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INTERNAL COMBUSTION ENGINE
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FIG.3

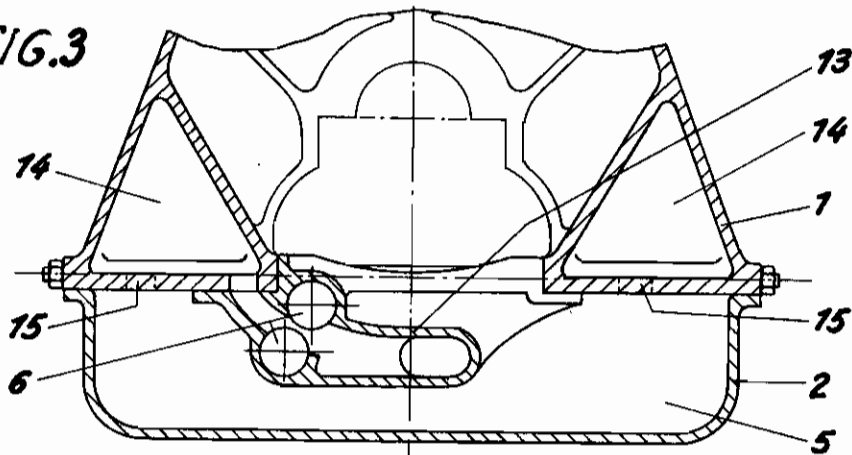


FIG.2

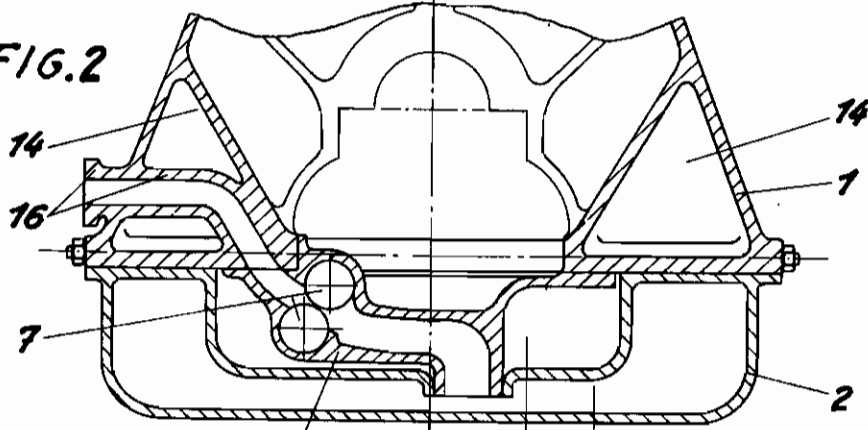
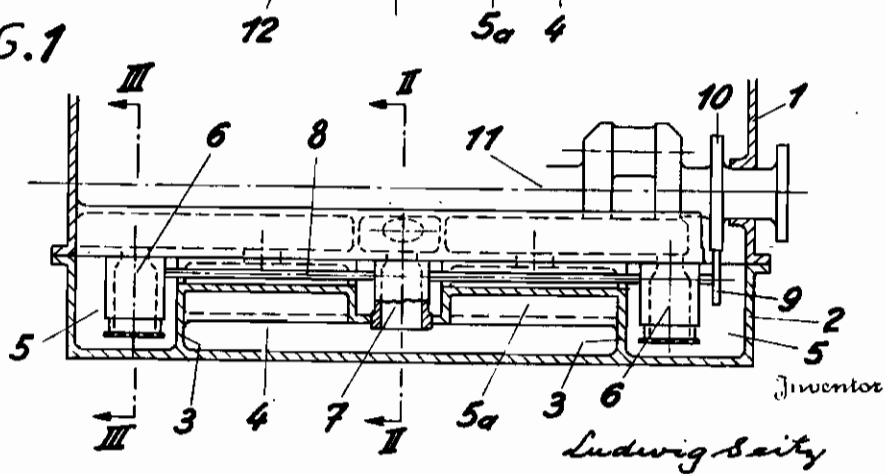


FIG.1



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INTERNAL COMBUSTION ENGINE

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This invention relates to an internal combustion engine, particularly one used in driving vehicles, and has for its object to arrange the collecting spaces for the lubricating oil and also the oil pumps in a manner insuring uninterrupted feeding of oil to the engine.

It has frequently been noted that when engines of automotive vehicles, as motor cars, aircraft and boats, occupy an inclined position for some time the oil feed is interrupted, which is due to an unsuitable arrangement of the oil collecting spaces and of the oil pumps. The oil collects at the points of the sump that are located at the lowest level for the time being and is thus not available at times at the suction point of the pump while the engine is in this position.

The invention eliminates this defect by subdividing the sump from which oil is delivered to the engine in such manner that at both ends of the sump separate oil collecting spaces are provided besides a main oil space located between them. An auxiliary pump delivers the oil from each end chamber into the main space from which another pump feeds it to the engine.

In such an arrangement the position occupied by the engine relative to the horizontal is immaterial, since the main space always contains enough oil to permit continual operation of the main pump, which is due to the fact that one of the auxiliary pumps invariably delivers oil to that space. The three pumps are so constructed that their cases containing also the necessary short suction and pressure pipes can be screwed from below to the crankcase, and the housings of the two auxiliary pumps act as cross members for bracing the two longitudinal base plates of the crankcase. The pumps are driven by a joint shaft running parallel to the crankshaft. In order to make the main space large enough for all requirements the lower portion of the crankcase, in further accordance with the invention, possesses in its longitudinal sides additional oil receptacles which directly communicate with the main oil space and into which the two auxiliary pumps discharge without the interposition of pipings.

The arrangement of the oil collecting spaces and of the pumps as contemplated by the inven-

tion, besides insuring without fail a constant supply of lubricating oil to the consuming points of the engine, affords the following advantages: Suitable construction of the general pumping plant and of the individual pumping sets, omission of pipings up to the pressure connection of the main pump and favorable utilization of the space available for providing the largest possible amount of lubricating oil.

The invention is illustrated by way of example in the accompanying drawing, in which

Figure 1 is a longitudinal section of the lower part of the crankcase and sump;

Fig. 2, a cross section of the lower part of the crankcase and sump taken on a level with the main pump on the line II—II, of Fig. 1; and

Fig. 3, a cross section of the lower part of the crankcase and sump taken on a level with an auxiliary pump on the line III—III, of Fig. 1.

To a crankcase 1 a sump 2 is secured in the usual manner and subdivided by partitions 3 to form a central space 4 and two end chambers 5. The two end chambers 5 communicate with each other through a space 5a and contain each an auxiliary pump 6 which directly draws its oil from its respective end chamber 5. The oil from the central space 4 is delivered by a main pump 7. All three pumps 6 and 7 are driven by a common shaft 8 with the aid of gear wheels 9, 10 and a crankshaft 11.

In the example shown, the pumps are gear driven and with their housings 12, 13 and the cast-in suction and pressure pipes secured from below in the crankcase 1. The housings of the pumps 8 form cross members for bracing the two longitudinal plates of the crankcase 1. The pumps 6 deliver their oil collecting in the end chambers 5 to one of the additional oil spaces 14 provided in the longitudinal sides of the crankcase 1 and communicating with the main oil space 4 through openings 15. From the main oil space 4 the pump 7 forces the oil through a pressure connection 16 cast into the crankcase 1 and through a connecting piping, not shown, to the consuming points of the engine, possibly after it has passed through coolers and filters, not shown.

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