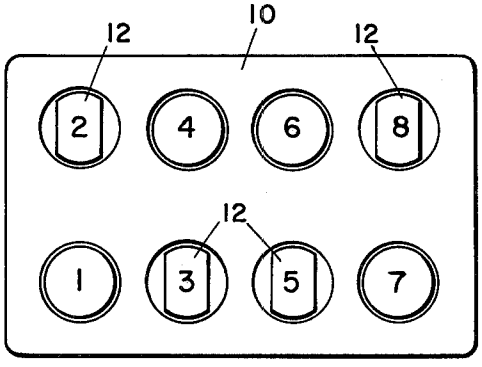


Fig. 2

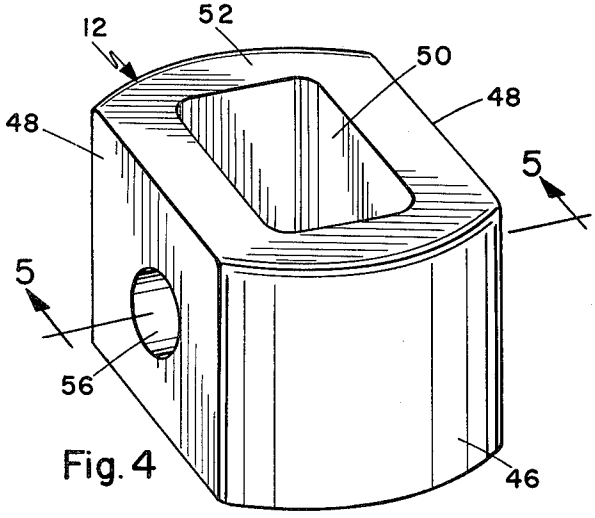


Fig. 4

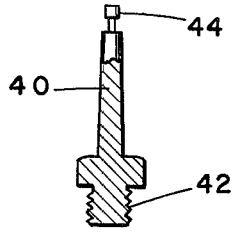


Fig. 3

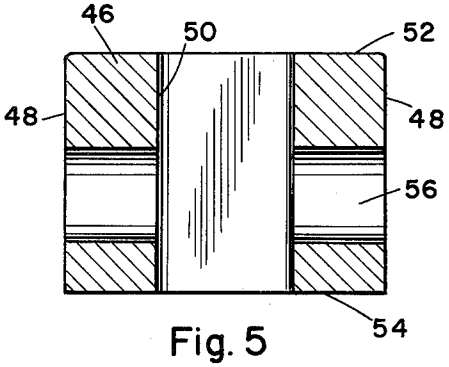


Fig. 5

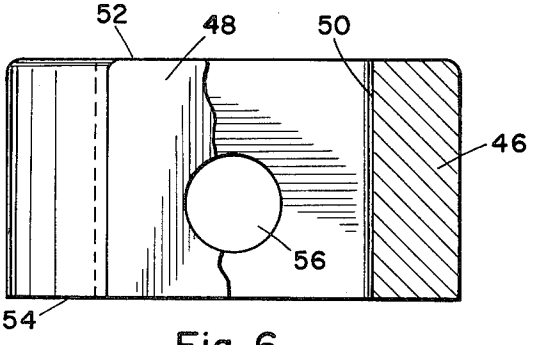


Fig. 6

ENGINE CONVERSION SYSTEM

BACKGROUND OF THE INVENTION

Various techniques have been tried to reduce power and improve operating economy of an internal combustion engine. If certain of the pistons and connecting rods are removed, considerable work is involved in rebalancing the engine. If the pistons are left in place and the fuel and ignition sources cut off, some means must be provided to relieve compression, such as by leaving the exhaust valves open, which creates problems in the exhaust flow. In most instances, the modifications cause damage to the engine, or otherwise prevents its return to normal fully operational configuration.

SUMMARY OF THE INVENTION

The conversion system described herein is simple to install, does not damage the engine, and can be removed at any time and the engine returned to normal full capacity operation. The primary element which makes the conversion practical is the replacement of half the pistons with piston substitutes, which are equal in weight to the original pistons and thus do not upset the balance of the engine. The piston substitutes slide normally in the cylinders, but are cut away at the sides and through the center to allow free passage of air. This avoids any pumping or compression build-up in the deactivated cylinders and provides for lubrication of the cylinders and piston substitutes by crankcase oil.

Push rods to the valves of the deactivated cylinders are removed and the tappets are replaced by fixed substitutes which do not contact the cams, the existing valve springs keeping the valves closed. To prevent damage to the ignition system, the deactivated spark plugs are replaced by solid conductive dummy plugs, which short the discharges through the engine ground.

Since the deactivated cylinders will not draw fuel and air, it is not essential that the carburetor be modified. However, minor adjustments may be made as necessary in the course of a tune-up on the converted engine.

The primary object of this invention, therefore, is to provide a new and improved engine conversion system for deactivating some cylinders of an internal combustion engine.

Another object of this invention is to provide an engine conversion system which requires a minimum of modification and can be removed at any time to restore the engine to normal operation.

Another object of this invention is to provide an engine conversion system utilizing piston substitutes which do not require rebalancing of the engine.

A further object of this invention is to provide an engine conversion system which does not require modification of the fuel supply and ignition circuitry.

Other objects and many advantages of this invention will become more apparent upon a reading of the following detailed description and an examination of the drawings, wherein like reference numerals designate like parts throughout and in which:

FIG. **1** is a transverse sectional view of two cylinders of a typical V–8 engine, illustrating the differences between normal and deactivated cylinders.

FIG. **2** is a diagram of an eight cylinder block, indicating the order of the deactivated cylinders.

FIG. **3** is a partially sectioned view of a dummy spark plug.

FIG. **4** is a perspective view of a piston substitute.

FIG. **5** is a sectional view taken on line **5**—**5** of FIG. **4**.

FIG. **6** is a side elevation view, partially cut away, of the piston substitute.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. **2**, the engine block **10** contains eight cylinders in four pairs, numbered consecutively **1** through **8**. The conventional firing order is **1 - 8 - 4 - 3 - 6 - 5 - 7 - 2** and every other cylinder is deactivated in the conversion. Thus cylinders **1**, **4**, **6** and **7** are unaffected, while cylinders **8**, **3**, **5** and **2** are modified, as indicated by the flat sided piston substitutes **12** in those cylinders. The converted engine operates as a V–4 on cylinders **1**, **4**, **6** and **7** in a fully balanced configuration.

A typical pair of cylinders, such as **4** and **3**, is illustrated in section in FIG. **1**, the conventional cylinder **14** being on the left and the converted cylinder **16** being on the right to clarify the differences. In the conventional cylinder **14** is a piston **18** on a connecting rod **20** coupled to crankshaft **22**. Valve **24** is operated through a rocker arm **26** by a push rod **28**, which is actuated through a tappet **30** by camshaft **32**. The other valve, not shown, is similarly operated and a spark plug **34** is suitably positioned.

In the converted cylinder **16**, a piston substitute **12** is attached to the existing connecting rod **36**. The valve push rods are removed and each tappet replaced by a tappet plug **38**, which may be fixed in place clear of camshaft **32** by any suitable means, such as a lock screw or expanding portion, not shown. The valves **24** are held closed by their existing springs **25** and the rocker arms **26** can be left in place, since their push rods have been removed. A dummy spark plug **40** replaces the conventional plug, the dummy being a unitary element of metal for conductivity, to short the spark discharge pulse to the engine block. The dummy spark plug, illustrated in FIG. **3**, may be of any suitable configuration, with a threaded plug **42** to fit the existing socket and a connecting tip **44** to receive the conventional ignition harness connector.

The piston substitute **12** is generally of piston-like configuration, with a cylindrical body **46**, but has flat parallel sides **48** extending from top to bottom to provide large clearances between the body and the cylinder wall. For some purposes it may be desirable to obtain the side clearance by channels or grooves instead of the simple flat sides. Body **46** also shows a large axially extending core opening **50** completely through its depth. The top and bottom faces **52** and **54** are flat, making it very simple to manufacture the unit. A transverse wrist pin bore **56** extends through the body to receive the existing wrist pin **58** on the connecting rod **36**. The piston substitute has a weight equal to that of the piston it is replacing, in order to maintain the balance of the engine. Precise balance can be obtained by drilling or cutting material away from the body as required.

With the core opening **50** and flat sides **48** allowing substantially unrestricted passage of air through and on both sides of the piston substitute, there is negligible resistance to its movement and no compression or air pumping action. No rings are necessary, merely a free sliding fit with no play. As an example, the preferred clearance between the cylindrical body portion and the cylinder wall is on the order of 0.005 to 0.010 of an

inch. Adequate lubrication is obtained from oil thrown by the moving parts in the crankcase.

In most V–8 engines it is not necessary to alter the carburetor for the conversion. The intake manifold is usually divided for alternate cylinders and the deactivated cylinders will not draw on one side of the manifold. However, in a comprehensive tune-up it may be desirable to adjust the idle mixture screws equally to avoid hesitation above idle. Also, one of the accelerator pump outlet parts may be blocked and a small bypass hole made in the pump plunger to reduce the output. All conventional automotive service procedures are followed in the conversion.

While the conversion is described as applied to a V–8 engine, it is equally applicable to other multi-cylinder engines, such a V–6, or V–12. It is not practical to so modify four cylinder or other small engines, which are already economical in operation.

In vehicles tested the only appreciable effect on performance is in acceleration, which has been found adequate for all normal driving. Available top speed remains well above legal limits, since maximum power is not normally used for cruising performance. Fuel economy is greatly improved and, with proper tuning, can be almost doubled compared to that of the original engine configuration. Atmospheric pollution is also reduced and the useful life of associated pollution control devices is prolonged.

One great advantage of the conversion is that the engine can be returned to normal full capacity operation at any time, since no permanent modifications are made to the basic engine. Alternatively, for prolonged use at reduced capacity, the conversion may be switched to the other set of alternate cylinders for even distribution of wear.

Having described my invention, I now claim:

1. In a multi-cylinder internal combustion engine, in which each cylinder has a piston, a spark plug, valves and valve actuating means, the improvement comprising:

piston substitutes replacing the pistons in alternate cylinders in the firing order of the engine, each piston substitute having a diametrical wrist pin receiving bore, an axially extending opening therethrough, and being equal in weight to the respective replaced pistons;

and the valve actuating means in the said alternate cylinders being disconnected.

2. The structure of claim **1**, wherein:

said piston substitute has a substantially cylindrical body with axially extending cut away side portions.

3. The structure of claim **2**, wherein:

said cut away portions are flat parallel sides.

4. The structure of claim **2**, wherein:

said cylindrical body has a sliding clearance in the respective cylinder to allow for expansion of the piston substitute.

5. The structure of claim **1**, and including:

a dummy spark plug in each of the selected alternate cylinders, the dummy spark plug being conductive and providing a direct electrical connection to the engine ground.

6. The structure of claim **1**, wherein:

the valve actuating means includes a push rod to each valve and a cam actuated tappet connected to each push rod;

the improvement further comprising a fixed tappet plug replacing each tappet and the associated push rod being removed.

7. The structure of claim **6**, wherein:

the substitute piston has a substantially cylindrical body with axially extending flat sides.

8. In a multi-cylinder internal combustion engine, in which each cylinder has a piston, a spark plug, valves and valve actuating means, the method of converting the engine to smaller capacity, comprising:

removing the pistons from alternate cylinders in the firing order of the engine, and installing in their place piston substitute equal in weight to the removed pistons and with substantially unrestricted openings therethrough;

and disconnecting the valve actuating means in the said alternate cylinders.

9. The method of claim **8** and including the further step of;

replacing the spark plugs in the alternate cylinders with dummy conductive plugs providing an ignition short circuit to ground.

10. The method of claim **8**, wherein the valve actuating means includes a push rod and a cam actuated tappet for actuating each valve, and including the step of:

removing the push rod from each valve in the alternate cylinders and replacing the associated tappets with fixed tappet plugs clear of the actuating cam.

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