

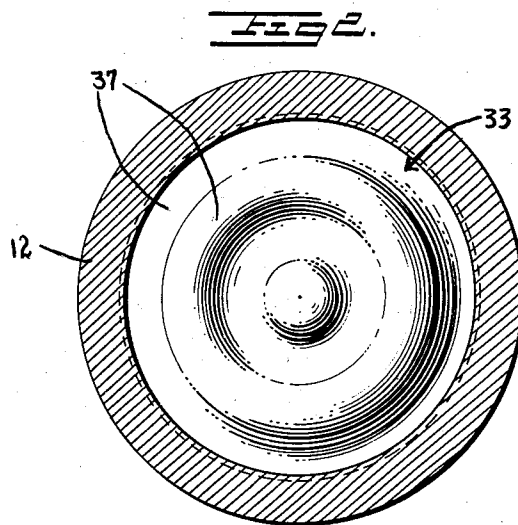
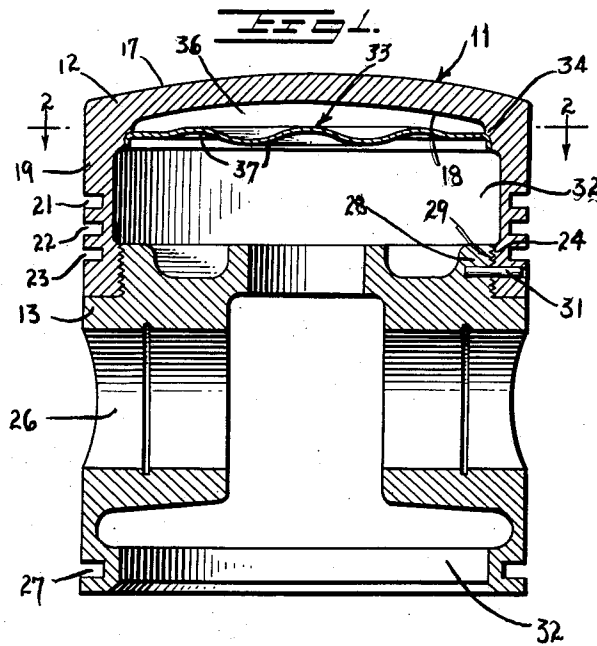
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PISTON

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The present invention relates to the construction of a piston for an internal combustion engine. More particularly, the invention is concerned with a piston construction in which a significant operating temperature differential is maintained between the piston head and the piston skirt when functioning within an internal combustion engine.

The invention particularly relates to a Diesel type engine in which combustion is achieved by compressing a combustible charge to its ignition temperature rather than igniting the charge by use of a high voltage ignition device such as a spark plug.

It is necessary in all piston type engines to cool the pistons to provide non-binding, sliding contact between the piston and cylinder wall and also to reduce thermal stressing of the piston. It is imperative in a diesel type engine in cooling the piston skirt, however, that the piston head or face be not cooled significantly below the temperature of the combustion chamber generally least combustion be inhibited. In other words, it is necessary for most efficiency when operating a Diesel engine to maintain a hot piston top.

The need to maintain the top of a piston in a hot condition to facilitate combustion in Diesel operation is thus in conflict with the countervailing necessity of maintaining the remainder of the piston relatively cool. By the present invention it is possible to provide a piston construction in which the piston head is isolated or insulated from the piston cooling medium and thus effectively maintain a significant temperature differential between the piston top or head and the remainder of the piston.

The need for maintaining such a temperature differential in a diesel type engine piston has long been recognized, however, the means for achieving this condition have frequently been cumbersome and expensive in realization. One previous expedient has been to employ a complicated multi-part piston head in which the piston head parts were insulated from each other to prevent the flow of heat by conduction therebetween. Another variant has been the use of "heat plates" which are adapted to localize the heat concentration in the piston head. The use of heat plates normally requires a specially formed piston which has been altered to receive and support the plate in non-conduction relation with the remainder of the piston. All of the heretofore known devices dedicated to the problem of a hot top piston have, however, involved relatively complicated and expensive piston head constructions.

Accordingly, the present invention is directed to a simple and inexpensive piston head insulating or baffling device which may be initially incorporated in a piston or readily added to pistons not previously so equipped.

The present invention is particularly adapted for use with an engine in which a cooling fluid is directed against the inside of the piston to reduce the overall temperature thereof. The present invention provides a uniquely simple means whereby any piston may be made or modified

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to insulate the piston head against contact by the cooling fluid.

To this end the present invention provides a baffle or diaphragm member mounted within the piston proximate the head and disposed so as to entirely shield the inside of the latter from any cooling medium.

The invention will be described in greater detail hereinafter.

In the drawings:

Figure 1 is a sectional view of a piston embodying the subject invention.

Figure 2 is a bottom view along line 2—2 of Figure 1. Referring to the drawings, Figure 1 shows a piston 11 which includes a head portion 12 and a skirt portion 13. While the piston could be made of a one-piece construction, it is preferable to make the head and skirt portions of different materials in order to better match the operating conditions to which these portions of the piston are subjected.

The piston head 12 is preferably made of a high heat and corrosion resistant material such as an austenitic steel. The skirt on the other hand may be formed from aluminum which reduces the overall piston mass and also is a good conductor of heat.

Piston head 12 includes outer and inner crowned faces 17 and 18. The side or depending portion 19 of the head has the conventional annular piston ring grooves 21, 22 and 23 formed therein. The lower part of head portion 19 is internally threaded at 24 in order to facilitate the connection of the head and skirt portions.

Skirt portion 13 includes a substantially centrally disposed wrist pin bearing 26 formed transversely thereof. The lower end of skirt 13 has a groove 27 formed therein to receive a piston oil wiper ring.

The upper end of skirt 13 has a portion 28 of reduced diameter externally threaded at 29 and is adapted to be engaged with the threaded portion 24 of head 12 to provide a unitary piston construction.

A locking pin 31 is inserted in registering holes in the assembled head and skirt portions 12 and 13 to insure against relative rotation between these portions.

The substantially hollow construction of the head and skirt portions 12 and 13 defines a chamber 32. In operation, a fluid, liquid or air, is adapted to be circulated within chamber 32 for the purpose of contacting the inner piston wall surfaces and reducing the piston temperature to a level conducive to relatively long piston and piston ring life.

Normally, the cooling fluid is crankcase oil which is splashed or sprayed in any well-known manner within the piston 11.

As already suggested, in most internal combustion engines it is both customary and desirable to cool the entire piston for longer life. With a present type piston it is necessary to maintain a hot piston top while the remainder of the piston is in a relatively cool condition. To insulate the inner head face 18 against contact by the cooling fluid whereby the piston face 17 is maintained at an appreciably higher temperature than the remainder of the piston, a baffle or diaphragm member 33 is provided.

An annular shoulder 34 is formed within head 12 in proximate but spaced relation from inner face 18. Member 33 is adapted to be peripherally supported upon shoulder 34 in any convenient manner such as by a press fit. When assembled within head 12, member 33 and inner face 18 define a second or insulating chamber 36. It is apparent that the dead air space of chamber 36 creates an effective insulating medium.

In order to provide a member which will not be unduly affected by temperature changes generally and specifically the temperature differential between the piston

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face and skirt, the diaphragm baffle 33 is made of a thin metallic material and is provided with concentric annular corrugations 37 to insure adequate flexibility. By this means any temperature induced stresses in the diaphragm 33 will be substantially absorbed by the member itself in flexing, and the member will not transmit any appreciable stresses to the piston head.

It is apparent that other cross-sectional configurations might be employed with baffle 33 in order to achieve the flexibility that is realized with the baffle as shown.

The positioning of diaphragm 33 in spaced relation to the inside face of the piston head 18 in addition to providing the insulating dead air space, has the added advantage of permitting the relatively free movement of the diaphragm in accordance with changes in operating temperatures.

With a piston as thus constructed it is seen that cooling fluid may circulate within the piston to cool the depending portion 19 of the head 12 as well as the skirt portion 13 while the head faces 17 and 18 are maintained in a relatively hot condition. In view of the aforementioned heating differential between the head of the piston and the remainder, it is apparent that the pressure within chamber 36 will exceed that within the remainder of the head during normal operating conditions.

While it is to be understood that various structural modifications could be made in the piston and baffle structures within the scope of applicant's teaching, the modification shown in Figures 1 and 2 represents the preferred form of the invention.

The scope of the present invention is hereinafter set forth in the appended claims.

What is claimed is:

1. A piston for a diesel-type engine which comprises a head portion having inner and outer faces, a skirt having wrist pin bearings formed therein, said head being formed of a material less conductive of heat than the skirt, and an imperforate diaphragm member mounted in said head proximate the inner face intermediate said inner face and said wrist pin bearings, and a shoulder circumscribing said

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inner face adapted to receive said diaphragm, said diaphragm and inner face coacting to define a closed insulating chamber adapted to reduce the loss of heat from said inner face, the pressure within said chamber exceeding that within the remainder of the head during normal operating conditions.

2. A piston for a diesel-type engine which comprises a head portion having smooth outer and inner faces, a skirt having wrist pin bearings formed therein, said head being formed of a material less conductive of heat than the skirt, an imperforate flexible diaphragm supported in spaced relation with said inner face intermediate said inner face and said wrist pin bearings, and a shoulder circumscribing said inner face adapted to receive said diaphragm, said diaphragm and inner face forming a closed chamber adapted to reduce the loss of heat from said inner face, the pressure within said chamber exceeding that within the remainder of the head during thermal operating conditions.

3. A piston as described in claim 1 in which the diaphragm is flexible to permit the volume of said insulating chamber to vary with changes in temperature.

4. A piston as described in claim 1 in which said diaphragm comprises a thin metal member having a plurality of concentric annular depressions formed therein.

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