Dec. 1, 1936. C. S. BROWN 2,062,391

CYLINDER CONSTRUCTION FOR AIR COOLED INTERNAL COMBUSTION ENGINES

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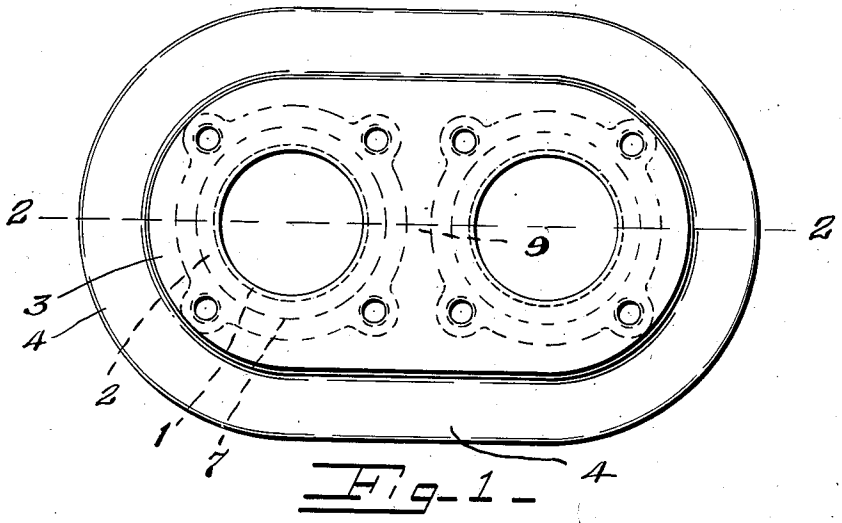
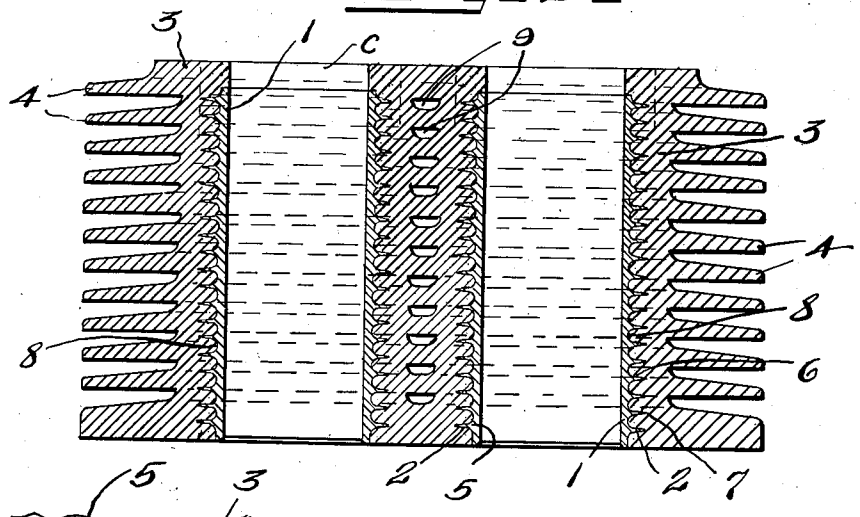


Fig-1-

Fig-2-



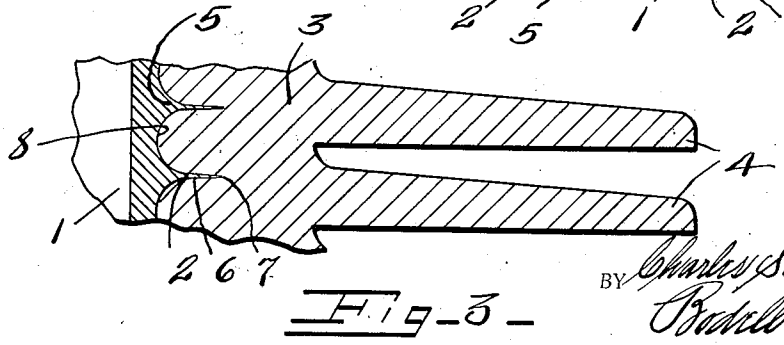


Fig-3-

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CYLINDER CONSTRUCTION FOR AIR COOLED INTERNAL COMBUSTION ENGINES

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2 Claims. (Cl. 123—171)

This invention relates to cylinder or cylinder block construction for air cooled internal combustion engines and particularly to cylinders having a liner surrounded by a body or mass of metal, as aluminum or aluminum alloy, having greater heat conductivity and coefficient of expansion than the metal of the liner, which is usually a ferrous metal, and has for its object a cylinder or block construction in which the lining is formed with flexible heat conducting flanges, which are embedded in the outer mass or body of metal having the greater heat conductivity, so that a good mechanical and heat conducting or thermal joint is maintained between the body or mass and the liner, and the outer body or mass of metal will not loosen or break away from the liner and the fins thereof under varying degrees of temperature, and hence under the different degrees of expansion and contraction of the liner and the outer body and mass, due to their having different coefficients of expansion.

It further has for its object a cylinder block consisting of a liner or liners having circumferentially extending heat radiating fins which terminate in thin, knife-blade-like flanges, which in turn terminate substantially in a knife edge, the flanges having gradually widening base portions joining them to the body of the liner and a mass or body of metal surrounding the liner and the fins and being of considerably greater mass than the liner and fins.

It further has for its object either a single cylinder block or a multi-cylinder block embodying the above-mentioned features.

The invention consists in the novel features and in the combinations and constructions hereinafter set forth and claimed.

In describing this invention, reference is had to the accompanying drawing in which like characters designate corresponding parts in all the views.

Figure 1 is a plan view of a multi-cylinder block embodying my invention.

Figure 2 is a sectional view on line 2—2, Figure 1.

Figure 3 is an enlarged fragmentary cross sectional view through the liner and contiguous portion of the surrounding body or mass or metal of different heat conductivity.

I have here shown my invention as embodied in a multi-cylinder engine block consisting of a pair of cylinders. Obviously, the block may have one or any plural number of cylinders. This cylinder block comprises a liner 1, usually of ferrous metal, as steel, having integral peripheral circumferentially-extending heat radiating fins 2, and a body or mass 3 of metal having greater heat conductivity and a greater coefficient of expansion than that of the liner 1, surrounding the liner and in which the fins 2 are embedded. The mass or body 3 is also formed with external heat radiating flanges 4, preferably extending circumferentially around the same. The fins 2 preferably at least extend over the portion thereof forming the expansion space of the cylinder, but not necessarily over the combustion or compression chamber C. As shown, the compression chamber is formed in the upper or outer end of the block in contradistinction to being in the heads, and the liner 1 terminates short of the upper face of the block. In this construction, the head (not shown) is intended to be flat or not recessed to form the compression chamber. The fins 2 are flexible in order to flex and react under varying degrees of heat when the outer mass 2 elongates and contracts faster and to a greater extent than the liner 1. Owing to the flexibility of the fins, the body or mass 3 having the greater heat conductivity and coefficient of expansion will not loosen or break away or destroy the good mechanical and thermal joint between the body or mass 3 and the liner 1, and owing to the comparatively greater mass 3, not only is the heat absorbed quickly from the liner 1 and dissipated but also the effect of internal stresses, due to the different coefficients of expansion of the metals of the mass 3 and liner 1 are relieved or distributed through a mass large enough to stand them without straining the mass and without undue warping. Also, due to the thin knife edge fins, the far greater mass of metal of greater coefficient of expansion unites with fins better than with relatively larger fins and make a far better heat conducting union than with thicker fins.

The fins 2 are integral with the body of the liner 1 and include a base portion 5 and a thin flange portion 6, the flange portion 6 being thin and what for convenience I have called knife-blade flange, and this flange in turn terminates in a sharp or knife edge 7. The base portion widens from the knife-blade flange gradually into the body of the liner 1, thereby providing rounding grooves 8 in the liner, the grooves having rounding or arcuate bottoms. In other words, the gradually widening bases 5 provide grooves 8 between the heat radiating fins. This formation contributes to the forming and maintaining of a good mechanical and thermal joint between the

body or mass 3 and the liner during the flexing of the fins.

In the cylinder block here shown, the fins 4 extend circumferentially around the entire block, and the mass or body 3 is formed with transverse air passages 9 therethrough between the two liners. It will be understood that in use the cylinders are cooled by means of an air current created in any suitable manner. The air current may be directed from the side of the block transversely thereof or longitudinally of both sides of the block. However, the creating and directing of the air current forms no part of this invention.

The cylinder block is formed by standing the liner or liners in the mold and pouring the mass or body 3 which is usually aluminum or aluminum alloy around the liners and permitting the mass to cool. Preferably, the liners are covered with a flux, as tin, before the metal forming the mass 3 is poured, and also the liners may be preheated before the mass is poured in any suitable manner, as for instance by first pouring more metal into and through the mold than is needed for the casting, and when the liner is heated to the desired amount, as determined by the foundryman, the mold allowed to fill up and cool. The cooling may be regulated or retarded by heating the mold in any suitable manner. However, the method of forming the cylinder block of this application forms no part of my invention, and is the invention of co-pending application of Thomas A. Delaney of Syracuse, New York.

This cylinder block is particularly advantageous in that the heat generated in the use of the engine is quickly conducted away from the liner, and further in that owing to the flexible fins and their construction, a good mechanical and thermal joint between the liner and the mass of metal having the greater heat conductivity is constantly maintained during expansion and contraction or elongation and shortening of the liner and the mass of metal.

What I claim is:

1. An air cooled internal combustion engine cylinder construction comprising a liner having thin flexible integral heat radiating fins on the periphery thereof and a body of metal having greater heat conductivity than the metal surrounding the liner and the fins thereon and in which the liner and the fins are embedded, the portions of the periphery of the liner between the flexible fins being concave providing grooves with the rounding bottoms between the flexible fins, the sides of the fins curving into the margins of the rounding bottoms of the grooves.

2. An air cooled internal combustion engine cylinder construction comprising a liner having thin flexible integral heat radiating fins on the periphery thereof and a body of metal having greater heat conductivity than the metal surrounding the liner and the fins thereon and in which the liner and the fins are embedded, the flexible fins being of knife-blade thinness and having knife blade edges, the portions of the periphery of the liner between the flexible fins being concave providing grooves with rounding bottoms between the fins and the sides of the fins curving into the margins of the rounding bottoms of the grooves.

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