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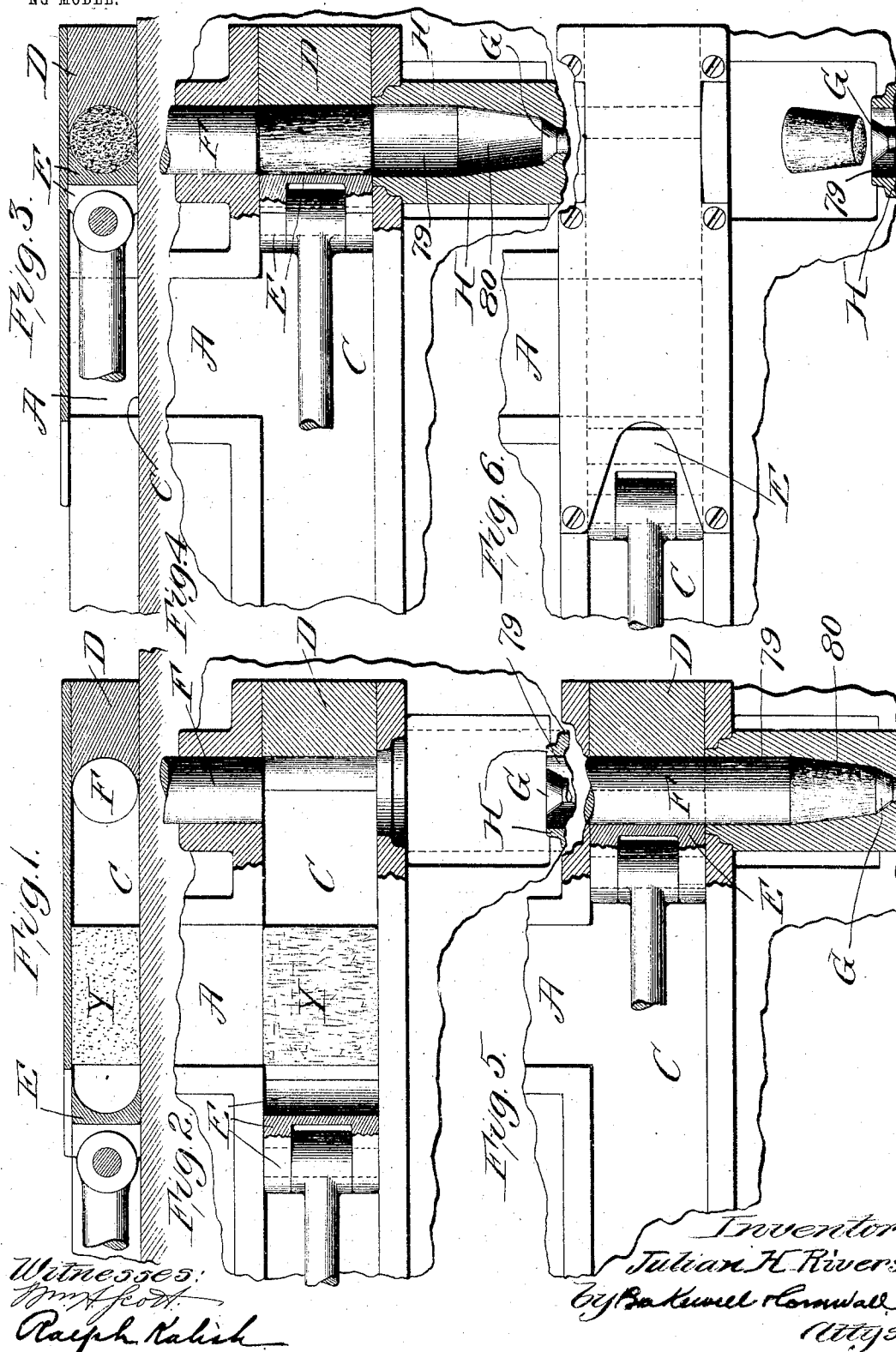
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J. H. RIVERS.

PROCESS OF FORMING STOPPERS, &c., FROM FIBROUS PULP.

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NO MODEL.



UNITED STATES PATENT OFFICE.

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PROCESS OF FORMING STOPPERS, &c., FROM FIBROUS PULP.

SPECIFICATION forming part of Letters Patent No. 768,304, dated August 23, 1904.

Application filed January 2, 1903. Serial No. 137,526. (No model.)

To all whom it may concern:

Be it known that I, JULIAN H. RIVERS, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Processes of Forming Stoppers and the Like from Fibrous Pulp, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which I have illustrated apparatus for practicing my process.

Figure 1 is a vertical elevation, chiefly in section, illustrating the trough or raceway in which is received the charge of pulp to be acted upon, together with the compressor and its cooperating abutment-block, the plunger being illustrated in end elevation. Fig. 2 is a plan view, partly in section, showing the parts illustrated in Fig. 1, together with a portion of the ejector and the die. Fig. 3 is a view of the character of Fig. 1, the pulp being shown compressed and the compressor being shown in its compressing position. Fig. 4 is a plan view, partly in section, of the parts shown in Fig. 3, together with the plunger, the die, and the ejector. Fig. 5 is a view of the character of Fig. 4, the plunger being shown in the position it assumes when the pulp is fully forced into the tapering portion of the die-cavity; and Fig. 6 is a view showing the machine after the compressor, plunger, and die have retreated, the finished stopper falling from the ejector.

My invention relates to processes for forming stoppers and the like from fibrous pulp, my object being to produce a process by means of which fibrous pulp can be so treated that in the finished stopper the fibers are principally disposed in longitudinal lines, a compacted, matted, or felted outer portion is provided, and the outer surface of the stopper is calendered or burnished, whereby the finished stopper has great strength to resist pulling strains, is provided with a surface of such character that it will not readily absorb liquids

or moisture and dirt will not readily adhere thereto, and the stopper is sufficiently elastic to cause it to properly close the opening in which it is placed.

To these ends and also to improve generally upon processes of the character indicated my invention consists in the various matters hereinafter described and claimed.

In following my process the fibrous pulp is placed upon a substantially horizontal support in order to permit the fibers to tend to arrange themselves in substantially horizontal planes, and this body of pulp is then compressed, the pressure being applied in a line transverse to that including the axis of the pulp mass which will become the longitudinal axis of the completed stopper. In this manner the fibers are forced to arrange themselves in lines substantially parallel with the said axis, the fibers tending to arrange themselves in lines parallel with the faces between which they are compressed. This transverse compressing is of such character that the mass of pulp is formed into a cylinder, and the fibers therefore lie in lines substantially parallel with the longitudinal axis of said cylinder. The said cylinder of pulp is then subjected to longitudinal pressure, whereby the fibers at the ends of the cylinder are forced out of the lines in which they have previously been disposed and are caused to lie in lines at angles to the longitudinal axis of the cylinder, said end fibers tending to arrange themselves in lines substantially parallel with the compressing-surfaces engaging the said ends. Said longitudinal compressing also serves to compact the pulp at the ends of the cylinder, so that a compacted mass of felted or matted fibers is produced at each end of the cylinder. The periphery of the cylinder is also subjected to pressure at an angle to the longitudinal axis of the cylinder, whereby the portion of the cylinder adjacent its periphery is compacted and the fibers are forced to move from their positions substantially parallel with the longitudinal axis of the cylinder, the article thus resulting having a compacted peripheral por-

tion of matted or felted fibers. The stopper thus produced is also burnished or calendered upon its surface.

The process can probably be better understood by reference to the accompanying drawings.

In the drawings, A represents a feed-trough or raceway, and C a trough into which said feed-trough opens, one end of said trough being closed by an abutment D, and a compressor E, adapted to cooperate with said abutment, reciprocating in said trough. F indicates a plunger which reciprocates across the said trough C, and G represents an ejector-head which is adapted to cooperate with the said plunger, H being a die which is provided with a cavity having a substantially cylindrical portion 79 and a tapering portion 80. The operative faces of the abutment-block D and of the compressor E are provided with complementary semicircular recesses, so that when said members are in substantial engagement with each other they produce a cylindrical chamber having one end closed by the head of the plunger F. The die H is movable over the said ejector and can move into such position that its cavity alines with the opening in the said cylindrical chamber formed by the abutment-block and the compressor, the ejector-head closing the smaller end of the said die-cavity when the die is in the position just indicated. The die can move backwardly over the ejector-head in order to expose the same.

The mass of pulp to be treated, Y, is deposited in the raceway C and is forced by the compressor against the abutment D, the said compressor and abutment thus compressing the pulp into a cylinder and causing the fibers to dispose themselves in lines substantially parallel with the longitudinal axis of said cylinder. The plunger F then moves longitudinally against one end of the pulp cylinder and forces the same out of the cylindrical chamber into the die-cavity and against the ejector-head, the said plunger and the said ejector-head thus exerting longitudinal pressure against the ends of the pulp cylinder and causing the pulp at said ends to become compacted and also causing the fibers at said ends to become matted or felted, as heretofore explained. Furthermore, as the pulp cylinder is forced into the tapering portion 80 of the die-cavity the wall of said cavity exerts pressure upon the periphery of the cylinder at an angle to the longitudinal axis of said cylinder, and thus compacts the peripheral portion of the pulp mass and also causes the fibers in said peripheral portion to move out of the substantially longitudinal lines in which they have been previously included, thus producing a matted or felted portion, as heretofore explained. The die-cavity being smooth and polished, the periphery of the pulp mass is burnished as it is forced into said cavity. After the stopper

has been forced into the cavity, as shown in Fig. 5, the plunger is rocked upon its axis, and thus burnishes what may be termed the "head" of the stopper, after which the plunger and the die are moved out of engagement with the stopper, said die moving into the position shown in Fig. 6, whereupon the support is removed from the stopper and it falls from the end of the injector, the stopper being then permitted to dry. It is believed that the burnishing action of the tapering portion of the die and of the smooth head of the plunger will be readily apparent and that no explanation of the same is necessary in this specification. I shall, however, explain the other actions recited in this specification. We will assume that when the pulp is deposited upon said raceway C the fibers extend in lines running at all angles, so that there is no regularity whatever as to the arrangement of said fibers. The fibers which are acted upon in the manner heretofore described are those which have some length and very little thickness. Bearing in mind the fact that when these fibers are deposited upon the horizontal raceway C they are in a measure suspended in a liquid it will be apparent that there is nothing to induce these fibers to stand on end and that therefore the fibers will act under the influence of the force of gravity and arrange themselves upon what may be termed their "sides" just as a match supported in a thin mucilage will fall upon its side, and thus lie in a plane substantially parallel with the supporting-surface. Although the fibers upon the raceway C will lie in substantially horizontal planes, they will extend in various directions in these planes. As the compressor moves against one end of the pulp mass in the raceway and forces this mass against the abutment D the fibers will be forced to arrange themselves in lines which extend substantially parallel with the faces between which the pulp mass is pressed just as if several matches in mucilage extending in all directions were subjected to the pressure of boards at the sides of the mass and moving toward each other said matches would assume positions parallel with the compressing-faces. It will therefore be readily apparent that after the compressing action the mass of pulp is a cylindrical body with its fibers arranged in lines substantially parallel with its longitudinal axis. When now the plunger-head moves against one end of the cylindrical mass, the fibers at said end are compacted in a manner which will be readily apparent, and they tend to arrange themselves in lines substantially parallel with the pressing-surface, so that the fibers at the head of the mass are forced out of the lines substantially parallel with the longitudinal axis of the pulp mass and tend to arrange themselves in lines at right angles to the said longitudinal axis. In being thus forced out of their former positions the end fibers are

more or less interwoven, matted, or felted, and in the mat thus produced are included the ends of the longitudinally-disposed fibers in the body of the stopper. The compacted, matted, or felted outer portion at the opposite end of the stopper is produced by the ejector-head in substantially the same manner in which the plunger-head produces the compacted, matted, or felted portion at its end of the stopper. As the cylindrical pulp mass is forced into the tapering portion of the die-cavity the peripheral fibers are compacted and tend to arrange themselves in lines substantially parallel with the tapering wall of the cavity, certain of these peripheral fibers moving over the ends of adjacent fibers which do not move as readily from their longitudinal lines, the peripheral compacted, matted, or felted portion thereby resulting.

I am aware that minor changes in the steps of this process can be made and substituted for those herein shown and described without in the least departing from the nature and principle of my invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The process of producing stoppers from fibrous material which consists in shaping a mass of such material, arranging the interior fibers in lines extending substantially longitudinally of the stopper and arranging peripheral fibers in lines extending at an angle to said longitudinal lines; substantially as described.

2. The process of producing stoppers from fibrous material which consists in shaping a mass of such material, arranging the interior fibers in lines extending substantially longitudinally of the stopper, and compacting the peripheral portion of the stopper and arranging the fibers thereof in lines at angles to said longitudinal lines; substantially as described.

3. In the process of forming stoppers from fibrous material, depositing a mass of such material upon a substantially horizontal support, and, while said mass of material is free from longitudinal pressure, subjecting the

same to lateral pressure between surfaces which are substantially straight in horizontal lines to cause the fibers to arrange themselves in substantially longitudinal lines; substantially as described.

4. In the process of producing stoppers from fibrous material, causing the fibers to arrange themselves in substantially horizontal planes, and then, while the mass of material is free from longitudinal pressure, subjecting the mass to lateral pressure between surfaces which are substantially straight in horizontal lines to cause the fibers to arrange themselves in substantially longitudinal lines; substantially as described.

5. The process of producing stoppers from fibrous material which consists in subjecting a mass of material to lateral pressure to form said material into a cylinder with its fibers in longitudinal lines, and then applying longitudinal pressure to one end of said cylinder and thus forcing the same into a tapering shape; substantially as described.

6. The process of producing stoppers from fibrous material which consists in depositing a mass of such material upon a horizontal support, then subjecting said mass to lateral pressure to form the same into a cylinder, and then forcing said cylinder by longitudinal pressure into a tapering shape; substantially as described.

7. The process of making pulp stoppers which consists in causing the fibers of the pulp to be arranged substantially in line with the length of the stopper, then condensing the pulp in a direction transverse to the length of the stopper, and finally calendering the exterior surface of the stopper by pressure applied in the direction of the length thereof; substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 31st day of December, 1902.

JULIAN H. RIVERS.

Witnesses:

GALES P. MOORE,
GEORGE BAKEWELL.