

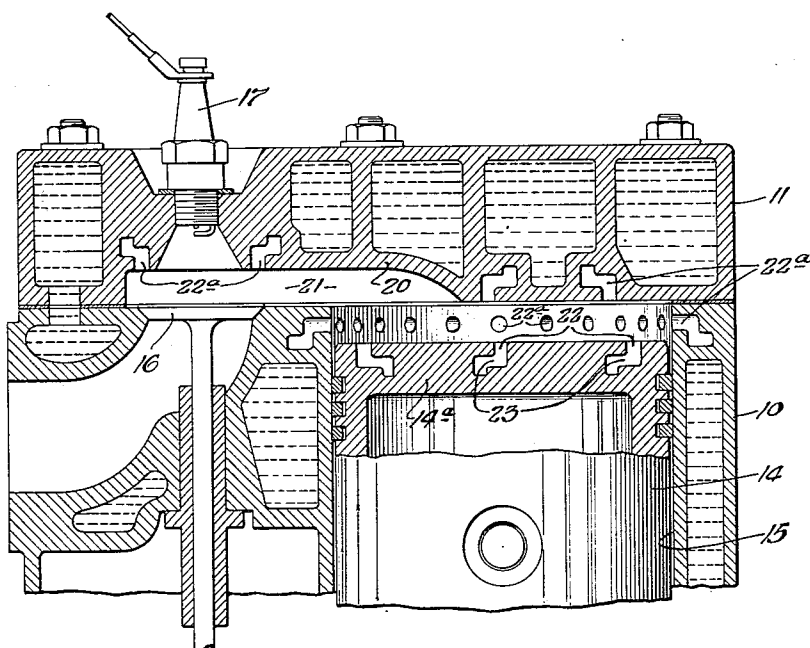
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DETONATION SPOILERS FOR INTERNAL COMBUSTION ENGINES

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DETONATION SPOILERS FOR INTERNAL COMBUSTION ENGINES

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Original application July 2, 1951, Serial No. 234,688, now Patent No. 2,573,536, dated October 30, 1951. Divided and application October 24, 1951, Serial No. 252,818, now Patent No. 2,738,781, dated March 20, 1956. Divided and application December 6, 1955, Serial No. 551,263. Again divided and this application April 16, 1956, Serial No. 578,472

2 Claims. (Cl. 123—191)

This invention relates generally to internal combustion engines and to means for suppressing irregular burning and detonation of fuel-air mixture therein. The invention is based on my discovery that detonation in combustion engines involves acoustic phenomena and can be alleviated by means of certain acoustic apparatus used in combination with the combustion chamber.

The present application is a division of my copending application Ser. No. 551,263, filed December 6, 1955, allowed February 15, 1956, entitled Piston Carried Detonation Suppression Means for Internal Combustion Engines. That parent application was in turn a division of my application Ser. No. 252,818, filed October 24, 1951, entitled Engine Detonation Control by Acoustic Methods and Apparatus, now Patent No. 2,738,781, which application was a division of my earlier application Ser. No. 234,688, filed July 2, 1951, entitled Engine Detonation Control by Acoustic Methods and Apparatus (now Patent No. 2,573,536), which last mentioned case was in turn a continuation-in-part of my prior application Ser. No. 760,914 filed July 14, 1947, entitled Method and Means for Suppressing Detonation in Internal Combustion Engines, now abandoned.

The present invention is based on the fact that detonation in an engine combustion chamber produces sound waves, a large part of which rise to high amplitude at resonant frequencies of the chamber, and on my discovery that the sound waves produce the various well-known and harmful manifestations of detonation. According to my basic invention, I inhibit or attenuate these harmful effects by interfering with or attenuating the high amplitude detonation-induced sound waves, and this is done by use in connection with the combustion chamber of acoustic attenuation means made responsive to the frequencies at which the detonation induced sound waves build up to high amplitudes.

The acoustic attenuation means of the present invention is of the general type of certain spoiler cavities disclosed and claimed in my aforesaid Patent No. 2,573,536, and the object of the invention may be stated to be to provide improvements in such spoiler cavities.

The drawing shows a transverse section through an illustrative L-head engine equipped with the improved spoiler cavities of the invention. This engine is shown as comprised of a water-cooled block 10, a water-cooled head 11 fastened to block 10, a piston 14 working in cylinder 15 in block 10, an exhaust valve 16, and a spark plug 17. It will be understood that an intake valve (not shown) will be located along-side exhaust valve 16, such valve being understood to be in front of the plane of the drawing. Block 10 and head 11 are shown with more or less conventional cooling jackets, and head 11 has an inner combustion chamber wall 20, enclosing a combustion chamber space 21 over the cylinder and valve, as shown. A plurality of "spoiler" cavities or resonant absorbers 22 are formed in the upper or head wall 14a of piston 14, and as here shown, additional spoiler cavities 22a may, if desired, be sunk in the upper end portion of the cylinder, and in the combustion chamber defining wall

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of head 11. Straight spoiler cavities were disclosed and claimed in my aforesaid Patent No. 2,573,536, and functioning and effect of spoiler cavities in combating detonation was there set forth in full. As was there explained, such spoiler cavities are effective to absorb sound wave frequencies in the combustion chamber to which they have a resonant response; and it will be further understood that the spoilers such as illustrated, formed with closed inner ends, comprise quarter wavelength pipe resonators having a frequency selective attenuative response to sound waves whose wavelength is four times the depth of the cavities.

The characteristic novel feature of the present invention is that the quarter-wavelength resonant absorbers or spoilers 22 are not straight throughout their full lengths, but are provided with laterally extending intermediate sections 23, so that the inner end portions of the cavities are laterally offset from the entrance ends thereof. By this arrangement, the interior end portions of the cavities are substantially shielded from the heat produced within the combustion chamber. In this connection, it is found in practice that carbon tends to accumulate on surfaces which are in a certain intermediate heat range, and that surfaces maintained at either a relatively high temperature, or at a relatively low temperature, will not accumulate carbon. This is believed to be due to the fact that certain varnishes are produced in the combustion process. These varnishes are capable of adhering to combustion chamber wall surfaces within a certain heat range, so providing conditions favorable to an accumulation of carbon. Both above and below such heat range, the varnishes do not appear on the combustion chamber surfaces and the carbon does not deposit. The embodiment shown will be seen to be one means providing offset shielding from radiation for keeping the inner end portions of the resonant cavities at an operation temperature below that for which carbon will deposit.

While as stated above, the spoiler cavities shown in Fig. 1 may be located in either the head wall of the piston, or within the stationary wall structure definitive of the combustion chamber, I have found that the piston is in an advantageous location, permitting ready installation of the attenuator configurations without redesign of conventional combustion chambers, and operating entirely satisfactorily even though the piston is moving.

It will be understood that the drawings and description are merely illustrative of one specific embodiment of the invention, and that various changes in design, structure and arrangement may be made without departing from the spirit and scope of the appended claims.

I claim:

1. An internal combustion engine with internal combustion chamber defining walls including the top wall of a piston, at least one of said walls being breeched by a plurality of holes having closed inner ends, said holes being of quarter wavelength for the frequency of resonant detonation induced sound waves occurring in said chamber and said holes having laterally offset portions such that inner end portions thereof are shielded from the direct flame and heat within the combustion chamber.

2. An internal combustion engine with internal combustion chamber defining walls including the top wall of a piston, at least one of said walls being breeched by a plurality of holes having closed inner ends, said holes being of quarter wavelength for the frequency of resonant detonation induced sound waves occurring in said chamber and said holes having directional bends therein such that the inner end portions thereof are out of alignment with the outer end portions thereof and are thereby shielded from heat radiated into the holes from the combustion chamber.

No references cited.