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(56) Documents cited
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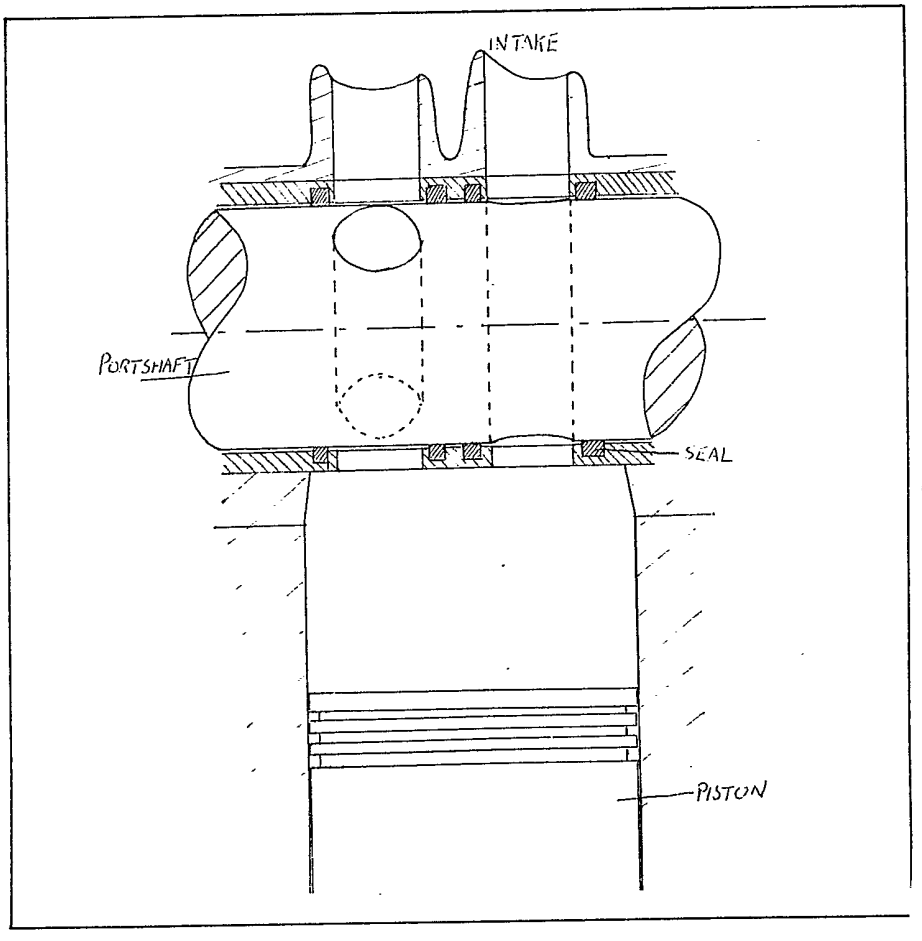
(58) Field of search F1B
(71) Applicants Leonard Alan Hassell, 62 Harmers Hay Road, Hailsham, East Sussex
(72) Inventor Leonard Alan Hassell

(54) **I.C. engine rotary cylindrical valves**

(57) The valve shaft has through ports bored at pre-determined points along it's length and rotates in a housing at one quarter crankshaft speed. It communicates 'inlet' and 'outlet' ports in the housing with combustion chambers at the appropriate points in the engine operating cycle.

The housing can form an integral part of a suitably designed manifold system. Alternatively, it can form an integral part of the cylinder head or cylinder block.

Seals are fitted between the through ports.



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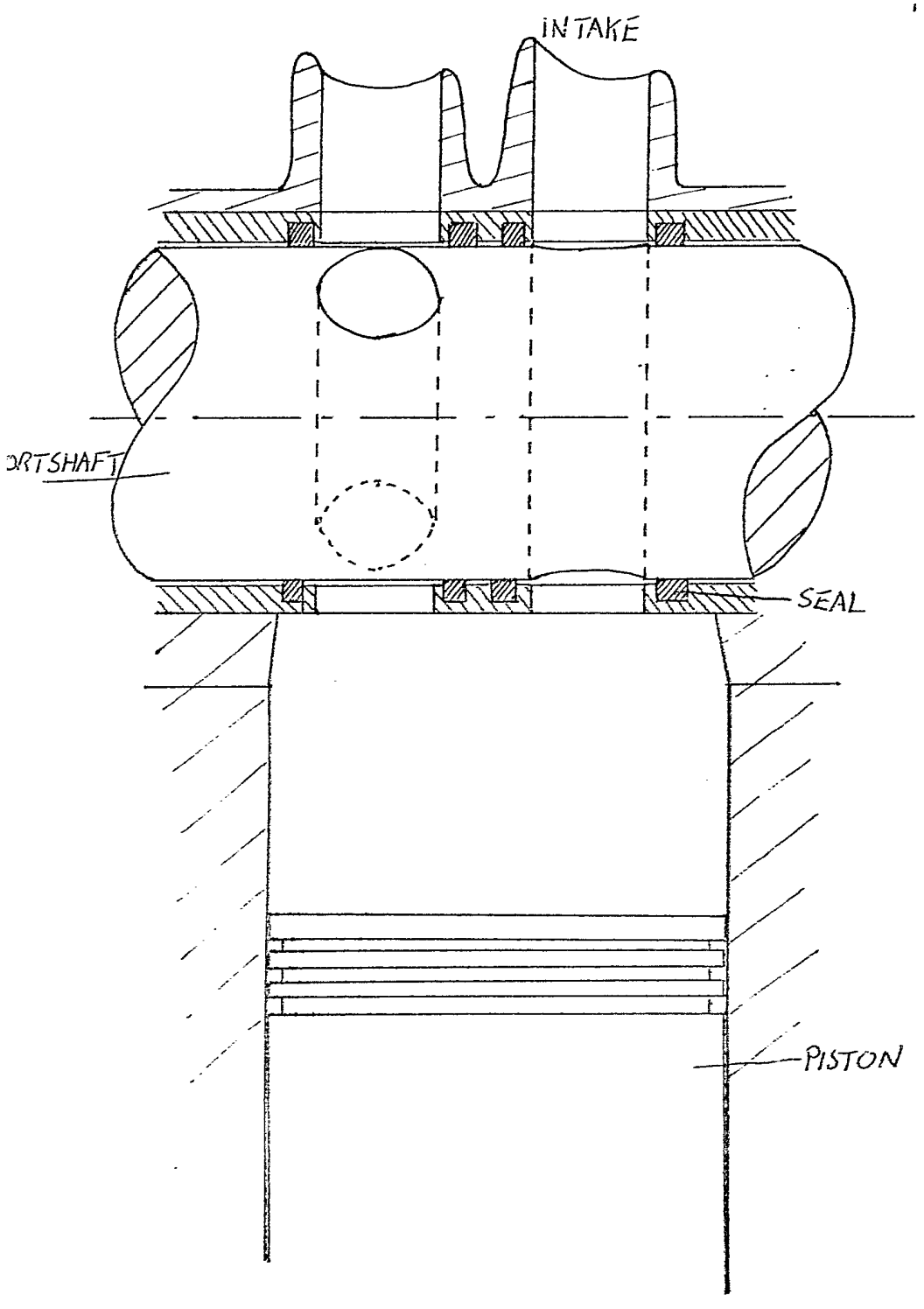


FIG 1

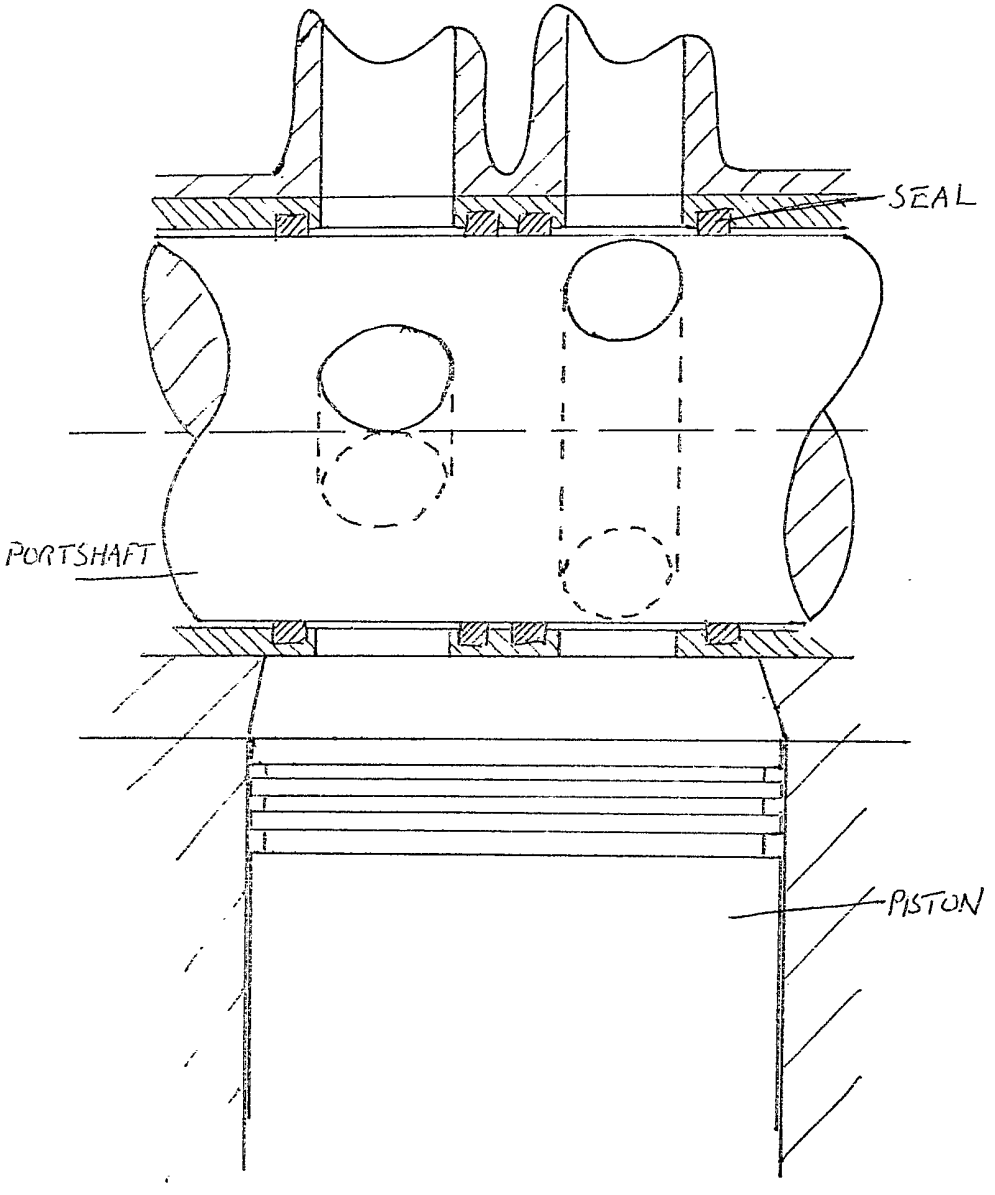


FIG2

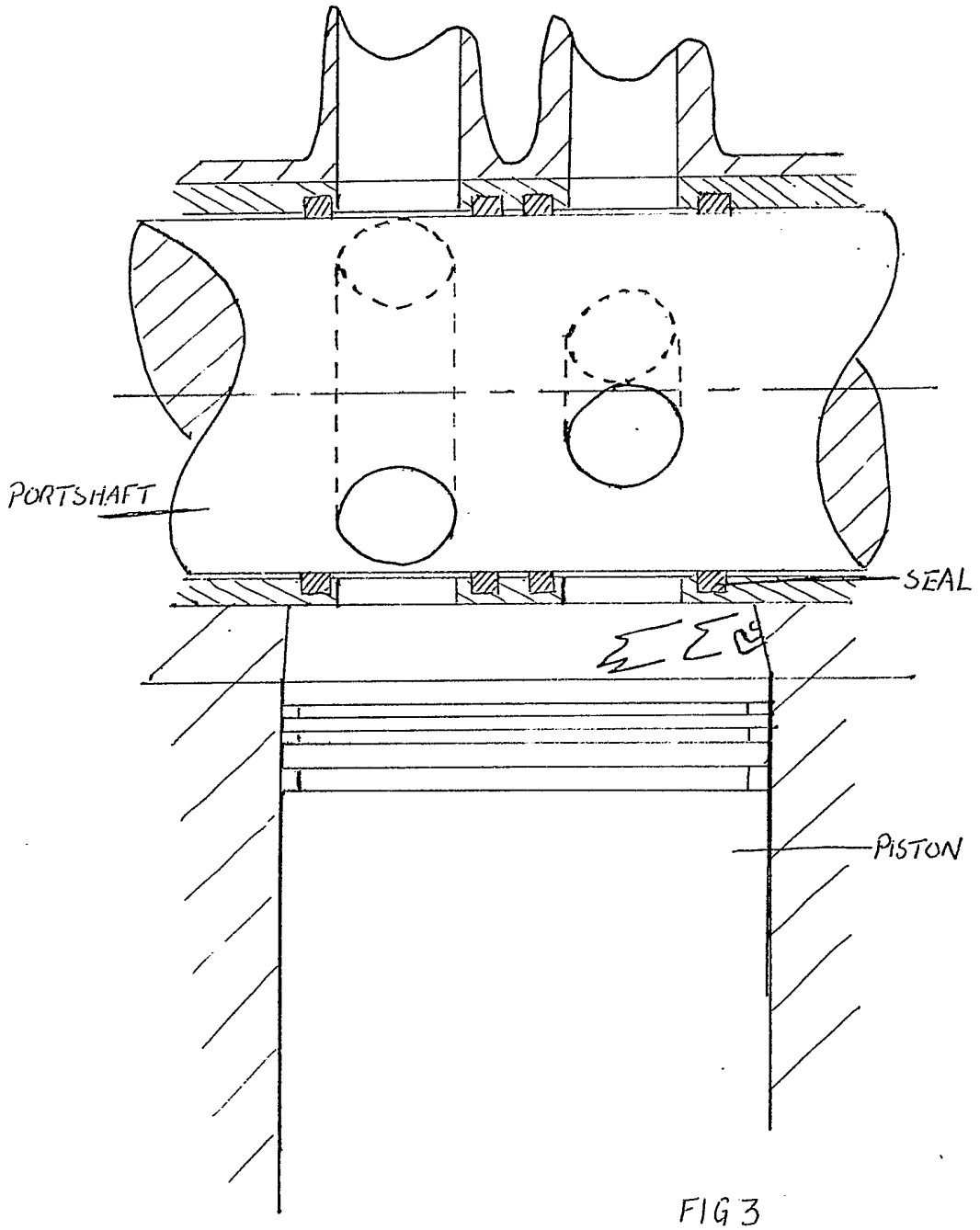


FIG 3

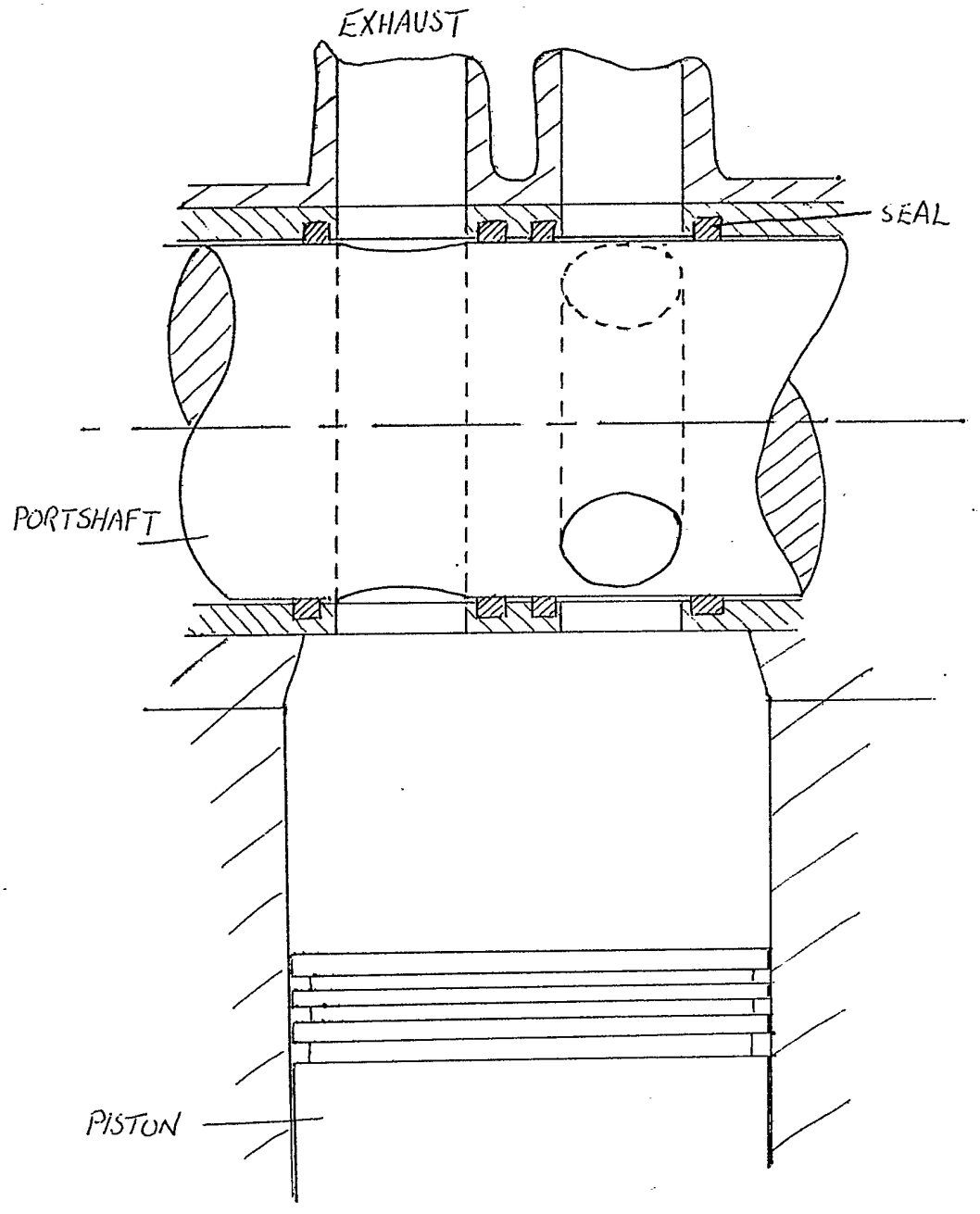


FIG 4A

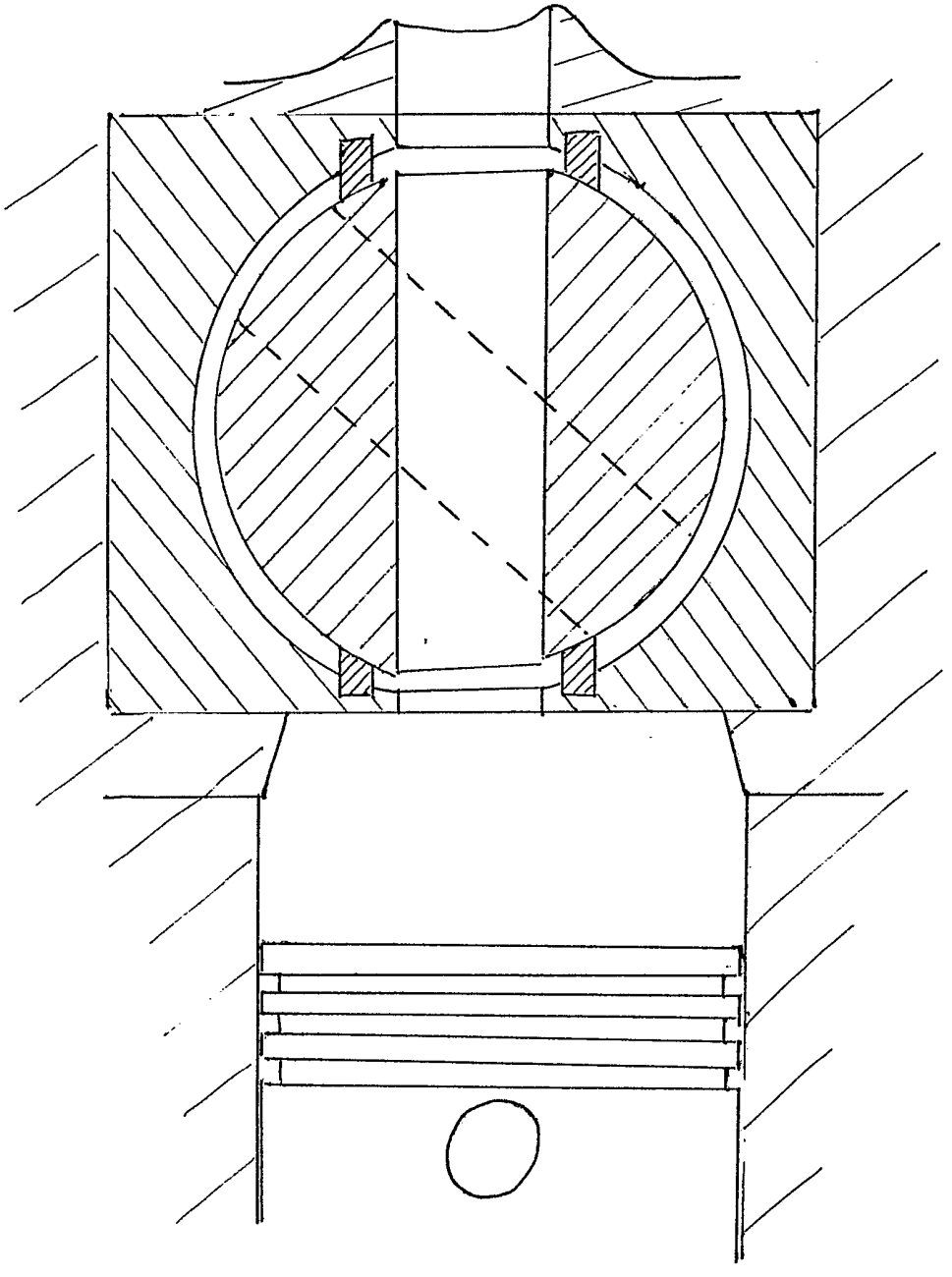
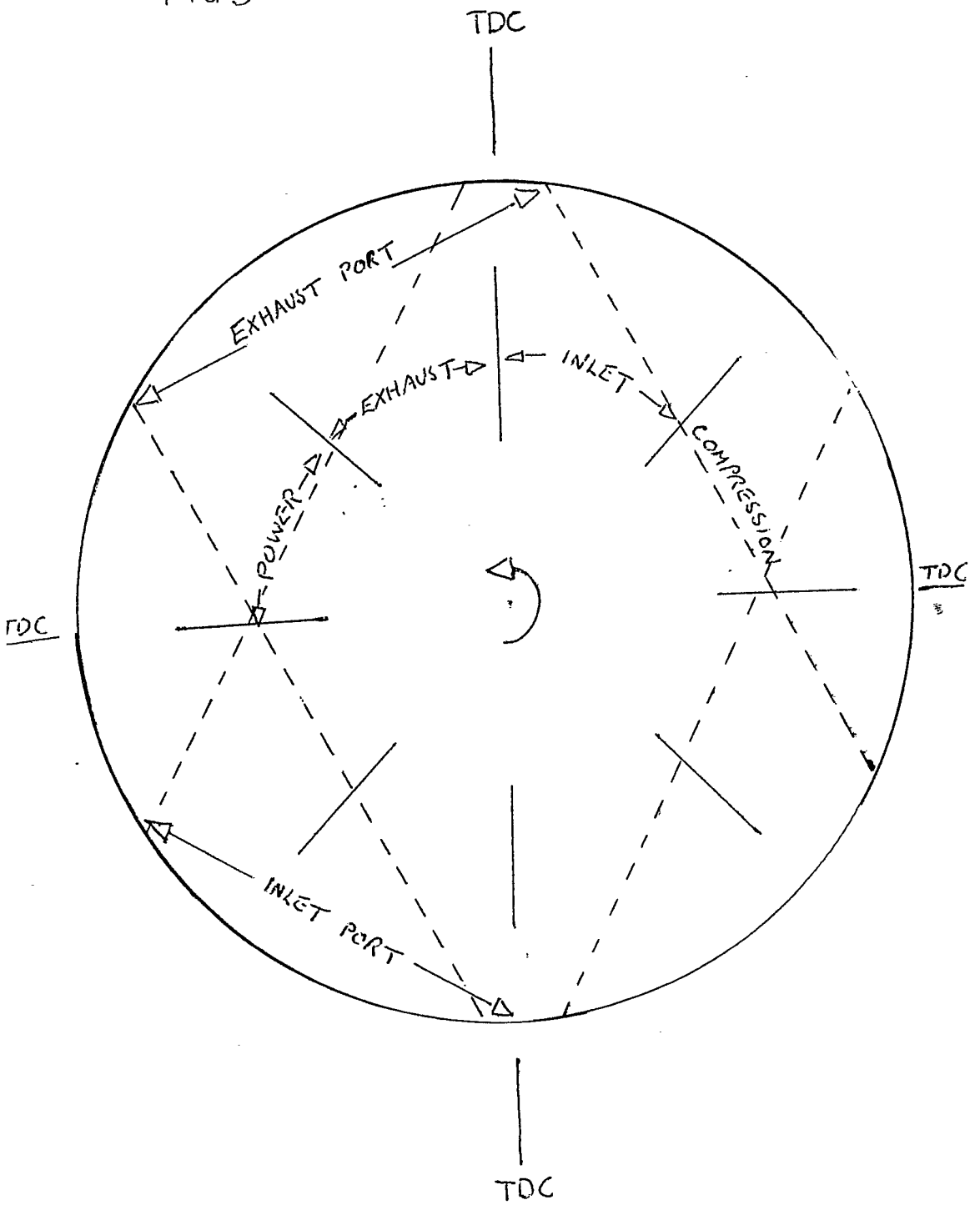


FIG 4B (END-VIEW)

FIG 5


TDC
EXHAUST PORT
EXHAUST
INLET
POWER
COMPRESSION
TDC
TDC
INLET PORT
TDC

SPECIFICATION

Port shaft

The Port Shaft is a driven cylindrical rod with through ports.

It is designed to replace the conventional valve systems in any internal combustion engine.

The rotatable Port Shaft aligns through ports in the shaft with 'inlet' and 'outlet' ports in the combustion chamber at the appropriate points in the engine operating cycle.

It can be mounted and supported as part of a suitably designed manifold system or it can be mounted and supported as an integral part of a suitably designed cylinder head system.

ADVANTAGES OF THE PORT SHAFT OVER PRESENT SYSTEMS.

a. Fuel economy and improved engine starting. This is achieved by
   1. Less power required to drive Port Shaft.
   2. Smaller throttle openings for a given speed.
   3. Reduced load on starter systems.

b. Lighter, cheaper drive gears and drive systems can be used.

c. Reduced risk of engine damage arising from component failure, common in conventional valve systems.

d. Reduced servicing and maintenance.

e. Simpler design and manufacture.

BASIC PRINCIPLES OF PORT SHAFT SYSTEM

The Port Shaft consists of a driven rod with ports bored through at pre-determined points along its length. The ports can be of any shape or size. The only limitation to this is the effect on the length of time the ports will remain open.

The positioning of the ports in the Port Shaft are determined by the basic engine design requirements.

The ports need to have a method of sealing. These port seals can be part of the Port Shaft or incorporated in the Port Shaft housing.

Mounting the Port Shaft can be external to the main engine block and cylinder head, housed in a manifold system, or internal, as part of the cylinder head.

In a conventional four stroke engine the Port Shaft is driven at quarter engine speed from the crankshaft via timed cam shaft drives.

OPERATING CYCLE OF PORT SHAFT IN A FOUR STROKE ENGINE.

Induction Stroke. FIG. 1.

As the piston starts the induction stroke, the 'inlet' port in the Port Shaft is aligned with the 'inlet' ports in the manifold and combustion chamber. This allows air/fuel mixture to pass into the cylinder.

As the piston moves down the Port Shaft will rotate at quarter engine speed, the 'inlet' port will fully open and close.

The 'inlet' port seals will seal against gas leaks or excessive oil leaks.

Compression Stroke. FIG. 2.

During the compression stroke the 'inlet' and 'outlet' ports are sealed by the Port Shaft. The port seals will prevent gas leaks.

Power Stroke. FIG. 3.

The air/fuel mixture is ignited by conventional I.C. engine methods.

i.e. spark plug and coil.

The 'inlet' and 'outlet' ports are sealed by the Port Shaft. The port seals will prevent gas leaks.

(The Port Shaft and port seals need to be manufactured from materials able to withstand the energy and heat generated by the explosion.).

Exhaust Stroke. FIG. 4A. & 4B.

At the start of the exhaust stroke the Port Shaft, 'outlet' port is aligned with the 'outlet' ports in the manifold and combustion chambers. This allows the exhaust gases to evacuate the cylinder. The rotating Port Shaft then closes the 'outlet' ports and the cycle re-commences.

PORT SHAFT PORTS.

Theoretical Diagram of Timing. FIG. 5.

The diagram illustrates a theoretical four stroke cycle in a typical engine fitted with the Port Shaft system.

Settings are:

Inlet opens	22½°	B.T.D.C.
Inlet closes	67½°	A.B.D.C.
Exhaust opens	67½°	B.B.D.C.
Exhaust closes	22½°	A.T.D.C.

It will be seen that any required timing can be introduced by altering the relative positions of the Port Shaft ports at the machining stage.

If the basic engine design requires a small Port Shaft with small ports, the ports can be elongated along the Port Shaft to increase the flow. The positions of the leading and trailing edges of the ports must be retained – these determine the timing.

DEVELOPMENT OF THE PORT SHAFT SYSTEM FOR IMPROVED PERFORMANCE AND ECONOMY ON CONVENTIONAL INTERNAL COMBUSTION ENGINES.

By enlarging the 'inlet' port of the 'inlet' manifold a fuel/air mixture reservoir would be created eliminating 'time lag' in the flow of mixture to the cylinder.

Primary and secondary ports in the Port Shaft could be introduced. ('inlet' and/or 'outlet'.)

The primary port for normal running, secondary port (larger in size) for increased power or performance. Switching could be via the carburettor or throttle linkage or a centrifugal mechanical system.

Developing the shape and path of the ports through the Port Shaft would increase efficiency by reducing mixture turbulence and 'back flow' problems.

Development of alternative port shapes in the Port Shaft would allow greater volumes of gas to flow in less time, this would improve performance and efficiency.

CLAIMS

1. The Port Shaft consists of a driven shaft with through ports bored at pre-determined points along

its length. This is mounted and rotated within a housing that also has bored through ports.

As the shaft is revolved in the housing the through ports in the shaft will either align with or be blanked off from the ports in the housing.

This will create an 'open' access or 'closed' access to the combustion chamber.

The positioning, type, size, shape and number of through ports in the Port Shaft, Housing and combustion chambers are determined by the specification for the basic engine design.

Mounting the Port Shaft and Housing can be, external to the main engine block assembly as an integral part of a suitable manifold system. Alternatively, it can be manufactured and mounted as an integral part of the cylinder head or cylinder block.

In a conventional four stroke internal combustion engine, the Port Shaft is driven at quarter engine speed from the crankshaft.

The Port Shaft and Housing has seals fitted between the through ports to contain the gases. These seals will also stop excess oil entering the combustion chamber.

The shape of the through ports in the Port Shaft can be designed and specified to influence the mixture flow paths. The shape of the through ports can also be designed to influence the method of introducing fuel to the engine.

2. The housing as claimed in Claim 1, can be part of a manifold system or, built into the cylinder head or cylinder block.

The housing will have bored through ports of shape and size as dictated by the basic engine specification.

A fuel mixture chamber can be incorporated in the 'inlet' side of the housing.

3. The Port Seals, as claimed in Claim 1, are fitted to contain the gases and to stop excess oil entering the combustion chambers.

They can be fitted into the housing or on the Port Shaft.

4. As claimed in Claim 1, through ports of any shape or size can be used, the only limitation being the leading and trailing edges, these determine the port timing.

Changing the shape (path) of the through port will provide options for affecting changes in the performance and efficiency of the engine. (i.e. allowing fuel to be introduced into the through port).

If a small diameter Port Shaft was required through ports would be elongated to increase gas flow whilst retaining port timing.

The Port Shaft system can have more than one 'inlet' and/or 'outlet' through ports per cylinder. These through ports could be different in size, a primary and a secondary port. A primary port giving normal economy operation and a secondary port giving increased performance operation.

The selection or Primary and Secondary Through Ports would be electrically or mechanically operated. An adjustable single port would be operated by the same means.

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