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DRYING LIQUID-COATED THIN METAL COIL STOCK

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FIG. 1.

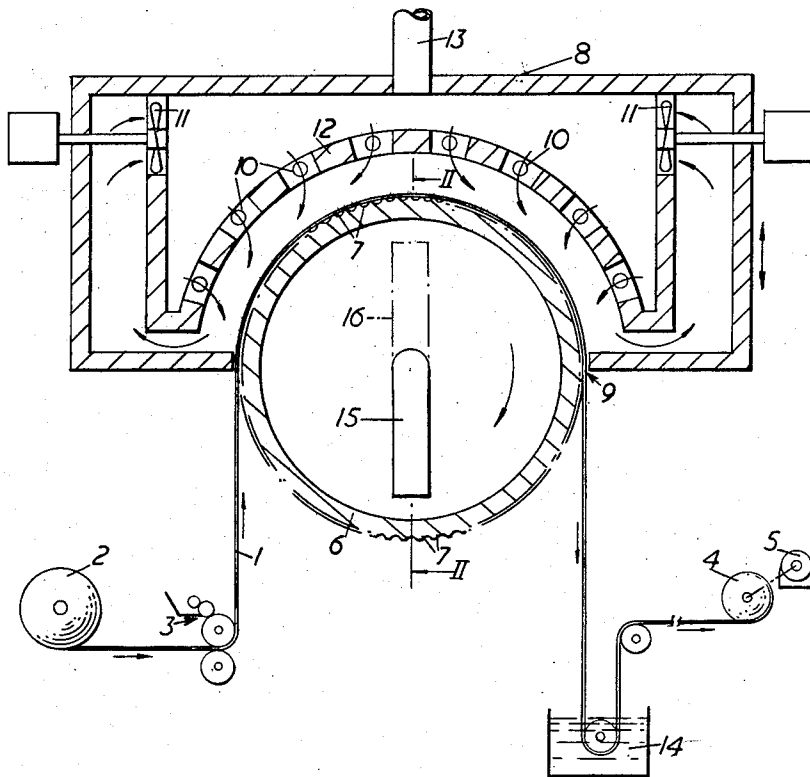
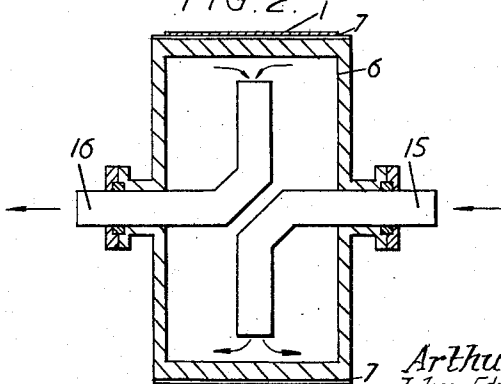


FIG. 2.



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DRYING LIQUID-COATED THIN METAL COIL STOCK

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2 Claims. (Cl. 34—13)

This invention relates to drying a liquid coating of lacquer, varnish, or paint freshly applied to a side of thin metal stock drawn from a coil thereof.

Heretofore it has been usual to effect the drying of liquid coatings applied to thin metal stock by passing the coated stock through a drying oven. Such an oven occupies a large floor area and during the passage thereof through the oven the coated stock is heated throughout to the high temperature of the oven thus necessitating a relatively long cooling stage before the stock can be handled.

It is an object of the present invention to provide a method of and apparatus for drying liquid-coated thin metal stock which will occupy a lesser floor area than that occupied by the known forms of drying ovens and which will permit drying of the liquid-coating in a manner such that the stock is not raised to a high temperature during the drying of the liquid-coating applied thereto.

As will be well understood by those skilled in the art a side of thin metal stock is sometimes provided with a liquid coating which covers the whole of the side whereas on other occasions a side is provided with a pattern of liquid coating which covers a part only of the side. Accordingly, wherein herein the term "liquid coating" is employed it is deemed to include a coating which covers the whole or a part of a side of the stock to which it is applied.

According to the invention there is provided the method of drying a liquid coating of lacquer, varnish or paint freshly applied to a side of thin metal stock drawn from a coil thereof, which includes subjecting the freshly coated side to a relatively high coating drying temperature while maintaining the mass of the stock at a temperature considerably less than that to which the coating is subjected, and moving the stock lengthwise at a linear speed which ensures drying, and curing if necessary, of the coating during subjection thereof to said coating drying temperature.

Further the invention contemplates apparatus for drying liquid coated thin metal stock, comprising means to move stock lengthwise from a coil thereof past a coating device arranged to apply a liquid coating of lacquer, varnish, or paint to one side of the stock, and a heater device located in close proximity with the path of said one side of the stock and arranged to subject the freshly coated side of the stock to a relatively high coating drying temperature, and control means to maintain a predetermined geometric relation between the heater device and the coated surface of the stock and to maintain the mass of the stock at a temperature considerably less than that to which the coating is subjected, said stock-moving means being arranged to effect lengthwise movement of the stock at a linear speed which ensures drying, and curing if necessary, of the coating during subjection thereof to said coating drying temperature.

In order that the invention may be clearly understood one embodiment thereof will now be described, by way of example, with reference to the accompanying diagrammatic drawings, in which:

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FIGURE 1 is a sectional elevation of apparatus according to the invention, and

FIGURE 2 is a section on line II—II, FIGURE 1.

Referring to the drawings, thin metal stock 1, for example tinplate or aluminum, is supported as a coil 2, in known manner, and is drawn lengthwise from the coil past a liquid-coating applicator 3 and a coating drying apparatus described below, and is then rewound into a coil or is cut into lengths, as desired. When the coated stock is rewound this is performed, in known manner, by winding the stock on to a reel 4 which is positively rotated, as by an electric motor 5, and which serves as the means by which the stock is moved lengthwise from the original coil and past the applicator and drying apparatus. It will be understood that should the stock be cut into lengths after drying of the coating applied thereto known means will be provided to draw the stock from the coils and to pass it to a cutting device. The liquid applicator 3 may be of any known kind arranged to apply a liquid coating wholly or in part to one side of the stock during movement of the stock past the applicator.

Shortly after the stock passes the liquid applicator 3 it is moved in a curved path during which the coating is subjected to a relatively high temperature, for example a temperature of the order of 1000° F., for a short period of time to effect drying, and curing if necessary, of the coating. Because of this temperature/time ratio it is important that a consistent geometric relationship be maintained between the stock and heater means by which the coating is subjected to the high temperature. In a preferred embodiment of the invention the geometric relation between the stock and the heater means is ensured by moving the stock in a curved path by causing it to be engaged by the periphery of a roller or drum 6 rotatable, by means not shown, in the direction of movement and in timed relation with the lengthwise movement of the stock 1.

To ensure that the mass of the stock is not raised to a temperature allied to that to which the coating is raised the roller or drum is subjected to a tempered cooling. With this object in view, the roller or drum 6 comprises a hollow member provided with inlet 15 and an outlet 16 by which a heated fluid is passed through the hollow member, the fluid preferably being heated water, as illustrated in FIGURE 2.

If it should be possible for a pocket of air to be trapped between the stock and the periphery of the roller it might be difficult to maintain the above-mentioned consistent geometric relationship between the stock and the heating means and to reduce this possibility the periphery of the roller is vented as by the provision therein of small air pockets 7. The surface of the roller may be vented by knurling or by other means which provide a broken surface of regular pattern.

The heating device is formed by a housing 8 having at one end an opening 9 which is arranged to lie located in close proximity with the roller in a manner such that while the stock is movable lengthwise with the roller or drum 6 only the freshly coated side of the stock is exposed to heat transmitted by the heating device, the opposite side of the stock being excluded from the temperature to which the coating is subjected.

The desired high temperature may be provided by any desired means such as gas or oil burners or by electrical conversion and in one embodiment of the invention the heating means comprises electrical resistance elements 10 supported within the housing and so positioned relative to the opening that radiant heat from the elements passes through the coating on the stock and is reflected from the coated side of the stock so that the temperature of the stock as a whole is not raised to the high drying tem-

perature to which the coating is subjected by the heater elements.

A current of air is caused by fans 11 to pass into the housing and arranged, after passage about the heater elements 10 to become heated thereby, to impinge against the coating passing across the opening 9 from the housing. The drying may be effected primarily by the use of air heated as just described and in such circumstances a baffle 12, of arcuate form, co-operates with the roller or drum 6 to form a chamber through which heated air is circulated by the fans 11 and is caused to engage the coated side of the stock. The housing is provided with a chimney 13.

The housing is preferably supported, by means not shown, to be retracted from operative relation with the stock when lengthwise movement of the stock is terminated in order to prevent excessive heating of stock in a localised region thereof, and the stock is passed through a cooling medium, such as a water tank 14 before being wound on to the reel 4 or cut into strips.

The relatively high drying temperature and the rate of lengthwise movement of the coil stock, is determined by the kind of coating material which is applied to the stock. For example, with phenolic resin type lacquers the heating device may be arranged in conjunction with the rate of movement of the stock, to subject the coating to a relatively high temperature which is of the order of about 1,000° F., for a period of about 5 seconds to effect drying and curing. Since the roller or drum 6 is controlled by hot water it will be understood that the uncoated side of the stock is at a considerably lower temperature than that to which the coating is subjected.

From the foregoing it will be understood that, in effect, only the coating is subjected to the relatively high temperature at which drying, and curing if necessary, thereof is effected and that because of the short interval of time during which drying is effected the temperature of the stock is not raised throughout to that of relatively high drying temperature. Indeed, as stated above, means is provided to control the temperature of the stock, although to a temperature which is considerably less than that of the relatively high drying temperature to which the coating is subjected.

Although in the embodiment of the apparatus described above drying has been effected while moving the stock through a curved path, it will be understood that, if desired, drying may be effected while the stock is moved in a straight line path the heater device being suitably modified to accommodate this form of path and the hollow member being also suitably modified.

We claim:

1. The method of drying a liquid coating of lacquer, varnish, or paint freshly applied to a side of thin metal stock drawn from a coil thereof, which includes subject-

ing the freshly coated side to a coating drying temperature of the order of 1,000 degrees F. while opposite side of the stock is engaged by an outer surface of a hollow member, passing a heated cooling fluid at a maximum temperature of the order of 212 degrees F. through the hollow member to maintain the mass of the stock at a temperature considerably less than that to which the coating is subjected, and moving the stock lengthwise at a linear speed which ensures drying, and curing if necessary, of the coating during subjection thereof to said coating drying temperature, and venting said outer surface to prevent the formation between the hollow member and stock of air pockets which might disturb the geometric relation between the stock and a heat source by which said relatively high coating drying temperature is produced.

2. Apparatus for drying liquid coated thin metal stock, comprising means to move stock lengthwise from a coil thereof past a coating device arranged to apply a liquid coating to one side of the stock, a heater device located in close proximity with the path of said one side of the stock and arranged to subject the freshly coated side of the stock to a coating drying temperature of the order of 1,000 degrees F., a hollow rotating drum member engageable by the uncoated side of the stock and so disposed relative to the heater device as to maintain a predetermined geometric relation between the heater device and the coated surface of the stock, means defining an inlet and means defining an outlet communicating with the hollow member to permit the passage therethrough of a heated cooling fluid having a maximum temperature of the order of 212 degrees F. to maintain the mass of the stock at a temperature considerably less than that to which the coating is subjected, said stock-moving means being arranged to effect lengthwise movement of the stock at a linear speed which ensures drying, and curing if necessary, of the coating during subjection thereof to said coating drying temperature, said means defining an inlet opening downwardly into said drum member, and said means defining an outlet opening upwardly into said drum member, whereby the stock engaging surface of said drum member is progressively cooled as said drum member rotates.

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