

[54] **INTERNAL COMBUSTION ENGINE WITH SOUND-PROOFING CASING**

[75] Inventors: **Gerhard Thien; Heinz Fachbach; Othmar Skatsche**, all of Graz, Austria

[73] Assignee: **Hans List**, Graz, Austria

[22] Filed: **Sept. 1, 1972**

[21] Appl. No.: **285,772**

3,601,101 8/1971 Thien et al. 181/33 K

Primary Examiner—Stephen J. Tomsky
Assistant Examiner—Vit W. Miska
Attorney, Agent, or Firm—Watson, Cole, Grindle & Watson

[30] **Foreign Application Priority Data**

Sept. 3, 1971 Austria 7715/71

[52] U.S. Cl. 181/33 K, 181/33 G, 123/41.7, 123/198 E

[51] Int. Cl. E04b 1/99, G10k 11/04

[58] Field of Search 181/33 K; 123/41.7, 198 E

[56] **References Cited**

UNITED STATES PATENTS

3,684,053 8/1972 Fachbach et al. 181/33 K

[57] **ABSTRACT**

An internal combustion engine having a sound-proofing casing comprising at least one spaced bottom portion raised sump-fashion and surrounding the engine and attached to the latter by means of sound-proofing supporting members attached to the engine in its bottom-most area, the spaced bottom portion of the casing being closed on top by means of a cover.

6 Claims, 3 Drawing Figures

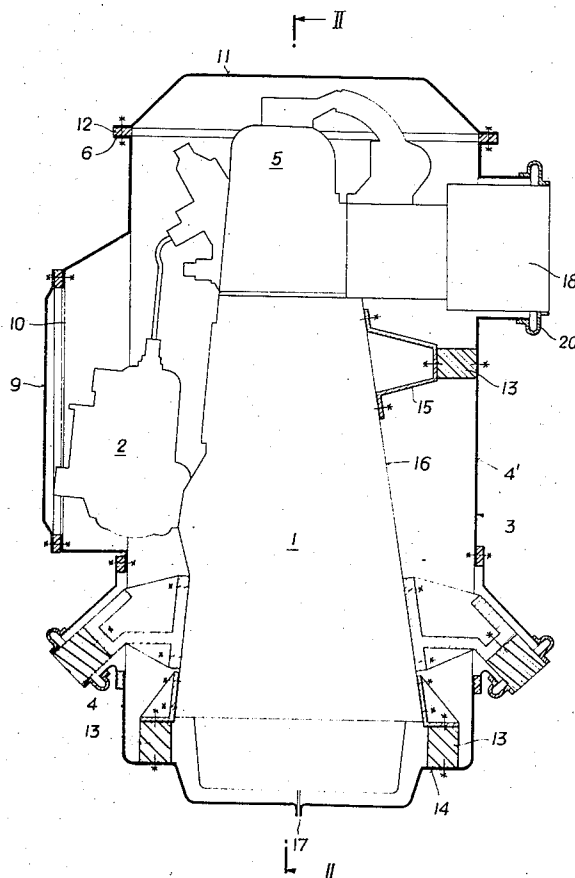
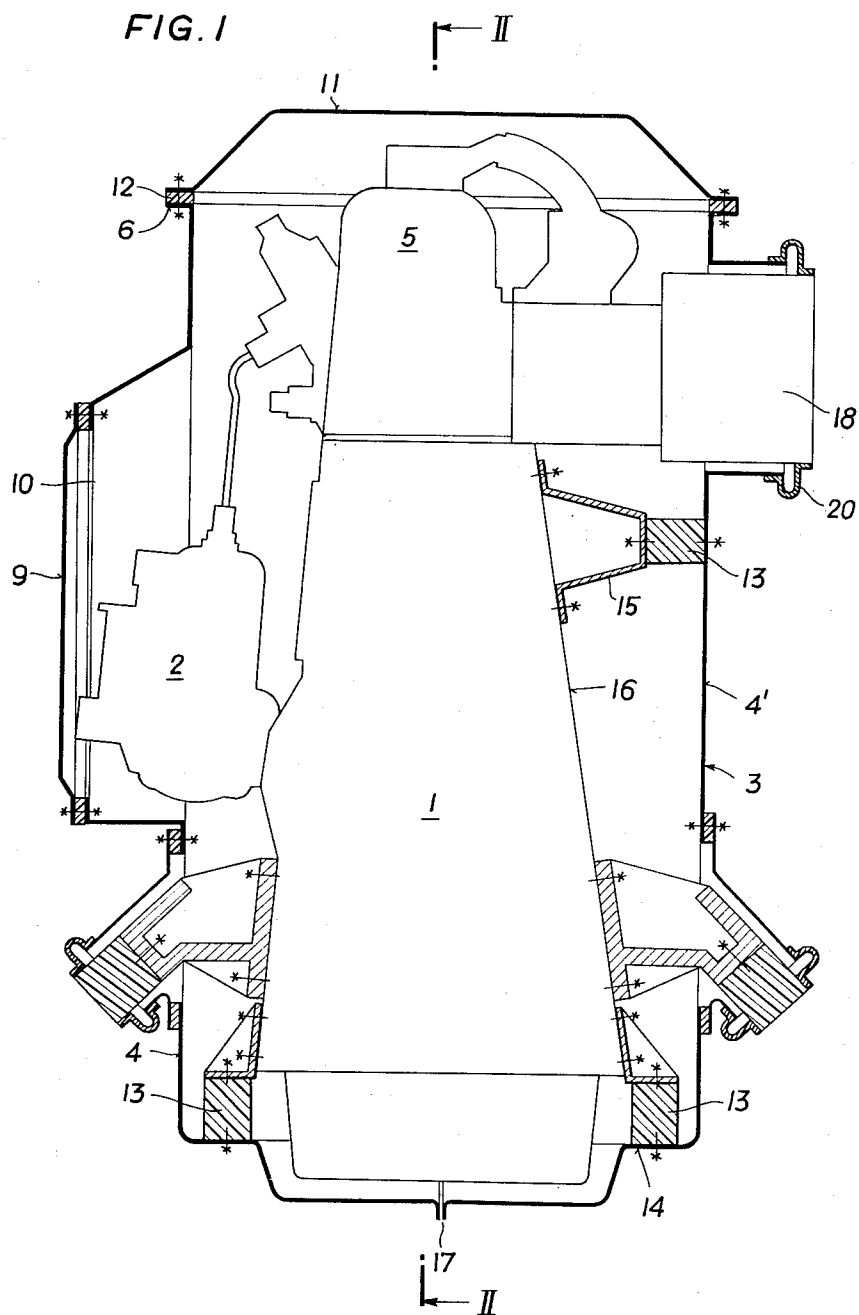


FIG. 1



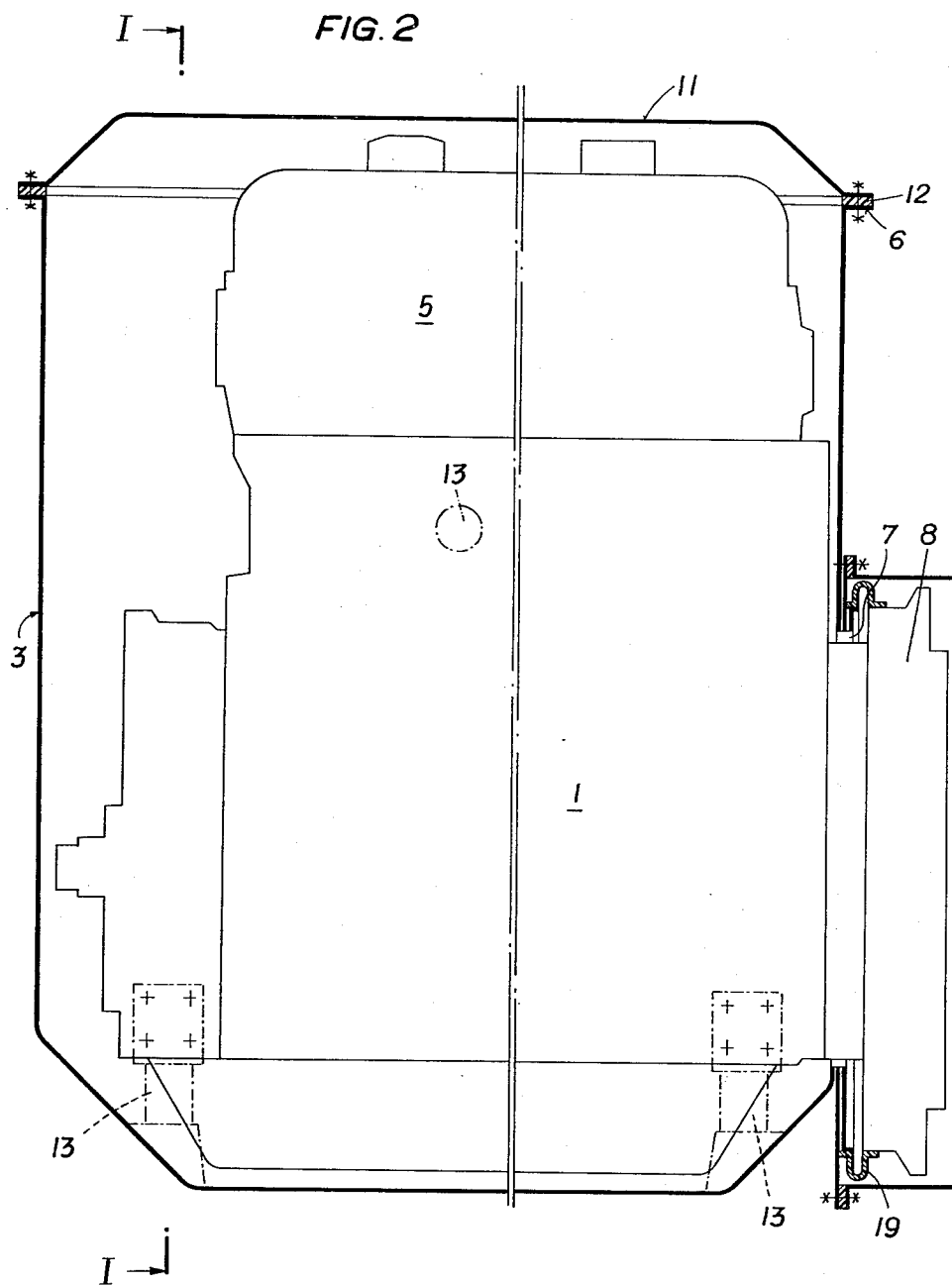
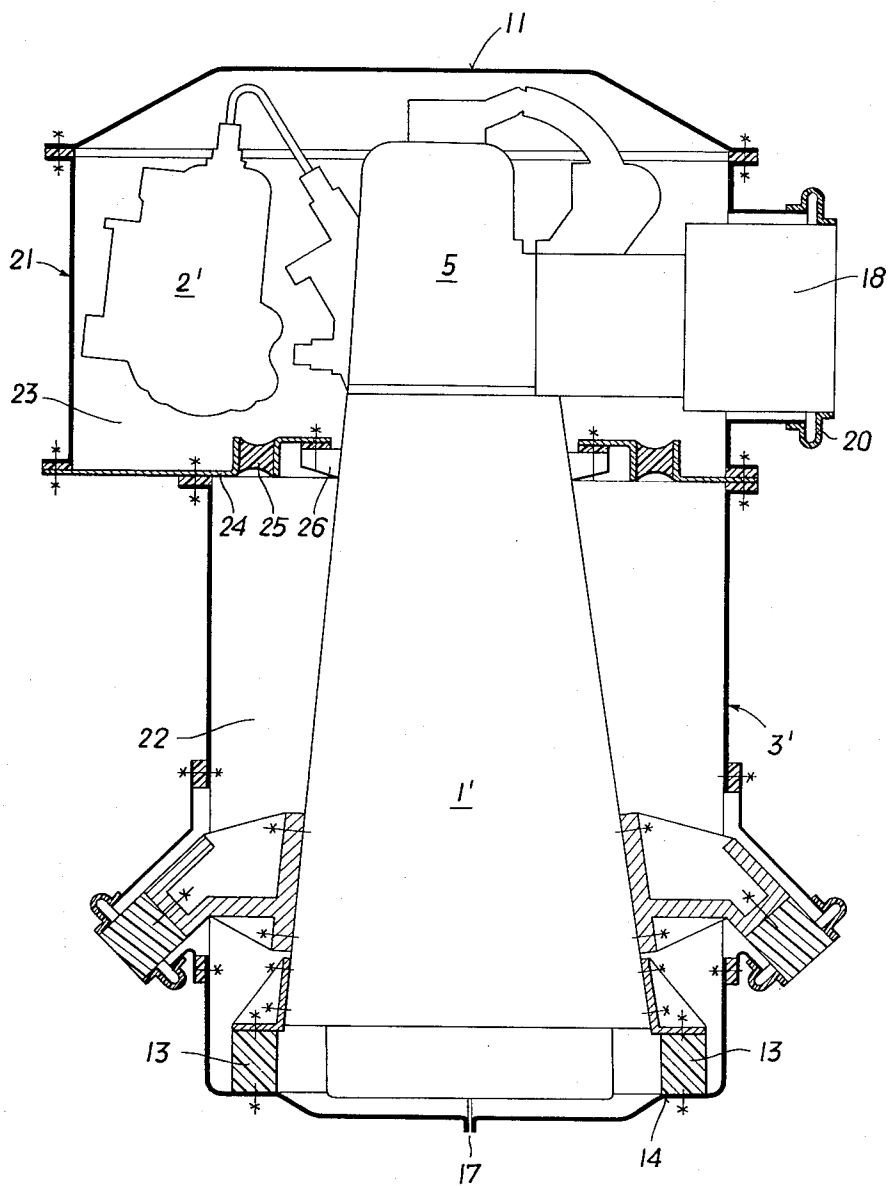


FIG. 3



INTERNAL COMBUSTION ENGINE WITH SOUND-PROOFING CASING

This invention relates to an internal combustion engine with a sound-proofing casing located in spaced relation to, and around the outer engine surfaces, and connected with the engine in such a manner as to absorb such sounds as are conducted through solids. In an internal combustion engine of this type the oil sump which is raised as far as above the crankshaft center and attached with its upper border to a laterally spaced supporting flange of the crankcase in such a manner as to absorb sound conducted through solids, provides a sound-proofing casing for the engine joined by sound-absorbing metal sheet mounted on top on each side of the cylinder block, whereas the bottom portion of the oil sump is designed as a spacious oil container. The crankcase of this known type of internal combustion engine is so adapted as to provide an open-worked supporting framework carrying the crankshaft bearings, the raised oil sump forming the oil-wetted outer wall of the engine.

It is the purpose of the present invention to provide an internal combustion engine of the type hereabove described having a sound-absorbing casing, and distinguishing itself by a particularly plain design and a construction facilitating assembling work, with an encasing producing a high degree of sound-absorption. According to the invention, the casing comprises a bottom portion raised sump-fashion and having a self-contained lateral aperture for the passage of the crankshaft, the said bottom portion being attached to the cylinder block by means of at least two supporting members isolating sound conducted through solids and located at bottom level for instance, and closed on top by means of a cover, preferably with an upper portion rigidly attached to the bottom portion.

By the allround encasement of the internal combustion engine an astoundingly high degree of effective attenuation of engine noise is obtained by very simple structural means as compared with engines having only part of their outer surface properly sound-proofed. Since as a rule, two or three soundproofing supporting members are amply sufficient for the attachment of the casing to the engine block, the assembly of the engine and the casing is particularly easy. Moreover, these parts are interconnected only over relatively small cross-sections.

Since the portions constituting the casing assembly are very plain and preferably flat structural elements, it is possible for them to be shaped in such a manner as to facilitate their manufacturing process. It is furthermore, possible to sound-proof internal combustion engines by means of the encasing according to the invention at a later stage, as required.

According to a preferred embodiment of the invention the bottom portion of the casing terminates approximately at the level of the upper edge of the cylinder head with a directly adjoining flat cover. This design, equally applicable both to internal combustion engines with a solid and with an open-worked crankcase, distinguishes itself by its particular simplicity, since the casing essentially comprises two structural elements only.

According to another feature of the invention as applied to an internal combustion engine having a casing comprising a lower and an upper portion, the space be-

tween the casing and the engine can be divided into two chambers sealed off against each other, the chamber enclosed by the bottom portion of the casing being oil-wetted and the other chamber surrounded by the upper portion of the casing kept free from oil and containing all auxiliary appliances of the engine. Consequently, the two encased chambers each have entirely different functions since the bottom portion of the casing acts as an oil-wetted outer wall of the engine, while the upper portion of the casing serves exclusively for the sound-proofing of the cylinder head area of the internal combustion engine and its auxiliary machines.

According to a further embodiment of the invention the bottom portion, and occasionally, also the upper portion of the casing are each of one piece and preferably made of synthetic material. This type can be manufactured at extremely low cost.

However, it is also possible according to the invention, to produce the lower portion of the casing by combining two or more members inseparably interconnected, preferably by welding, in such a manner as to provide an oil-tight seal. The bottom portion of the casing comprising a plurality of constituent parts is particularly suitable for use in internal combustion engine of large external dimensions.

Further details of the invention will become apparent from the following description of two embodiments of the invention with reference to the accompanying drawings wherein

FIG. 1 is a diagrammatic cross-section of a first internal combustion engine according to the invention on line I—I of FIG. 2,

FIG. 2 is a diagrammatic longitudinal section through the engine on line II—II of FIG. 1, and

FIG. 3 is a diagrammatic cross-section through a modified form of a sound-proofed internal combustion engine according to the invention.

The schematically illustrated internal combustion engine shown in FIGS. 1 and 2 comprises a soundproofing casing enclosing the engine 1 with the fuel injection pump 2 and the rest of the auxiliary machines in spaced relation.

The casing consists of a bottom portion 3 with its walls raised sump-fashion, terminating approximately at the level of the upper edge of the cylinder head 5 and provided at its upper border with a circular mounting flange 6.

The bottom portion 3 of the casing has a self-contained lateral aperture 7 for the passage of the crankshaft or of the flywheel flange 8 of the internal combustion engine 1. The bottom portion 3 of the casing is furthermore provided on one of its sidewalls 4 with an aperture 10 which can be tightly closed by means of a removable cover 9, through which access can be gained to the fuel injection pump 2.

On top, the bottom portion 3 of the casing is closed by means of an essentially flat cover 11 screwed to the mounting flange 6 of the bottom portion 3 of the casing with the interposition of a gasket 12.

The encasing is attached to the engine block by means of a number of sound-absorbing supporting member 13, two of which engage the bottommost part of the bottom portion 3 of the casing. The third supporting member 13 engages the sidewall 4 of the bottom portion 3 of the casing opposite the fuel injection pump 2 on the one hand, and the crankcase sidewall 16

of the engine by means of a bracket 15, on the other hand.

Both the bottom portion 3 of the casing and the covers 9 and 11 can be made from either a synthetic material or from sheet steel or light-metal casting. In the embodiment shown the bottom portion 3 of the casing comprises two half-shells tightly interconnected by welding along their borders 17.

In order to prevent the passage of sound in the area around the flywheel flange 8 and the inlet connection 18, the casing is provided with rubber sleeves 19 and 20, respectively.

The design according to FIG. 3 differs from the embodiment hereabove described mainly insofar as the sound-proofing casing of the internal combustion engine 1' comprises a bottom portion 3' and an upper portion 21 rigidly connected with the former, and the cavity between the casing and the engine 1' is divided into two chambers 22 and 23 sealed off against each other. For that purpose, a partition 24 is provided between the bottom portion 3' of the casing and its upper portion 21. This partition is attached to a flange 26 of the crankcase with the interposition of a sound-absorbing gasket 25.

The lower chamber 22 is oil-wetted, which means that the bottom portion 3' of the casing forms the oil-tight outer shell of the internal combustion engine 1', whereas the upper chamber 23 is kept free from oil and contains in addition to the fuel injection pump 2' also the rest of the auxiliary units of the internal combustion engine.

The various conduits not particularly shown in the drawings, for the supply of cooling water, fuel and oil can be sound-proofed in a manner known per se by the interposition of sound-absorbing elements such as corrugated tubes, fabric hoses and the like.

I claim:

1. An internal combustion engine with a sound-proofing casing arranged in spaced relation to the outer surfaces of the engine and connected to the engine in

such a manner as to absorb sound conducted through solids, said casing comprising a troughlike lower casing portion having a bottom and sidewalls, one of the sidewalls having a self-contained aperture for the passage of a crankshaft, an upper casing portion arranged upon said troughlike lower casing portion and rigidly attached to same, a cover placed upon said upper casing portion and closing the casing, at least two sound-proofing supporting members mounted on the said troughlike lower casing portion which is attached to the cylinder block by means of said sound-proofing supporting members, a cavity defined by the casing and the outer surfaces of the engine, two chambers sealed off against each other within said cavity, the first of said chambers being enclosed by said trough-like lower casing portion and oil-wetted, the second of said chambers being surrounded by said upper casing portion and kept free from oil and auxiliary machines arranged on the engine within said second chamber.

2. An internal combustion engine as in claim 1, wherein said bottom portion terminates approximately on the same level as the upper edge of the cylinder head, with the directly adjoining said cover being essentially flat.

3. An internal combustion engine as in claim 1, wherein said bottom portion of the casing and said upper portion of the casing each are made of one piece.

4. An internal combustion engine as in claim 6, wherein said bottom portion of the casing and said upper portion of the casing are made of synthetic material.

5. An internal combustion engine as in claim 1, wherein said bottom portion of the casing comprises a number of structural elements interconnected inseparably and in a manner providing an airtight seal.

6. An internal combustion engine as in claim 5, wherein said structural elements are tightly interconnected by welding.

* * * * *

45

50

55

60

65