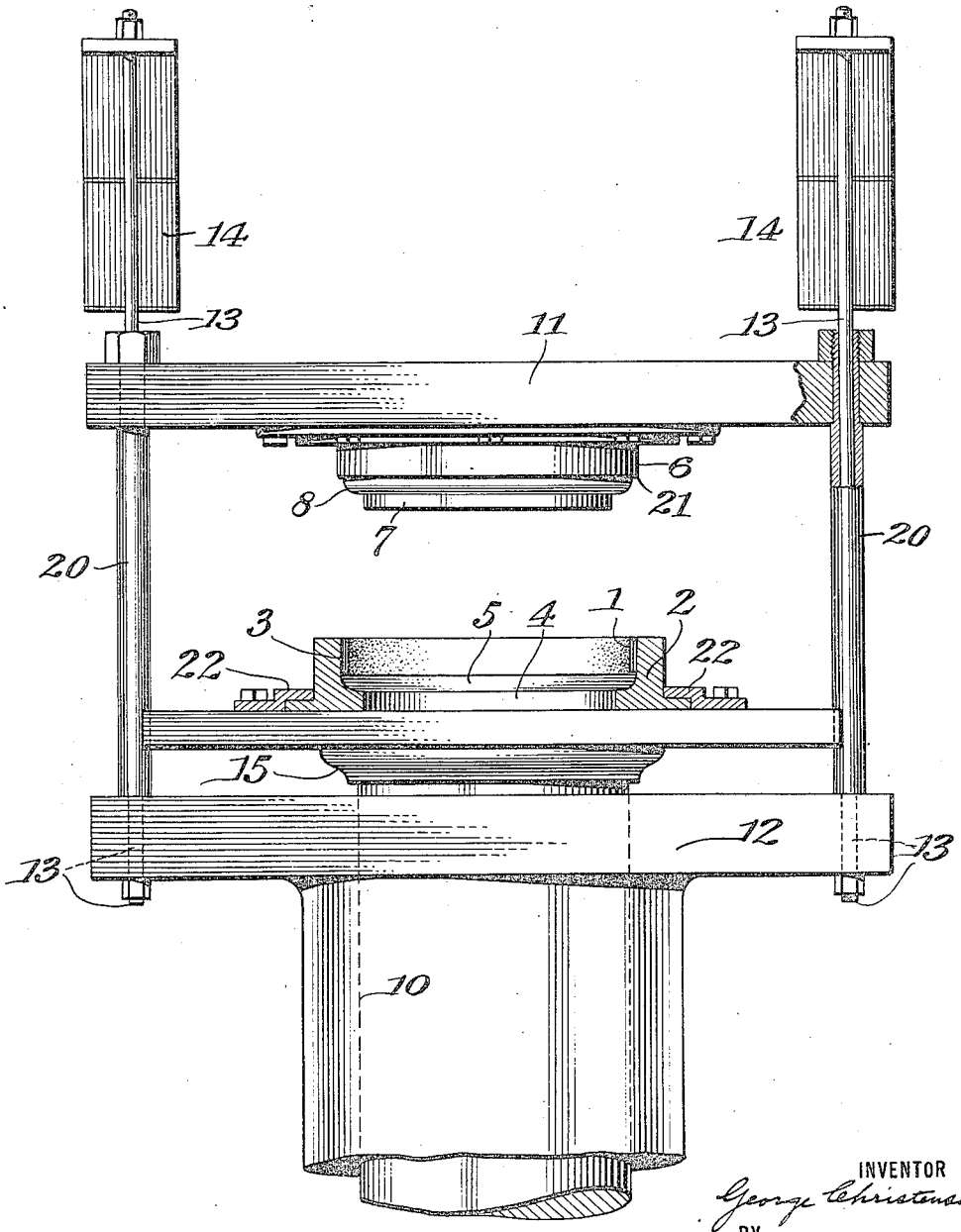
May 8, 1923. 1,454,506

G. CHRISTENSON

PROCESS AND APPARATUS FOR FORMING CUP PISTON RINGS

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Fig. 1.



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Fig. 2.

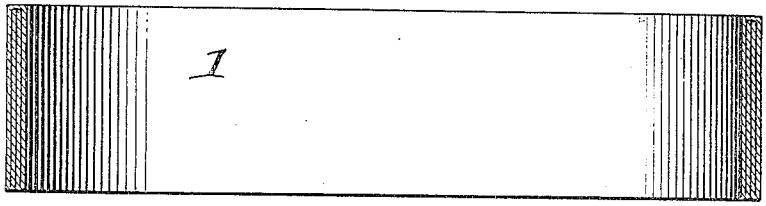


Fig. 3.

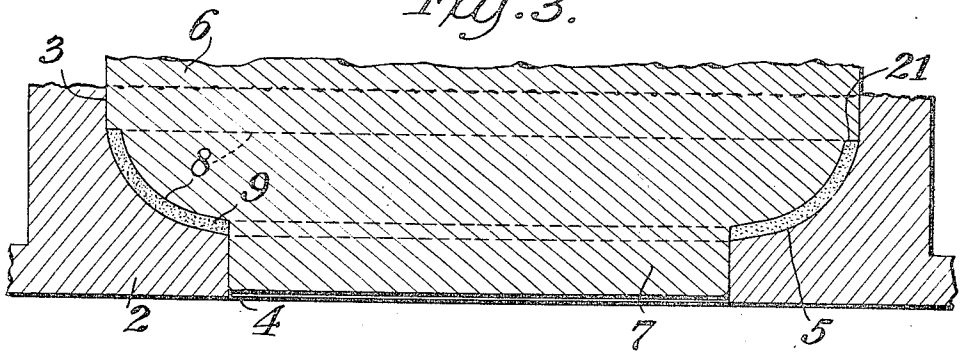
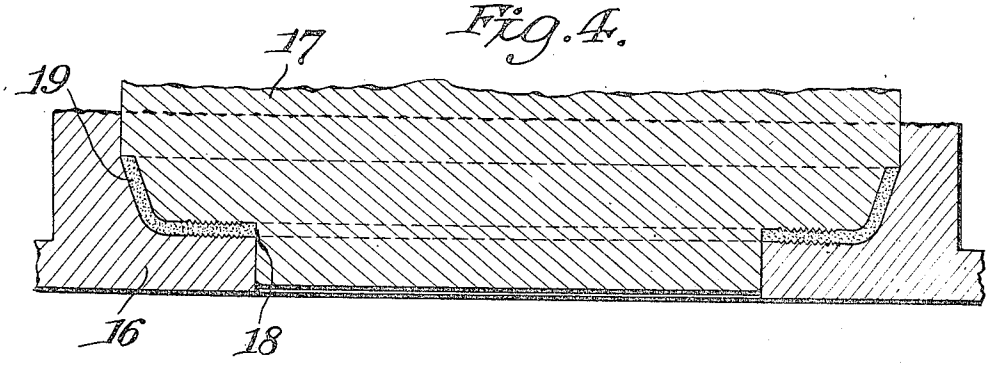


Fig. 4.



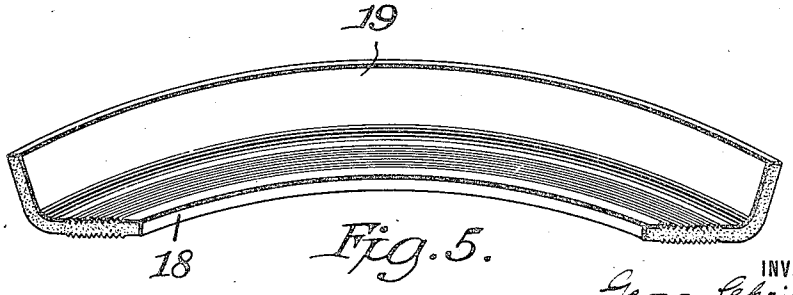


Fig. 5.

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UNITED STATES PATENT OFFICE.

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PROCESS AND APPARATUS FOR FORMING CUP PISTON RINGS.

Application filed September 1, 1920. Serial No. 407,495.

To all whom it may concern:

Be it known that I, GEORGE CHRISTENSON, a citizen of the United States of America, residing at North Plainfield, county of Somerset, State of New Jersey, have invented certain new and useful Improvements in Processes and Apparatus for Forming Cup Piston Rings, of which the following is a specification.

While my invention may be used on different kinds of material it more particularly relates to the manufacture of cup shaped, piston packing rings of vulcanized textile fabric such as are described in my Patent No. 1,320,675 granted November 4, 1919.

These rings are usually made of heavy asbestos cloth folded on itself several times, and when these have to be pulled, and distorted from their original form to produce the shape necessary for insertion in the vulcanizing mold, it requires great strength and dexterity on the part of the operatives (especially in the case of large rings), soon wears the skin off their hands, and requires much time and effort.

When attempts to mold these rings by presses have been heretofore made, by using molds of the final shape of the packing, the material has usually broken at the point where the inwardly extending flange of the completed packing ring merges into the outwardly flaring lip, and the inner edge of the flange has been wrinkled and bent or buckled when crowding the material together and upsetting it to reduce it to the smaller inner diameter of said flange. This buckling of the material has also concentrated at various points an excess of the graphite used as a coating for the ring, which interfered with complete vulcanization at those points and produced defects which developed after the ring was completed and sometimes after being put into use and thus making the entire cost of its manufacture a total loss.

According to my present invention I take the cylindrical ring of folded fabric, or other material, which is the blank resulting from the first step of the process, and force it into a mold having cylindrical walls of the same diameter as the ring which merge into a tangential, concave portion, the inner face of which is of approximately arc-shaped cross section, so that the cylinder of textile material is gradually and smoothly crimped inwardly by the concave part of the mold and compressed or upset evenly to reduce all but its upper edge to varying lesser diameters. The blank is held down on the concave walls of the mold by correspondingly convexly curved walls of a former which has a main cylindrical body fitting into the above described cylindrical part of the mold. Said cylindrical plunger body is offset from, or overhangs the adjacent portion of the wall of the convex portion to form a circular shoulder which acts as a follower to drive the blank being operated upon down into the concave part of the mold. The blank, with inwardly curved walls, formed by this second step of my process, is of smooth surface and even structure and can safely withstand the slight further distortion in the final, vulcanizing mold necessary to produce the finished ring.

The best method of carrying out my invention and the best form of apparatus for use therein at present known to me, are illustrated in the accompanying two sheets of drawings in which,

Fig. 1 is a side elevation of a press with mold and former in position for use, parts being shown in section and others broken away.

Fig. 2 is an axial cross section of a short cylinder or ring of textile material folded on itself, which is the blank prepared for the first molding step of the process.

Fig. 3 is a cross section of the mold and former, showing them operating on this blank to give it its intermediate, inwardly curved shape, parts being broken away.

Fig. 4 is a similar view of the final or vulcanizing mold with the contained blank in its third form and

Fig. 5 is a perspective view of a fragment of the completed packing ring.

Throughout the drawings like reference characters indicate like parts. 1 is the ring of textile fabric, usually treated with rubber cement for vulcanization, which is the blank produced for subsequent molding, the fabric being folded on itself to form a short hollow cylinder of a diameter equal to the outer diameter of the desired

packing ring. 2 is an annular mold having an upper cylindrical portion 3 of an internal diameter equal to the external diameter of ring or blank 1, a lower portion with a central bore 4 of a diameter equal to the diameter of the inner edge of the flange 18 on the completed packing ring shown in Fig. 5, and an intermediate concave portion 5 joining the portions 3 and 4. This concave portion has an inner wall or face of approximately arc-shaped cross section, the upper portion of each arc being approximately tangential to the corresponding element of the upper cylindrical portion 3, and the lower portion of each arc curving inwardly and, at that extremity, being approximately normal to the corresponding elements of the cylindrical bore 4. With this mold cooperates a former having a main cylindrical body 6, of a diameter equal to that of the portion 3 of the mold, or near enough thereto to make a working fit therewith, a projecting cylindrical nose or centering guide 7, which is a working fit in the bore 4 of the mold and an intermediate convex portion 8, the axial cross sections of which are of substantially arc-shaped profile, concentric with the profiles of the concave wall 5 of the mold. The radius of the profile of part 8 of the former is less than that of the part 5 of the mold by an amount equal to the thickness of the blank 9 to be produced by this apparatus in this step of the process.

The model and former above described are placed in a suitable press such as the hydraulic press shown in part in Fig. 1 where 10 is the cylinder of the press supporting overhead platen 11 from yoke 12, on vertical guide and tension rods 13, 13, by means of sleeves 20, 20, placed around said guides, rods 14, 14 are rubber buffers fast on the upper ends of rods 13, 13. Mold 2 is suported on the ram or plunger 15 of the press by any suitable fastenings such as clips 22, 22.

In operating the process with the apparatus so far described the blank ring 1, is placed in the upper cylindrical portion 3 of mold 2, as indicated in Fig. 1. When the press is operated and ram 15 rises, it forces the blank 1 up against the shoulder 21 on the former and as the mold gradually envelopes the former by its further upward motion the blank 1 is forced down in the mold's concave portion 5, its lower portion being curved inwardly and upset slightly into the form of the second blank shown at 9 in Fig. 3. When the pressure on the former becomes sufficient to lift it, and platen 11, the latter is raised on guides 13, until rubber buffers 14, 14 are compressed to the limit of the upward thrust of the ram. This forces the inner edge of the blank 9 to a bearing on cylindrical nose 7 of the plunger and compresses and compacts the original blank 1 into the form of blank 9 of reduced thickness and correspondingly greater density, but without wrinkling or buckling or breaking it. When the press is opened buffers 14, 14 expand and platen 11, drops back onto the ends of sleeves 20, 20, which stop the further descent of the former. Continued downward travel of the ram 15 frees the mold from the former, the blank 9 is removed from the mold, a new blank 1 substituted and the operation repeated.

The blank 9 is then placed in the finishing mold 16, slightly distorted by the pressure of cooperating plunger or former 17 to produce the inwardly extending flat flange 18, and the outwardly flaring lip 19 of the completed packing ring as shown in Fig. 4, and the parts are vulcanized by heat in position in this final mold in the usual way. On opening this mold the completed packing ring is removed for use.

By employing my process and apparatus one press can be made to turn out as many rings as ten men can make by hand in the old way in the same time, and all of them perfect.

Having described my invention I claim.

1. The process of forming a cup-shaped piston packing ring out of textile fabric or the like which comprises the following steps: First, forming a hollow cylinder of the fabric, the diameter of which equals the outer diameter of the cup ring to be formed; second, changing said cylinder by externally applied stresses into a ring, the cross-section of which is concave and arc-shaped, curving inwardly toward the center of the ring, the greatest diameter of said ring equalling the diameter of the original cylinder and the smallest diameter equalling the inner diameter of the flange of the cup ring to be formed; third, flattening the inner portion of the blank so formed to produce the inwardly extending flange of the completed packing ring and molding the remainder of the blank into an outwardly flaring lip.

2. An apparatus for use in carrying out one step of the herein described process which comprises an annular open ended mold, the inner wall of which has concentrix cylindrical portions at either end of different diameters, and an intermediate portion of concave, approximately arc-shaped, profile, one end of which profile is tangent to the wall of the cylindrical portion of larger diameter and the other end of which profile is approximately normal to the wall of the cylindrical portion of smaller diameter, combined with a co-operating former which has a main cylindrical body of an external diameter the same as the internal diameter of the largest portion of the mold, a cylindrical projecting

portion of an external diameter the same as the diameter of the bore of the smallest portion of the mold, and an intermediate portion with a wall of convex, approximately arc-shaped profile concentric with the profile of the concave portion of the mold but of a radius less than that of the mold profile by an amount equal to the predetermined thickness of the completed packing ring blank to be made in the mold.

GEORGE CHRISTENSON.

Witnesses:
JOHN J. REYNOLDS,
WILLIAM N. ALLMAN.