

COMMISSIONER'S DECISION

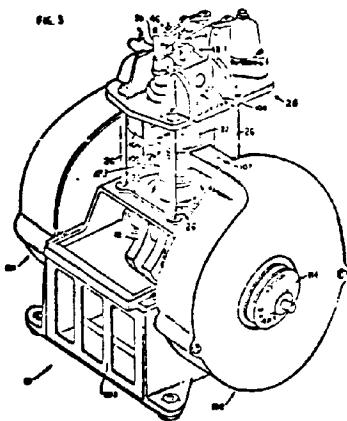
Obviousness - Internal Combustion Engine

The invention is an engine with a transparent cylinder wall used for educational purposes. The internal moving parts are exposed to view during operation. The rejection of some of the claims is affirmed.

Final Action: Affirmed, but amended claims suggested for allowance.

Patent application 120,868 (Class 35-19), was filed on August 18, 1971, for an invention entitled "Transparent Internal Combustion Engine." The inventors are Charles W. Haldeman et al, assignors to Megatech Corporation. The examiner in charge of the application took a Final Action on January 12, 1977, refusing to allow it to proceed to patent. In reviewing the rejection, the Patent Appeal Board held a Hearing on October 11, 1978, and at which the applicant was represented by Mr. G. Houle. Also in attendance was Dr. C.W. Haldeman, one of the inventors.

The application relates to an internal combustion engine and, more particularly concerns transparent cylinder walled engines for educational use exposing the internal moving parts of the engine to view during operation. Figure 3, below, shows that arrangement:



In the Final Action the examiner refused claims 1 to 9 and 11 to 15 for "lack of inventive ingenuity" in view of the following cited art and common knowledge.

United States Patents

2,919,688	Jan. 5, 1960	Bowditch et al
2,751,146	June 19, 1956	Moseley
3,358,914	Dec. 19, 1967	MacMillan
3,315,881	Apr. 25, 1967	Halpin et al
2,992,052	July 11, 1961	De John

Catalogue-Perry School Supplies Ltd., Catalogue Number 1060
Glass Motor (Received in Patent Office January 27, 1969 and
available in Cl. 35-19 (formerly Cl. 35-10)).

Internal Combustion Engines - Lester C. Lichty - Sixth
Edition 1951 - page 135.

The Moseley and MacMillan references relate to piston and cylinder wall construction for air compressors, the pistons having grooves in which dry lubrication plastic rings are inserted. Bowditch and the Catalogue reference provide some visual demonstration of the inner workings of moving parts of an engine. De John describes a self sealing piston which incorporates the use of a flexible flap, while the Halpin patent is directed to variations in self-lubricating systems.

In the Final Action the examiner discussed in detail his reasons for rejecting the claims for failing to define inventive subject matter. For example, he had this to say about claim 1:

...

Claim 1 is refused as failing to define inventive subject matter over either of Bowditch et al or the Perry catalogue reference taken in conjunction with any of Moseley, MacMillan, or Halpin and common knowledge. It is well known in view of either Bowditch or Perry to provide moving assemblies partially constructed of material which allows viewing of moving parts. While the glass motor of the cited catalogue reference of Perry does not constitute a working motor as does that of the Bowditch patent, yet the principle of providing visual devices to demonstrate inner workings of machinery has long been known as evidenced by Bowditch or Perry. Further, Bowditch at Column 1, line 23 to line 30 describes that viewing windows in cylinder heads were old at the date of his patent (January 1960). But even eschewing the teaching of Bowditch, it is held that a mechanic skilled in the art would have little difficulty in providing a transparent working model of an internal combustion engine given prior knowledge of internal combustion engines and the glass motor of the Perry catalogue reference. Obviously, the material used to provide visibility would have to have the necessary attributes of strength heat-resistance, etc. Thus the replacement of certain metallic parts of an internal

combustion engine with transparent material would constitute a mere substitution of material to one skilled in the art. Furthermore, the definition in the claim whereby a sealing means is provided to coact with the piston and cylinder wall to establish a dry lubrication has long been in use as described in patents to any of Moseley, MacMillan or Halpin who suggest piston rings of resilient plastic such as Teflon.

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In response to the Final Action the applicant presented amended claims 1 to 15 and had this to say, inter alia:

...

The Examiner's primary references are Bowditch et al and the Catalogue reference taken in conjunction with any of Moseley, MacMillan or Halpin and common knowledge. Bowditch et al relates to an operating engine and presents the problem of wanting to see inside the combustion chamber of the engine during operation. Bowditch et al states that this has previously been done by making the cylinder head transparent. However, this can be expensive when different shaped heads are used. Bowditch et al solves the problem by making the piston head transparent and using a mirror arrangement within a long piston skirt between the piston head and piston rod attachment. The arrangement is obviously complex. Bowditch et al neither discloses nor suggests making the cylinder wall transparent.

The Bowditch et al patent teaches the desirability of being able to look inside an engine to view the action of the fluids in the expansible chambers formed by the piston cylinder assembly to study certain effects. The cylinder wall is not transparent as disclosed and claimed in this application.

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The Catalogue reference may apparently disclose a transparent cylinder wall, but it is not in the environment of an operating engine. Further, there is no indication that the Catalogue reference discloses combustion chamber sealing means which prevent damage to the cylinder wall during operation.

While it may be well known to make moving assemblies partially constructed from material which allows viewing as the Examiner states, and as shown by Bowditch et al or the Catalogue reference, certainly there is no teaching or suggestion in the art in making the cylinder wall of an operating engine transparent. Making the cylinder wall transparent is not only a simpler way of viewing the combustion chamber, as compared to Bowditch et al, but a better way since more of the engine can be seen. Problems are presented when making the cylinder wall transparent in an operating engine. The wall must remain transparent during operation and means must be provided to ensure this. To this end, combustion chamber sealing means are provided which are made of a material preventing damage to the cylinder wall.

...

At the Hearing Mr. Houle argued strongly that indeed an invention had been made and was fully described in the disclosure. Dr. Haldeman demonstrated the invention with a working model of his internal combustion engine which showed the advantages of a transparent cylinder wall. One of Mr. Houle's major points was that there is no teaching or suggestion in the cited art to make the cylinder wall of an operating engine transparent. He went on to say that making the cylinder wall transparent is not only a simpler way of viewing the combustion chamber, but a better way since more of the combustion process can be seen.

Our first consideration will be whether or not an invention has been described in the disclosure. To do this we will first analyze the cumulative teachings of the art cited.

The Bowditch patent teaches the desirability of being able to look inside an engine to view the action of the fluids in the expansion chamber formed by the piston cylinder assembly to study certain effects. The cylinder wall, however, is not transparent and the viewing is done through a quartz window in conjunction with a mirror viewing arrangement. No suggestion was made to have the cylinder wall transparent. On the other hand the Catalogue reference discloses a transparent cylinder wall, but it is not in the environment of an operating engine.

As mentioned the Moseley and MacMillan patents are directed to piston and cylinder wall construction while DeJohn and Halpen are concerned with self-lubricating systems. Moseley, MacMillan and Halpin which are directed to compressors are not, however, concerned with the many problems encountered in designing internal combustion engines.

We agree with the applicant that there is no teaching or suggestion in the cited art of making the cylinder wall of an operating engine transparent. The fact, however, that this was done before with a non operating engine precludes the applicant from claiming the broad concept per se.

We have carefully read the disclosure and considered the drawings of this application and studied them with respect to the cumulative teachings of the cited art. We are satisfied that the applicant has overcome problems not encountered in the prior art which required a degree of ingenuity for fruition. These problems centered around piston and cylinder seal combination in that the piston does not contact the glass cylinder wall. The circumferential means near the top of the piston, such as the flap or rings, function both to provide a bearing surface between the piston and cylinder wall and effect a seal. This is in contrast to the customary engine construction where the piston and cylinder walls are essentially in contact over their common length and normally requiring a fluid lubricating system.

The specific question then is the scope of monopoly which the applicant is entitled to in defining his invention in the claims.

The advance in the art, in our view, is broadly the use of a transparent wall in an operating engine in conjunction with the inventive application of that idea. First the piston must be made of a material which has good thermal heat conducting properties and the cylinder wall is made of transparent glass. The non-contacting arrangement between the piston and cylinder walls appear to be most important. Finally the application of the flexible ring or rings which co-acts with the surface to produce the lubrication, while at the same time sealing the engine.

To clear a point which was discussed at the Hearing the applicant does not have to claim his preferred embodiment, but may define his invention in the claims as broad as the invention described in the disclosure and what the prior art will permit.

We will now consider the claims. Amended claim 1 reads:

An operative internal combustion engine for displaying the operative relationship among elements thereof comprising, piston means, means defining a cylinder wall surrounding the piston means made of transparent material so that operation of said engine may be visually observed during operation,

and means coacting with said piston and said cylinder wall for sealing the combustion chamber bounded by means including said cylinder wall and said piston, the latter means also comprising means for establishing a dry lubricating relationship with said cylinder wall as said piston reciprocates therein during engine operation, said engine being free from liquid lubrication inside said cylinder wall, said means for sealing said combustion chamber comprising at least one sealing ring made of resilient self-lubricating material having a low coefficient of friction attached to said piston means and sealing the region between said piston means and said cylinder wall, said engine including first means on said piston means for supporting said piston means to permit relative axial displacement with said cylinder wall and means cooperating with said first means and said piston means for radially spacing said piston from said cylinder wall in noncontacting relationship therewith, said piston means made of material which if allowed to contact the cylinder wall directly would damage said cylinder wall while said sealing ring and said means for radially spacing prevent damage to said cylinder wall.

It is observed that this claim is the only independent apparatus claim, therefore, any dependent claims will stand or fall with claim 1.

Some amendments to this claim were discussed at the Hearing. For example, the transparent "material" of the cylinder should be restricted to "thermal resistant glass." Another feature which was brought out at the Hearing as considered important was that the piston is made from "material which is a good thermal conductor." This feature, in our view, should also appear in the claim. The claim also appears redundant or negative in some parts, for example, there is recited "means for radially spacing said piston from said cylinder wall...." Then the claim goes on to recite that the piston is made of material "which if allowed to contact the cylinder wall directly would damage the cylinder wall...." The claim does, however, cover the lubricating and sealing features and probably most important the means to support the piston "to permit relative axial displacement with said cylinder wall," in other words "radially spacing said piston from said cylinder wall in noncontacting relationship therewith." At the Hearing, however, the spacing was considered as a "substantial" spacing relative of course to other internal

combination engines. This we feel should also be brought out in the claim. The drawing in the Halpin patent shows some cylinder spacing in an air-compressor arrangement. The disclosure of that patent, however, states that "The piston 10 is reciprocable in generally conventional manner within a cast iron cylinder liner 16." In other words this patent does not teach a "substantial" spacing for a specified purpose.

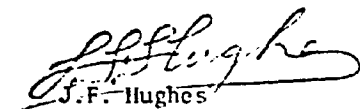
This claim when amended as indicated would in our view define the proper scope of monopoly of the invention described in the disclosure and illustrated in the drawings. Any appropriately dependent claim or claims would also be found allowable.

Amended claim 15 is directed to a method and reads:

A method of operating the internal combustion engine utilized for displaying the operative relationship among elements thereof and having piston means, a cylinder wall surrounding the piston means, and a combustion chamber, said method including the steps of supplying to said combustion chamber a mixture of air and fuel characterized by combustion products substantially free of material that would coat said cylinder wall to reduce the transparency thereof, and then igniting said mixture to relatively displace said piston means and cylinder wall while the latter remains transparent.

This claim recites steps of operating an engine which clearly apply to any internal combustion engine and is totally lacking in any inventive merit. This claim should be refused.

To summarize, we are satisfied that a patentable advance in the art has been described in the disclosure. We recommend that claim 1, when amended as suggested, along with appropriate dependent claims, should be allowed, but that the decision in the Final Action refusing claims 1 to 9 and 11 to 15 should be affirmed. Amended claim 15 should also be refused.



J.F. Hughes
Assistant Chairman
Patent Appeal Board, Canada

I have studied the prosecution of this application and reviewed the recommendations of the Board. Accordingly, I refuse claim 15, but will accept claim 1 when amended as suggested by the Board along with any appropriately dependent claim or claims. The applicant has six months within which to submit an appropriate amendment, or to appeal my decision under the provisions of Section 44 of the Patent Act.



J. H. A. Gariepy
Commissioner of Patents

Dated at Hull, Quebec

this 24th. day of November, 1978

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