Oct. 22, 1940. G. CHRISTENSON 2,218,638

PACKING

Filed July 21, 1938

Fig. 1.

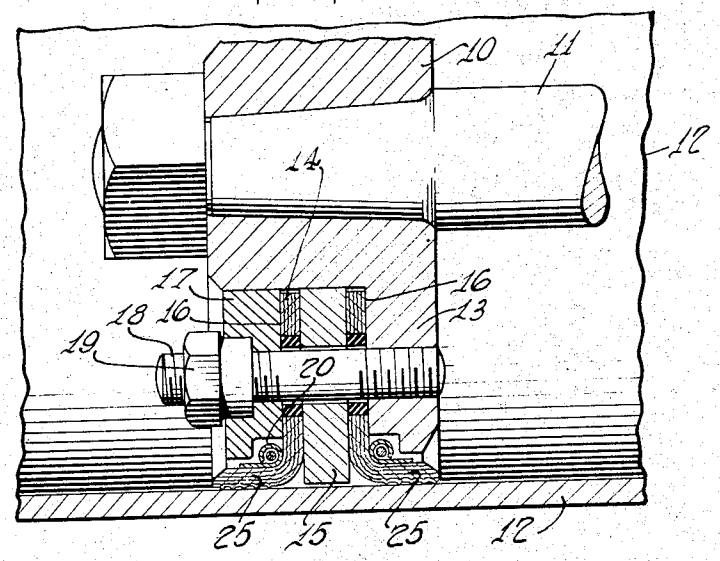


Fig. 2.

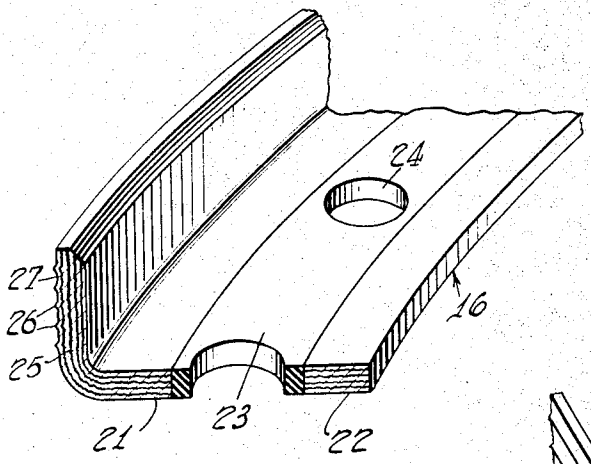
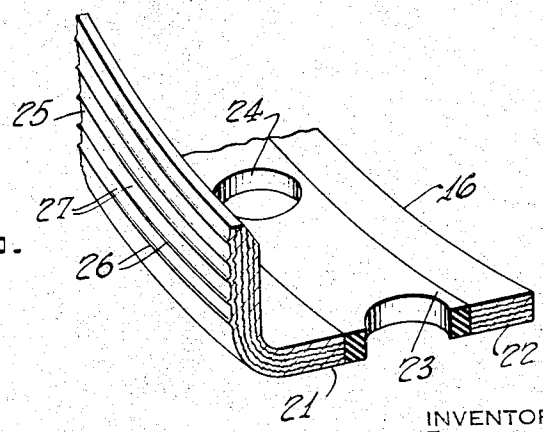


Fig. 3.



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PACKING

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9 Claims. (Cl. 309—23)

The present invention relates to cylinder and piston assemblies, and particularly to such assemblies applicable to power reverse gear mechanisms, air brake mechanisms, and the like. The invention is more particularly concerned with an improved packing to be employed in cylinder-piston assemblies, constructed and arranged to insure against loss of pressure through the material of the packing and to provide an efficient seal between the piston and the cylinder walls.

Cylinder and piston assemblies, of the type referred to above, now conventionally include a packing ring having a base resting upon the piston head and an out-turned lip or flange for sliding and sealing engagement with the cylinder wall. Packings of this description are usually referred to as "cup packings" and such terminology will be hereinafter employed. The cup packing is retained in its proper position on the piston head by means of a keeper ring and a plurality of bolts or studs extending through the keeper ring and the base of the packing and into the piston head. The cup packings of preferred present practice comprise a suitable laminated asbestos fabric or the like impregnated with a compound such as a rubber composition. For convenience in manufacture, the perforations for the reception of the bolts or studs are formed by punching or drilling the packing after the impregnant is applied thereto, the fibres of the fabric strands being cut and their interstices exposed by this operation.

Although the known cup packings have served satisfactorily, at least for the most part, under previous conditions of use it has recently been found necessary to increase the pressure against which the cups work. It has been discovered that the increased pressure causes the air or other fluid under pressure within the cylinder to enter the minute interstices of the fabric strands exposed by the punching or drilling of the bolt holes, the fluid wicking through the strands, unimpeded by the rubber or other impregnant which surrounds the strands, with consequent loss of the pressure in the cylinder. This loss of pressure, termed here "porosity leakage", has substantially impaired the operating efficiency of the cylinder-piston assemblies. Accordingly, the present invention is principally concerned with, and has for its principal object, the provision of a packing ring which overcomes this objectionable feature of present cup packings.

A further disadvantage of the known type of cup packings resides in the relatively frequent failure of the lip or flange of the cup to seat in adequate sealing engagement against the piston walls until the cup is thoroughly broken in. A further object of the invention is the provision of a lip construction for cup packings which will overcome this disadvantage of the prior art cups.

A further object of the invention is the provision of a cup packing attaining the above defined objects which may be punched or drilled to provide apertures for the penetration of the conventional securing bolts or the like without exposing the fibres of the fabric of the packings.

My invention, whereby the above noted objects are attained, will be fully understood and further objects and advantages of the invention will become apparent when reference is made to the detailed description of the invention which is to follow and to the accompanying drawing, in which

Fig. 1 is a fragmentary sectional view of a piston and cylinder assembly employing a cup packing of the present invention;

Fig. 2 is a fragmentary view, partially in perspective and partially in section, illustrating a packing cup embodying the present invention; and

Fig. 3 is a fragmentary perspective view illustrating a feature of the invention.

Referring now particularly to Fig. 1, the piston cylinder assembly illustrated is of generally conventional design and comprises a suitable, double acting piston 10 carried by piston rod 11 and adapted for reciprocation within a cylinder 12. A double acting piston has been illustrated, as such is conventionally employed, particularly in power reverse gears. It will be understood, however, that the cup packings of the present invention are in no way limited to use with assemblies of the above referred to type, but may be employed as well with single acting pistons and in piston-cylinder assemblies for varied purposes.

The piston 10 includes a head or seat 13 of annular form on which rests the base of a cup packing 14. Resting on the base 16 of cup packing 14 is an annular separator ring 15 which supports a second cup packing 14. The two packings 14 have their lips or flanges 25 oppositely directed, as indicated. A keeper ring 17 rests upon the base of the second cup packing and bolts or studs 18 extend through the keeper plate, spreader ring and cup packing bases, and into threaded engagement with the piston head 13. The bolts or studs carry nuts or heads 19 in jambing engagement with the keeper plate, whereby the several elements of the piston are held firmly together in assembled relationship.

The flanges or lips of the cup packings are forced outwardly against the piston walls by expander rings **20**, the latter being of any suitable and conventional construction.

Referring now to Figs. 1, 2, and 3, the cup packing, in accordance with the present invention, is illustrated which comprises a base **16** and the lip or flange **25**. The flange **25** and an annular portion **21** of the base **16** adjacent the flange are preferably formed of a laminated asbestos fabric suitably impregnated with a material, such as rubber composition, the impregnated fabric being suitably the same or similar to that heretofore conventionally employed for cup packings. An annular ring **22** forming the innermost portion of the packing is preferably formed of similar material. Between the two annular portions **21** and **22** composed of the multiply impregnated fabric, an annular ring **23** is provided formed preferably of a rubber composition or other suitable plastic compound adapted to become readily distorted under pressure. The reenforcing fabric is preferably entirely omitted from this portion, and, in any event, no continuous fabric or strands are included.

The annular ring **23** includes perforations or bolt holes **24** for the reception of the securing bolts or studs **18**, previously referred to. As will readily be understood, the location of the bolt holes in the ring **23** containing no fabric continuous with that of the rings **21** and **22**, and preferably formed substantially entirely of the rubber or other plastic composition, insures against the presence of the exposed ends of continuous fibres or threads in the walls of the bolt holes, when the latter are punched or drilled in accordance with the desired present practice. In this way, porosity leakage is wholly done away with, air or other fluid maintained under pressure by the piston being prevented from entering the pores of the fabric of either ring **21** or **22**. The deformable character of the material of the ring **23** further results in the provision of a tight seal around the bolts or studs **18**, the plastic material flowing against the bolts as the nuts are tightened down. The fabric rings **21** and **22**, due to their relatively non-yielding properties, confine the plastic ring **23** and prevent undesirable distortion thereof.

Thus, the construction, in accordance with the invention, fully overcomes the disadvantages of the prior cup packings with respect to porosity leakage, secures additional advantages with respect to sealing at the bolts, and at the same time retains the strength of the prior type and permits the punching or drilling of the bolt holes in the conventional manner.

In accordance with a further feature of the present invention, the lip or flange **16** of the cup packing has, formed in the face thereof adapted for engagement with the cylinder wall, suitable annular ridges **26** providing annular grooves or valleys **27** therebetween. This construction provides lines of contact between the flange of the cup and the cylinder wall, whereby the flange of the cup is very quickly seated with consequent substantial reduction of air leakage past the cup, particularly when a new cup packing is first applied in a piston-cylinder assembly. The valleys **27** further provide reservoirs for a lubricant such as graphite grease. Thus, the grooves **27** are suitably filled with the grease prior to assembly of the cup packing with the piston, the grease serving to lubricate the cups indefinitely in service.

Having now described my invention in rather full detail, it will be understood that these details need not be strictly adhered to, but that various changes and modifications will suggest themselves to one skilled in the art, all falling within the scope of the invention as defined by the subjoined claims.

What I claim is:

1. A cup packing for assembly with a reciprocable piston including packing retaining means, said cup packing comprising a base and a peripheral upstanding lip, said base comprising an annular section including fabric material carrying a yieldable impregnant and an annular section formed of a yieldable plastic material, said last-named section including perforations for the reception of said retaining means.

2. A cup packing for assembly with a reciprocable piston including packing retaining means, said cup packing comprising a base and a peripheral upstanding lip, said base comprising an annular section integral with said lip and including a fibrous fabric material carrying a yieldable impregnant and having minute pores in the fibres thereof, and an annular section formed of a yieldable plastic non-porous material, said last-named section including perforations for the reception of said retaining means.

3. A cup packing for assembly with a reciprocable piston including packing retaining means, said cup packing comprising a base, and a peripheral upstanding lip, said base comprising spaced annular sections formed of fabric material carrying a yieldable impregnant and an annular section of yieldable non-fabric material interposed therebetween, said last-named annular section including perforations for the reception of said retaining means.

4. A cup packing for assembly with a reciprocable piston including packing retaining means, said cup packing comprising a base and a peripheral upstanding lip, said base comprising an annular section integral with said lip and including a fibrous fabric material carrying a yieldable impregnant and having minute pores in the fibres thereof, a second annular section formed of such fabric material carrying a yieldable impregnant, and a third annular section interposed between said first-mentioned annular sections, said last-named annular section being formed of a yieldable, plastic material and including perforations for the reception of said retaining means.

5. A cup packing for assembly with a reciprocable piston including packing retaining means, said cup packing comprising a base and a peripheral upstanding lip, said base comprising spaced annular sections formed of fabric material carrying a rubber-like impregnant and an annular section interposed therebetween, said last-named annular section including perforations for the reception of said retaining means.

6. A cup packing for assembly with a reciprocable piston including packing retaining means, said cup packing comprising a base and a peripheral upstanding lip, said base comprising an annular section integral with said lip and including a fibrous fabric material carrying a rubber-like impregnant and having minute pores in the fibres thereof, a second annular section formed of fabric material carrying a rubber-like impregnant, and a third annular section interposed between said first-mentioned sections, said last-named annular section being formed of a

rubber-like material and including perforations for the reception of said retaining means.

7. A cup packing for assembly with a reciprocable piston including packing retaining means, said cup packing comprising a base and a peripheral upstanding lip, said base comprising a fabric material carrying a yieldable impregnant and including a section formed of a yieldable non-porous plastic material, said section including a perforation for the reception of said retaining means.

8. A cup packing for assembly with a reciprocable piston including packing retaining means, said cup packing comprising a base and a peripheral upstanding lip, said base comprising a fabric material carrying a rubber-like impregnant and including a section formed of a rubber-like yieldable plastic material, said section including a perforation for the reception of said retaining means.

9. A cup packing for assembly with a reciprocable piston including packing retaining means, said cup packing comprising a base and a peripheral upstanding lip, said base comprising a fabric material carrying a yieldable impregnant and including a section formed of a yieldable non-porous plastic material, said section including perforations for the reception of said fastening means.

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