Aug. 26, 1924. 1,506,252

A. PONDELICK

PISTON

Filed Jan. 23, 1922

Fig. 1

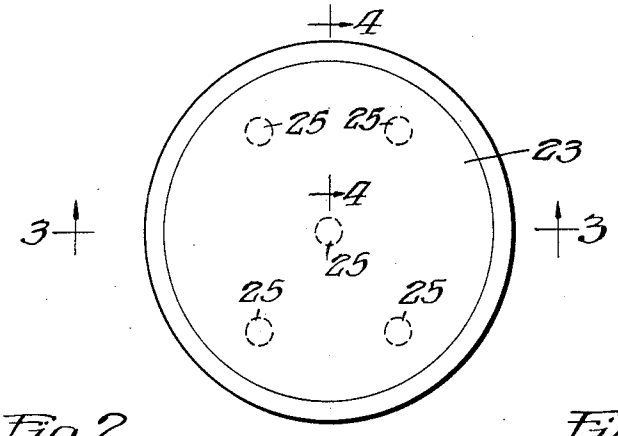


Fig. 2

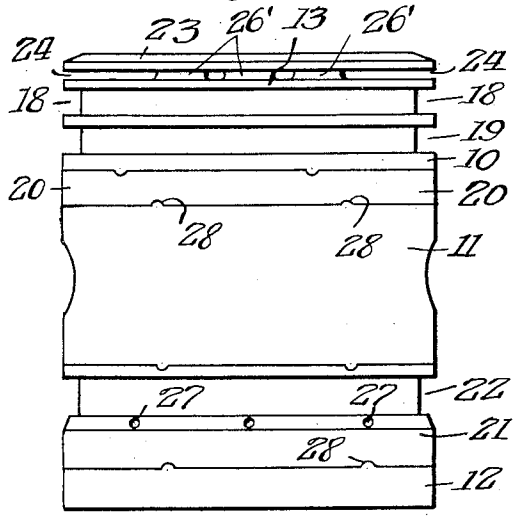


Fig. 3

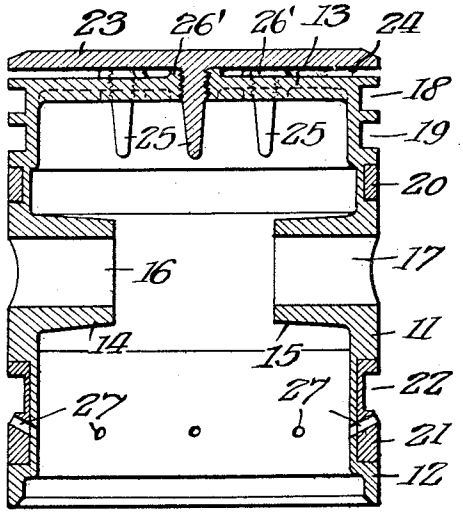


Fig. 4

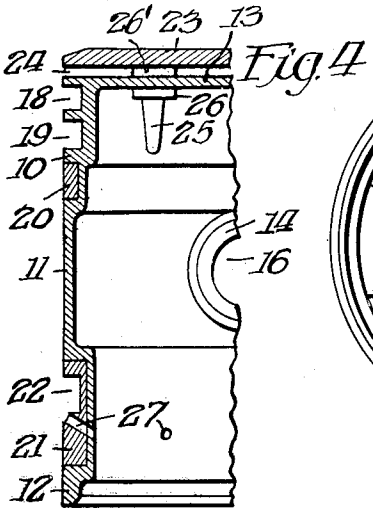
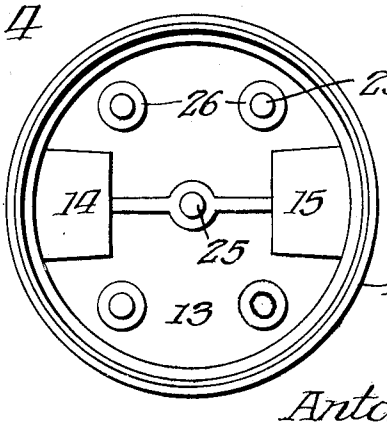


Fig. 5



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UNITED STATES PATENT OFFICE.

ANTON PONDELICK, OF CHICAGO, ILLINOIS.

PISTON.

Application filed January 23, 1922. Serial No. 531,069.

To all whom it may concern:

Be it known that I, ANTON PONDELICK, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Pistons, of which the following is a specification.

My invention relates to pistons, particularly to pistons for engines of the explosive type such as automobile engines.

In explosive engines for vehicles it is very desirable to get lightness combined with strength, durability and efficiency. In order to get lightness pistons used in cast iron cylinders have heretofore been constructed entirely of aluminum, but such pistons have objections. One objection is that owing to the marked difference in the expansion and contraction of aluminum and cast iron abnormal clearance space has to be provided between the pistons and cylinder walls to permit expansion of the pistons without binding thereof in the cylinders. Such abnormal clearance is detrimental to efficient lubrication. Another objection to the all aluminum piston is the softness of the metal and its inability to efficiently resist the action of the explosive gases.

Although aluminum may be readily bent, dented and distorted, it nevertheless is very tenacious and light, and I have found that by combining and arranging cast iron with aluminum in a practical and judicious manner a piston can be constructed which is very light yet which possesses all the advantages of an all cast iron piston and which overcomes the objections of an all aluminum piston. In accordance with my invention I make the cylinder structure in greater part of aluminum, and securely imbed zones or bands of cast iron in the aluminum to give the required peripheral strength, and I provide a cast iron facing for the piston head firmly imbedded and secured in the aluminum, which facing will shield the piston from the effects of the explosive gases.

A structure embodying the various features of my invention is disclosed on the accompanying drawing in which—

Fig. 1 is top view of the piston,

Fig. 2 is a side elevational view,

Fig. 3 is a sectional view on plane 3—3 Fig. 1,

Fig. 4 is a sectional view on plane 4—4 Fig. 1, and

Fig. 5 is a bottom view.

The piston shown is cylindrical and comprises the upper or head zone 10, the intermediate zone 11, and the skirt zone 12, the head zone having the top 13. Extending diametrically inwardly at the intermediate zone are the bearing lugs 14 and 15 having the passageways 16 and 17 for receiving the wrist pin (not shown) which connects the piston with the crank rod of the engine with which the piston is associated. The above mentioned parts of the piston are all of aluminum, and in the head part are the peripheral upper and lower grooves 18 and 19 for receiving the piston rings usually provided for pistons, the application of such rings being well known in the art. Between the head and intermediate zone is provided a band or strengthening ring 20 preferably of cast iron, and surrounding the skirt zone 12 is another strengthening band or ring 21 of cast iron having the peripheral groove 22 therein for receiving a piston ring. The cast iron bands or rings strengthen the cylindrical section of the piston. To shield and protect the top 13 against mechanical injury and especially against the explosive gases a shield plate or cover 23 of cast iron is provided and securely attached to the top, the air space 24 for ventilation purposes being preferably left between the top and plate as clearly shown.

There are perhaps several ways in which the cast iron and the aluminum parts could be intimately secured compactly together. Preferably I arrange the cast iron parts in a suitable mold and then cast the aluminum around such parts, preferably under pressure. To rigidly secure the plate 23 and head top 13 together threaded pins 25 may be extended from the plate to receive the aluminum during the casting operation, the mold being preferably such that upper and lower lugs 26 and 26′ are provided on the top 13 so that the aluminum may get a firm and extended hold on the threaded pins. After the casting operation the aluminum will shrink, and owing to the greater coefficient of expansion of the aluminum, such shrinkage will cause it to powerfully and intimately clamp and receive the cast iron whereby the two metals are firmly secured together. The head can then be suitably machined and finished. The plate 23 will rest on and be spaced away by the upper lugs 26′ to provide the air space 24.

The resulting structure, being in greater

part of aluminum, is very light yet possesses substantially all the advantages of cast iron, besides being much stronger. Owing to the reenforcing iron bands the expansion and contraction of the structure will not exceed that of an all cast iron structure, so that it is unnecessary to provide for any greater cylinder clearance than would be necessary if the structure were entirely of cast iron.

The iron guard plate 23 will protect the piston against the explosive gases, and preferably the pins 25 are extended downwardly a distance into the interior of the piston to conduct heat to the interior of the piston and prevent it as much as possible from being conducted to the piston sides. The peripheral air gap 24 between the guard plate and piston top will also tend to prevent passage of heat to the piston sides and will cause the heat to travel more toward the center of the head so that it can be more readily dissipated.

Downwardly inclined holes 27 are shown extending through the lower ring 21 and the piston skirt, these holes receiving surplus lubricating oil and conducting it back into the piston interior from where it drops into the crank case.

To further strengthen the structure and prevent any relative movement between the aluminum and the rings, the rings may have side notches 28 into which the aluminum is forced during the casting operation, this rigidly locking the parts against relative displacement.

I thus produce a strong, light and durable piston structure which overcomes the disadvantages of all aluminum piston structures, particularly those disadvantages resulting from the different coefficients of expansion. I do not desire to be limited to the exact construction and arrangement shown and described as changes and modifications can no doubt be made which would still come within the scope of my invention.

I claim as follows:

1. A piston structure comprising a cylindrical body and head formed of aluminum, circumferential reenforcing bands of cast iron, and a cast iron guard plate for the head, such cast iron parts being intimately secured by casting the aluminum around them.

2. A piston structure comprising a cylindrical body and head formed of aluminum, circumferential reenforcing bands of cast iron imbedded in said aluminum, a guard plate of iron on said head, pins extending from said plate through said head, the aluminum being cast and intimately shrunk around said bands and pins, whereby said iron parts and aluminum are intimately secured together.

3. In a piston structure the combination of a head zone, an intermediate zone, and a skirt zone, a top for the head zone, said parts being all formed of aluminum, the head zone having peripheral piston ring receiving grooves therein, a circumferential reenforcing band of cast iron imbedded in the aluminum between said head and intermediate zones, a reenforcing band of cast iron imbedded in the aluminum at the skirt zone and having a piston ring receiving peripheral groove, an iron guard plate for the head zone top, and pins extending from said plate through said top to secure the plate thereto.

4. A piston structure comprising a cylindrical body having a top and formed of aluminum, circumferential reenforcing iron bands immovably imbedded in said body part, a guard plate of iron on said top rigidly and immovably secured thereto, and an air space between said plate and top.

5. In a piston structure, the combination of a cylindrical body part having a top and forms of aluminum, reenforcing cast iron bands imbedded in the aluminum of the body part, a guard plate on said top spaced away therefrom to provide an air space, and pins extending from said plate through said top and a distance into the interior of said body part.

6. In a piston structure, the combination of a cylindrical body part having a top and formed of aluminum, circumferentially extending cast iron bands imbedded in the aluminum of said body part to reenforce it, a guard plate on the top, threaded pins extending from said top plate through said top and a distance into the interior of said body part, and a ventilating air space between said plate and top.

7. In a piston structure, the combination of a cylindrical body part having a top and formed of aluminum, reenforcing cast iron bands on said body part, a guard plate on said top, threaded pins extending from said guard plate through said top, the aluminum being cast and shrunk around said bands and pins to rigidly and intimately secure the parts together.

In witness whereof, I hereunto subscribe my name this 20 day of January A. D., 1922.

ANTON PONDELICK.