March 4, 1941. D. M. SMITH 2,234,148

PISTON EXPANDER

Filed Jan. 6, 1940

FIG. 1.

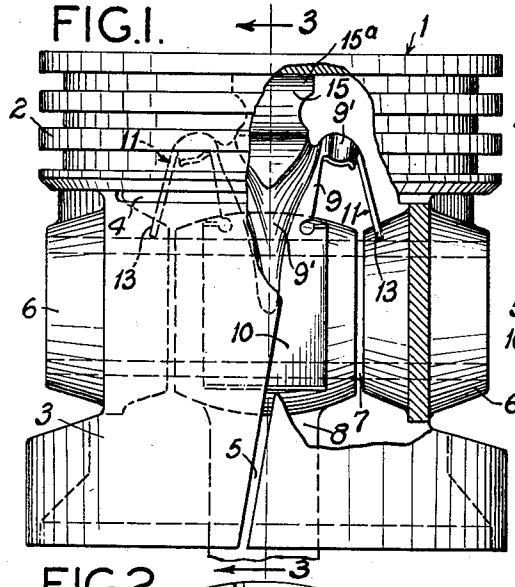


FIG. 3.

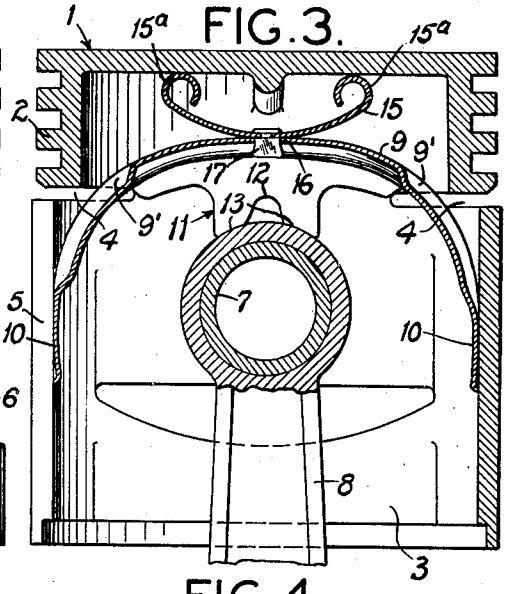


FIG. 2.

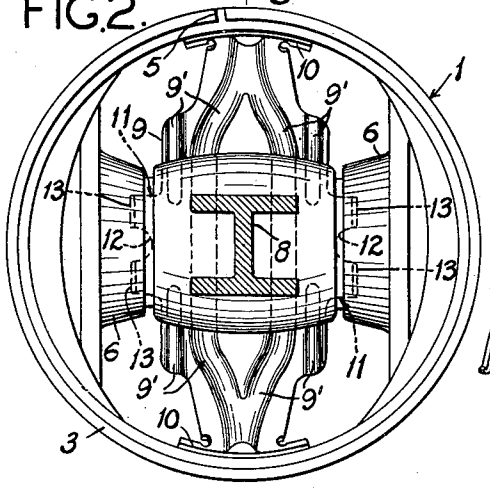


FIG. 4.

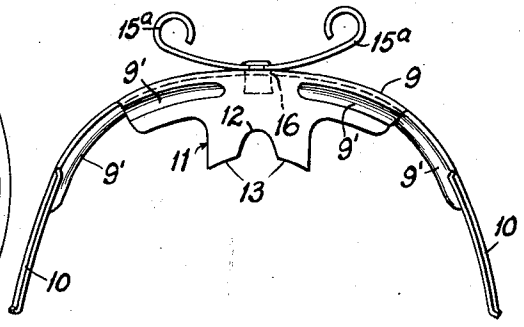


FIG. 5.

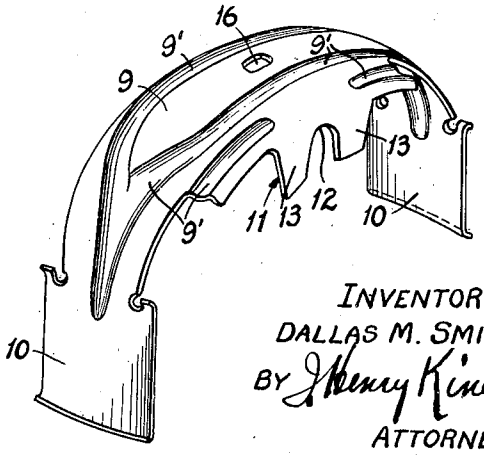
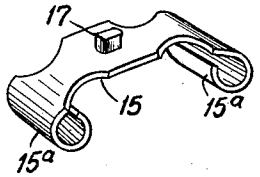


FIG. 6.



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PISTON EXPANDER

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Application January 6, 1940, Serial No. 312,754

4 Claims. (Cl. 309—12)

My invention relates to piston expanders and more particularly to piston expanders as used in internal combustion engines to increase the effective diameter of the piston skirt whereby compensation will be made for wear between the piston and the cylinder in which it reciprocates.

I have described very fully in my Patent No. 2,103,664, Dec. 28, 1937, that it is necessary to anchor the expander securely to the piston so that it may not become dislodged from its position therein and drop into the moving parts of the motor, when the skirt goes into a flutter or tuned vibration.

Because of the complicated motion of the piston as it reciprocates in the cylinder an expander positioned in the piston is subjected to complicated mechanical forces, some of which cause the expander to creep or rotate in the piston, and this movement of the expander in the piston sets up undue stresses on certain parts of the expander when the expander assumes a new position in the piston.

My invention contemplates an expander adapted to distribute equally throughout parts of the expander stresses carried by these parts when the expander creeps or rotates in the piston to assume a new position therein.

With the problem in mind as set forth above and also in my co-pending application, the objects of my invention are to provide a piston expander which includes parts whereby the expander may be anchored securely inside the piston and to provide a piston expander which will be simple in design, cheap to manufacture and efficient in operation.

A more specific object of my invention is to provide a piston expander adapted for commercial manufacture that will distribute equally throughout parts of the expander stresses carried by these parts when the expander creeps or rotates in the piston to assume a new position therein.

Other objects and advantages will be apparent to those skilled in the art from the following description wherein reference is made to the accompanying drawing illustrating a preferred embodiment of my invention and wherein reference numerals designate like parts throughout the several views.

In the drawing,

Fig. 1 is a view of a piston partially broken away and its included expander made according to my new and improved design.

Fig. 2 is a bottom view of the assembly shown in Fig. 1.

Fig. 3 is a section along the line 3—3 of Fig. 1.

Fig. 4 is a view of the expander removed from the piston, and

Figs. 5 and 6 show the expander before the parts are assembled.

Referring to the drawing, the piston 1 on which the expander is assembled has a head 2 and a skirt 3 separated therefrom throughout a major portion of its periphery by circumferentially extending slots 4. The skirt 3 also is split axially as at 5 so that in effect the skirt is a resilient split band. The piston is provided with bosses 6 of usual design adapted to receive a wrist pin 7 on which is mounted the upper end of the connecting rod 8.

The expander proper consists of a U shaped member 9 having flat ends 10 adapted and arranged to engage the interior surfaces of the piston skirt at diametrically opposed points removed approximately 90° from the bosses 6, as shown in Fig. 3. The member 9 is formed and arranged so that the upper portion thereof extends above the pin 7 and the upper end of the connecting rod 8. The member 9 preferably has formed therein corrugations 9' which are arranged parallel to the longitudinal edges of the member 9 and preferably coincide at the flat ends 10, all as shown in Fig. 5. The corrugations 9' are formed and arranged in the member 9 so as to increase the resiliency and therefore the expansive force of the member. Positioned approximately at the center of the member 9 is an opening 16 for the purpose more fully described hereinafter.

Extending downwardly from the edges of the member 9 and preferably formed integral therewith are a pair of parts 11 each having its lower end arranged with an arcuate shaped notch 12 which separates each one of the parts 11 into the arms 13 which are adapted to engage the upper surface of the boss 6.

Positioned in the opening 16 in the member 9 and extending upwardly therefrom is loosely mounted a stud 17 rigidly fastened to a spring 15 which is arranged to engage the inner surface of the top of the piston and to create a tension to force the lower ends of the parts 11 firmly against the pin bosses 6, so that the expander will be maintained in place securely within the piston. The opening 16 and the stud 17 are preferably rectangular in shape so the spring 15 is unable to rotate on the member 9 about an axis perpendicular to the plane of the opening.

The spring 15 preferably curves upwardly and then back upon itself near the end portions

thereof to form a pair of arms 15a to contact the inner surface of the top of the piston, as shown in the drawing.

In some instances it may be found more expedient to loosely fasten the spring 15 on the stud 17 and to fasten the stud 17 rigidly to the member 9, or in other instances it may be found more expedient to attach both the spring 15 and the member 9 loosely on the stud 17. In any case, the spring 15 is to be mounted loosely or hingedly on the member 9 so that if the member 9 creeps or rotates in the piston to assume a new position therein, the spring 15 will continue to exert a substantially uniform pressure on the inner surface of the top of the piston at the points of contact. The loose mounting as described above will permit the member 9 to rock on the spring 15 so that the spring 15 may remain in the same attitude relative to the head when the member 9 creeps or rotates to a new position in the piston.

As implied above, a portion of the expander comprising the member 9 and parts 11 preferably is stamped from a single sheet of spring steel of proper guage and hardness, and the tension spring 15 is formed from a separate piece of the same material. Also, of course, the parts 11 may be positioned and adapted to engage knobs formed on the piston skirt or other protuberances on the inner surfaces of the piston. In any event, the spring 15 will hold the lower ends of the parts 11 firmly in their place of engagement.

When an expander embodying my invention is to be inserted in place in the interior of a piston, the spring 15 is loosely attached to the member 9 by inserting the stud rigidly fastened to the spring 15 through the opening 16 in the member 9 and enlarging the end of the stud remote from the spring, as by tamping or the like. The end portion of the stud should be enlarged only enough to prevent the spring from becoming detached from the member 9 while positioning the expander in the piston, but not enough to fasten the spring rigidly thereto. The flat ends 10 of the member 9 preferably are tied together by wire or held by flaps or other suitable expedients, and the expander is inserted upwardly in the piston from the open bottom of the skirt. When the parts 11 come into engagement with the pin bosses movement of the expander into the piston will collapse these parts, and then when the parts 11 have moved past the inner faces of the bosses the parts will spring outwardly to engage the upper portions of the bosses as shown in Fig. 1. As stated above, firm engagement between the parts 11 and the bosses 6 will be maintained by tension of the spring 15 on the inner surface of the piston head. Also, by loosely mounting the spring 15 on the member 9, the arms 15a of the spring 15 in contact with the inner surface of the top of the piston will exert substantially equal pressures relative to each other on the piston regardless of the position assumed by the expander in creeping or rotating therein.

In the specification and claims of this application, when describing the expander the word "downwardly" is used to denote a direction from the piston towards the crank shaft, and the word "upwardly" is used to denote a direction from the piston towards the motor head when the expander is properly positioned in the piston.

I have described in detail a particular construction embodying my invention, but it is of course evident that the construction may be varied in many particulars and I therefore do not limit myself to the form and arrangement shown and described.

Having described my invention, what I claim is:

1. A piston expander comprising a member arranged to engage and expand the skirt of a piston, a pair of parts carried by said member and positioned to engage the interior of the piston at opposed points, and a spring loosely mounted on said expander to engage the head of said piston at spaced points and to exert a tension to hold said parts firmly at their place of engagement, said spring being arranged so as to exert a uniform pressure on all portions of said piston head in engagement therewith for any position assumed by said member.

2. A piston expander comprising a member arranged to engage and expand the skirt of a piston, a pair of parts carried by said member and positioned to engage the interior of the piston at opposed points, a spring loosely mounted on and carried by said expander so as to remain in the same attitude relative to said head when said expander rotates in said piston, and said spring being arranged to engage the head of said piston at spaced points in order to hold said parts firmly in their place of engagement and adapted to exert a uniform pressure on all portions of said head in engagement therewith for any position assumed by said expander.

3. A piston expander comprising a member arranged to engage and expand the skirt of a piston, a pair of parts carried by said member and positioned to engage the interior of the piston at opposed points, a spring movably supported and carried by said expander to engage the head of said piston at spaced points in order to hold said parts firmly in their place of engagement and adapted to exert a uniform pressure on all portions of said head in engagement therewith for any position assumed by said expander.

4. A piston expander comprising a member arranged to engage and expand the skirt of said piston, a pair of parts carried by said member and positioned to engage the upper surfaces of the pin bosses of said piston, and spring means loosely mounted on and carried by said expander to engage the top of said piston at spaced points and exert a tension to hold said parts in firm engagement with said pin bosses, said member and said spring means being adapted to rock on each other in order to equalize various additional forces on said spring means occasioned by said expander assuming a new position in said piston.

DALLAS M. SMITH.