E. C. HAWKINS.

WATERPROOFED PAPER CONTAINER.

APPLICATION FILED JULY 6, 1918.

1,301,840. Patented Apr. 29, 1919.

Fig. 1.

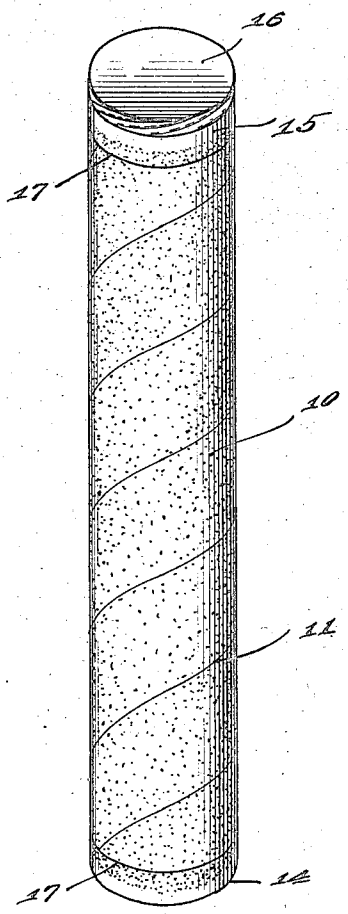
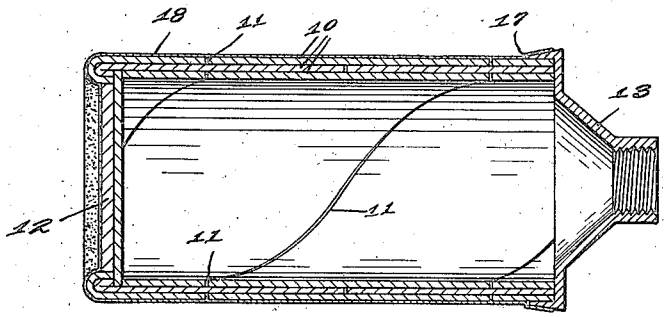


Fig. 2.



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UNITED STATES PATENT OFFICE.

EDWIN C. HAWKINS, OF NOBLESVILLE, INDIANA.

WATERPROOFED PAPER CONTAINER.

1,301,840. Specification of Letters Patent. Patented Apr. 29, 1919.

Application filed July 6, 1918. Serial No. 243,685.

To all whom it may concern:

Be it known that I, EDWIN C. HAWKINS, a citizen of the United States, residing at Noblesville, in the county of Hamilton and State of Indiana, have invented a new and useful Waterproofed Paper Container, of which the following is a specification.

It is the object of my invention to provide a water-proof paper container, especially of the mailing tube type where the body of the container is formed of a plurality of superposed layers of suitable paper wound helically with broken joints, and where the ends of the tube are provided with separate end members, for closing such ends.

Many articles must not only be protected while in storage or transit, but must be kept free from moisture, because they would be spoiled if permitted to become wet or even damp. Containers of the mailing tube type have not heretofore been suitable for such articles, for attempts effectively to waterproof such containers, against submergence for instance, had not been successful. This was largely because of the joints in these containers, both between the adjacent turns of the helical winding and between the body of the container and its end pieces, which joints gave water ready access to the edges of the paper layers so that it could soak edgewise through them. By reason of the structure of the paper used for such tubes, such as strawboard and test-board, this is much easier than soaking transversely therethrough.

By my present invention, I provide a paper container which is not only impervious to water transversely, but one in which the joints both in the body of the container and between such body and the end pieces are waterproof, so that access of water to the edges of the paper layers is prevented. In order to do this, I cover the surface of the paper container and span such joints by a vulcanized rubber film, which is applied as a solution of rubber in a volatile solvent, preferably in two coats with evaporation of the solvent between the application of the two coats, and is vulcanized in position after the final evaporation of the solvent. The process of waterproofing these containers is claimed in my co-pending application Ser. No. 243686 of even filing date herewith.

The accompanying drawing illustrates my invention.

Figure 1 is a perspective view of a waterproof paper container embodying my invention; and Fig. 2 is a partial longitudinal section through such a paper container, of somewhat different form and on a somewhat larger scale, and with the thickness of the walls and the rubber coating magnified, to show more clearly how the rubber coating overlaps the joints.

The body of the container comprises a plurality of layers 10, of suitable paper such as strawboard or test-board, wound helically upon one another to form a tube, in the usual manner of mailing tubes. The joints 11 of the respective layers break with one another, so that beneath such joints of each layer there is a jointless surface of the adjacent layer. The end members of the tube fit over or within the tube, as desired, in the latter case some of the outer layers of the tube near the end preferably being folded in upon themselves so as to leave no raw edges exposed. The end pieces may be of material similar to that of the tube, as is the permanently closing end disk 12 of Fig. 2; or may be of metal, as are the end piece 13 of Fig. 2 and the end bands 14 and 15 of Fig. 1. If of metal, they may be parts of closing end caps, as in the band 14; or they may or may not be provided with internal or external screw threads, as are the end piece 13 and the end band 15, for receiving a detachable closing piece, such as the end cap 16 of Fig. 1. In the particular containers shown, a paper closing disk is shown inserted in one end of the container body of Fig. 2, and metal end caps or bands are shown encircling the other end of the container in that figure and both ends of the container in Fig. 1; but these are merely illustrative arrangements, to show both an inserted and an encircling end piece and both a paper and a metal end piece, and neither arrangement is essential. The paper container itself is old, and may take various forms; *per se*, it is not my invention.

In order to water-proof the container, I first apply to one or both surfaces—as illustrated, to the outside surface—a solution of rubber in some volatile solvent, such as benzol, gasolene, carbon tetrachlorid, or carbon bisulfid; particularly I spread this solu-

tion over the helical joints 11 between the adjacent edges of successive turns of the paper layer forming the surface being coated and over the joints 17 between the body of the container and the end pieces 12, 13, 14, or 15. When the end pieces are paper, such as the disk 12, I apply the solution over the corresponding surface thereof as well as over the entire surface of the tube; and when they are metal, such as the end piece 13 and the end bands 14 and 15, I apply the solution over the joints 17 and part way up on to the metal. Preferably I apply this solution with a brush, brushing in both directions; and particularly I brush in both directions over the helical joints 11 so as to cover both raw edges at such joints. I find the best results are obtained if the brushing over the joints 11 is done obliquely to such joints, as by brushing in planes perpendicular to the tube axis. After the solution has been applied, the solvent is permitted to evaporate, preferably in a current of hot air to expedite the evaporation. This leaves a thin film of rubber on the surface on which the solution has been applied and spanning the joints 11 and 17. This first coat acts as a filler, to some extent, to fill the pores of the paper. After the solvent of the first coat has evaporated, a second coat of the rubber solution is applied over the first coat, care being taken as before to cover the joints 11 and 17; and then the solvent of this second coat is allowed to evaporate. This leaves a second rubber film superposed upon and coalescing with the first, to form a rubber coating 18 covering the surface and spanning the joints 11 and 17. Then this rubber coating 18, if obtained from a non-vulcanizing solvent such as gasolene, benzol, or carbon tetrachlorid, is exposed to a suitable vulcanizer, such as sulfur chlorid. The vulcanizer may be applied with a brush as a liquid, or the rubber coating may be exposed to the fumes of the vulcanizer. The vulcanizing process is continued until the desired quality of rubber in the coating is obtained. However, if the rubber solvent used is itself a vulcanizer, as is carbon bisulfid, vulcanization is produced thereby, and no other vulcanizer need be applied.

The rubber solution and the vulcanizer may be applied by hand or by machinery, one machine for applying it to open-ended tubular containers being shown in the copending application of Charles B. Macy, Ser. No. 243629, of even filing date herewith.

The container which is thus produced is substantially water-proof under rigid tests. It may be submerged in water for considerable lengths of time and under considerable pressure, without any seepage of moisture through it. It may therefore be used for storing and transporting materials which must be kept dry but which are in danger of exposure to moisture in storage or transit; such as gun shells, shell timers, medical and surgical and hospital supplies, and also many other articles useful in both war and peace. The container may also be used as the permanent casing of many articles, such for instance as hand grenades, the contents of which must be kept dry. By applying the rubber solution to the inside surface instead of to the outside surface, the container is protected from internal moisture, so that it may be used as a holder for such liquids as do not re-act upon or dissolve rubber.

I claim as my invention:

1. A water-proof container, comprising a paper container coated with a vulcanized rubber film which was applied in solution in a plurality of coats and vulcanized in position.

2. A water-proof container, comprising a paper container coated with a vulcanized rubber film which was applied in solution and vulcanized in position.

3. A water-proof container, comprising a paper container of the mailing tube type with helical joints in its surface, and a vulcanized film of rubber spanning such helical joints and applied in solution in a plurality of coats and vulcanized in position.

4. A water-proof container, comprising a paper container of the mailing tube type with helical joints in its surface, and a vulcanized film of rubber spanning such helical joints and applied in solution and vulcanized in position.

5. A water-proof container, comprising a tubublar body of the mailing tube type with helical joints in its surface, separate end pieces at the ends of such tubular body with joints between such end pieces and body, and a vulcanized film of rubber spanning said helical joints and the joints between such end pieces and body, said film of rubber being applied in solution in a plurality of coats and vulcanized in position.

6. A water-proof container, comprising a tubular body of the mailing tube type with helical joints in its surface, separate end pieces at the ends of such tubular body with joints between such end pieces and body, and a vulcanized film of rubber spanning said helical joints and the joints between such end pieces and body, said film of rubber being applied in solution and vulcanized in position.

7. A water-proof container, comprising a tubular body, separate end pieces at the ends of such tubular body with joints between such end pieces and body, and a vulcanized film of rubber spanning said joints between such end pieces and body, said film of rubber being applied in solution in a

plurality of coats and vulcanized in position.

8. A water-proof container, comprising a tubular body, separate end pieces at the ends of such tubular body with joints between such end pieces and body, and a vulcanized film of rubber spanning said joints between such end pieces and body, said film of rubber being applied in solution and vulcanized in position.

In witness whereof, I have hereunto set my hand at Indianapolis, Indiana, this 21st day of June, A. D. one thousand nine hundred and eighteen.

EDWIN C. HAWKINS.