

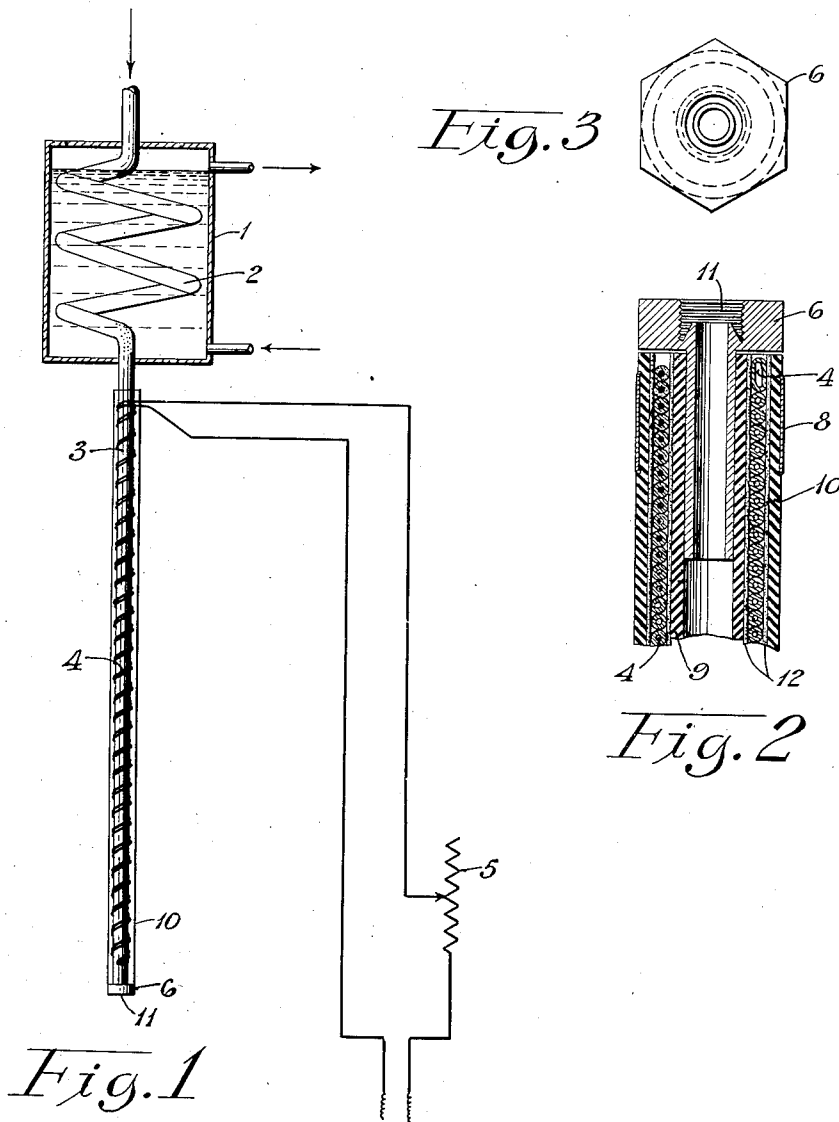
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APPARATUS FOR THE APPLICATION OF COATING COMPOSITIONS

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APPARATUS FOR THE APPLICATION OF
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This invention relates to a process for applying coating compositions and more particularly to a process and apparatus for spraying cellulose nitrate lacquers and enamels at elevated temperatures.

It is customary practice in the finishing industry when spraying coating compositions to utilize equipment in which the thinned material passes from a pressure pot through a flexible hose of suitable length to a spray gun. In some industrial finishing operations this flexible hose may be of considerable length so that when a coating composition is sprayed at elevated temperatures a new problem is presented in maintaining a temperature at the gun substantially equivalent to that at the pressure pot. For example, if the spraying apparatus is not in continuous operation a drop in temperature occurs in the material remaining in the hose. Therefore, prior to each spraying period it may be found necessary to discard this material in order to avoid inconsistent spraying results.

Recent developments in the industry involve a substantial increase in the solids content of cellulose nitrate compositions at the gun through the use of elevated temperatures whereby a normal spraying viscosity is obtained. This improvement in the art offers substantial economy in operating and in thinner, and frequently eliminates the need of one or more coats to give equivalent film thickness. The present invention, although useful in applying various types of coating compositions including synthetic resinous and oleoresinous compositions, in its preferred embodiment is designed to further promote the industrial practicability of spraying cellulose nitrate coating compositions at elevated temperatures, for example, on the order of about 160° F.

This invention has as an object the provision of a process for spraying coating compositions at elevated temperatures whereby better control and greater uniformity in the temperature of the coating material at the gun are secured. Another object is the provision of a process for spraying coating compositions at elevated temperatures whereby a substantial saving in material and operating costs is effected. A further object of the invention is the provision of an apparatus for applying coating compositions at elevated temperatures which eliminates the deficiencies characteristic of conventional equipment heretofore available. Other objects will become apparent as the description of the invention proceeds.

These objects are accomplished by passing a preheated coating composition, preferably a high solids content cellulose nitrate lacquer or enamel of the type described above through a flexible hose which is heated by applying electric current

to a suitable resistance wire around the flexible hose.

In the practice of the present invention a coating composition such as a cellulose nitrate lacquer or enamel from a plant circulating system or other supply is fed under pressure to the heating pot and directly from the heating pot through the electrically heated flexible hose to the spray gun. The coating composition leaves the heating pot at the required spraying temperature and preferably only sufficient electric power is applied to the hose to compensate for heat losses by radiation and convection from the hose and fittings. The power required for heating the hose may be obtained from an ordinary lighting circuit and is controlled by an individual rheostat or variable transformer in the case of a single spray unit, or by a master rheostat or variable transformer in the case of a multiple unit such as commonly used in automotive production.

In the drawing, Figure 1 is a diagrammatic sketch showing the arrangement of the parts. Figure 2 is a detailed section showing the construction of the hose and coupling by means of which it is attached to the spray gun. Figure 3 is an end view of Figure 2. In all of the figures, the reference numbers refer to the same parts.

In Figure 1, the preliminary heating chamber is designated as 1 and may be heated by means of a hot liquid or by hot vapors such as steam and thermostatically controlled. Within the heating chamber is a coil through which the lacquer or enamel to be heated passes. This coil is shown as 2. Attached to the coil 2 is the hose 3 around which is wound a heating element 4. The amount of heat developed in the resistance element 4 is controlled by rheostat 5. It is to be understood, however, that in place of a resistance rheostat such as 5, a transformer or other current regulating device may be used. It is also to be understood that the amount of current passing to the resistance wire 4 may be thermostatically controlled to the temperature of the lacquer in the hose 3, the heating coil 2, or the temperature of the liquid or vapor in the heating chamber 1.

In Figure 2, the coupling by means of which the hose is attached to the spray gun is indicated as 6. This coupling is provided with threads 11. The hose itself has an inner layer of a composition shown as 9 which is resistant to lacquer solvents. It has been found that neoprene which is essentially a plastic polymer of 2-chloro-butadiene 1,3 or Thiokol, an olefin polysulfide resin, are particularly suitable. It is also to be understood that the inner layer of the hose may be protected by other material such as metal foil which prevents the solvent of the lacquer from coming in contact with the body of the hose. Next to the neoprene or equivalent layer 9 is a

layer of rubber 12 in which is embedded cotton fiber or threads. Around this layer 12 is wound the suitable resistance wire 4. It has been found that for a standard $\frac{5}{8}$ inch hose, 15 gauge (B. S.) nichrome wiring having a resistance of 0.2 ohm per ft. and wound to about 6 turns per inch is satisfactory. This resistance wire when operated under 110 volts is sufficient to maintain the temperature of the enamel at about 160° F. throughout a flexible hose about 12 ft. long. The resistance wire 4 may be coated or covered in the usual way. Around the resistance wire is another layer 12. Covering this layer is a comparatively heavy outside layer of rubber composition shown as 10. If desired, a final layer of braided metal or other material to protect the hose against abrasion may be used. The hose is made to bind on the coupling 6 by means of a ferrule 8.

In the operation of the device, the enamel enters the heating coil 2 through the opening indicated by the uppermost arrow of Figure 1. It then passes through the heating coil where its temperature is raised to about 160° F. or even higher. It then passes through the hose 3 where this temperature is maintained until it is sprayed from the gun.

It is desirable for greater safety to select resistance wire of such electrical characteristics that when maximum electric current is applied with the particular equipment utilized, the maximum heat that can be developed will not exceed a safe limit, for example, about 200° F. This selection can be readily made by those skilled in the art from known electrical factors of the resistance wire. It has been found experimentally that if a wire having a resistance of about 52 ohms is connected to a 30 ohm variable rheostat in series, a temperature range of from 117 to 185° F. in the internal hose may be obtained.

With the particular equipment shown in the drawings it is possible to develop a wide range of temperatures, although for the specific utility described the resistance wire and rheostat setting are selected to maintain a temperature between 140° F. and 200° F. depending upon several variables including the particular enamel to be applied, its solids content, the type of volatile solvents employed, the skill of the operator, the temperature of the work being finished, etc. It has also been found that the temperature of the enamel passing through the flexible hose in actual practice may be maintained within 1-2° F. of the temperature of the enamel in the heated spray pot or heated coil shown in Figure 1.

While the process is applicable for cellulose nitrate lacquer or enamel having conventional solids content widely employed by the industry in the past which is limited to a maximum of about 20% at the gun, it is of particular merit in applying these types of coating compositions where the solids content at the gun is at least 25%, a proportion of such magnitude as to preclude proper application at room temperature because of the high viscosity of such compositions at ordinary temperatures. However, at elevated temperatures, for example, above 140° F., the viscosity is greatly reduced thus permitting the application of such compositions with otherwise conventional technique, and therefore the present invention facilitates the use of these materials.

The process and apparatus herein described are of particular practical merit in finishing surfaces with liquid coating compositions in which

elevated temperatures must be maintained to the point of application of the material. It is of considerable practical significance for both automotive and general industrial finishing operations.

The invention provides greater uniformity in results particularly as regards the quality of the finish, whereas heretofore difficulty has been experienced when applying enamels at higher temperatures in securing uniform results especially if the application of the coating composition is intermittent. The invention offers a simplified system with incidental operating economy and in this respect is practically preferable to the more complex circulation system commonly employed in an attempt to overcome the deficiencies which are apparent due to the radiation losses in the flexible hose which sometimes may be used in lengths of 30 feet or more, thus accounting for appreciable losses of material in clearing the gun of cooled material where the finishing operation involves intermittent application. Tests have indicated that pigment settling in the heated flexible hose is negligible so that no difficulties from this angle are experienced. Accurate control over wide temperature limits is possible by simple adjustment of the rheostat setting. The invention provides a light weight construction wherein the actual dimensions of the flexible hose are also not materially increased to make it more cumbersome in handling by the operator as would be the case where recirculation of the heated material through the hose or heating by circulation of hot water or other heating fluid through the hose, requiring additional tube passages, is employed.

It is apparent that many widely different embodiments of this invention may be made without departing from the spirit and scope thereof; and, therefore, it is not intended to be limited except as indicated in the appended claims.

I claim:

1. Apparatus for spraying lacquers at a high temperature which comprises means for heating a large mass of nitrocellulose lacquer in a closed container, an atomizing spray gun, and a hose between and connecting the container containing the nitrocellulose and the spray gun, said hose having an inner layer of a plastic polymer of 2-chloro-butadiene 1,3, an intermediate layer of cotton threads embedded in rubber, and an electrical resistance wire wound next to the rubber layer, and means for supplying electrical energy to the said wire in amount just sufficient to maintain the temperature of a liquid passing through the hose and spray gun at between 160° F. and 200° F., and a heavy outside layer of rubber over the resistance wire.

2. Apparatus for applying lacquer at high temperatures which comprises means for heating a large mass of nitrocellulose lacquer in a closed container, an atomizing spray gun, a flexible hose of the type described between and connecting the said container and the said gun, having an inner layer of a plastic polymer of 2-chloro-butadiene 1,3, an electrical resistance wire next to the said plastic polymer having a current consumption of between about 8 and 19 watts per linear foot of hose, means for connecting the said resistance wire to a source of electric current, and a wear-resistant layer over the said resistance wire.

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