

[54] **AIR DRIVE ADAPTOR**
 [76] Inventor: **Garnet J. Simington**, General
 Delivery, Lethbridge, Alberta,
 Canada

2,391,174 12/1945 Lownsbery..... 137/627
 2,584,659 2/1952 Audemar et al..... 91/188
 2,884,908 5/1959 Campbell..... 123/DIG. 7
 3,563,032 2/1971 La Pointe 60/412 X
 3,765,180 10/1973 Brown..... 60/370

[22] Filed: **June 22, 1973**

Primary Examiner—Edgar W. Geoghegan

[21] Appl. No.: **372,559**

Related U.S. Application Data

[57] **ABSTRACT**

[63] Continuation-in-part of Ser. No. 182,387, Sept. 21,
 1971, abandoned.

An apparatus is disclosed for adapting an internal combustion engine for operation on compressed air. The apparatus includes a source of compressed air, valving means for introducing the correct amount of air into the cylinders and valve actuation means to cause timed opening of the valve means for introducing compressed air to the appropriate cylinders at the correct time. The apparatus is constructed so that it can be readily mounted on or removed from the engine thereby allowing portability from one engine to another or conversion of the engine back to operation on a combustible fuel.

[52] U.S. Cl. **60/370; 60/407; 60/412;**
 123/DIG. 7

[51] Int. Cl. **F15b 1/20**

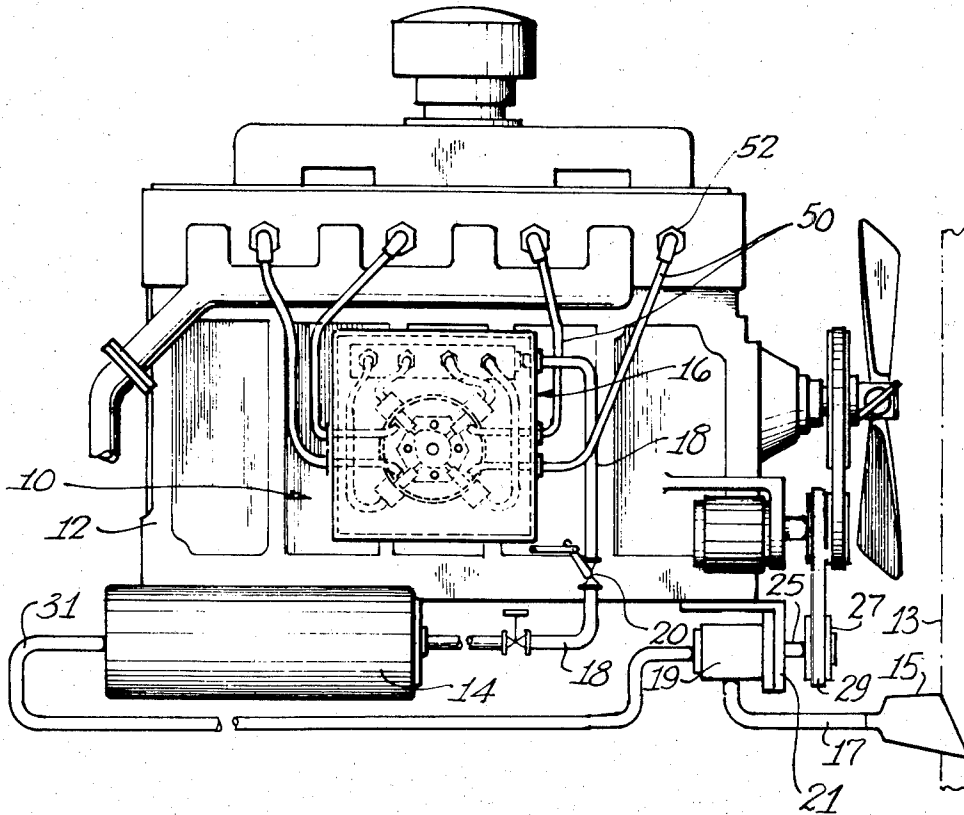
[58] Field of Search..... 123/DIG. 7; 137/627;
 60/327, 369, 370, 371, 407, 408, 412

[56] **References Cited**

UNITED STATES PATENTS

1,502,244 7/1924 Gore..... 91/188
 1,716,049 6/1929 Greve 91/188
 2,113,936 4/1938 Fickett et al..... 91/188

3 Claims, 4 Drawing Figures



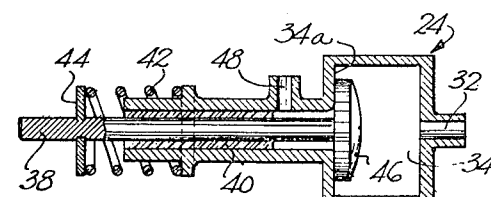
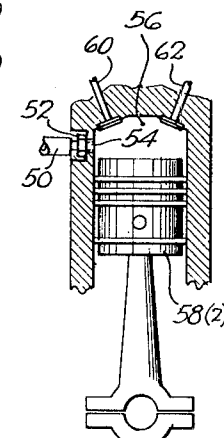
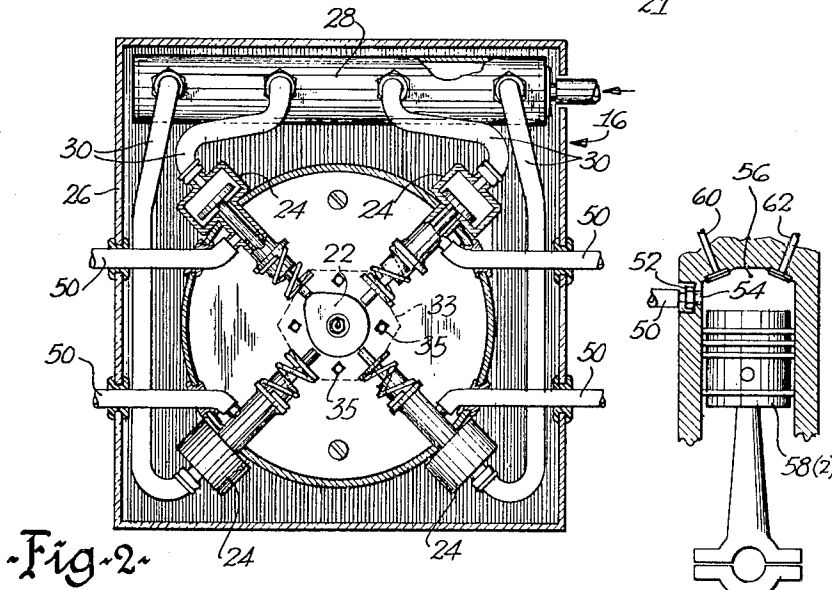
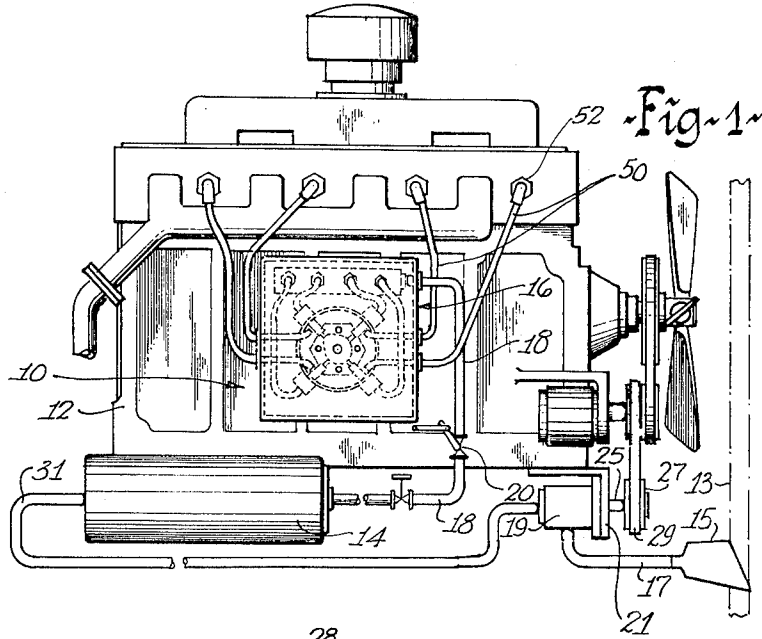


Fig. 2

Fig. 4

Fig. 3

AIR DRIVE ADAPTOR

The present application is a continuation-in-part of my copending application Ser. No. 182,387 filed Sept. 21, 1971, now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to engines and more particularly to apparatus for converting an internal combustion engine for operation with a compressed non-combustible gas.

Air pollution is one of the most serious problems facing modern humanity and, as is well known one of the greatest contributors to air pollution is the automobile engine. In the vast majority of automobiles and other self-propelled vehicles, the motive power is obtained through operation of an internal-combustion engine with high or medium octane gasoline as the fuel. The internal-combustion engine is not noted for its efficiency in obtaining useful work from the energy available through combustion and as a consequence of this inefficiency many unburnt hydrocarbons are exhausted into the air. Gases such as carbon monoxide and nitrogen dioxide are harmful to animal and plant life, thereby contributing to a breakdown in the ecology of this planet.

The transportation industry is extremely large and wields considerable power and influence, so it is doubtful whether it will introduce non-legislated changes in the product in which it has heavily invested. It therefore rests with the individual to either lobby for more efficient motive power for his automobile (which will be around for many years) or to modify the engine he is now using to run more efficiently and hopefully aid in the reduction of air pollution.

BRIEF SUMMARY OF INVENTION

The present invention provides a specific apparatus, easily and removably adaptable to an internal combustion engine whereby motive power is derived from the energy released upon expansion of a compressed gas such as air. The apparatus includes a source of compressed air, a valving and valve actuation mechanism and means to introduce the compressed air into the cylinders of the engine. For simplicity and removability, the air is introduced through the spark plug holes during the power stroke of the engine cycle.

With such an apparatus installed in an automobile, pollution due to unburnt hydrocarbons is eliminated and more efficient energy conversion is obtained. In addition, the noise level in the vicinity of the automobile is drastically reduced since much of the sound of an internal-combustion engine is the result of detonating the fuel-air mixture. Also the adaptor may be removed from the vehicle for attachment to another vehicle, thereby reducing the overall cost to the consumer since he doesn't have to purchase a new unit each time he purchases a new vehicle, providing there is no change in the number of cylinders in the power plant. Removal of the adaptor of the present invention also will permit the engine, with little effort, to be again operated as a combustion engine should the necessity arise.

BRIEF DESCRIPTION OF DRAWINGS

The invention will now be described in greater detail with reference to the drawings wherein:

5 FIG. 1 is a side view of a four cylinder I-C engine with apparatus of the invention mounted thereon.

FIG. 2 is an enlarged view of the apparatus of the invention.

10 FIG. 3 is an enlarged view of an air distribution valve used in the apparatus of the invention.

FIG. 4 is a view of a piston and cylinder in the engine.

DETAILED DESCRIPTION OF INVENTION

With reference now to FIGS. 1 and 2, a preferred embodiment of the apparatus of this invention is shown generally as reference numeral 10, mounted on a standard four-cylinder automobile engine 12.

15 Mounted in or below the grill 13 of the vehicle is an air scoop 15 connected via conduit 17 to an air compressor 19. The air compressor may be driven by a small gasoline engine or electric motor if it is located in the trunk of the vehicle or by an electric motor, or by the fan belt if it is located in the engine compartment. In FIG. 1 the air compressor 19 is shown as 20 mounted on a bracket 21 which may be bolted to the engine 12. Shaft 25 of the compressor is provided at its outermost end with a pulley 27 such that the compressor may be driven therethrough by fan belt 29. From the outlet of compressor 19, conduit 31 leads to tank 25 14 which acts as an accumulator and hence is a source of compressed air for the engine.

30 The source 14, is attached to the vehicle wherever convenient. It is shown in FIG. 1 as detached from the engine, logical areas for its location being the trunk or the engine compartment. If a pre-charged tank of compressed air is used mileage obtained from the tank is directly related to the available volume of the tank. Source 14 is connected to valving means 16 via flexible high pressure hose 18, in which, and secured to the vehicle, is a throttle valve 20. This valve is connected 40 through linkages (not shown) to the accelerator pedal in the passenger compartment and meters the volume, and hence the pressure, of air permitted to flow through the valving means 16. In a normal manner the accelerator pedal is used to alter the output of the engine in response to load demands.

45 Valving means 16 is especially adapted to be interchangeable from engine to engine thereby obviating the necessity of purchasing a new adaptor each time a new vehicle is purchased. Since spark plugs are not longer required there is no requirement for a distributor and hence the valving means 16 can be attached to the engine in place of the distributor. Bracket means, appropriately sized to the individual engine make, and shown as character 33, is mounted to the engine in place of the distributor, but in such a manner that the distributor drive is still available. The valving means 16 is then attached, as by bolts 35 to the bracket in such a manner that it can be readily removed therefrom, the bracket itself, in turn, being readily removable from the engine block.

50 Valving means 16, in conjunction with valve actuation means 22 and throttle valve 20 provides the correct volume of air to the correct cylinder at the correct time. Valving means 16 includes a plurality of air distribution valves 24, one for each cylinder, the valves being housed within metal block or housing 26. Block 55

26 may be cast and/or machined from any appropriate metal and receives bolts 35 for mounting the valving means 16 to the vehicle. Within, or attached to block 26 is a manifold 28 connected to flexible hose 18 and to each valve 24 via pipes or flexible hoses 30.

Air distribution valve 24 is shown in cross-section in FIG. 3. It includes an inlet 32 connected to flexible hose 30 for introducing air into chamber 34. A valve guide 40 extending from the side of chamber 34 opposite to inlet 32 houses valve stem 38 and provides a cylindrical, yet annular, core for valve spring 42. Spring 42 is a compression spring acting on washer and keeper 44 fixed to stem 38 to maintain the valve in a normally closed state with curved closure plate 46 abutting wall 36 of chamber 34. In this condition compressed air in chamber 34 is prevented from entering outlet 48 which is, in turn, connected via pipe or flexible hose 50 to adapter 52 in spark plug hole 54.

Valve actuation means 22 may be a cam driven from the existing crankshaft of the engine or as is preferable, from the distributor drive to provide operation of each valve 24 in its proper sequence. In the standard four cycle engine operating on a combustible fuel, two revolutions of the crankshaft are required to fully complete the four cycles. On the first revolution fuel-air mixture is introduced into the cylinder and it is then compressed. On the second revolution, the compressed mixture is detonated by the spark plug giving the power stroke to the piston and the expanded gases are then exhausted.

Since the compressed air utilized in the present invention must expand to deliver its energy, it must be introduced into the cylinder 56 when piston 58 is at top-dead-center, ready to begin its power stroke. In the following description, pistons 58 are referred to as pistons 58(1), 58(2), 58(3) and 58(4) to indicate the specific pistons in a four cylinder engine, from front to back. The pistons are not shown, except for piston 58(2) as in FIG. 4. With valve actuation means 22 rotating as shown in FIG. 1, piston 58(2) is almost at top-dead-center, ready to receive its charge of compressed air. Piston 58(1) is ready to begin a compression stroke, compressing atmospheric air brought in through inlet valve 60 during its intake stroke. Piston 58(3) is ready to commence an intake stroke and piston 58(4) is nearing the end of its power stroke and is ready to deliver an exhaust stroke to exhaust the expanded air to atmosphere through exhaust valve 62. With inlet valve 60 open to the atmosphere, outside air is drawn into cylinder 56 on the intake stroke and, with valve 60 closed, is compressed during the compression stroke of piston 58, being augmented by compressed air at considerably higher pressure from source 14 for the power stroke. All air in cylinder 56 is exhausted to atmosphere on the

exhaust stroke.

Starting an engine fitted with the adaptor of the present invention is accomplished in the usual manner. The existing starter motor will turn the engine over and operate the compressor so that the tank 14 is properly charged. Valve actuation means 22 also rotates at this time and thus permits a charge of compressed air to enter the cylinders and after the starter motor is disengaged, the engine will sustain itself in operation, as long as the air pressure in tank 14 is sufficient. The compressor 19 could also be provided with clutch means, not shown, such that it would operate only when the pressure in tank 14 falls below a predetermined minimum, there being appropriate sensors and control means for ensuring proper engagement of the clutch.

While the valving means 16 is shown as being adapted for use with a four-cylinder engine, it is understood that the invention is equally applicable to engines having a different number of cylinders. The only change would be in the block 26 and the number of valves 24 provided. An appropriate valving means could also be provided for a rotary engine, many of which are now being sold.

I claim:

1. Apparatus removably adaptable to an internal combustion engine having at least one cylinder containing a piston reciprocable therein, an intake valve, an exhaust valve and a hole for reception of a spark plug, said apparatus comprising a source of compressed, non-combustible gas, valving means including a manifold and at least one gas distribution valve, said gas distribution valve being connected to said cylinder at said hole and to said manifold, said manifold also being connected to said source of compressed gas, and valve actuation means connected to said gas distribution valve, said gas distribution valve upon actuation by said valve actuation means permitting introduction of said compressed gas through said spark plug hole from said manifold into said cylinder when said intake and exhaust valves are closed and said piston is in a position to provide a power stroke in said engine.

2. Apparatus according to claim 1 including bracket means attachable to said engine, said valving means including a housing attachable to said bracket means, said gas distribution valve being cam-operable and mounted in said housing for permitting flow of said compressed gas from said manifold to said spark plug hole.

3. Apparatus according to claim 2 wherein said valve actuation means includes a cam connectable to the distributor drive of said engine, said cam being engagable with said gas distribution valve for actuation thereof.

* * * * *

55

60

65