Aug. 15, 1933. G. PIELSTICK 1,922,393

PISTON FOR DOUBLE ACTING INTERNAL COMBUSTION ENGINES

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Fig. 1.

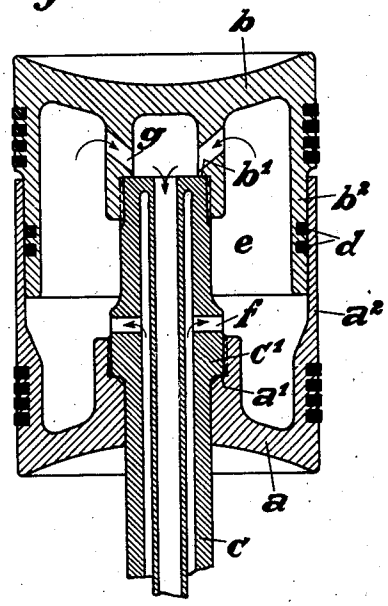


Fig. 2.

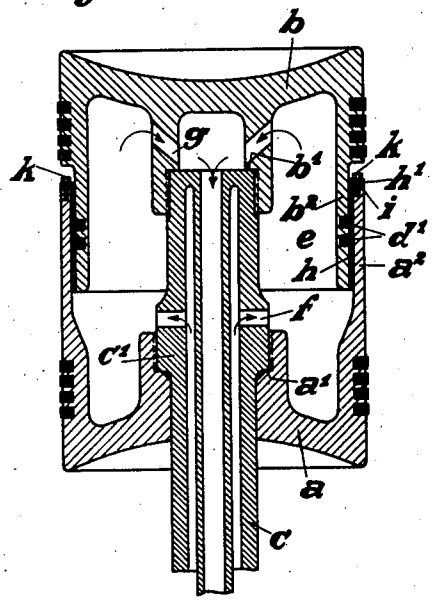
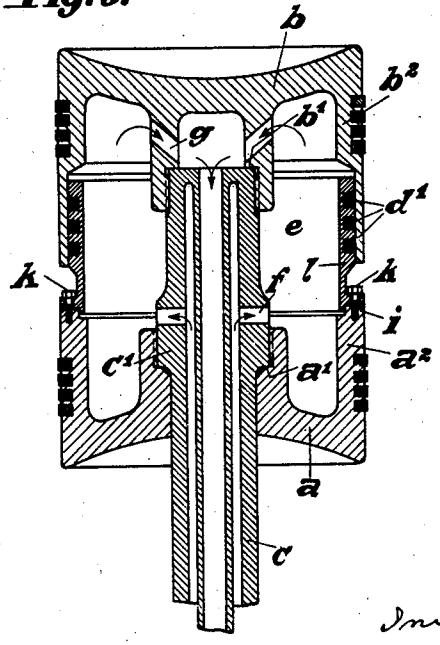


Fig. 3.



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PISTON FOR DOUBLE ACTING INTERNAL COMBUSTION ENGINES

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12 Claims. (Cl. 123—176)

This invention relates to piston construction, and more particularly to pistons for double acting internal combustion engines.

One object of the invention is the provision of a piston for double acting engines, having opposed separate head sections provided with skirt extensions slidably or telescopically related one with respect to the other to permit expansion in an axial direction.

Another object of the invention is the provision of a liquid cooled piston of the character mentioned, having a chamber for the cooling medium that is free from obstructing walls or ribs to provide for unrestricted flow of the cooling medium.

Another object of the invention is the provision of a piston in which the skirt extensions of the two opposed head sections are both operably associated with a cylindrical guide member that is slidably related to the extension of one of the head sections and detachably connected to the extension of the other head section.

Further objects and advantages of the invention will be apparent from the following description, the appended claims, and the accompanying drawing, in which,

Fig. 1 is a cross sectional view taken centrally through a piston embodying the present invention;

Fig. 2 is a corresponding central section of a piston of modified form; and

Fig. 3 is a sectional view showing still another modified form of construction.

Referring more particularly to the drawing by reference letters, like letters designating similar parts in the several views, and first with reference to Fig. 1, *a* and *b* designate two opposed separate head sections of a piston for a double acting internal combustion engine. The pistons of the present invention are particularly adaptable to Diesel engines and the like and more especially to high speed two-stroke Diesel engines, in which the explosions succeed one another very rapidly and in which there is, therefore, a very substantial expansion of the piston. Known types of piston constructions are not so arranged that cooling medium can flood the inside walls of the piston at all places, and although used for low speed engines, they have proved ineffective for high speed two-stroke engines even though large clearances have been provided in attempt to care for the comparatively great expansions.

In accordance with the present invention the piston is constructed from two head sections in such a manner that there are two telescopically related cylindrical or skirt extensions that fit one into the other so as to seal the inside space in which cooling medium may be provided. Thus the head section *a* is provided with a cylindrical skirt extension a^2 which fits over and slides upon the skirt extension b^2 of section *b*. These skirt extensions may therefore expand longitudinally, that is in an axial direction, as far as necessary without causing torsional strains in the piston. The section *b* is provided with an axially located or central connecting portion, as shown, that is threaded on the upper end of the piston rod *c*, the piston section *b* having a shouldered surface *b'* that abuts directly against the top of the piston rod so as to relieve the threads from strain occasioned by axial thrusts. In a similar way the section *a* is threaded on the piston rod *c* is provided with a shoulder *a'* which abuts against the shouldered portion *c'* of the piston rod so as to relieve the threads from strain. The piston rod and the threaded connections with the two head sections thus connect the two head sections securely together at their axial portions leaving the space between the piston rod and the outer telescopic skirt extensions free from unobstructing walls, ribs or reinforcements, to provide for the free movement of the cooling medium. The cooling medium can be supplied through the passages in the hollow piston rod, so as to flow out through the openings *f* into the cooling chamber or space within the piston, the return flow being through the passage *g* and through the axial passage in the piston.

In order to seal the sliding connection between the piston extension a^2 and b^2, piston rings *d* are provided preferably received within grooves in the inner extension b^2. The piston rings may be of metal or of other suitable material of a softer character.

When the piston packings or rings are of soft material, fibrous material for example, a very considerable swelling of the material may result from the influence of the moisture of the cooling medium, and this swelling may cause a very considerable binding tendency when attempting to separate the two piston sections in case of repair or replacement or for any other reason. Where fibrous packing material and the like is used, as shown in Fig. 2 for example, one of the piston sections is preferably provided with a detachable guide member or cylindrical bushing, so arranged that it may be readily disassembled from one of the sections with which it is normally rigidly connected.

With more particular reference to Fig. 2, which illustrates one type of piston construction embodying a detachable guide member, the piston head sections *a* and *b* are secured to the piston rod *c* in the same manner as in the construction shown in Fig. 1. Between the cylindrical extensions a^2 of the section *a* and the extension b^2 of the section *b* is a cylindrical member *h*, which is detachably secured to either the upper or lower cylindrical extension. As herein shown, however, it is secured to the lower extension a^2. This member *h*, as shown, is a bushing or sleeve that is flanged outwardly as indicated at *h'*, this outward flange being ground so as to fit tightly on the upper end of the extension a^2 to which it is fastened securely by bolts *k*. There is a ground fit between the lower side of the flange *h'* and the upper end of the extension a^2 and it will therefore be apparent that no leakage is possible between the bushing *h* and the outer cylindrical extension a^2. The bushing *h*, however, is freely rotatable within the extension a^2 when these two parts are disconnected from one another by removal of the bolts *k*. When the bolts *k* are removed it will be apparent that either of the head sections of the piston may be unscrewed and removed from the piston rod *c*. The bushing *h* is telescopically slidable on the extension b^2, and leakage of cooling medium between the extension b^2 and the bushing *h* is prevented by means of the packing material *d'* provided in the grooves of extension b^2. The packing material *d'* may be of fibrous material and may expand so as to have a binding tendency between extension b^2 and the bushing *h* that might prevent rotational movements of the bushing on the extension b^2, except upon the exertion of very great forces, but such rotational movements are unnecessary in disassembling the piston, as the relative rotational movements when unscrewing one of the piston head sections, take place between the bushing and the outer extension a^2, that can move freely one on the other.

In the embodiment of the invention shown in Fig. 3, the two piston parts *a* and *b* are screwed upon the piston rod *c* in the same manner as in the constructions of Figs. 1 and 2. The lower piston section *a* is provided with a cylindrical skirt portion a^2 to which is detachably fastened a cylindrical extension or sleeve ring *l*. This extension *l* fits upon the upper end of the portion a^2 with a ground fit so as to seal this connection against any leakage of the cooling fluid. Fastening screws *k* detachably secure the lower flanged end of the extension ring *l* to the upper end of the piston portion a^2. This extension *l* is telescopically associated with the cylindrical skirt extension b^2 of the piston section *b*, which may be of the same outside diameter as the extension portion a^2. Fibrous or other packing material *d'* is provided between the extension *l* and the extensions b^2, preferably in grooves arranged in the extension ring *l*. This packing material seals against the leakage of cooling medium but at the same time permits longitudinal or axial expansion of the piston sections. In order to disassemble the piston parts it is apparent that the screws *k* can be removed, and the upper piston section can be unscrewed from the piston rod, the extension ring *l* rotating with the piston section *b* if the packing material *d* has been swelled and prevents relative turning movement of the extension ring *l* and the extension b^2.

In accordance with the invention herein set forth it is apparent that the piston sections provide a cooling chamber which is free from interposed walls or ribs and permit the cooling material to flood the entire piston space completely and unrestrictively to provide for an efficient cooling action.

While the forms of apparatus herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise forms of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A piston for double acting engines of the character described, comprising opposed separate head sections, said sections having telescopically related hollow cylindrical skirt portions, cooperating to provide a common chamber extending between the inner sides of the piston heads, and a piston rod extending through one section and in threaded engagement with both of said sections and rigidly securing said head sections together.

2. A piston for double acting engines of the character described, comprising opposed separate substantially cup-shaped head sections, said sections having cylindrical extensions axially slidable one on the other and cooperating to provide a common chamber extending between the inner sides of the piston heads, packing means arranged between said extensions, and means in threaded engagement with both of said sections and rigidly connecting axial portions of said sections together.

3. A piston for double acting engines of the character described, comprising a piston rod having cooling medium passages therein, a head section, means rigidly securing said head section to said rod against movement in any direction with relation to said rod, a second head section, means rigidly securing said second head section to said rod against movement in any direction with relation to said rod, said sections being substantially cup-shaped and having telescopically slidable skirt portions cooperating to provide a common chamber extending between the inner sides of the piston heads in communication with said piston rod passages.

4. A piston for double acting engines of the character described, comprising a piston rod, separate integral substantially cup-shaped head sections each threaded directly on said rod and each having a shouldered surface abutting a portion of the rod for relieving the threads from axial thrust.

5. A piston for double acting engines of the character described, comprising a piston rod, separate head sections each threaded on said rod and each having a shouldered surface abutting a portion of the rod for relieving the threads from axial thrust, and telescopically slidable skirt portions provided on each of said head sections and cooperating to provide a common chamber extending between the inner sides of the piston heads.

6. A piston for double acting engines of the character described, comprising a piston rod having a cooling medium passage therein, and opposed separate head sections each having a cylindrical skirt extension, the cylindrical skirt extensions being telescopically slidable one on the other, each head section having means arranged axially thereof and spaced a substantial distance away from the skirt extension and fixed rigidly

to said piston rod, the inner walls of the cylindrical extensions being substantially of unbroken cylindrical form so as to provide an unobstructed space in communication with said piston rod passages for receiving cooling medium within the piston.

7. A piston for double acting engines of the character described, comprising opposed separate head sections, a piston rod rigidly securing axial portions of said head sections together, a cylindrically formed guide means telescopically associated with one of said sections, and means detachably connecting said guide means to the other of said sections, said sections having hollow skirt portions supported only from the piston heads and providing an unobstructed space for cooling medium, said piston rod having cooling medium passages in communication with said space.

8. A piston for double acting engines of the character described, comprising opposed separate head sections, means rigidly securing portions of said head sections together, a cylindrically formed guide means telescopically associated with one of said sections, and means detachably connecting said guide means to the other of said sections, and packing means arranged between said guide means and the section with which it is telescopically associated.

9. A piston for double acting engines of the character described, comprising opposed separate head secions, cylindrical skirt extensions for said head sections arranged one within the other, a hollow cylindrical guide means arranged slidably on the inner extension, packing means between said inner extension and said guide means, and means securely fastening an end of said guide means to the outer one of said extensions.

10. A piston for double acting engines of the character described, comprising opposed head sections, said sections having cylindrical skirt extensions extending one within the other, a guide sleeve having a flanged end, means detachably securing said flanged end to one of the skirt extensions, said guide sleeve extending slidably around the other said extension, and packing means between said guide sleeve and said last named extension.

11. A piston for double acting engines of the character described, comprising opposed separate head sections, said sections having cylindrical skirt portions projecting toward one another, an extension detachably provided on one of said portions and slidably associated with the other of said portions, and packing means arranged between said other portion and said extension.

12. A piston for double acting engines of the character described, comprising opposed separate head sections, said sections having cylindrical skirt portions of the same outside diameter projecting toward one another, an extension detachably provided on one of said portions and slidably associated with the other of said portions, and packing means arranged between said other portion and said extension.

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