

[54] IMPREGNATION OF A TRAVELLING WEB	2,770,216	11/1956	Schock	118/323
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	3,155,540	11/1964	Loeffler et al.	118/323 X
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	3,428,024	2/1969	Oita et al.	118/411 X

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Primary Examiner—Dorsey Newton

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Attorney, Agent, or Firm—Larson, Taylor & Hinds

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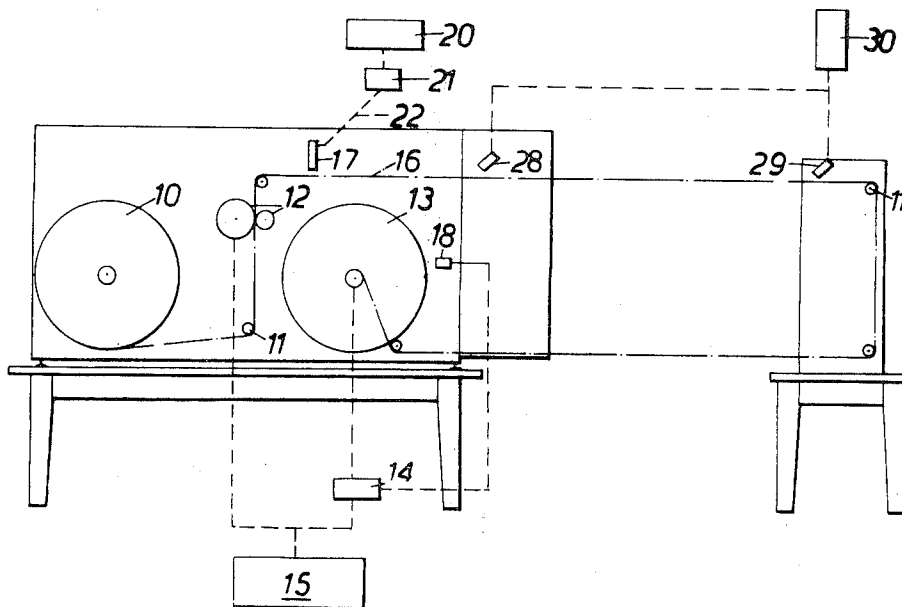
[57] ABSTRACT

[52] U.S. Cl. 118/63; 118/69; 118/315;
118/323; 118/325
[51] Int. Cl.² B05C 5/02; B05C 11/06
[58] Field of Search 118/63, 315, 323, 325,
118/410, 411, 412, 69

Apparatus for impregnating a travelling web of packaging material with one or two sinuous lines of liquid flavourant, e.g. menthol, discharged from one or two nozzles which oscillate to and fro across the travelling web. Air jets are directed at the peak portions of the flavourant deposited on the web to spread and dry them quickly so that the impregnated web may be safely wound on a spool.

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4 Claims, 7 Drawing Figures



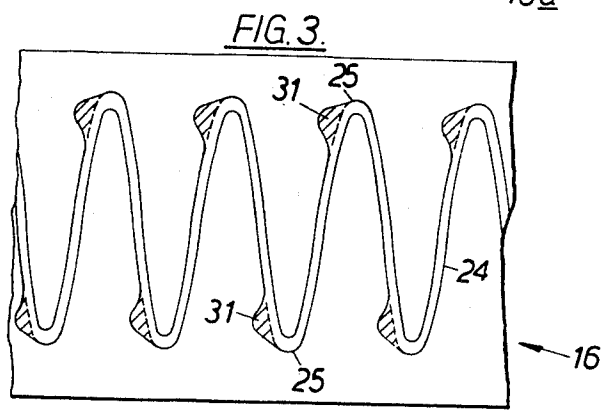
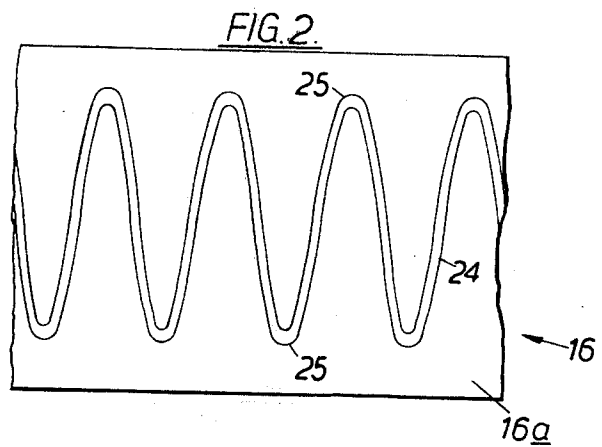
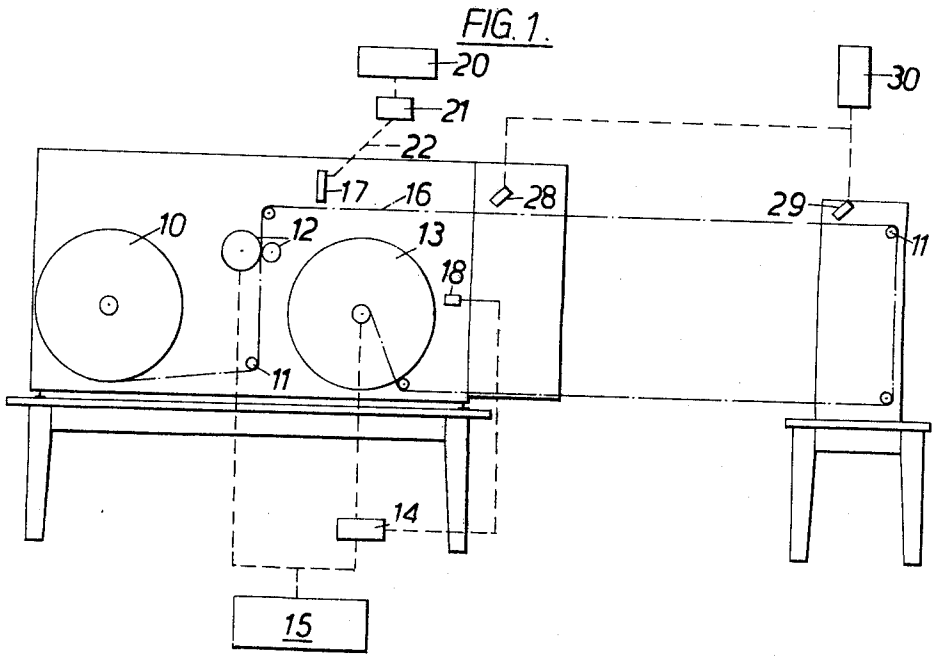


FIG. 4.

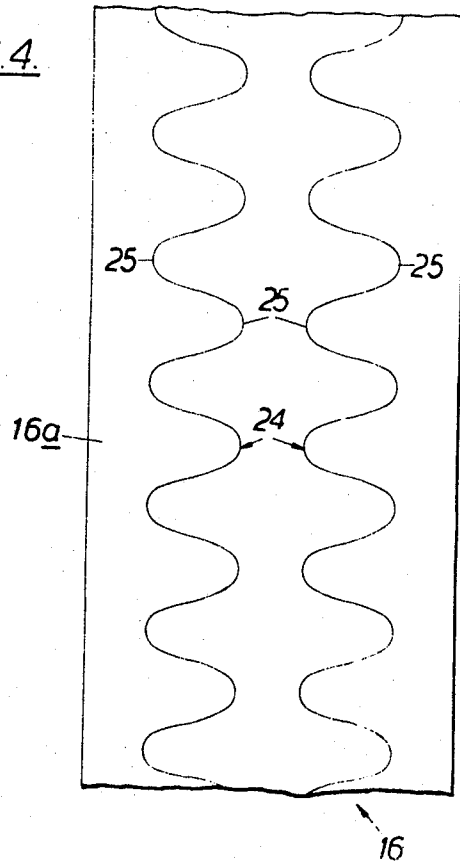


FIG. 5.

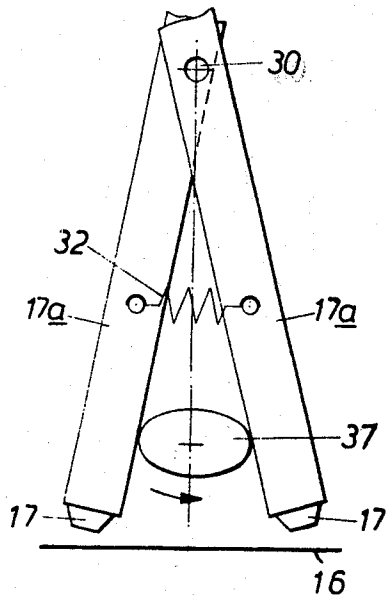
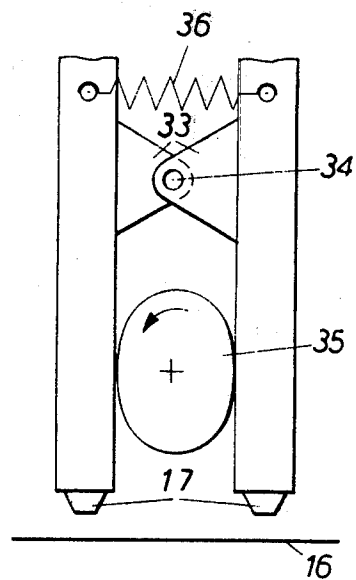


FIG. 6.



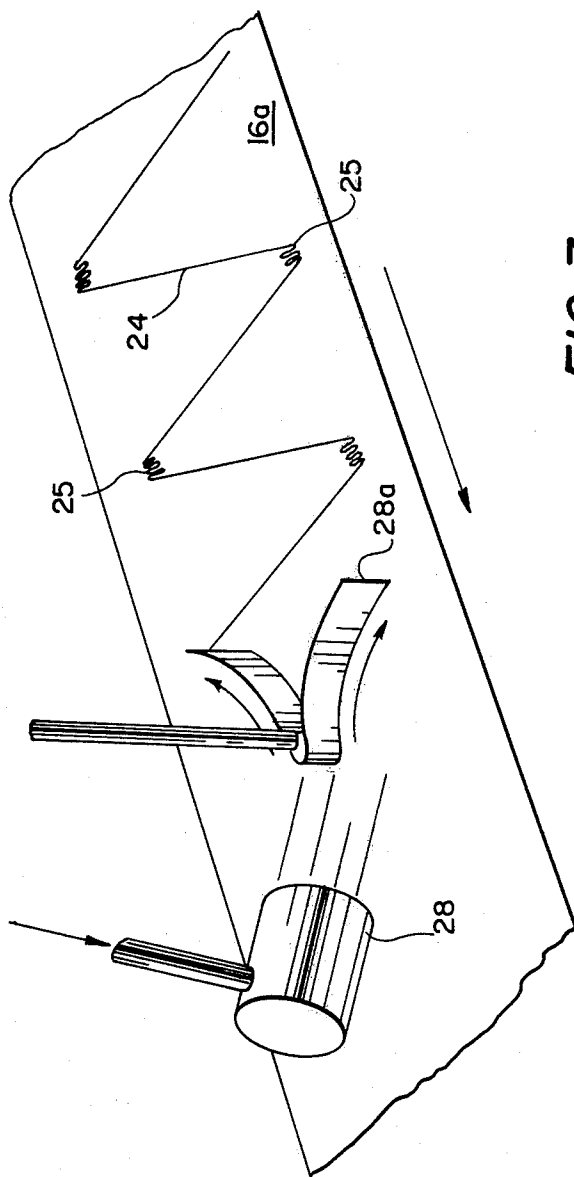


FIG. 7

IMPREGNATION OF A TRAVELLING WEB

This invention relates to apparatus for impregnation of a travelling web of material which has an absorbent surface.

It is known to impregnate a laminated web of aluminium foil and paper tissue with a flavourant which is a solution of menthol in alcohol. The impregnated web is used to wrap batches of cigarettes which are then packaged. By this means a menthol flavour may be imparted to the wrapped cigarettes.

Typically, impregnation of a web with flavourant is achieved by passing the web over stainless steel discs which dip into a bath of flavourant. With such an arrangement it is difficult to achieve a deposit of flavourant within close limits. With the present invention a close control on the amount of flavourant deposited on the web can be obtained.

According to the invention there is provided apparatus for impregnating an absorbent surface of a travelling web of material with a liquid, the apparatus comprising a nozzle for discharging a liquid, means for causing a web of material to travel past the nozzle, a device for moving the nozzle to and fro transversely to the direction of travel of the web past the nozzle so as to cause the liquid from the nozzle to be deposited in a sinuous line on the absorbent surface, an air nozzle adjacent and downstream of the liquid nozzle, which air nozzle is oriented to direct compressed air at peak portions of the sinuous line of liquid so as to spread the liquid on the absorbent surface, a heater for heating the liquid before deposition on the absorbent surface, and a further air nozzle adjacent and downstream of the first-mentioned air nozzle, which further air nozzle is oriented to direct compressed air at the spread peak portions of the sinuous line of liquid so as to cool the liquid. Other features of the invention will be apparent from the ensuing description taken in conjunction with the accompanying drawings, and the appended claims.

By way of example the invention will now be described with reference to the accompanying drawings of which,

FIG. 1 is a diagrammatic layout of apparatus for impregnating a travelling web,

FIGS. 2 and 3 are plan views of a portion of a web having a sinuous line of deposited flavourant,

FIG. 4 is a plan view of a portion of a web having a pair of sinuous lines of deposited flavourant,

FIG. 5 is an end view of a pair of oscillating nozzles used to deposit the flavourant shown in FIG. 4, and

FIG. 6 is an end view of another pair of oscillating nozzles showing an alternative form of nozzle mounting.

FIG. 7 is a schematic illustration of an air nozzle provided with a baffle at its outlet end for dividing the discharge so as to direct air jets at the peak portions of the deposited material.

In this example it is desired to impregnate a web of laminated aluminium foil and paper tissue with a menthol flavourant, the web being intended for providing wrappers for batches of cigarettes which are to be packaged in cartons or other outer containers. The portion of the web which is to be impregnated is the tissue which partly absorbs the volatile menthol deposited on it.

The apparatus shown in FIG. 1 comprises mainly a supply system for supplying heated liquid menthol to at least one oscillating nozzle, a conveyor system for caus-

ing a web to travel past the nozzle at a constant speed, a nozzle-actuating system for causing the nozzle to deposit a sinuous line of menthol on the travelling web, and an air nozzle system for directing jets of air at the peak portions of the sinuous line of menthol in order to spread and cool the newly applied menthol.

Referring in more detail to FIG. 1, the conveyor system comprises a free-running feed spool 10, guide rollers 11, a pair of constant drive rollers 12, and a take-up spool 13 which is connected via a slipping clutch 14 with a drive motor 15 which also drives the rollers 12. A web 16 is arranged to travel horizontally, with its tissue uppermost, in a straight line past the oscillating nozzle 17 which is located immediately above the path of the web. As the impregnated web 16 winds upon the spool 13, the increase in the diameter of the wound web is sensed by a sensor 18 which signals the slipping clutch 14 so as to cause a decrease in the speed of the driven spool 13 and thereby maintain a constant tension in the web 16 being wound up. The separate drive to the drive rollers 12 remains unaffected so that the latter maintain their r.p.m. in order to keep constant the speed of the web 16 past the nozzle 17.

The menthol supply system comprises a heated reservoir 20 for menthol which is connected by a pump 21 and flexible supply pipe 22 to a heating chamber in the upper portion of the nozzle 17. The pump 21 has an output control to vary the rate of flow to the nozzle 17. The whole of the system from reservoir to nozzle is thermally insulated and the menthol is delivered to the nozzle in liquid form heated to about 50°C.

In the nozzle-actuating system, the single nozzle 17 which points downwards is pivotable about a horizontal axis and in its position of rest lies in a vertical plane which intersects the longitudinal centre line of the web. The nozzle is arranged to oscillate to and fro across the web 16 in a simple harmonic motion which is preferably at right angles to the direction of travel of the web but may be inclined up to 45°. The nozzle movement is controlled by means of a suitable drive mechanism such as a vertical drive shaft mounting an eccentric connected to a crank arm which drives a pusher rod having at its free end a roller follower held in contact with the side of the nozzle.

When the nozzle 17 supplied with menthol is oscillated across the travelling web 16, it deposits on the web tissue 16a a predetermined amount of menthol in the form of a sinuous or substantially sinusoidal line 24 as shown in FIG. 2. However, because of the nozzle motion, more menthol is deposited at the peak portions 25 of the sinuous line where the nozzle speed is lowest than at the intermediate portions where the nozzle speed is higher. This creates a problem in high speed production because the deposited hot menthol must be dry and crystallised before it reaches the take-up spool 13. Accordingly the apparatus is further provided with an air nozzle system.

The air nozzle system comprises a fixed air nozzle 28 mounted above the web 16 downstream of the menthol nozzle 17 and preferably also a second fixed air nozzle 29 mounted above the web 16 downstream of the air nozzle 28. The air nozzles are shown inclined in a forward and downstream attitude but may be oriented vertically downwards or even rearwards and downwards. The air nozzles 28, 29 are supplied with compressed air from a source 30. As shown schematically in FIG. 7, air nozzle 28 may have a Vee-shaped baffle 28a at its out-

let which divides the nozzle discharge to direct air jets at the two series of successive peak portions 25 which pass underneath on the travelling web 16. The primary purpose of the jets from the air nozzle 28 is to spread the deposited menthol, as indicated at 31 in FIG. 3, thereby assisting drying and recrystallisation of the menthol. The primary purpose of the jets from the air nozzle 29 is to cool the newly spread hot menthol and so assist recrystallisation. As a result the danger of transfer of menthol from the tissue to the foil during winding of the web upon the spool 13 is avoided or at least minimised.

In a typical range of application which is applicable to the single menthol nozzle apparatus, relevant data is as follows.

1. Linear speed of web.	60 - 160 feet per mn.
2. Width of web.	80 - 150 mm.
3. Menthol nozzle outlet diameter.	0.015 inch.
4. Number of nozzle oscillations per minute.	50 - 500
5. Arc traversed by menthol nozzle.	15° - 30°
6. Rate of flow of menthol to nozzle.	4 - 27 cc per mn.
7. Deposit of menthol per linear metre of web.	0.25 - 1.00 gms

It will be appreciated that the amount of menthol applied to the web is dependent on the web speed and the flow rate from the reservoir pump. By simply adjusting the relevant controls for these conditions the amount of menthol deposited can be quickly varied.

Preferably, instead of a single nozzle the apparatus has a pair of oscillating nozzles 17 as shown in FIGS. 5 and 6. Each nozzle 17 includes a heating chamber 17a supplied with hot liquid menthol by the pipe 22. In FIG. 5 the nozzles pivot about an axis 30 under the control of a rotatable cam 37, their sides being held in contact with opposing portions of the cam by means of a spring 32. In operation, the oscillating nozzles deposit a pair of sinuous lines of menthol 24 on the tissue 16a of the web 16 travelling beneath the nozzles, the lines 24 together defining a continuous bellows shape as shown in FIG. 4. It will be appreciated that each nozzle 17 is moved to and fro across only half of the treated width of the web, thus halving its maximum velocity and enabling the frequency of the sinuous lines 24 to be doubled. This increase in frequency results in an improved distribution of the deposited material.

In FIG. 6 which shows an alternative mounting of the twin nozzles 17, the two nozzles are supported on inwardly-extending brackets 33 and pivot about an axis 34 under the control of a rotatable cam 35, their sides being held in contact with opposing portions of the cam by means of a spring 36 located on the other side of the axis from the cam.

In a modification of the apparatus (not shown), there are two nozzles at the lower end of an oscillating heated

chamber which deposit two lines of menthol on the web. If the nozzles are suitably spaced and angled, the distance between the two deposited lines is equivalent to half an oscillation and the two lines of menthol will be 180° out of phase, defining a series of generally oval figures. This two-line system is suitable for high web speeds.

The method and apparatus of the present invention are applicable to the deposit of other liquids which may be flavourants. Where two liquid nozzles are used, each may deposit a different liquid.

Instead of oscillation, the liquid nozzle or nozzles may be given a reciprocating action.

What I claim is:

1. Apparatus for impregnating an absorbent surface of a travelling web of material with a liquid and comprising a nozzle for discharging a liquid, means for causing a web of material to travel past the nozzle, a device for moving the nozzle to and fro transversely to the direction of travel of the web past the nozzle so as to cause the liquid from the nozzle to be deposited in a sinuous line on the absorbent surface, an air nozzle adjacent and downstream of the liquid nozzle, which air nozzle is oriented to direct compressed air at peak portions of the sinuous line of liquid so as to spread the liquid on the absorbent surface, a heater for heating the liquid before deposition on the absorbent surface, and a further air nozzle adjacent and downstream of the first-mentioned air nozzle, which further air nozzle is oriented to direct compressed air at the spread peak portions of the sinuous line of liquid so as to cool the liquid.

2. Apparatus according to claim 1 wherein there is a pair of downwardly-inclined nozzles for discharging liquid, which liquid nozzles are mounted above the path of travel of the web and are arranged to oscillate in a common plate at right angles to the path of travel of the web under the control of a rotatable cam which is located between and arranged to act on side portions of the nozzles, and means are provided for urging the side portions of the nozzles against the cam.

3. Apparatus according to claim 1 wherein said means for causing a web of material to travel past the nozzle comprise a pair of drive rollers for the web upstream of the liquid nozzle, a motor arranged to rotate the drive rollers at a constant speed, a spool for receiving the impregnated web, the motor being also arranged to rotate the spool separately from the drive rollers, means for reducing the speed of the spool to maintain a constant tension on the web downstream of the drive rollers, and a sensor arranged to sense the build-up on the spool of the impregnated web, the speed reducing means being controlled by that sensor.

4. Apparatus according to claim 1 wherein the spreader air nozzle has a baffle at its outlet to divide its discharge into two air jets directed at the two series of peak portions of the sinuous line of deposited liquid.

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