

March 20, 1928.

1,662,816

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METHOD OF SURFACE COATING ARTICLES

Filed Dec. 8, 1924

Fig. 1

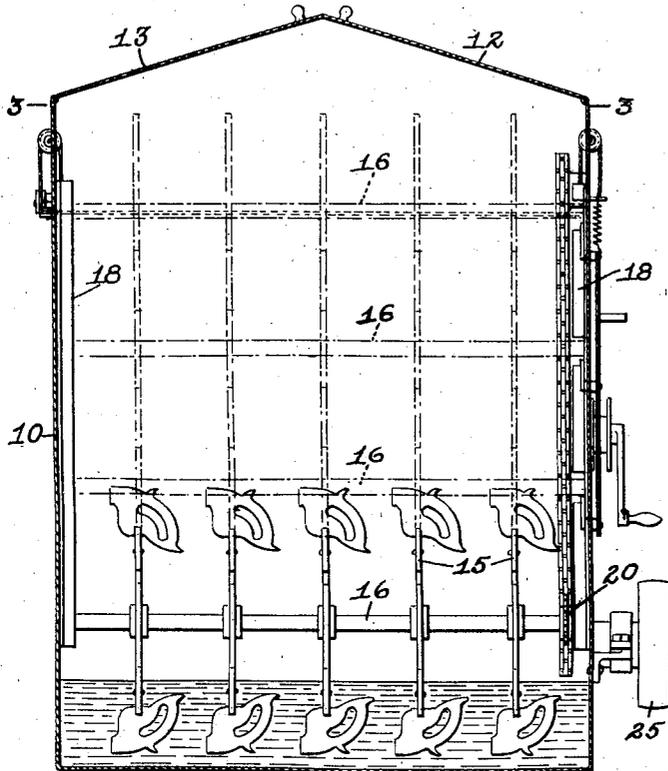


Fig. 2

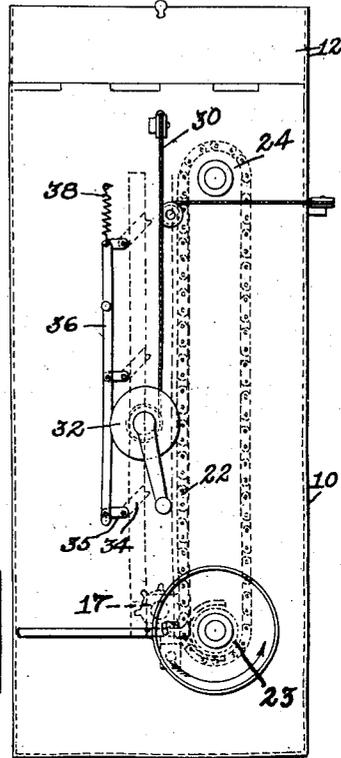
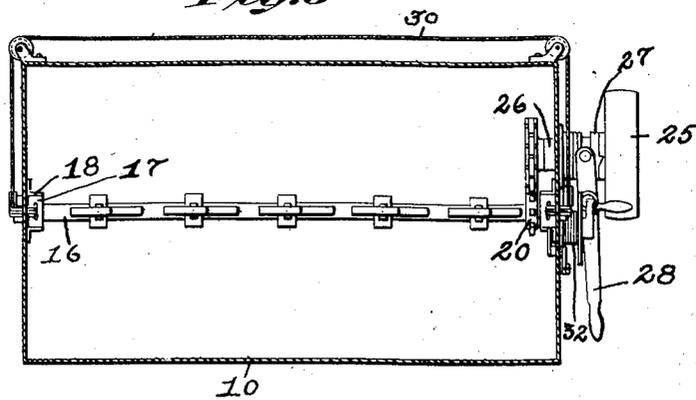


Fig. 3



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METHOD OF SURFACE COATING ARTICLES.

Application filed December 8, 1924. Serial No. 754,667.

This invention relates to the method or process of coating or filming articles or surfaces with protective finish material, or compounds, such as lacquers, paints, varnishes or the like.

An object of the invention is to reduce the cost of applying protective coating, by eliminating high cost skilled labor, by the use of lacquers, when feasible, in place of varnishes and in producing uniformity of thickness of coating or filming on an article or surface, upon the first application of the material or compound thereto, thereby eliminating the loss of time heretofore required to dry the article after each coating, preparatory to receiving subsequent coats, in order to attain the proper thickness and uniformity thereof.

It is a further object of the invention to coat articles or surfaces in such manner as to entirely eliminate runs, thin places, and so called fatty edges, and to produce a film of substantially uniform thickness and at an appreciably reduced cost, particularly as to labor, and in less time per given article or surface than has been possible in the past.

Primarily this invention has for one of its objects encouragement in the use of lacquers for protective coating in innumerable instances where varnishes or similar compounds are now used and applied at great cost of time, labor and material and not always in a satisfactory and durable manner.

It is also an object of this invention to successfully and expeditiously coat articles having irregular surfaces or contours, which heretofore was not possible excepting by the use of hand methods wherein highly skilled labor was necessarily employed, and consequently present day requirements as to production and cost were not attained.

Another important object of the invention is to eliminate wastage of coating material during the application thereof, and to use the vaporous gases arising from the volatile coating material, or gases having like properties and derived from other sources if need be, in carrying out a feature of the invention.

In the drawing illustrating the preferred apparatus for practicing the present process, Figure 1 is a vertical sectional view of the apparatus; Fig. 2 is a side elevation of the right hand side of the apparatus shown in

Fig. 1; and Fig. 3 is a cross-section on the line 3—3 of Fig. 1.

In practice, the preferred method of covering an article with lacquer, for instance, is by dipping it into the compound and allowing it to drain thereinto, but it will be understood that in so far as this invention is concerned, it is immaterial how the coating is applied, whether by dipping, brushing, or spraying.

It will be further understood that while this invention is intended to be used in connection with lacquers, its use is not to be limited thereto as it might be used in connection with paints and varnishes or other materials which may be adaptable to its use.

In carrying out the invention it is preferred to dip the article in a tank containing lacquer, by mechanical means, and while the article is in the lacquer impart motion to it, the mechanical means to be employed and the motion to be imparted depending upon the article to be coated.

It has been the practice in the past to dip articles into varnish and the like and withdraw them into the surrounding atmosphere where they were permitted to drain into the dipping tank during which process coagulation or setting took place slowly when varnish was used, and rapidly when lacquers were used.

This method did not include movement of the article during the drying process and consequently a uniform thickness of coating was not obtained as runs occurred, thin places were evident, and the formation of thin and fatty edges was the rule.

In the present instance, and preferably by the use of mechanical means, the motion imparted to the article during the dipping thereof is continued when the article is withdrawn from the dipping tank, and is to be such a motion as to prevent runs and thin places, and to prevent excessive flows in any particular direction and to cause a uniformity of coating to gradually take place after the excess material surrounding the freshly dipped article has fallen away or dripped therefrom regardless of the continued motion of the article.

It is a fact that the speed of withdrawal of the article from the tank of coating or filming material to great extent determines the final thickness of the film on an article

or surface, inasmuch as an article which has been slowly withdrawn from the tank will have appreciably less material adhering thereto than the same article would have if withdrawn from the tank speedily.

In view of the above it is considered a feature of this invention to control, to a considerable extent, the final film thickness of an article by the speed or lack of speed of its withdrawal from the filming material.

As is well known, lacquers dry very rapidly, and even when the freshly dipped article is kept in motion as above referred to, the best coating results cannot be obtained unless the lacquer on the article is kept moist or at least in partial solution by the proper agent or agents and the surface evaporation retarded until such time as it has ceased flowing, at which time it will have automatically spread itself over the article in an equal and uniform degree of thickness.

It has been discovered that if an article, after having been dipped in lacquer, is suspended or maintained in an area or zone of vaporous gases which arise from the lacquer tank, or the vaporous gases formed by the evaporation of lacquer or any of the known thinners or solvents of lacquer, for even an extended period of time, surface evaporation is very appreciably retarded, which action conveniently serves a very useful adjunct to the present invention by permitting a natural and unretarded diffusion of the solvent below the surface of the coating.

It has also been discovered that by simple mechanical means, not deemed necessary to show herein, such as an air excluding cover placed on the lacquer tank, it was possible to retain, confine and concentrate the vaporous gas arising from the lacquer, and put it to use as a moistening or film surface evaporation retarding agent for lacquer on an article suspended in its zone during the automatic place finding of the said lacquer.

Vaporous gases are heavier than air and consequently seek a lower level, and when confined as just described, its density and moistening power are greatest adjacent the surface of the lacquer in the tank, gradually decreasing in moistening power and density until the upper limit of the gas zone or area is reached, where it is nil.

Advantage has been taken of this condition to the end that the fumes or vaporous gases given off by the lacquer in the tank have been confined and in some instances concentrated and put to valuable use in carrying out certain objects of the present invention.

This last mentioned condition also conveniently operates to the benefit of the present invention as it enables an article to undergo a gradual bodily movement or traverse through a zone of vaporous gases, the density of which ranges from maximum at the

surface of the lacquer in the tank to zero at a point very appreciably removed from the surface of the lacquer which in one instance at least was forty inches.

In the drawing illustrating the preferred apparatus for practicing the present process, 10 represents a tank or chamber provided with covers 12, 13 hinged and adapted to be opened up to a vertical position between successive operations of the present process, it being understood that the present process operates as a batch or intermittent process. The lower portion of the tank 10 comprises a dipping tank and into which a plurality of articles herein shown as saw handles are dipped during the operation of the process, as will be described, to cover the articles with a coating material. As herein shown, a plurality of the saw handles are supported by holding devices 15 comprising any convenient form of clamp and the latter are mounted to rotate with a shaft 16 journaled in bearings 17 slidable vertically in guideways 18 mounted upon the sides of the tank. Provision is made for rotating the shaft 16, and as herein shown the shaft 16 is provided with a sprocket 20 which is adapted to mesh with the links of an endless chain 22 passing over a lower sprocket 23 and an upper sprocket 24. The lower sprocket 23 is driven from a suitable source of power through the driving pulley 25 and counter shaft 26, its rotation being controlled by a manually operated clutch indicated at 27 and provided with an operating lever 28.

In practicing the present process the saw handles or other articles to be coated are first dipped into a bath of coating material by rotating the shaft 16 when the latter is in a position such as is illustrated in Fig. 1, and after the coating material has thus been applied, provision is made for raising the shaft 16 and for slowly rotating the shaft 16 at different levels within the tank 10. The tank 10 is preferably made of sufficient height such that the shaft 16 may be rotated at three succeeding stations, illustrated in dotted lines in Fig. 1, and during the operation of the process the covers 12, 13 of the tank are closed providing a closed operating chamber above the level of the liquid coating bath and within which chamber the vapors of the volatile solvent or solvents of the coating material are present due to the evaporation from the liquid coating bath and also from the articles being coated. The solvents, as is well known, are heavier than air, and consequently the density or concentration of the solvent in the vapor space above the coating bath gradually decreases from the coating bath toward the top of the tank, and in practicing the present process provision is made for slowly rotating the dipped saw handles or other articles at successive stations or heights above

the coating bath to permit the coating material upon the saw handles or other articles to dry in contact with successive portions of the atmosphere within the tank 10 containing gradually decreasing proportions of the volatile solvents. In this manner the rate of drying of the coating material is controlled so as to enable the rotary movement of the articles at the successive stations to distribute the coating material upon the articles into a uniform film extending over all parts of the article.

As herein shown, provision is made for manually raising the shaft 16 into the successive stations illustrated in dotted line positions in Fig. 1, while enabling the shaft to be rotated at each station. For this purpose the bearing blocks 17 are as above stated mounted to slide in vertical guideways 18 and are connected by suitable cords 30 to a windlass 32, thereby permitting the bearing blocks 17 to be raised as the windlass is wound up. Provision is made for holding the bearing blocks 17 at the different stations, and for this purpose holding dogs 34 are provided and which are pivoted in levers 35 connected by a link 36, and which holding dogs 34 are yieldingly held into a position to engage the bottom of the block 17, as the latter is raised past the particular dog, by a spring 38. When it is desired to lower the shaft when a fresh supply of saw handles or other articles are to be coated, the link 36 is depressed, throwing out the holding dogs 34 from the path of the block 17.

It will therefore be seen that in the present process the article is first dipped in the liquid coating material and then dried while being rotated in contact with an atmosphere containing progressively decreasing proportions of the volatile solvent. After having been dried or substantially dried, the tank is opened by lifting the covers and the article removed, and at the same time opportunity is afforded for the vapors containing the solvent to escape, thus permitting a fresh supply of air to be introduced into the chamber or tank to dry the succeeding batches of saw handles or other articles.

The present process is particularly designed for producing an absolutely uniform film or coating upon irregular shaped objects such as saw handles, and it has been found in practice that a single operation in accordance with the present process produces very satisfactory work.

From the foregoing it will be readily seen that considerable latitude is permitted the operator or workman in instances wherein it is not desirable or advantageous to slowly move the article through the vapor zone, but when best or better results might be obtained by causing the coated article to be subjected to a steady and approximately constant density of vaporous gases which will be

found somewhere intermediate the extremes thereof and readily located by easily performed experiments and might be observed through glass forming part of the tank cover.

When operating under this condition the article is allowed to remain in the chosen position until the lacquer thereon has found its place and uniformity of thickness thereof has been attained, whereupon it is withdrawn from the vapor and exposed to the atmosphere where it rapidly congeals or sets providing this action has not been accomplished during its exposure to the vapor.

The invention contemplates the application of protective coating of any kind that is adaptable to this method, and in any way best suited for the occasion, or desires, and subjecting the article to movement of some sort, whether it be rotary, vibratory or reciprocatory, best suited to accomplish the results required and subjecting the coated moving article to vaporous gases, which method may be modified by omitting the movement of the article during the process, as in many classes of work it might be prohibitive and even unnecessary.

The invention also contemplates the application of coating material in any suitable manner and the movement of the article during the drying process and omitting the exposure to vaporous gases, which in most instances may not be successfully dispensed with, but in others may not be required to accomplish the desired result.

It will be understood that, as previously referred to, the invention "might be used in connection with paints and varnishes, or other materials which may be adapted to its use" it is of especial importance in the rubber industry, particularly in the manufacture of thin rubber goods, or hollow articles such as gloves, nipples, bathing caps, and in fact rubber goods of all kinds made up by dipping or repeated dipping in a rubber or rubber substitute solution, whether made on a form or core, or as a permanent coating to an article.

Having described the invention I claim:

1. The process of surface-coating articles with a liquid coating material containing a volatile solvent which consists in dipping the article into a bath of the liquid coating material contained in the bottom of a chamber, closed during the coating operation, lifting the article from the bath and slowly rotating it at a plurality of stations spaced succeeding distances from the bath whereby the slowly rotating article is permitted to dry while being rotated in contact with atmosphere containing progressively decreasing proportions of the solvent, and thereafter opening the receptacle to remove the article.
2. An intermittent process of surface-coating articles with a liquid coating material

containing a volatile solvent which consists in dipping the article into a bath of the liquid coating material contained in the bottom of a chamber, closed during the coating operation, and then removing the article and rotating it until substantially dry, in contact with vapor containing decreasing portions of the solvent, and then opening the tank and removing the dried coated article. 10

Signed by me at Boston, Mass., this 4th day of Dec., 1924.

CARLE M. BIGELOW.