March 16, 1965 M. L. THOMPSON 3,173,345

PISTON

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FIG. 1.

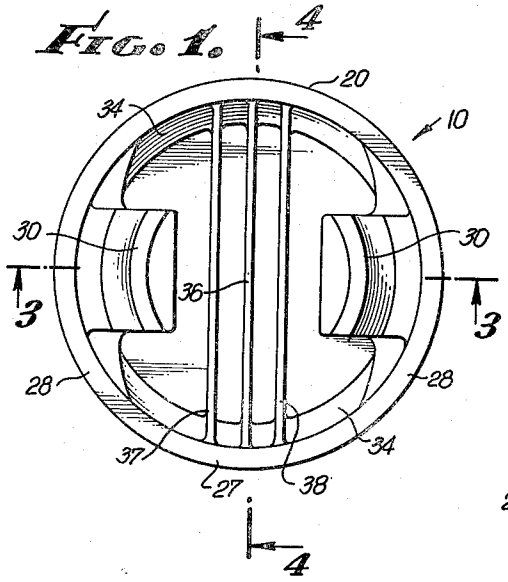


FIG. 2.

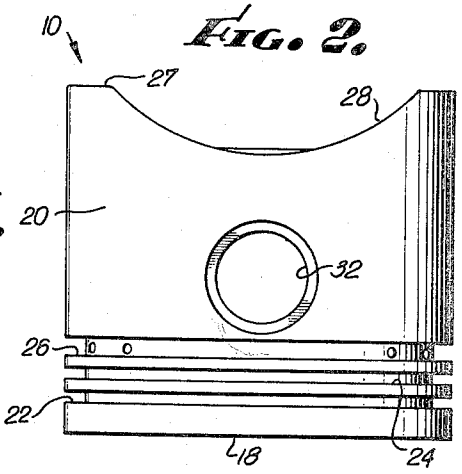


FIG. 3.

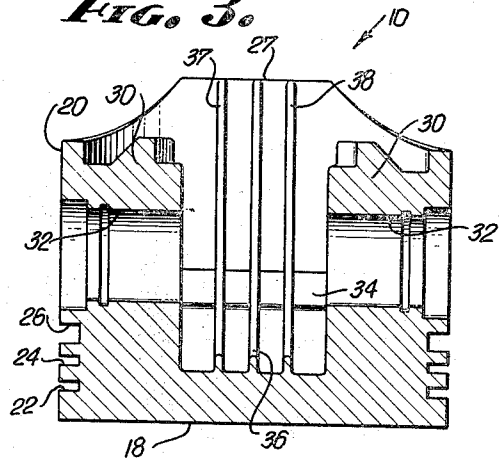


FIG. 4.

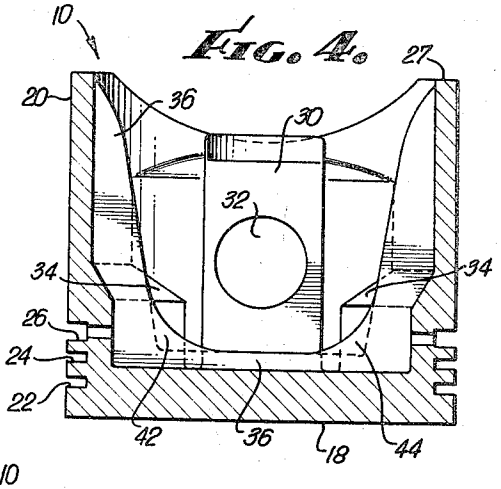
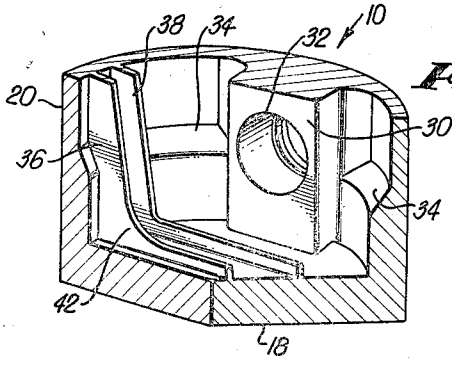


FIG. 5.



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FIG. 6.

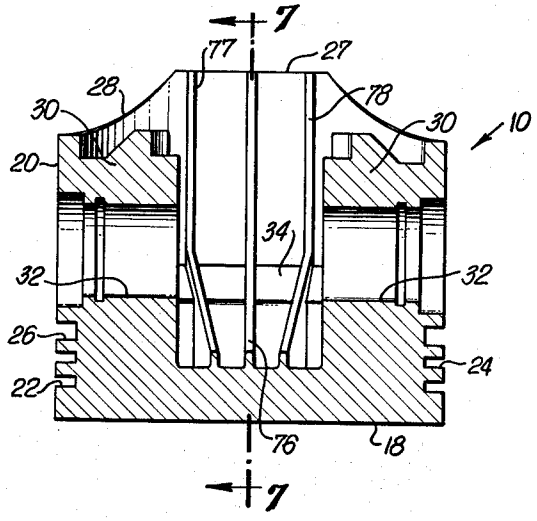


FIG. 7.

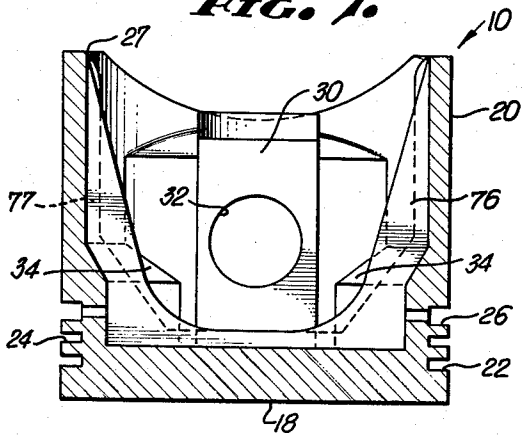
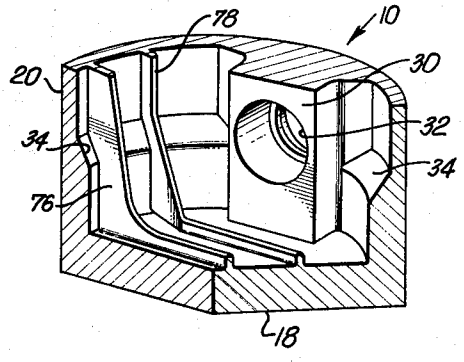


FIG. 8.



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FIG. 9.

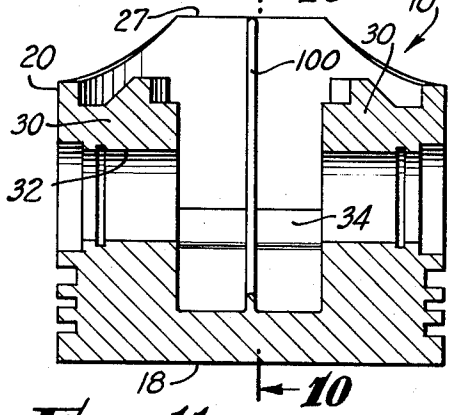


FIG. 10.

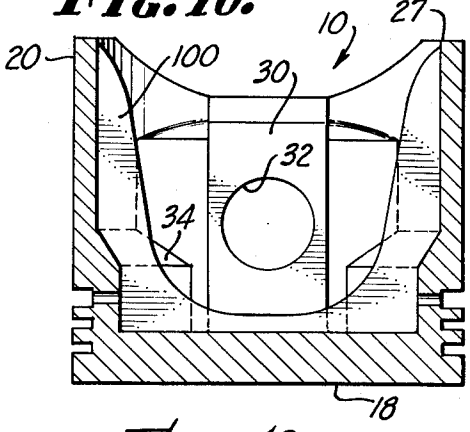


FIG. 11.

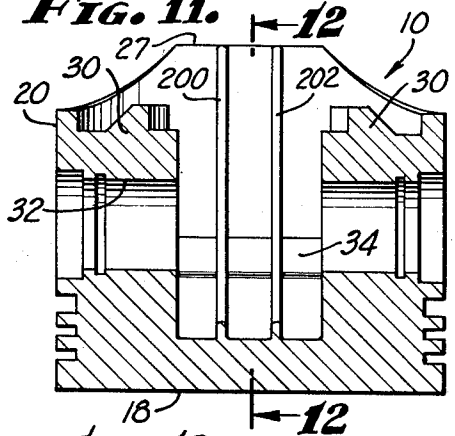


FIG. 12.

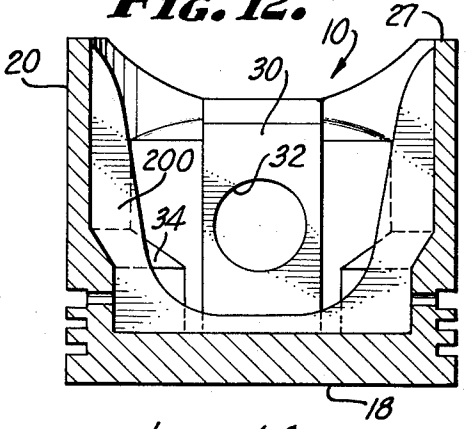


FIG. 13.

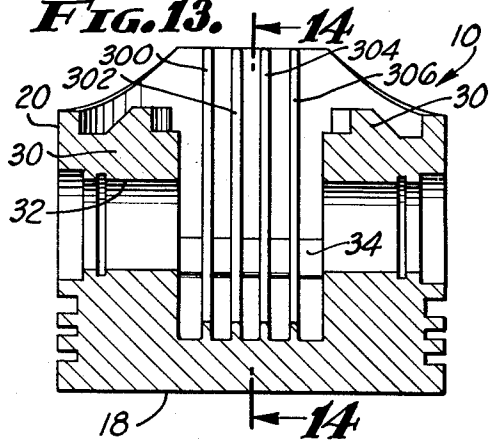
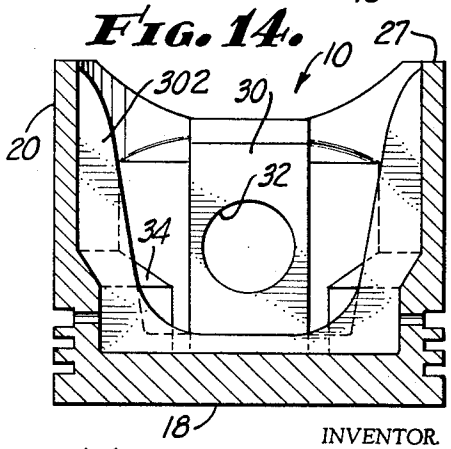


FIG. 14.



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PISTON

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6 Claims. (Cl. 92—239)

This invention relates to pistons used in various mechanisms where intense compression forces occur, and particularly to pistons used in internal combustion engines.

This application is a continuation-in-part of application Serial No. 143,917, filed October 9, 1961, entitled "Piston," and now abandoned.

A piston disposed within a cylinder and within an environment of intense forces such as those that develop in internal combustion engines, is subjected to conditions that affect the efficiency of combustion of fuel within the cylinder, and also affect the efficiency of operation of the piston. When fuel is exploded on the combustion stroke of an internal combustion engine, intense forces develop in the cylinder which surrounds the exterior of the piston and tend to compress those regions of the piston skirt which are least capable of resisting said forces.

An object of this invention is to provide a piston, the skirt of which is reinforced and rendered substantially rigid to resist in a piston cylinder intense compressive forces that would otherwise distort the piston and impart movements thereto which would reduce the efficiency of operation of the piston and the structures associated therewith, such as the piston rings.

A more specific object of this invention is to provide a piston of the aforementioned character which is reinforced by one or more strengthening webs on the internal side of the piston head and skirt disposed so as to render the skirt substantially rigid.

Further objects and advantages of the invention will appear during the following part of this specification, in which the details of construction and the mode of operation of preferred embodiments of the invention are described with reference to the accompanying drawings, wherein:

FIG. 1 is a plan view illustrating and having embodied therein one form of the present invention;

FIG. 2 is a side elevational view of a piston;

FIG. 3 is a cross-sectional view taken on line 3—3 of FIG. 1;

FIG. 4 is a cross-sectional view taken on line 4—4 of FIG. 1;

FIG. 5 is a perspective view, partly in section, illustrating configuration of a portion of the webs that serve to reinforce the skirt and head of the piston illustrated in FIGS. 1–4;

FIG. 6 is a cross-sectional view similar to FIG. 3, but illustrating a first alternative form of the invention;

FIG. 7 is a view similar to FIG. 4, but illustrating the first alternative form of the invention shown in FIG. 6;

FIG. 8 is a view similar to FIG. 5, but showing the first alternative form of the invention shown in FIGS. 6 and 7;

FIG. 9 is a cross-sectional view similar to FIG. 3 and FIG. 6, but illustrating a second alternative form of the invention;

FIG. 10 is a cross-sectional view taken on line 10—10 of FIG. 9;

FIG. 11 is a cross-sectional view similar to FIG. 3, FIG. 6 and FIG. 9, but illustrating a third alternative form of the invention;

FIG. 12 is a cross-sectional view taken on line 12—12 of FIG. 11;

FIG. 13 is a cross-sectional view similar to FIG. 3, FIG. 6, FIG. 9 and FIG. 11, but illustrating a fourth alternative form of the invention; and

FIG. 14 is a cross-sectional view taken on line 14—14 of FIG. 13.

A piston 10 has a cylindrical configuration, and includes a head 18 having a flat external surface and a cylindrical skirt 20. A plurality of external circumferential grooves 22, 24, and 26 are formed in skirt 20 adjacent head 18 and adapted to receive piston rings, not shown.

The external edge 27 of skirt may cut arcuately as at 28. A pair of rigid posts, bosses or enlargements 30 are formed integrally with head 18 and skirt 20, and extend vertically on opposite sides of skirt 20 between head 18 and the bottom of cut 28. An aligned bore 32, adapted to receive a rocker arm shaft, not shown, is transversely disposed in piston 10, passing through skirt 20 and posts 30. The rocking motion of piston 10 occurring during operation of the piston and cylinder assembly of which piston 10 is intended to be a part, will be located about the axis of bore 32, and it will be apparent that skirt 20, supported as it is by posts 30, will be rigid and strong in the area of posts 30 and resistant to compressive movement.

Piston skirts are frequently formed with a relatively thick wall in the vicinity of the juncture of the skirt with the piston head, but in order to save weight, the thickness of the wall of the skirt is generally reduced in its outer portions. In skirt 20, at the point where the wall thickness is so reduced, the internal surface of skirt 20 may be beveled as at 34. It will thus be seen that the area of skirt 20 between posts 30 and above bevel 34 is relatively thin-walled and most subject to reaction to compressive forces.

To strengthen this comparatively weak area of skirt 20, a web 36 is formed internally on piston 10. Web 36 is a continuous web formed integrally with piston 10 and passes from a point closely adjacent to edge 27 of skirt 20 and approximately midway between oppositely disposed posts 30 on one side of skirt 20, down skirt 20, across head 18 at approximately the center of head 18, and up the other side of skirt 20 to a point closely adjacent to edge 27 of skirt 20, also approximately midway between posts 30.

In the first form of the invention shown in FIGS. 1–5 of the drawings, on opposite sides of web 36, spaced apart therefrom and arranged substantially parallel thereto, additional continuous webs 37 and 38 are similarly integrally formed and disposed, all of said webs 36, 37 and 38 passing freely between said posts 30.

In order to add supporting strength to webs 36, 37 and 38, it has been found advantageous to build up said webs 36, 37 and 38 in the areas of the juncture of head 18 and skirt 20, rather than to form a sharp right angle in those areas. Consequently, web 36 is built up in those areas designated 42 and 44 to form a deeper arched turn. Of course, webs 37 and 38 may be similarly formed, but in practice, it has been found that a sharper turn may be provided for webs 37 and 38, if desired, without significant loss of rigidity.

Referring to the first alternative form of the invention illustrated in FIGS. 6–8 of the drawings, instead of providing webs which are substantially parallel to each other throughout their entire length, a central web 76, substantially similar in configuration and location to web 36 in the first form of the invention illustrated in FIGS. 1–5 in the drawings, is provided. However, the webs on opposite sides of web 76 are disposed differently than webs 37 and 38 in the first form of the invention.

In the first alternative form of the invention, webs 77 and 78 are disposed on opposite sides of web 76, and run

generally parallel thereto along the skirt portion 20 of piston 10, but as they approach head 18, and preferably in the vicinity of bevel 34, webs 77 and 78 are toed inwardly toward web 76. Thereafter, webs 77 and 78 continue across head 18, again in a substantially parallel relationship to web 76, all of said webs 76, 77 and 78 passing freely between posts 30.

In said first alternative form of the invention, webs 76, 77 and 78 are preferably spaced farther apart from each other where they are disposed on the parts of skirt 20 which have generally thinner walls than are webs 36, 37 and 38 in the first form of the invention, and thus provide a wider area of skirt support.

Referring to the second alternative form of the invention illustrated in FIGS. 9 and 10 of the drawings, instead of providing the trio of webs 36, 37 and 38 of the first form of the invention, best shown in FIGS. 1 and 2 of the drawings, or the trio of webs 76, 77 and 78 of the first alternative form of the invention, best shown in FIG. 6 of the drawings, a single web 100 is provided, said web 100 being substantially similar in configuration and location to central web 36 of the first form of the invention and to central web 76 of the first alternative form of the invention.

Referring next to the third alternative form of the invention illustrated in FIGS. 11 and 12 of the drawings, instead of providing the trio of webs 36, 37 and 38 of the first form of the invention, or the trio of webs 76, 77 and 78 of the first alternative form of the invention, or the single web 100 of the second alternative form of the invention, a pair of webs 200 and 202 are provided. Said webs 200 and 202 are substantially similar in configuration to web 100 of the second alternative form of the invention. Said webs 200 and 202 are disposed in substantially parallel relationship to each other and are preferably spaced equidistant from posts 30 and each other on opposite sides of the axis of posts 30.

Now referring to the fourth alternative form of the invention illustrated in FIGS. 13 and 14 of the drawings, in lieu of the trio of webs 36, 37 and 38, the trio of webs 76, 77 and 78, the single web 100, or the pair of webs 200 and 202, a series of four webs 300, 302, 304 and 306 may be provided, said webs 300, 302, 304 and 306 being substantially similar in configuration to, for instance, webs 200 and 202, and being disposed substantially parallel to each other. Said webs 300, 302, 304 and 306 are also spaced apart from posts 30 and are preferably equidistant from said posts 30 and from each other.

Although, for practical purposes, no more than four webs are illustrated in the fourth alternative form of the invention, it will be understood that if desired a number of webs greater than four, limited only by space restrictions between posts 30, may be provided.

While the instant invention has been shown and described herein in what is conceived to be the most practical and preferred embodiments, it is recognized that departures may be made therefrom within the scope of the invention, which is therefore not to be limited to the details disclosed herein, but is to be accorded the full scope of the appended claims.

I claim:

1. A piston which comprises: a head; a cylindrical skirt integral with said head; opposed means integrally formed on the internal side of said piston adapted to receive structure to support said piston within a cylinder; and a plurality of continuous webs formed within the piston and disposed between said support means in spaced relationship to said support means and substantially parallel to each other, one of said webs being generally centrally located, and all of said webs being integral with said head and skirt so as to provide stability thereto and to resist compression forces which occur within a cylinder and surround the piston.

2. A piston which comprises: a head; a cylindrical skirt integral with said head; opposed means integrally formed on the internal side of said piston adapted to receive structure to support said piston within a cylinder; and a trio of webs formed within the piston and disposed between said support means and in spaced relationship thereto, one of said webs being generally centrally located in a plane passing through the axis of said piston, and the other webs being disposed on opposite sides of said one web, each of said webs running continuously in a substantially straight line from a point adjacent the outer edge of said skirt along the edge of said skirt, across said piston head, and along the opposite side of said skirt to a point adjacent the outer edge of said skirt, and all of said webs being integral with said head and skirt and disposed in substantially parallel relationship to each other, so as to provide stability thereto and to resist compression forces which would occur within a cylinder and surround the piston.

3. A piston which comprises: a head; a cylindrical skirt integral with said head; opposed vertical posts integrally formed on the internal side of said skirt and adapted to receive structure to support said piston in a cylinder; a centrally located, integrally formed web within the piston disposed on said skirt and said head in a plane passing through the axis of said piston between said support means; and a pair of integrally formed webs disposed on opposite sides of said centrally located web, each of said pair of webs converging toward said centrally located web in the areas of juncture of said skirt and said head, whereby said pair of webs in combination with said centrally located web render the skirt of said piston substantially rigid and resistant to compression forces in the area between said posts.

4. A piston which comprises: a head; a cylindrical skirt integral with said head; opposed means integrally formed on the internal side of said piston adapted to receive structure to support said piston within a cylinder; and a trio of webs formed within the piston and disposed between said support means, one of said webs being generally centrally located in a plane passing through the axis of said piston, and the other webs being disposed on opposite sides of said one web, each of said webs running continuously in a substantially straight line from a point adjacent the outer edge of said skirt, along one side of said skirt, across said piston head, and along the opposite side of said skirt to a point adjacent the outer edge of said skirt, all of said webs being disposed in spaced relationship to said support means and to each other, said centrally located web being substantially built up in the area of the juncture of said skirt and said piston head to provide a relatively deep arched turn, and said other webs being built up in said area to provide sharper arched turns, and all of said webs being integral with said head and skirt to provide stability thereto and to resist compression forces which would occur within a cylinder and surround the piston.

5. A piston which comprises: a head; a cylindrical skirt integral with said head; opposed means integrally formed on the internal side of said piston adapted to receive structure to support said piston within a cylinder; and a plurality of webs formed within the piston and disposed between said support means, one of said webs being generally centrally located in a plane passing through the axis of said piston, and the other webs being disposed on opposite sides of said one web, each of said webs running continuously in a substantially straight line from a point adjacent the outer edge of said skirt, along one side of said skirt, across said piston head, and along the opposite side of said skirt to a point adjacent the outer edge of said skirt, all of said webs being disposed in spaced relationship to said support means and to each other, said centrally located web being substantially built up in the area of the juncture of said skirt and said piston head to provide a relatively deep arched turn, and said other webs being built up in said area to provide sharper arched turns, and all of said webs being integral with said head

and skirt to provide stability thereto and to resist compression forces which would occur within a cylinder and surround the piston.

6. A piston which comprises: a head; a cylindrical skirt integral with said head; opposed means integrally formed on the internal side of said piston adapted to receive structure to support said piston within a cylinder; and a plurality of webs formed within the piston and disposed between said support means, each of said webs running continuously in a substantially straight line from a point adjacent the outer edge of said skirt, along one side of said skirt, across said piston head, and along the opposite side of said skirt to a point adjacent the outer edge of said skirt, all of said webs being disposed in spaced relationship to said support means and to each other, one of said webs being substantially built up in the area of the juncture of said skirt and said piston head to provide a relatively deep arched turn, and the other of said webs being built up in said area to provide sharper arched turns, and all of said webs being integral with said head and skirt to provide stability thereto and to resist compression forces which would occur within a cylinder and surround the piston.

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