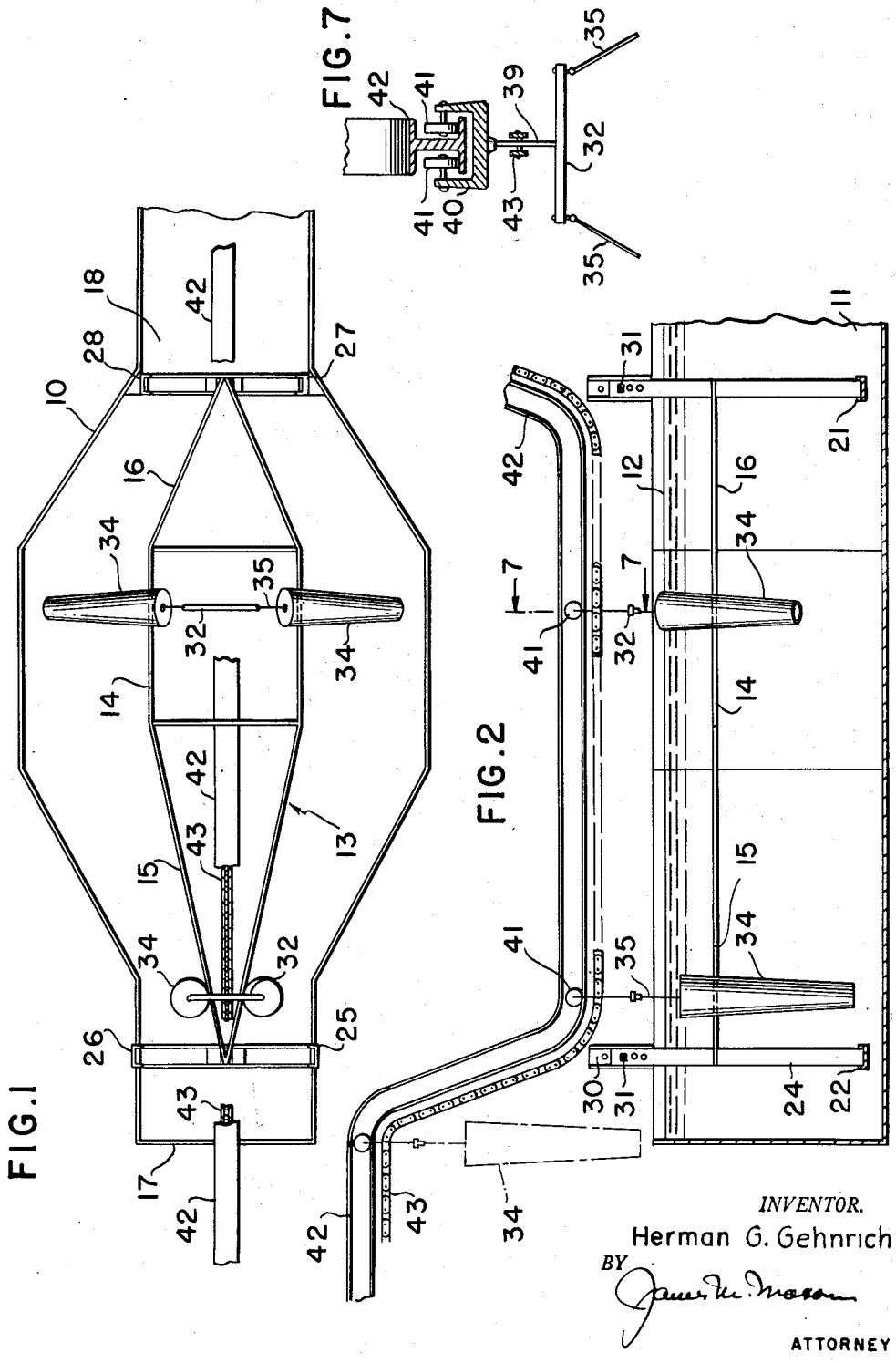
Nov. 9, 1954 H. G. GEHNRICH 2,694,018

METHOD FOR APPLICATION OF COATINGS TO CYLINDRICAL OBJECTS

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FIG.5

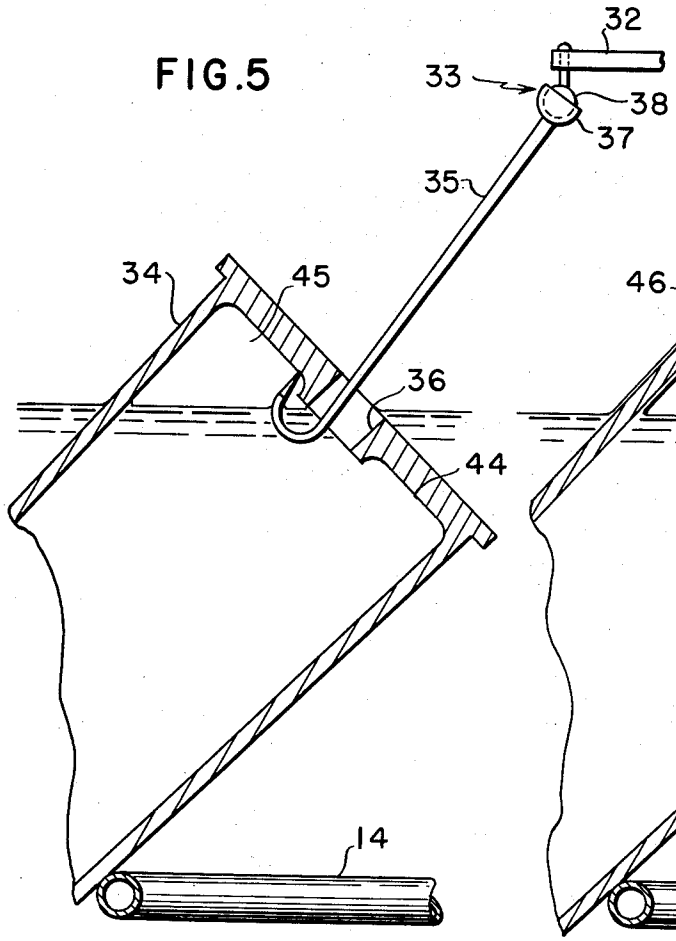


FIG.6

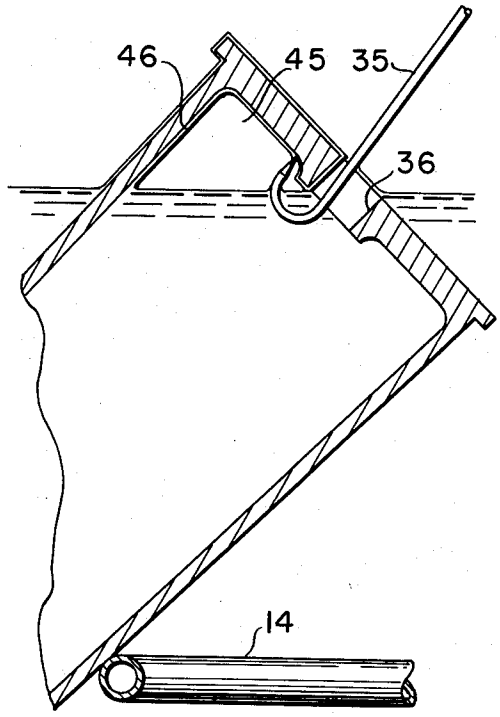


FIG.3

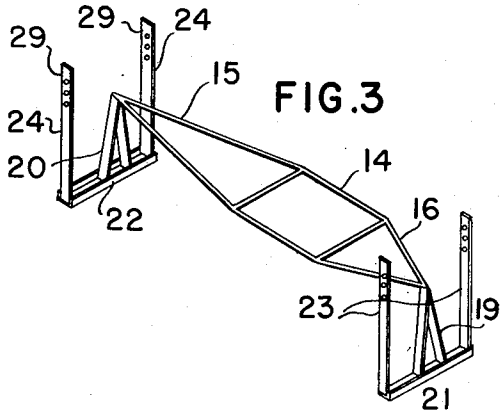
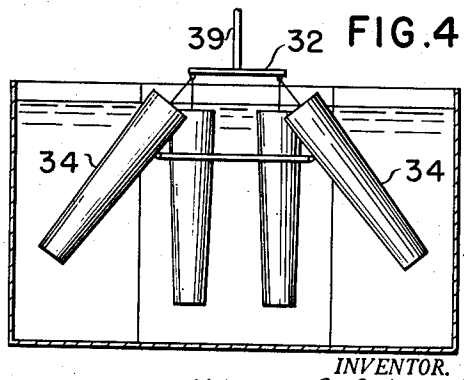


FIG.4



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United States Patent Office 2,694,018 Patented Nov. 9, 1954

2,694,018

METHOD FOR APPLICATION OF COATINGS TO CYLINDRICAL OBJECTS

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Application April 4, 1952, Serial No. 280,603

5 Claims. (Cl. 117—97)

The present invention relates to a novel method for covering cylindrical objects, particularly shell cases, with a thin protective film of a liquid coating composition.

The invention is especially designed to provide a method of handling shell cases in connection with a bath of a liquid coating composition in such a manner that the outer exterior area of the shell case is entirely covered with a protective coating.

Current shortages of copper have dictated the development of substitute materials for the fabrication of shell cases and particularly cases of larger caliber such as artillery shell cases for ordnance, and more recently tests have been made with shell cases of steel instead of the usual brass. The corrosion characteristics of steel require a protective lacquer coating since corrosion, particularly on the interior of the shell case, may seriously affect the quality of the charge within the shell. The application of the protective coating has generally been applied in a continuous method of mass production whereby the shells are carried by a suitable conveyor mechanism in inverted position and with the apertured fuse end of the shell at the top, and the shells one at a time or in groups suspended crosswise from a conveyor chain are inverted as they enter the tank so that the fuse end is completely submerged in the coating composition to insure that all portions of the interior are entirely covered. The use of a single strand conveyor is most desirable since the shell cases may be transported prior to or after the dipping operation in any direction desired. However, if the shells are loaded in series with the present dipping method, the spacing of the shells on the conveyor must be substantial because of the distance required to tip them in the lacquer tank. This results in materially decreasing production. On the other hand, if load bars were placed on this same conveyor and a number of shell cases suspended from those load bars, it becomes apparent that the radii of the turns to effect a change of direction of travel would have to be considerably larger than in the case of the shells being loaded in series.

An alternate form of conveying method is to use two strands of conveyor chain, spaced apart from one another, with load bars between the two chains. The shell cases are suspended from the load bars and again because of the spacing requirements due to the existing method of dipping, it is obvious that considerable room will be required to effect air drying or forced drying in an oven. To offset this objection the load bars can be transferred after the dipping operation to another conveyor of similar nature, and in making that transfer the load bars can be spaced closer together, thus effecting a shortening of the drying space requirements. This system of conveyor, however, cannot be used in making horizontal turns, so that if the cases, after the drying operation, are to be carried in a direction of say 90° from the point of drying, this change of direction must be effected by a rather complicated additional conveyor system or manually and the continuity of the process may be disturbed.

It has been found that two or more shells may be so handled in the liquid coating bath that they maintain a parallel relationship throughout the procedure and are most conveniently arranged with respect to the conveyor mechanism for handling in subsequent operations. In accordance with the invention cylindrical objects such as shell cases, open at one end and having a restricted aperture for a fuse or the like at the other end, are passed through a liquid coating composition while suspended with the apertured end at the top and rotated while tilted at an angle to the vertical position they would normally occupy. During the rotation the objects are immersed to such an extent that the liquid level within the object reaches approximately the center point at the upper end of the object. In this manner all portions of the interior and exterior of the shell cases are subjected to and covered by the coating composition and the occurence of uncovered areas due to air pockets, particularly on the interior surrounding the apertured end, are entirely avoided.

Reference is made to the accompanying drawings wherein a suitable apparatus is shown for illustrative purposes only, whereby the method of the present invention may be conveniently carried out. Figure 1 is a plan view of an apparatus for coating the interior of cylindrical objects in accordance with the present invention. Figure 2 is a side elevation of the apparatus shown in Figure 1. Figure 3 is a perspective view showing the adjustable tilting rack employed in connection with the apparatus. Figure 4 is a cross-sectional view of the coating tank illustrating the disposition and relationship of the shell cases to each other during the coating process. Figure 5 is an enlarged sectional detail, partly in vertical cross-section, showing the relationship of the shell case to the liquid coating bath just prior to the start of the process. Figure 6 is a similar view of a shell case after completion of the process. Figure 7 is an enlarged sectional detail on the line 7—7 of Figure 2, showing a particular suspension means for the shell cases during the process.

Referring to the drawings it will be observed that a suitable apparatus may include a tank **10** for a liquid coating composition **11**, for example a lacquer, filled to the level **12** in the tank **10**. Mounted vertically within the tank **10** is an adjustable tilting rack **13**, detailed in Figure 3, consisting of a horizontal frame **14** converging to V-shaped ends **15** and **16**, the end **15** being nearest the entrance **17** and the end **16** being nearest the exit **18** of the tank **10**. The frame **14** is adjustable vertically by virtue of the fact that it is supported at the ends by vertical members **19** and **20** which rest in transverse channel members **21** and **22** and at the extremities of these channel members are uprights **23** and **24**. These uprights **23** and **24** are designed to slide within four relatively short channel members **25**, **26**, **27** and **28**, the channel members **25** and **26** being disposed on opposite sides of the entrance **17** and the channel members **27** and **28** being disposed at opposite sides of the exit **18**. The uprights **23** and **24** have a series of openings **29** and the relatively short channel members have openings **30** which are aligned and held in any desired position of adjustment by means of removable pins **31**. The frame **14** may also be adjustable laterally.

Pairs of the shell cases are preferably mounted in parallel relationship in the manner illustrated in Figure 4 by means of a cross member **32** provided with means whereby the shell cases may be suspended and angularly positioned during rotation as they pass through the tank **10** and liquid coating composition **11**. In the particular illustrated embodiment it will be observed that each end of the cross member **32** has a swivel **33** and the shell cases **34** are suspended by means of a hook **35** extending through the fuse aperture **36** and having a socket **37** at the upper end which cooperates with a pin ball **38** attached to the end of the cross member **32**.

It will be appreciated that pairs of the shell cases suspended from the cross members **32** pass through the tank **10** in series and each pair is spaced a particular distance from the succeeding pair of shell cases, whereby a continuous coating and lining of the interior of the shell case is obtained.

The cross members **32** are suspended and moved through the tank **10** and above the tilting frame **14** by the following mechanism. Secured at the center of the cross members **32** is a vertical rod **39** which connects the cross members **32** with yokes **40**, the opposite ends of which may be provided with rollers **41**, as shown in

Figure 7, which travel along the opposite sides of an I beam track 42 located above and extending centrally for the length of the tank 10 through the entrance 17 to beyond the exit 18, as shown particularly in Figures 1 and 2 of the drawings. A power chain 43 extends directly below the I beam track 42 and moves the separate pairs of shell cases along as they travel through the coating composition 11 of the tank 10.

The operation of the apparatus described hereinabove is substantially as follows. It will be observed that the I beam track 42 is disposed a substantial distance above the top of the coating tank 10 at least sufficient for the bottom of the shell cases to clear the top of the tank 10 at the entrance and at this point the track slopes downward abruptly until the shell cases 34 are entirely submerged in the liquid coating composition 11 as the pairs of shell cases are moved along through the tank 10 by the power chain 43. It will be observed that the shell cases 34 encounter the frame 14 and tilt substantially in opposite directions by virtue of the swivel points 33 in such a manner that the liquid coating composition enters the channel 44 surrounding the fuse aperture 36 and then as the power chain 43 moves along the shell cases are rotated while in the angular position thus assumed by frictional contact with the tilt frame 13, as represented by Figures 5 and 6. It will be appreciated as observed in Figure 6 that after a complete rotation the surfaces of the shell case within the air cavity 45 are completely covered and protected by a thin coating 46 of the liquid coating composition, as shown in Figure 6 of the drawing. The pairs of shell cases finally encounter the trailing end 16 of the tilt frame 13 and eventually return to the vertical position and emerge from the tank 10 through the exit 18.

It will be appreciated that the devices and contrivances described herein and illustrated in the drawings are purely for purposes of illustrating the manner in which the present invention may be accomplished and are not to be deemed as restrictive beyond the scope of the invention as represented by the appended claims.

I claim:

1. A method of coating generally cylindrical shell cases, open at one end and having an apertured wall at the opposite end, which comprises immersing said shell cases into a liquid coating composition with the open end downward and tilting the shell cases at an acute angle to the vertical until the level of the liquid coating composition substantially coincides with the aperture formed at the opposite end of the shell case about its cylindrical axis, and rotating the shell case to uniformly coat and cover all surfaces thereof.

2. A method of coating elongated generally cylindrical open ended objects having an apertured wall partially closing at the top end which comprises immersing said objects in a liquid coating composition and tilting said objects at an acute angle to the vertical until the liquid level reaches at least the centerpoint at the top of the object, while they are rotated about their cylindrical axis, to cover the exposed surfaces of the objects with the liquid coating composition.

3. A method of coating open-ended generally cylindrical objects, having an inwardly directed flanged wall at one end, which comprises immersing said objects and passing them through a liquid coating composition while so immersed with the walled end upward, tilting the objects until the liquid level reaches at least approximately the centerpoint of the walled end, and rotating said objects about their cylindrical axis to subject the entire area thereof to the liquid coating composition.

4. A method of coating generally cylindrical shell cases, open at one end and having a wall and a restricted apertured opening therein at the opposite end, which comprises immersing said shell cases in a bath of a liquid coating composition, tilting the cases until the liquid level passes the centerpoint of the walled end, and rotating the shell cases about their cylindrical axis to provide a covering of the liquid coating composition on the interior and exterior of the shell case.

5. A method of coating generally cylindrical shell cases, open at one end and having a wall and a restricted apertured opening therein at the opposite end, which comprises immersing said shell cases into a liquid coating composition with the open end downward, and tilting the shell cases, with the liquid level at least near the centerpoint of the apertured opening, at an acute angle to the vertical until the level of the liquid coating composition substantially coincides with the apertured opening formed at the opposite end of the shell case about its cylindrical axis, and rotating the shell case to uniformly coat and cover all surfaces thereof.

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