

Dec. 24, 1946.

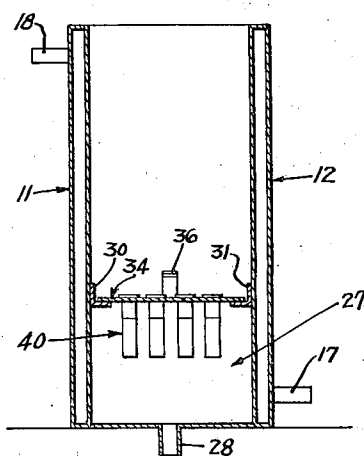
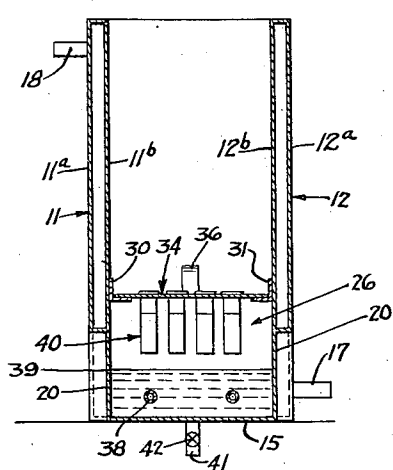
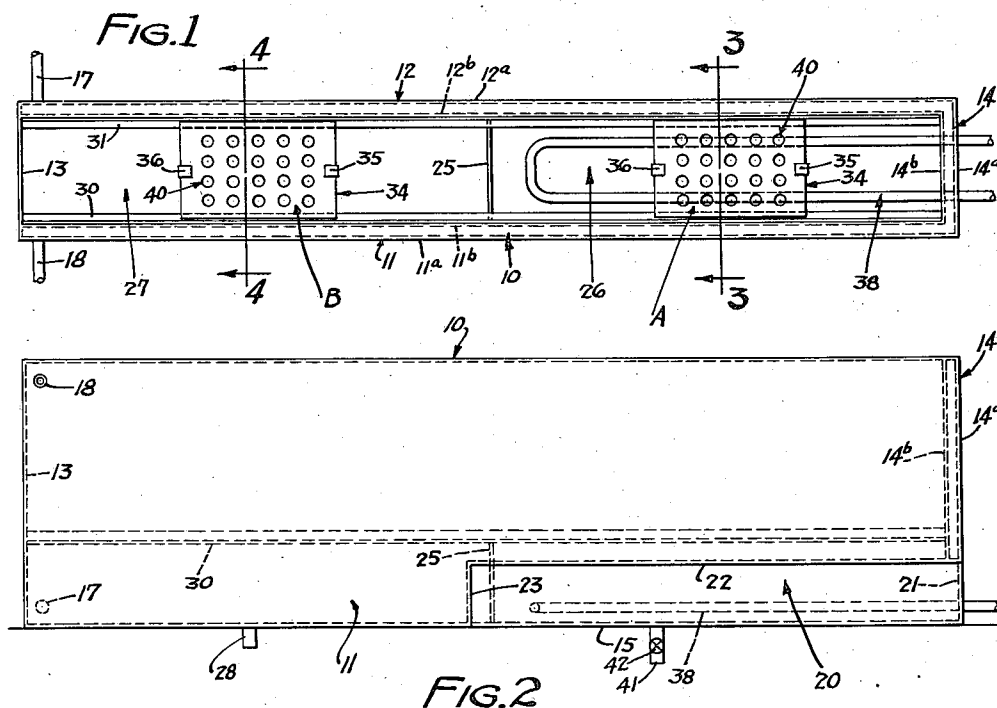
W. N. KING

2,413,144

METHOD OF FINISHING CONTAINERS IMPREGNATED WITH WAX

Filed Aug. 22, 1944

2 Sheets-Sheet 1



INVENTOR
WILLIAM N. KING

By Paul, Paul & Moore
ATTORNEYS

Dec. 24, 1946.

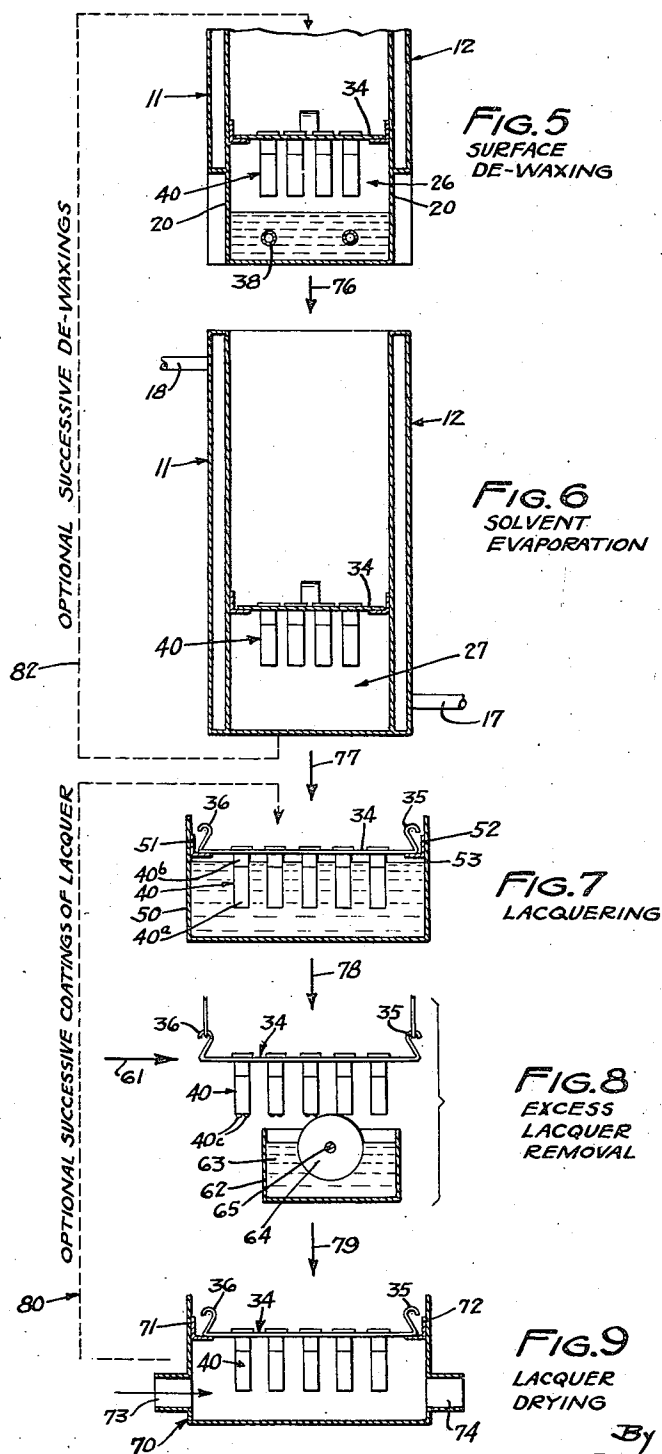
W. N. KING

2,413,144

METHOD OF FINISHING CONTAINERS IMPREGNATED WITH WAX

Filed Aug. 22, 1944

2 Sheets-Sheet 2



INVENTOR
WILLIAM N. KING
By Paul, Paul & Moore
ATTORNEYS

UNITED STATES PATENT OFFICE

2,413,144

METHOD OF FINISHING CONTAINERS
IMPREGNATED WITH WAXWilliam N. King, Anoka, Minn., assignor to
Federal Cartridge Corporation, Minneapolis,
Minn., a corporation of Minnesota

Application August 22, 1944, Serial No. 550,667

5 Claims. (Cl. 117-63)

1

This invention relates to a method and apparatus of finishing impregnated material and more particularly to a method and apparatus for lacquering paraffin impregnated fabricated paper articles. The invention is particularly adapted to the finishing of shotgun shells. As heretofore manufactured shotgun shells and the like have been composed of a paper tube that is fabricated together with a metal or plastic cup to form the finished cartridge. As customarily manufactured the tube is impregnated with a wax, usually paraffin wax, which serves in a measure to waterproof the paper, to provide some degree of finish and to provide a lubrication and binder for the paper during rolling, cutting, crimping and similar operations used in the fabrication of the finished shell. While paraffin and the like impregnating waxes do offer some measure of protection for the paper or cardboard tube of the shell, the degree of water-proofing thereby afforded is wholly insufficient for many uses to which the shotgun shells are put. This is particularly true of shotgun shells, mortar shells, and the like, which are utilized by the armed forces under extreme weather conditions of high temperature and humidity approaching saturation. During combat the shells may be subjected to a thorough wetting and even submergence. Likewise, in many of the field sports, for example duck hunting, it not infrequently occurs that the shells are subjected to a thorough wetting and swell or otherwise become unusable due to the moisture that is absorbed into the paraffin impregnated tube wall of the shell.

It is an object of the present invention to provide a method and apparatus for finishing impregnated porous materials and more particularly to provide a method and apparatus of applying a superior water-resistant, lacquer coating, to the surface of an impregnated article, for example shotgun shells and the like. More specifically it is an object of the invention to provide a method and apparatus for applying a lacquer coating to the paraffin impregnated paper tube walls of shotgun shells and similar ammunition. It is also an object of the invention to provide a method of surface dewaxing impregnated paper, for example paraffin impregnated paper.

Other and further objects of the invention are those inherent in the apparatus herein illustrated, described and claimed.

The invention is illustrated with reference to the drawings in which

Figure 1 is a plan view of a surface dewaxing apparatus;

2

Figure 2 is a side elevational view of the apparatus shown in Figure 1;

Figures 3 and 4 are sectional views taken along the lines 3-3 and 4-4, respectively, of Figure 1; and

Figures 5, 6, 7, 8 and 9 are fragmentary side elevational views in section of the several components of the apparatus and taken together are an illustrative series of views showing the apparatus utilized in carrying out the method of the invention.

Throughout the drawings corresponding numerals refer to the same parts.

Referring to the drawings Figures 1, 2, 3 and 4 illustrate the apparatus for surface dewaxing impregnated materials, and particularly paraffin impregnated shotgun shells for which the apparatus is particularly designed. The apparatus illustrated comprises a long tank generally designated 10 which is open at the top and has side walls 11 and 12, end walls 13 and 14, and bottom 15. These side walls 11 and 12, the end wall 14 and the end wall 13, if desired, are water jacketed, there being a double wall provided at 11a and 11b which connect with the double walls 13a and 13b, the latter in turn connecting to the double walls 12a and 12b, so forming a water jacket. The water jacket is provided with an inlet pipe 17 near the bottom of wall 12 into which cold water is introduced and an outlet pipe 18 near the top of wall 11 from which the cooling water is withdrawn.

Each of the side walls 11 and 12 is provided with an area that is not cooled by the water jacket, this being the area generally designated 20 and defined by the end wall portion 21, the wall 22 which forms the bottom of the right-hand end of the water jacket wall 11, the vertical wall 23 which likewise closes one part of the water jacket 11, and the right-hand end of the bottom 15 of the vessel. Extending from wall 11b to 12b at about the mid-point of the vessel 10 there is a partition 25 which divides the bottom of the vessel into two parts, the portion generally designated 26 being the solvent containing end of the tank and the portion generally designated 27 being the sump under the cooling section. The sump is provided with a drain tube 28.

Each of the inside side walls 11b and 12b is provided with an angle iron flange as illustrated at 30 and 31, serving to receive the holder plates generally designated 34 which carry the shotgun shells during treatment. Each of the plates is flat steel sheet having a plurality of holes therein of a correct gauge to receive the particular shot-

gun shell undergoing treatment. The shell is suspended through the holes and is retained suspended by means of its ejector flange at the rear end of the shell as illustrated in Figures 3 and 4. The plates 34 are provided with handles 35 and 36 (Figures 7 and 8) by means of which the operator may manipulate the plates.

The solvent retaining portion 26 of the vessel is provided with a heating device 33 which may be an electrical heater or steam pipe having a sufficient capacity to heat and boil the solvent used. The solvent is maintained at level 39, Figure 3, by periodic additions or by a float operated automatic solvent feeding device not illustrated.

In use the cooling water is turned on and flows into the pipe 17 and thence in sequence through the water jackets formed by walls 12, 14 and 11 and then out through the pipe 18. In this way the walls of the apparatus are maintained cold except for the wall portion 20, which is substantially coextensive with the area occupied by the solvent in the solvent evaporating pan 26. The solvent is introduced into the pan 26 and brought up to level 39, which is a little bit below the ends of shells 40, and steam is introduced into pipe 33 or electrical power turned on if an electrical heater is used. Various solvents may be utilized such as carbon tetrachloride, trichlorethylene, tetrachlorethylene, benzene, hexane or the like, carbon tetrachloride being very satisfactory for use where the impregnating wax is paraffin. The solvent is vaporized and as the vapor comes into contact with the outer surfaces of the shotgun shells 40, it condenses. The shotgun shells 40 are introduced into the carrier 34 and the plates are then lowered into the tank by the operator until the plates rest upon the angle irons 30 and 31, it being noted that the entire shell is suspended above the solvent 39 in this condition. At the time the shells 40 are introduced into the tank they have a temperature well below the boiling temperature of the solvent used. Where carbon tetrachloride is the solvent, no pre-cooling of the shell is necessary since carbon tetrachloride boils at 76° C., which is substantially above normal room temperature. Where other solvents are used having a lower boiling temperature, it may be desirable to pre-cool the shells before introducing them into the solvent vapors.

The solvent vapors rise above the body of solvent 39 and condense upon the cold surface of the shell, condensation of the solvent being continued until the warm solvent vapor has heated the entire shell to a temperature approaching the temperature of the vapor. The rate of condensation slows down as the shell is heated. It will be understood in this respect however that the condensation may continue for a considerable period of time due to the relatively low rate at which heat penetrates the interior of the shotgun shell and therefore the shell surfaces may continue wet with solvent for several minutes. The shells are usually sufficiently dewaxed after about one and one-half minutes. As the solvent is condensed on the surface of the shells 40 it dissolves the impregnating wax, for example paraffin, in the paper tube of the shell and the solvent drips down into the pan 39, thus washing the wax off the surface layers of the shell. The wax so removed remains in the body of solvent in pan 39, for although the solvent itself is continuously vaporized and hence is returned into contact with the shells, the wax remains in the pan where it collects and increases in

concentration until the entire body of solvent is ready to be drained and a fresh supply introduced. To facilitate draining of the solvent there is provided a drain tube 41 which is ordinarily closed by the valve 42. It has been found in actual practice that the concentration of paraffin wax in carbon tetrachloride may increase to as much as 30% and even then does not cause any serious difficulty. Thus, with 5 gallons of carbon tetrachloride in the solvent reservoir 26 there may be treated upwards of 60,000 shells before there is any serious concentration of paraffin in the solvent. The solvent may conveniently be removed and fresh solvent added at the beginning of each shift. The condensation of the solvent on the shell removes the impregnating wax from the portions of the paper adjacent the surface and leaves the surface in clean and completely dewaxed condition suitable for the application of lacquer as hereinafter described.

Any solvent vapors rising above the level of the carrier plates 34 move into contact with the shell walls 11 and 12 where the solvent is condensed and is returned to the reservoir. A sufficient dewaxing of the shells is usually accomplished before condensation ceases due to the heating of the shell. Permitting the shell to remain in the solvent vapors does not produce harmful effects because condensation of the solvent on the shell ceases after the shell is warmed up. When the shell has been sufficiently treated for dewaxing or after condensation has ceased, the plates 34 are lifted by means of the handles 35 and 36 from the dewaxing position A to the evaporating position B without however elevating the plate any more than is necessary to clear the partition wall 25. The plates are then allowed to remain in the evaporating position B while the contained heat of the shells 40 causes evaporation of the solvent on the shells. The side walls 11b and 12b are cooled to the very bottom of the tank and hence the vapor pressure of solvent in this area is substantially lowered. As a result the contained heat of the shells 40 causes the evaporation of any solvent on the surface of the shells and the solvent flows off as vapor which is condensed upon the adjacent portions of water cooled side walls 11b and 12b. The solvent drains down the inside of these side walls and into the sump 27 from which it is drained by the outlet tube 28.

Referring to Figures 5-9 the entire process of finishing the impregnated paper shells or similar impregnated paper objects includes the surface dewaxing step illustrated in Figure 5 heretofore described and the solvent evaporation step illustrated in Figure 6. After the evaporation of the solvent from the surface of the shells the plates 34 are lifted from the apparatus shown in Figures 1-4 and are lowered into a lacquer vat comprising a vessel 50 having supporting angle irons 51 and 52 on its inside, spaced so as to engage and support the ends of the plates 34. It will be observed that in Figures 3, 4, 5 and 6 the ends of plates 34 are illustrated, whereas in Figures 7, 8 and 9 the plates are illustrated from the side view. In Figure 7 the lacquer in vat 50 is maintained at level 53 by periodic additions of lacquer or by an automatic liquid level control valve from a lacquer supply reservoir not shown. The lacquer is maintained at level 53 so as to permit the shells 40 to be submerged sufficiently to cover the entire paper portion 40a of the shell and a little bit of the metal cup portion 40b of the shell.

5

Thus, the lacquer completely seals the junction of the paper to the metal cup and coats the paper.

After a submergence for a short time in the lacquering vat the plates 34 are elevated and permitted to drain which inevitably causes drops of lacquer to form on the bottoms 43c of each shell. In order to remove the drops, after a suitable draining period, the plate 34 is moved horizontally in the direction of arrow 61 over a vat 62 having lacquer solvent 63 therein in which a rotatable roller 64 turns on shaft 65. As the shells 40 are moved horizontally the bottoms of the shells with the adhering drops of lacquer thereon are brought into contact with the roller 64 and cause it to rotate thus bringing fresh lacquer solvent into engagement with the drops of lacquer that are on the bottom of the shells so as to remove them. The shells thus brushed by the roller 64 are ready to be sent to the lacquer drying oven illustrated at 70 in which the plates may be introduced and supported on pairs of spaced angle iron brackets 71 and 72. While a single drying level has been illustrated in Figure 9 it will be understood that a number of tiers may be provided in the oven 70 in order to increase the capacity thereof. Warm air is introduced into the oven by means of inlet tube 73 and is withdrawn from the oven by means of outlet pipe 74. Drying is preferably accomplished relatively slowly at first so as to prevent the formation of bubbles in the lacquer and the temperature is then increased after some of the solvent has been evaporated. The sequence in operations is illustrated by arrows 76, 77, 78 and 79 and may end there. If desired, the shells after being given a single coating of lacquer, may be returned as indicated by the dotted arrow 80 to the lacquering bath, Figure 7, for a second coat of lacquer which is drained and finished in the manner illustrated in Figures 8 and 9.

It is obvious that many variations may be made without departing from the spirit of the invention. Thus, other solvents than those stated may be utilized and if desired a preliminary cooling of the shells may be used so as to increase the maximum amount of solvent condensed upon the surface of the shells, or the shells may be dewaxed, then removed, allowed to cool and again dewaxed, as indicated by the dotted arrow 82. The invention may be applied to objects other than shotgun shells, for example cardboard containers for BB's and simple cardboard containers or impregnated flatware or other shapes. These and other modifications of the invention are deemed to be within the scope of the invention herein illustrated, described and claimed as follows.

What I claim is:

1. The method of finishing shotgun shells fabricated of wax impregnated paper which comprises suspending the completed shells in an enclosed space a short distance above and in the hot vapors from a boiling solvent for said wax, said shells having a temperature below the boiling point of the solvent when first suspended, removing the shells from the vapor after their

6

temperature has been elevated by contact with said hot vapors, thereafter while hot placing said shells in an enclosed space wherein the vapor pressure of the solvent is maintained at a minimum, and applying a lacquer coating to the thus surface-dewaxed shells.

2. The method of finishing shotgun shells fabricated of wax impregnated paper which comprises suspending the completed shells in an enclosed space a short distance above and in the hot vapors of a boiling solvent for said wax, said shells having a temperature below the boiling point of the solvent when first suspended, removing the shells from the vapor after their temperature has been elevated by contact with said hot vapors, thereafter while hot placing said shells in an enclosed space wherein the vapor pressure of the solvent is maintained at a minimum, applying a lacquer coating by dipping at least the paper portion of the shell in a lacquer bath, removing excess lacquer by wiping the suspended shells and drying the shells with heat.

3. The method of finishing shotgun shells fabricated from wax impregnated paper which comprises suspending the completed shells in an enclosed space immediately above and in the hot vapors of a boiling solvent for said wax, said shells having a temperature below the boiling point of the solvent when first suspended, removing the shells from the vapor after their temperature has been elevated by contact with said hot vapors, thereafter while still hot placing said shells in an enclosed space wherein the vapor pressure of the solvent is maintained low, dipping at least the paper portion of the shell in a high viscosity lacquer, draining the shells, wiping the lower ends of the drained shells with a solvent for the lacquer to remove residual drops of drained lacquer and drying the shells.

4. The method of finishing shotgun shells fabricated from a wax impregnated rolled paper tube having one end closed by means of a metallic cup having an ejector flange thereon and the other end closed by crimping, which comprises suspending the shells by means of their ejector flanges and then in successive steps suspending the shells immediately above the surface of boiling solvent for said wax and in said solvent vapors, the shells being initially cool when suspended in said vapors while still suspended removing said shells to a space wherein the solvent vapor pressure is low so as to promote evaporation of the residual solvent thereon due to the contained heat of the shells, while still suspended dipping the shells into a high viscosity lacquer to a depth sufficient completely to submerge the paper tube portion of the shell and at least a small contiguous portion of the overlying metallic cup, removing and draining the dipped shells, brushing off the residual drops of drained lacquer and drying the lacquer with heat.

5. The process of claim 4 further characterized in that the brush, used in brushing off the residual drops of drained lacquer, contains lacquer solvent.

WILLIAM N. KING.