Feb. 22, 1927. 1,618,511

W. H. BURSTALL

PACKING CONSTRUCTION

Filed March 7, 1923

Fig. 1

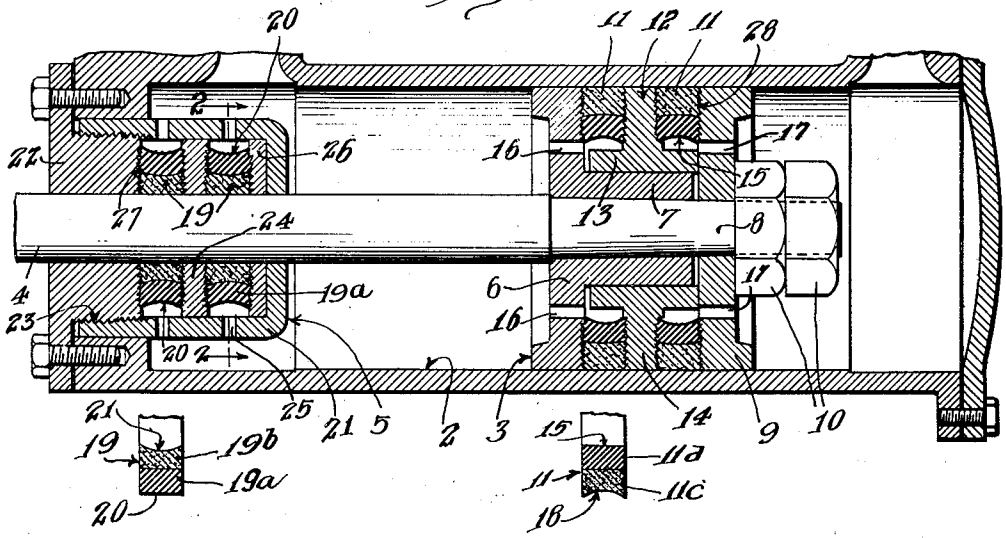


Fig. 1a

Fig. 1b

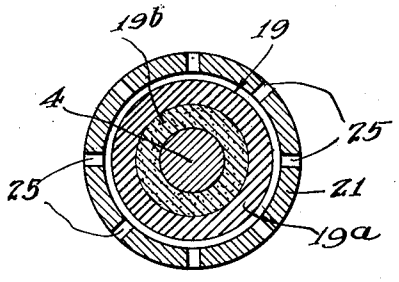


Fig. 2

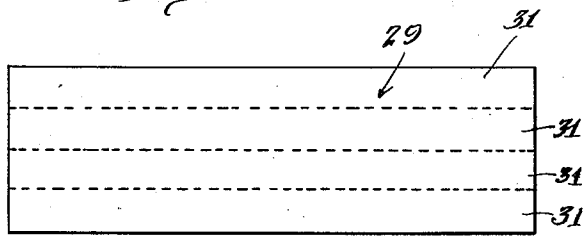


Fig. 3

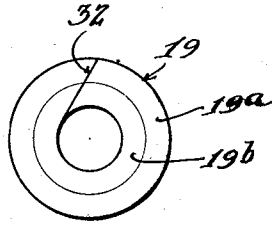


Fig. 5

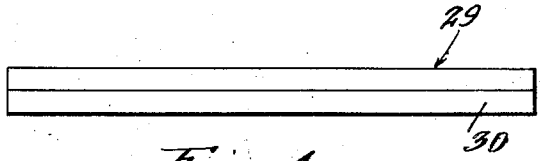


Fig. 4

Inventor
William H. Burstall

By Lyon & Lyon attys

Patented Feb. 22, 1927. 1,618,511

UNITED STATES PATENT OFFICE.

WILLIAM H. BURSTALL, OF LOS ANGELES, CALIFORNIA.

PACKING CONSTRUCTION.

Application filed March 7, 1923. Serial No. 623,402.

This invention relates to a packing construction for packing a cylindrical face in a fluid pressure device. While the invention is applicable to machines of any kind operating with or upon a fluid under pressure, in the following specification the invention is described as applied to a pump. The device is particularly useful when applied to pumps used in connection with the operation of oil wells. These pumps are subjected to rough usage, as considerable sand finds its way into the cylinders, making it very difficult to maintain the packing intact, and necessitating frequent shutting down of the pump to re-pack the piston or adjust its packing. The general object of the present invention is to produce a packing construction which will operate effectively to pack the pump, and which is so contructed as to take up the wear on the packing as it occurs, thereby obviating the necessity for frequent renewal or adjustment of the packing; also to provide a novel packing ring having a construction operating to assist in maintaining the packing force or pressure against the packed surface. A further object of the invention is to produce a packing ring of such construction as will enable it to co-operate with the fluid pressure within the device, to maintain the packing tightly pressed against the face to be packed.

Further objects of the invention will appear hereinafter.

The invention consists in the novel parts and combination of parts to be described hereinafter, all of which contribute to produce an efficient packing construction.

A preferred embodiment of the invention is described in the following specification while the broad scope of the invention is pointed out in the appended claims.

In the drawings:

Fig. 1 is a longitudinal section through a fluid pressure device in the form of a pump barrel or cylinder with its reciprocating piston or plunger, certain parts being broken away.

Fig. 1[a] is a cross section through the packing ring, of my invention, broken away, and illustrating the preferred form of the packing ring which is used for the stuffing box of the pump.

Fig. 1[b] is a view similar to Fig. 1[a], but showing the form of packing ring which I use for packing the piston head.

Fig. 2 is a cross section of the stuffing box taken on the line 2—2 of Fig. 1.

Fig. 3 is a plan showing a sheet or blank which is produced in the process of making the packing rings.

Fig. 4 is a side elevation of the blank or sheet shown in Fig. 3.

Fig. 5 is a side elevation of one of the packing rings embodying my invention.

In practicing my invention, I provide a unitary packing ring having a relatively soft annular portion with a rubbing face to rest against the face which is to be packed and having a relatively hard and compressible annular portion secured to the side of the first named annular portion remote from the face to be packed; I also prefer to provide means for forcibly clamping the sides of the ring, which develops compressive forces throughout the mass of the ring, and compresses the packing in a direction parallel to the axis of the surface being packed. In addition to this, I provide for admitting the fluid under pressure to the exposed face of the relatively hard annular portion, whereby the relatively hard portion imparts force to the relatively soft portion and forces the same toward and against the face to be packed. The clamping means maintains the hard portion in the position to which it has been advanced by the fluid pressure. The specific mode of operation is substantially as follows: The fluid pressure being exerted toward the face to be packed produces an outward movement and a distortion or bulge in the materil of relatively hard annular portion in the vicinity of the medial plane of the ring, and the clamping means on the side of the ring cooperates with the ring to prevent the relatively hard portion from restoring itself to its original shape.

In this way a permanent distortion is produced, the effect of which is that a continuous pressure or force is maintained by the relatively hard annular portion against the relatively soft annular portion, and as the wear takes place on the soft portion, the relatively hard portion follows up or advances to back up the soft portion and in this way takes up the wear as it occurs.

In using the term "exposed face," I mean the face of the relatively hard annular portion which is on the side opposite to the rubbing face of the relatively soft annular portion. My packing is of "soft" or vegetable material.

I shall now describe my invention as applied to packing the piston of a pump at the face of the cylinder, and also as applied to a stuffing box construction where the cylindrical face to be packed is inside of the packing, that is to say, where the side of a piston rod is to be packed.

The pump may comprise a horizontal cylinder 1 having a bore or cylindrical face 2, in which a piston head 3 reciprocates, said piston being carried on a piston rod 4, passing through a stuffing box 5 at the head of the cylinder. The packing rings are preferably applied in duplicate at each packing point, and the construction is such as to enable the water pressures to be admitted to the exposed face of the packing.

In order to accomplish this, the piston head comprises a body 6 having a disc at one end and a cylindrical neck 7 projecting from the disc. Through this neck the tapered end 8 of the piston rod 4, extends; and a cap plate, or follower 9 is employed to form the outer end of the piston head, held in place by adjusting nuts 10 received on the threaded end of the rod. The disc of the body 6, and the cap plate 9 operate as means for clamping two packing rings 11 in place, the said packing rings being held apart by a separator 12. This separator has an annular body 13 received on the neck 7, and has an annular flange 14 lying between the packing rings and engaging their side faces.

By tightening up the nuts 10, the packing rings may be clamped on their side faces, that is to say a clamping force is exerted parallel with the direction of the axis of the cylinder. I construct the parts so as to enable means to be employed to force the relatively hard annular portion toward the face to be packed. This may be accomplished by utilizing the fluid pressure for this purpose. In this case the inner diameter of the packing rings 11 is made slightly larger than the outer diameter of the hub or ring 13 of the separator. This enables me to admit the fluid pressure to the exposed faces 15, of the packing rings, and for this purpose I provide the piston head 6 with openings 16, and provide the disc or cap plate 9 with similar openings 17.

In order to disclose more fully the construction and mode of operation of my packing, reference is now made to Fig. 1^b, which shows the normal cross section of the packing rings 11 before the same are put in operation. Each ring comprises a relatively soft annular portion 11^c and a relatively hard but compressible annular portion 11^d. The soft portion 11^c has a rubbing face 18 to come in contact with the face to be packed and this rubbing face is preferably of concave form. In connection with Fig. 1^b, it should be understood that this figure represents the normal cross section taken through the underside or lower edge of the packing ring before it is placed in the pump. When the fluid pressure is admitted against the exposed face 15 of the relatively hard annular portion 11^d, it produces a distortion movement or bulge in the material in the vicinity of the medial plane of the ring, that is, to say, it forces this part of the ring outwardly; this may transform the face 15 into one of concave form (see Fig. 1). As the clamping means or plates on the side faces of the packing ring maintain their pressure, it will be seen that the relatively hard annular portion of the ring co-operates with the clamping means to maintain permanently this distorted shape of the relatively hard annular portion of the packing ring. The effect of this is that the concave face or rubbing face 18 of the relatively soft annular portion is also somewhat transformed and tends to assume a shape more nearly flat or cylindrical; by reason of this its pressure upon the bore 2 is rendered substantially uniform throughout the width of the ring. Furthermore, by reason of the distorted shape of the inner annular portion of the ring it maintains a constant pressure upon the relatively soft annular portion and follows up the soft portion as it becomes worn away.

When the invention is applied to a stuffing box, the construction of a packing and its mode of operation is substantially the same as that just described, except that in this case the relatively hard annular por- 19^a of the pack rings 19, is placed on the outer side of the ring instead of on the inner side, and the inner side of the ring is composed of a relatively soft portion 19^b. The outer face 20 of the ring now becomes the exposed face and the inner face 21 is the rubbing face, and is preferably made slightly concave. (See Fig. 1^a.)

The stuffing box has any suitable construction that will provide clamping means for clamping the side faces of the rings 19 and which will also provide for enabling the fluid pressure to be admitted to the exposed face 20 of each ring. In order to accomplish this, the stuffing box may be in the form of a container or cup 21, the outer end of which is carried by a plug 22 removably secured as a head on one end of the cylinder. The connection between the cup 21 and the the plug 22 includes threads 23, which enable the cup to be screwed onto the plug, so as to clamp the packing rings between the plug and the bottom of the cup. Between the two rings I provide a separator 24 which is simply a ring which fits loosely in the cup and loosely on the piston rod 4.

The fluid pressure existing within the pump cylinder is admitted to the exposed faces 20 of the rings through openings 25 in the side wall of the cup; in this way the relatively hard annular portions 9^a are dis-

torted, that is to say, a movement or bulge in the material in the medial plane of the ring takes place, giving the packing ring somewhat the shape illustrated in Fig. 1. This pressure, of course, flattens out the concave face 21 against the side of the rod, maintaining substantially uniform pressure throughout the width of the ring. By reason of the clamping force exerted on the side faces of the rings, this distortion is permanently maintained.

While the distortion of the rings tends to be permanently maintained as described, it will be evident that even if the side clamping means for the rings were not sufficiently tight to maintain a permanent bulge in the medial plane of the ring, as soon as the fluid pressure is exerted on the exposed face of the ring, the bulge would be produced.

The bottom of the cup which forms the stuffing box is provided with a liner plate 26. This is done for convenience and to facitlitate the use of serrations or annular teeth 27, which I prefer to provide on the face of this plate and on the face of the separator 24 and also on the inner face of the plug 22. These serrations or ribs project toward the face to be packed, that is to say, in the stuffing box they project toward the cylindrical face of the piston 4, and their function is to tend to prevent an outward or return movement of the packing ring away from the packed face after the fluid pressure is discontinued.

Similar teeth or ribs 28 are provided on the clamping faces of the piston head 6, the cap plate 9 and side faces of the flange 14 of the separator 12.

In producing the packing rings, I form a sheet 29 of relatively hard rubber. The rubber compound, to form this sheet, should contain about 20 to 30 per cent, of fibrous material, such as cotton fiber. The material from which the sheet is formed should be rolled so that the grain of the rubber runs transversely to the length of the sheet. This sheet is then laid over a similar shaped sheet 30 of relatively soft rubber and the two sheets are firmly pressed together so as to force out any air between the sheets. This operation is accomplished while the sheets are hot, so that they adhere together. The sheet is then cut into strips 31, as indicated by the dotted lines in Fig. 4, each strip having substantially the width which is desired for the finished packing ring. The strip, after being cut from the sheet, is rolled around and its ends cut so as to form a scarf joint 32, (see Fig 5) and in this shape the ring is placed in a mold which is heated by steam of approximately 60 pounds pressure per square inch; the molding operation gives the ring the desired shape and vulcanizes the rubber. This operation secures the two portions of rubber together as a unitary structure, and also vulcanizes the ends of the strips together at the scarf joint 32.

It is understood that the embodiment of the invention described herein is only one of the many embodiments this invention may take and I do not wish to be limited in the practice of my invention nor in my claims to the particular embodiment set forth.

What I claim is:

1. A unitary packing ring for packing a cylindrical face consisting of an annular portion of relatively soft and compressible vegetable material for engaging the cylindrical face, and a relatively hard annular portion of vegetable material having a face secured to the side of the relatively soft annular portion, for exposure to fluid pressure and operating under compressive forces developed in the mass of the said hard portion to force the relatively soft annular portion against the cylindrical face to be packed.

2. A packing ring for packing a cylindrical surface comprising an annular portion of relatively soft and compressible vegetable material having a concave circumferential rubbing face on one side to be applied to the surface to be packed, and having an annular portion of relatively hard compressible vegetable material on the opposite side of the relatively soft annular portion, said relatively hard portion having an exposed face to receive pressure and impart the same to the relatively soft annular portion.

3. A unitary packing ring for packing a cylindrical face, consisting of an annular portion of relatively soft compressible rubber having a rubbing face for engaging the cylindrical face and a relatively hard annular portion of rubber vulcanized to the side of the first named annular portion remote from the said rubbing face, the relatively hard annular portion having a face for exposure to fluid pressure and operating to impart the packing pressure to the relatively soft annular portion and hold the same against the cylindrical face to be packed.

Signed at Los Angeles, California, this 28th day of February, 1923.

WILLIAM H. BURSTALL.