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H. E. DEPUTY

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PISTON

Original Filed May 4, 1927

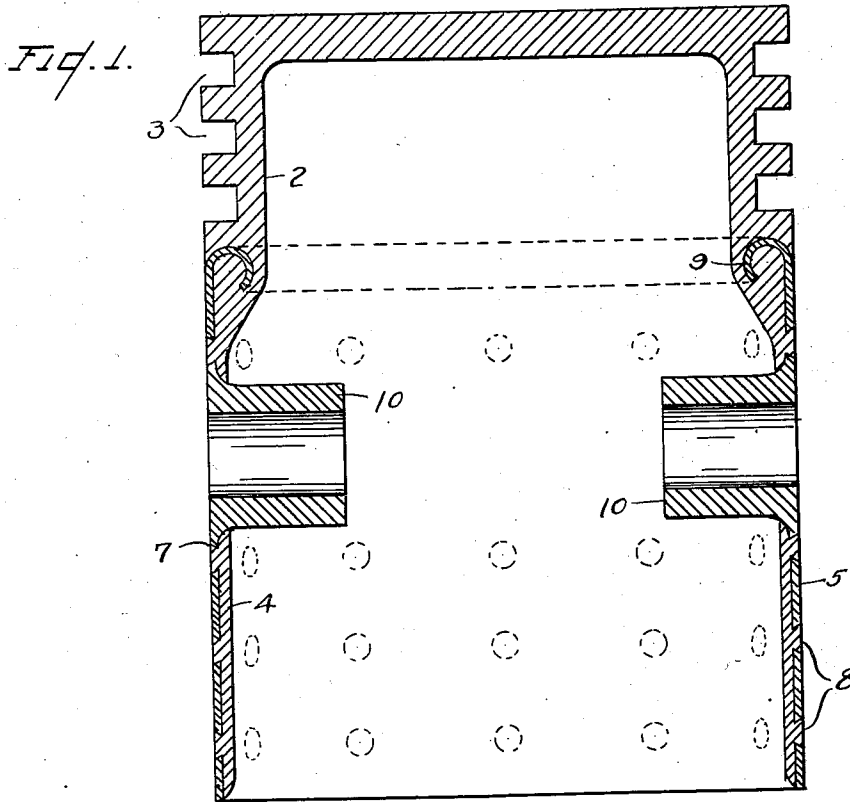


Fig. 2

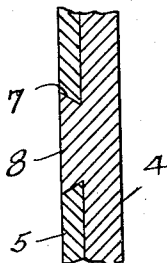
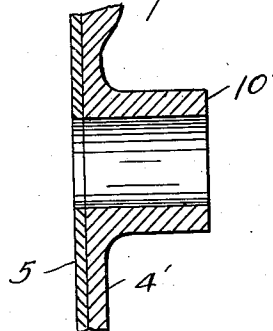


Fig. 3



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PISTON

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This invention relates to pistons and particularly to pistons for internal combustion engines. In the present practice the majority of pistons for internal combustion engines are formed of cast iron. While the relatively light weight of aluminum as compared to cast iron renders the former desirable for piston use, the co-efficient of expansion of aluminum is decidedly higher than that of cast iron, and because of the responsiveness of aluminum to heat change, it is difficult in utilizing all-aluminum pistons to avoid an undue looseness and slapping thereof in their cylinders before heating up of the engine, or an undesirably tight fit of such pistons in the cylinders after heating up. On the other hand, aluminum is more easily and economically machined than cast iron, and its greater conductivity of heat, as compared to cast iron is an advantage in dissipating the heat of combustion.

It is the primary object of the present invention to provide a piston combining portions of aluminum and cast iron in such a manner as to utilize the desirable characteristics of both metals.

More specifically expressed, the primary object is to form the head and grooved upper portion of a piston of aluminum or some similar relatively soft metal, and to form the skirt of the piston jointly of an inner aluminum portion integral with said head, and of an embracing sleeve, of cast iron or the like, more or less embedded in the aluminum member and suitably bonded thereto.

These and various other objects the invention attains by the constructions hereinafter described and illustrated in the accompanying drawing, wherein:—

Figure 1 is an axial sectional view of the piston embodying the improved construction.

Figure 2 is a fragmentary sectional view of the composite skirt portion of the piston.

Figure 3 is a fragmentary view of an alternative construction.

In these views the reference character 1 designates the head of a piston, and 2 the relatively thick upper portion of the piston wall, having the usual grooves 3, to receive sealing rings, (not shown). 4 and 5 design-

nate respectively an aluminum skirt portion of the piston formed integrally with the parts 1 and 2 and a sleeve of cast iron (or some other comparatively hard metal) embracing said portion 4. The sleeve 5 is rigidly united with the aluminum casting, preferably by flowing the molten aluminum into engagement with said sleeve, and two primary provisions are made for bonding together the aluminum and cast iron. Thus the sleeve 5 is formed with a plurality of outwardly flaring apertures 7 into which the molten aluminum is flowed forming heads 8 in said apertures serving to rigidly lock the two metals together. A second bond is established between the two metals by forming the upper end portion of the sleeve 5 with an annular inturned flange or hook 9 embedded in the relatively thick upper portion 2 of the piston wall below the grooves of said portion. Said flange 9 in addition to establishing a bond between the two different metals also transmits the longitudinal thrust from one to the other of said metals as the piston undergoes its stroke.

A pair of wrist pin bearings 10 are formed either integrally with the sleeve 5, as shown in Figure 1, projecting oppositely toward each other through the sleeve portion 4, or said bearings may be integrated with the aluminum skirt 4, as shown in Figure 3.

The use of aluminum in the described piston to form the head thereof and the grooved upper portion, and to also form the inner skirt portion, derives the advantage of easy machining and of rapid heat conduction that would characterize an all-aluminum piston. Sufficient clearance may be provided without detriment between these portions of the piston and the cylinder wall to avoid undue friction. Use of the cast iron sleeve to embrace the aluminum skirt portion of the piston restrains said skirt portion from the undue expansion that would otherwise result from heating of the piston, since the cast iron has a considerably lower co-efficient and will not expand to a detrimental extent when heated.

In forming the described piston, the sleeve 5 before being placed in the mold in which the aluminum is to be poured is preferably

heated to substantially the temperature of the molten aluminum so as to avoid chilling the latter and possible resulting imperfections.

The described dual means for bonding the
5 cast iron and aluminum parts together insures a completely rigid unitary construction and rigidity is further insured by the fact that the relatively high expansive nature of the aluminum portion 4 tends to cause it to
10 bind firmly in the cast iron sleeve when the piston encounters high temperatures in use.

Thus it is apparent that the described construction associates in a piston two metals of different hardness so as to utilize the desirable characteristics of both.

It will be understood to those skilled in the art that the described invention is susceptible of various modifications based upon the disclosed principles of construction and the invention is presented therefore as including
20 such changes of its form as fall within the spirit and scope of the appended claims.

What I claim is:—

1. A piston comprising a metallic skirt
25 portion, an annulus of comparatively hard metal embracing said skirt portion, and a pair of wrist pin bearings integrated with said annulus and projecting through said skirt portion.

2. A piston comprising a head, a grooved
30 wall portion, and a skirt portion integrally formed as a metallic casting, an annulus of relatively hard metal rigidly embracing said skirt portion, and a pair of wrist pin bearings
35 integrated with said annulus and projecting through said skirt portion.

3. A piston comprising a head, a grooved
wall portion adjacent to said head, and a relatively thin skirt portion, said head and wall
40 portions being integrally formed of metal, of a sleeve embracing said skirt portion formed of a relatively hard metal, formed at its upper end with an annular flange, projecting inwardly and downwardly hooked and em-
45 bedded in said groove wall portion, said flange, transmitting the end-wise thrust from one to the other of the specified parts of the pistons.

In testimony whereof, I sign this specification.
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HORACE E. DEPUTY.