Jan. 9, 1934 P. G. VANNI 1,942,887

PISTON

Filed Oct. 6, 1931

Fig. 1.

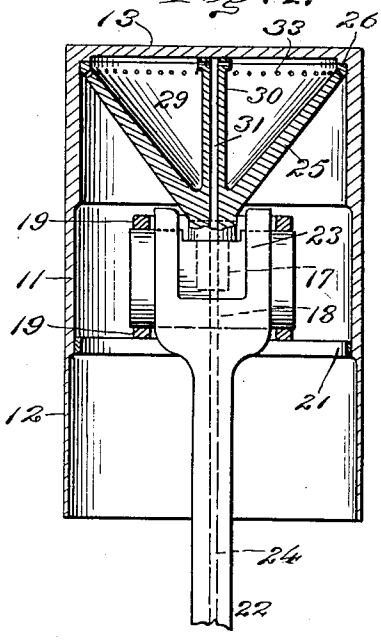
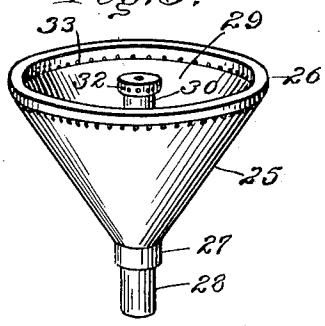


Fig. 3.



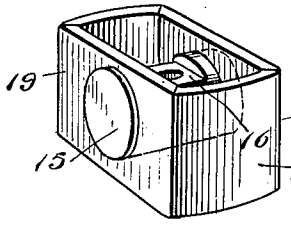


Fig. 4.

Fig. 2.

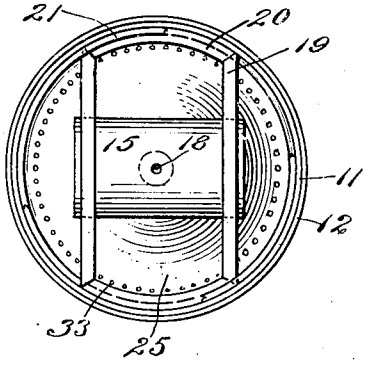
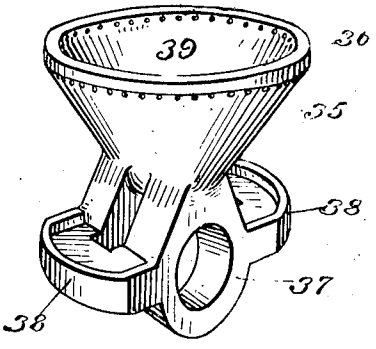


Fig. 5



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Patented Jan. 9, 1934 1,942,887

UNITED STATES PATENT OFFICE

1,942,887

PISTON

Pier Giorgio Vanni, Milan, Italy

Application October 6, 1931, Serial No. 567,188, and in Germany March 9, 1931

9 Claims. (Cl. 123—176)

This invention relates to pistons, and more especially to pistons of the trunk type, such as are adapted for use in the internal combustion engines, although the utility of the invention is not confined thereto.

The general object of the invention is to afford a more effective and durable piston. A particular object is to afford a piston wherein the barrel or shell and the crown are of quite light constructions and which, nevertheless, will not deform under working conditions; in other words a piston which is light, strong and rigid. A further object is to provide in a piston of the kind referred to an effective system of cooling the piston crown and shell. Other and further objects of the invention will be explained in the hereinafter following description of illustrative embodiments thereof or will be understood by those conversant with the subject. To the accomplishment of the aforesaid objects and advantages the present invention consists in the novel piston, and the novel features of construction and combination herein illustrated or described.

In the accompanying drawing Fig. 1 is a central longitudinal section of a piston embodying the present invention.

Fig. 2 is a bottom plan view of Fig. 1 with the connecting rod omitted.

Figs. 3 and 4 are perspective views of certain of the interior parts disassembled.

Fig. 5 is a perspective elevation of the interior parts of a modified form of the invention.

According to the present invention the piston, with its thin outer shell and crown, and the wrist pin on which the connecting rod oscillates and which is supported and spaced within the shell, are combined with an interior element or structure in the nature of a frame or shell formed with an upper peripheral or base that contacts and supports the crown of the piston and sides or walls that converge downwardly and at the vertex a lower central portion abutting or supported upon the wrist pin. The assembled parts after being inserted within the piston shell are there suitably and permanently confined, and a structure results having certain of the advantages already described; these same parts being formed with oil conducting passages so as continually to feed oil to the inner sides of the piston crown and shell, thus affording the piston cooling function described.

The main shell, barrel or cylindrical portion 11 of the piston may be composed of thin cast metal. It is shown as extended downwardly in the form of an extra thin skirt 12. The top or head end of the piston is closed by a crown or plate 13 also thin and cast integrally with the shell 11.

Near the interior center of the piston is shown the usual wrist or gudgeon pin 15. This may be cut away at its top side to form a recess 16, below which the pin may have a vertical bore 17, from the bottom of which an oil passage 18 extends downwardly to the lower side of the pin.

The wrist pin may be supported in any suitable manner from the sides of the piston. Thus side pieces 19 are shown having circular apertures receiving the ends of the pin, and the side pieces are combined with and spaced apart by curved end pieces 20 fitting the interior of the shell. These elements 19 and 20 are confined within the piston by a ring 21 threaded, wedged or otherwise fixed within the interior of the shell.

A connecting rod 22 is shown the upper end or head of which is preferably divided by a recess into opposite sides or eyes 23 enclosing the wrist pin, but the recess does not extend to the lower portion of the head, which thus gives full support to the pin. The connecting rod may be formed with a central oil passage 24 supplying oil for the lubrication of the pin.

The novel part of the structure comprises an interior frame, shell or wall 25, in the form of an inverted cone with its base 26 at its top periphery, bearing against the crown of the piston. The sides of the shell 25 converge or taper downwardly toward a lower portion or base 27 which rests within the recess 16 of the gudgeon pin and which may be extended in the form of a cylinder 28 depending in the bore 17.

The walled structure 25 encloses a chamber 29 below the piston crown. The structure may comprise also a central column 30 also in abutting contact with the piston crown and supporting the central part thereof.

To enable the flow of lubricating oil to be used as a cooling medium there is shown an oil passage 31 extending through the parts 28, 27, and 30 in line with the oil passage 18 in the gudgeon pin. This permits ascending oil to reach the top of the hollow column 30, from which it may flow by exit apertures 32 into the chamber 29, from which in turn the oil may pass by apertures 33 into the main shell of the piston, the oil thence flowing down the piston shell to be returned to the crank case. In this way a continuous cooling of the piston is performed.

In Fig. 5 while the principles are the same the structure is modified in several respects. The tapering wall 35 may be conical, with its upper

peripheral base 36 pressing directly against the piston crown. The central column may be omitted. The lower end of the tapered wall may be integrally connected with the parts that support the wrist pin. Thus an extension 37 constitutes a bearing for the pin, this bearing being recessed to accommodate the connecting rod. Flanged extensions 38 are shown at the lateral sides, their flanges adapted to contact the interior surface of the piston shell. When inserted in the shell the structure of Fig. 5 may be secured in place by a confining ring similar to the ring 21 shown in Figs. 1 and 2. The wall 35 encloses a chamber 39 which may receive oil from the wrist pin and discharge it upon the inner surface of the piston shell. The interior structure, readily receives the connecting rod and then the wrist pin, whereupon it may be bodily inserted in the piston shell, thrust into firm contact with the crown and confined by the ring. After making of the single casting 35—38 the proper machining can be effected, including turning the flanges 38 in a lathe to fit accurately the shell, the complete element being quite strong and stiff, and it can be made quite light by the use of aluminum alloy.

It is understood that the external shell 11 as well as the interior structure 35 . . . 38 could be made either by casting or by forging, or machining a piece of metal.

An important consideration is that the interior parts of this invention are separately formed and thereafter inserted and locked or confined within the piston. The interior structure, aside from the wrist pin may either comprise assembled parts mutually abutting each other between the crown and the pin, as in Figs. 1 to 4, or they may be cast integrally as in Fig. 5. After assembling and insertion the parts may be confined in various ways, for example by a part or ring 21 which may either bear directly against an integral extension of the interior structure, as in Fig. 5, or against a separate element or frame provided to space and support the wrist pin, as in Figs. 1–4, in which case the wrist pin confines the interior parts above it.

The interior frame or wall 25 while preferably closed to form a chamber, possesses an important function, not dependent on its closed character. This is due to the tapering form of the member extending from the peripheral rim 26 which supports the crown to a central vertex or part 27 which is supported on the wrist pin. A bracing effect results such as would be given by a system of diagonal struts extending from the outer part of the crown to the middle part of the pin, a very strong and rigid structure. The rim of the member or wall 25 is preferably of such a diameter that the perimetral tangent to the flexing surface of the crown is always horizontal whatever the gas pressure, so that the elastic deformation of the crown does not alter the form of the shell.

Referring further to the wrist pin this is herein prevented from rotating by the engagement of the parts 27 and 28 within the upper side of the pin. The side thrust between the wrist pin and the shell is effectively distributed by the parts 19, 20 in Figs. 1, 2 and 4 or the part 38 in Fig. 5, these same parts in both forms being confined against sliding within the shell by the locking ring 21.

Various changes of form are possible while retaining the disclosed principles of structure, including the strut character of the element 25 or 35 by which compression forces are well transmitted between the crown and pin. While Figs. 1 and 3 show central and peripheral support of the crown they might be supplemented by additional walls or extensions, such as concentric hollow cones contacting the crown. The pin could be changed to oscillate with the rod rather than be held with the piston structure, the latter in such case supported by a bearing upon the pin. The piston shell interior could have turned ribs to strengthen it.

Since many disclosed matters of construction, arrangement and design may be further variously modified without departing from the invention, it is not intended to limit the invention to such matters except so far as set forth in the appended claims.

What is claimed is:

1. A piston for internal combustion engines comprising a thin outer shell with a crown closing its upper end, a transverse pin on which the connecting rod oscillates, said pin being of such short length as not to reach to the thin piston shell but having means spacing it within the piston shell, an inserted frame having an upper peripheral portion engaging the crown, sides tapering downwardly, and a lower central portion engaging the pin, and means confining the inserted parts within the shell.

2. A piston comprising a thin outer shell with a crown closing its upper end, a transverse pin on which the connecting rod oscillates, said pin being of such short length as not to reach to the thin piston shell but having means spacing it within the piston shell, an inserted frame having an upper peripheral portion supporting the crown, sides tapering downwardly, and a lower central portion engaging the pin, the pin being recessed at its upper side to receive the lower end of the frame.

3. A piston comprising a thin outer shell with a crown closing its upper end, a transverse pin on which the connecting rod oscillates, said pin being of such short length as not to reach to the thin piston shell but having means spacing it within the piston shell, an inserted shell having an upper peripheral portion supporting the crown, a wall tapering downwardly, and a lower central portion engaging the pin, the wall forming a chamber, passages conducting oil into the chamber and peripheral passages from the chamber to the piston shell.

4. A piston comprising a thin outer shell with an integral crown completely closing its upper end, and a wrist pin, in combination with a preformed and inserted structure having (1) an upper peripheral portion supporting the crown, (2) sides tapering conically downward, (3) a lower central portion engaging the wrist pin, and (4) an extension portion at the level of the pin for spacing the structure and pin from the shell, all integral or united before insertion, and means confining the inserted parts within the shell.

5. A piston for internal combustion engines comprising a thin outer shell with a crown closing its upper end, a transverse pin on which the connecting rod oscillates, spaced within the piston shell, an inserted frame having an upper peripheral portion engaging the crown, sides tapering downwardly, and a lower central portion engaging the pin, and means confining the inserted parts within the shell; the inserted frame having not only a peripheral portion but also a central column abutting against the piston crown.

6. In a trunk piston a separately formed and

inserted structure having a peripheral extension abutting the piston crown and tapering therefrom to a central extension abutting the piston pin; the inserted structure having not only a peripheral portion but also a central column abutting against the piston crown.

7. A piston comprising a thin outer shell with a crown closing its upper end, a transverse pin on which the connecting rod oscillates, spaced within the piston shell, an inserted frame having an upper peripheral portion engaging the crown, sides tapering downwardly, and a lower central portion engaging the pin, the pin being recessed at its upper side to receive the lower end of the frame; the inserted frame having not only a peripheral portion but also a central column abutting against the piston crown.

8. A piston comprising a thin outer shell with a crown closing its upper end, a transverse pin on which the connecting rod oscillates, spaced within the piston shell, an inserted frame having an upper peripheral portion supporting the crown, a wall tapering downwardly, and a lower central portion engaging or supported on the pin, the wall forming a chamber, the inserted frame having a hollow central column arranged to receive oil from the pin and conduct it to the crown, within the chamber, and the frame wall having peripheral passages from the chamber to the piston shell.

9. In a trunk piston having the cylindrical shell and the overhead crown, and piston pin, a separately formed and inserted structure having a peripheral extension abutting the interior periphery of the piston crown and tapering therefrom to a central extension abutting the piston pin, the piston pin being formed with a top recess of substantial depth in which such central extension is engaged.

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