May 7, 1929. C. R. HUBBARD 1,712,003

PACKING

Filed Dec. 10, 1926

Fig. 1.

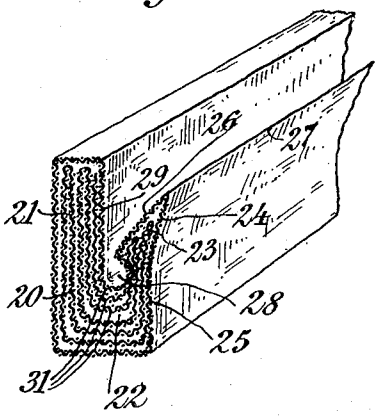


Fig. 2.

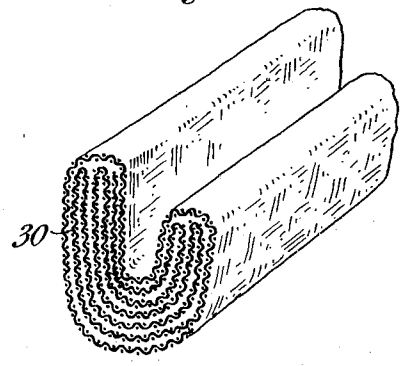


Fig. 3.

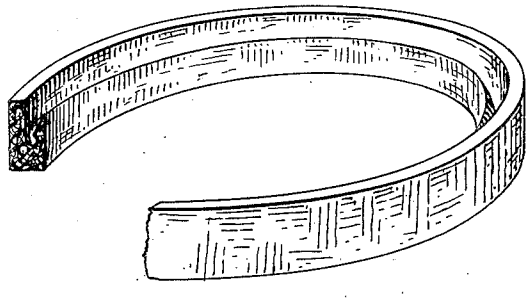
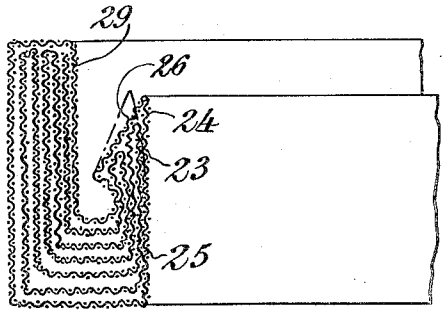


Fig. 4.



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UNITED STATES PATENT OFFICE.

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PACKING.

Application filed December 10, 1926. Serial No. 153,886.

This invention relates to improvements in packing of the type having a relatively thin lip portion adapted to be forced into snug engagement with the surface to be packed by the fluid confined in the packed structure.

It is an object of the invention to provide a packing of the above-described character, of which the lip will tend to maintain a normal position with its working surface in intimate contact with the surface to be packed irrespective of the fluid pressure, which need be relied upon only to increase the pressure between the surface of the lip and the surface to be packed.

It is a further object of the invention to provide a packing of the character described, of which the lip is weakened along the zone of its connection with the body portion of the packing, thereby forming a flexible or hinge-like joint between the lip and the body portion, whereby the fluid pressure may more readily maintain the lip in a sealed relationship with the surface to be packed.

In the drawings illustrating the preferred form of the invention—

Figure 1 is a perspective view of a fragmentary strip of packing embodying the invention, a part of which is illustrated in transverse cross-section.

Fig. 2 is a similar view of a strip of material from which packing like that illustrated in Fig. 1 may be made.

Fig. 3 is a perspective view of a strip of packing like that illustrated in Fig. 1, bent into an annulus or ring, a part of the ring being broken away and a part illustrated in transverse cross-section.

Fig. 4 is an enlarged cross-sectional view of the packing ring illustrated in Fig. 3, the portion indicated in broken lines being representative of the form which would be assumed by the lip if not constructed in accordance with one of the features of the invention.

Referring first to Fig. 1 of the drawings, a packing embodying the invention herein sought to be protected is illustrated as comprising a relatively massive body portion 20, of L-shaped form in cross-section, of which the two arms 21 and 22 in the form herein represented are perpendicular to each other. Extending from the free end of the arm 22 is a lip portion 23 preferably of wedge-like form in cross-section, said lip having an outer surface portion 24 which is an extension of the outer surface 25 of the end of the arm 22 of the L. Preferably the surface 24 will be slightly inclined or flared outwardly with respect to the surface 25, for reasons which will be explained. The inner surface 26 of the lip 23 may flare inwardly from the free edge portion 27 of the lip, whereby its thickest or most massive portion is located at a distance from the edge 27 and in the region of its zone of connection with the end of the arm 22 of the L. In accordance with one of the important features of this invention, however, the lip is intended to be weakened in any appropriate manner along this zone of connection between the lip and the body portion of the packing, thereby forming a relatively flexible or hinge-like joint, the importance of which will hereinafter be made clear. One satisfactory method of weakening the joint between the lip and the body portion, as illustrated in Fig. 1, consists in grooving the lip along the zone of connection as at 28. Preferably this groove and the angle at the junction of the arms 21, 22 of the L may comprise a gradually rounded surface extending from the base of the inner surface 29 of the arm 21 to the inner surface 26 of the lip portion 27. The form of this groove may be such as to deeply undercut the base portion of the lip, thereby localizing a zone of weakness therealong about which the lip as a whole may be flexed.

Packing of the above-described character is preferably made in relatively long strips which may be cut to suitable lengths and bent to ring-like form, as indicated in Fig. 3. The size of the ring will be dependent upon the diameter of the piston or plunger or other part of the mechanism to be packed.

When bending the strip of packing from its rectilinear form illustrated in Fig. 1 to the ring-like form in Fig. 3, the packing at the inner circumference of the ring is subjected to compression and the packing at the outer circumference is put under tension, since the same length of packing material must be caused to adjust itself to the shorter internal circumferential portion as that which accommodates the outer and relatively longer circumferential portion. In view of this compression the relatively thin lip portion of the packing would have a tendency during the bending of the strip to ring-

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like form to assume a position of the largest permissible diameter which would only be limited by the stresses set up in the material. For example, if the strip of packing of rectilinear form as indicated in Fig. 1 were to be provided with a lip having its working surfaces 24 and 25 in the same plane instead of having the portion 24 flared outwardly, the bending of the packing to ring-like form would cause the lip to be forced outwardly, with respect to the center of the ring, to the position indicated in broken lines in Fig. 4. This would be quite unsatisfactory since it would permit the fluid to enter the gap between the surface 24 and the surface to be packed and thereby defeat the intended purpose of the packing. It is one of the objects of the invention to overcome this undesirable deformation of the lip when bending the packing from rectilinear form to circular form. This is accomplished, as already explained, by giving the packing a normal form illustrated in Fig. 1 in which the surface 24 of the lip portion is inclined away from the arm 21 of the L. On bending the packing from rectilinear form to circular form, the compression in the lip portion tends to cause such portion to assume a diameter somewhat greater than it would assume if the lip were to retain its normal cross-sectional form relative to the body portion of the packing. This tendency to increase its diameter is overcome by the stresses in the elements of the packing parallel with the axis of the ring, the various elements being brought to a state of equilibrium when in the form illustrated in full lines in Fig. 4. The initial inclination of the packing in rectilinear form may be of such degree that when bent to ring-like form the surfaces 24 and 25 shall be in substantially the same plane. The packing is of course placed in the apparatus to be packed with the channel of V-shaped cross-section lying between the surfaces 26 and 29 opposed to the fluid to be confined. This fluid will be caused to enter the V-shaped channel and will have a tendency to force the lip portion 23 into firm engagement with the surface to be packed, which it may more readily do if the packing is also provided with the flexible or hinge-like joint along the zone of weakness between the lip and the body portion.

Packing of the above-described character may be constructed in any appropriate manner and of any suitable material. In the preferred form herein disclosed it is indicated as having been made by first folding a sheet 30 of rubber and asbestos fibre or other appropriate fibrous material in a plurality of folds, as indicated in Fig. 2, the last fold being carried entirely around the mass of material so as to form a covering or envelope for the internal folds. This folded mass of material may then be pressed in a suitable mold and vulcanized in the form illustrated in Fig. 1. The continuously curved surface at the base of the V-shaped channel tends to the longevity of the packing since it avoids the use of any sharp reentrant angle which would serve as a starting point for a line of rupture between the base of the lip and the body portion. When using a packing reinforced with layers of asbestos material the durability of the packing may be further enhanced, as illustrated in Figs. 1 and 2, by so disposing the fibrous material that the layers 31 will closely follow the curved surface extending from the surface 29 around to the surface 26 without any intermediate break or angle.

It is not essential that the packing be made in the specific form herein disclosed for purposes of illustration but should be regarded as including modifications and variations within the scope of the appended claims. The more important features, as already described, are the body portion and lip portion united by a weakened portion forming a flexible or hinge-like joint between the two, and the packing having the surfaces 24 and 25 disposed in different planes but adapted to be brought to substantially the same plane when the packing is bent from the form in which it is made to the form in which it is intended to be used.

What I claim is:

1. A packing comprising a relatively massive body portion, a lip portion, and an intervening zone of weakness and relatively great flexibility forming a hinge-like connection between said lip and body portions, one surface portion of said lip portion being an extension of a surface portion of said body portion and cooperating therewith as a working surface of said packing.

2. A packing comprising a relatively massive body portion and a lip portion, one surface portion of said lip portion being an extension of a surface portion of said body portion and cooperating therewith as a working surface of said packing, the other surface of said lip portion being flared from the free edge of said lip to a relatively massive portion adjacent its zone of attachment with the body portion, said lip portion being grooved along said zone of attachment to provide a relatively flexible connection between said lip portion and said body portion.

3. A packing comprising a relatively massive body portion of L-shaped form in cross-section and a tapered lip portion of wedge-shaped form in cross-section extending from one arm of the L in the general direction of its other arm, the external surface of said lip portion being a continuation of the surface of the end of the arm of the L of which the lip is an extension, and its inner surface

being flared inwardly from its free edge to its zone of attachment with the L-shaped body portion, said lip portion being grooved internally along said zone of attachment to provide a relatively flexible connecting portion localized along said zone.

4. A packing comprising a relatively massive body portion of L-shaped form in cross-section and a tapered lip portion of wedge-shaped form in cross-section extending from one arm of the L in the general direction of its other arm, the external surface of said lip portion being a continuation of the surface of the end of the arm of the L of which the lip is an extension, and its inner surface being flared inwardly from its free edge to its zone of attachment with the L-shaped body portion, the inner surface of said body portion being continuously curved from the base of the free arm of the L to the inner surface of the lip portion, the form of such curved portion being such as to provide an internally disposed groove along the zone of attachment between the lip and the body portion, thereby producing a relatively flexible hinge-like connection between said parts.

5. A packing, as defined by claim 2, constructed of rubber composition and reinforcing layers of fibrous material, a part of said reinforcing material being so disposed as to closely follow the surface of the groove along the zone of attachment between the lip portion and the body portion.

6. A packing comprising a relatively massive body portion and a lip portion, one surface portion of said lip portion being an extension of a surface portion of said body portion and cooperating therewith as a working surface of said packing, said packing being made in rectilinear form with the working surface of the lip portion normally inclined with respect to the working surface of the body portion of which it is an extension, whereby the distortion of the lip portion, when the packing is bent to circular form, will tend to cause its working surface to become a continuous cylindrical extension of the cylindrical working surface of the body portion, the normal inclination of the lip portion being such that it will be directed towards the axis about which the packing is intended to be bent to circular form.

7. A packing comprising a relatively massive body portion of L-shaped form in cross-section and a tapered lip portion of wedge-shaped form in cross-section extending from one arm of the L in the general direction of its other arm, the external surface of said lip portion being a continuation of the surface of the end of the arm of the L of which the lip is an extension, and its inner surface being flared inwardly from its free edge to its zone of attachment with the L-shaped body portion, said packing being made in rectilinear form with the external surface of its lip portion normally inclined away from the free arm of the L, whereby, when the packing is bent to the form of an annulus, with the lip portion at the part of smallest diameter, the distortion of the lip portion will tend to cause its working surface to become a continuous cylindrical extension of the cylindrical surface of the end of the L from which the lip extends.

In witness whereof, I have hereunto signed my name.

CECIL R. HUBBARD.

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