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APPARATUS FOR MAKING FILTER TIP CIGARETTES

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Sheet 1 of 2

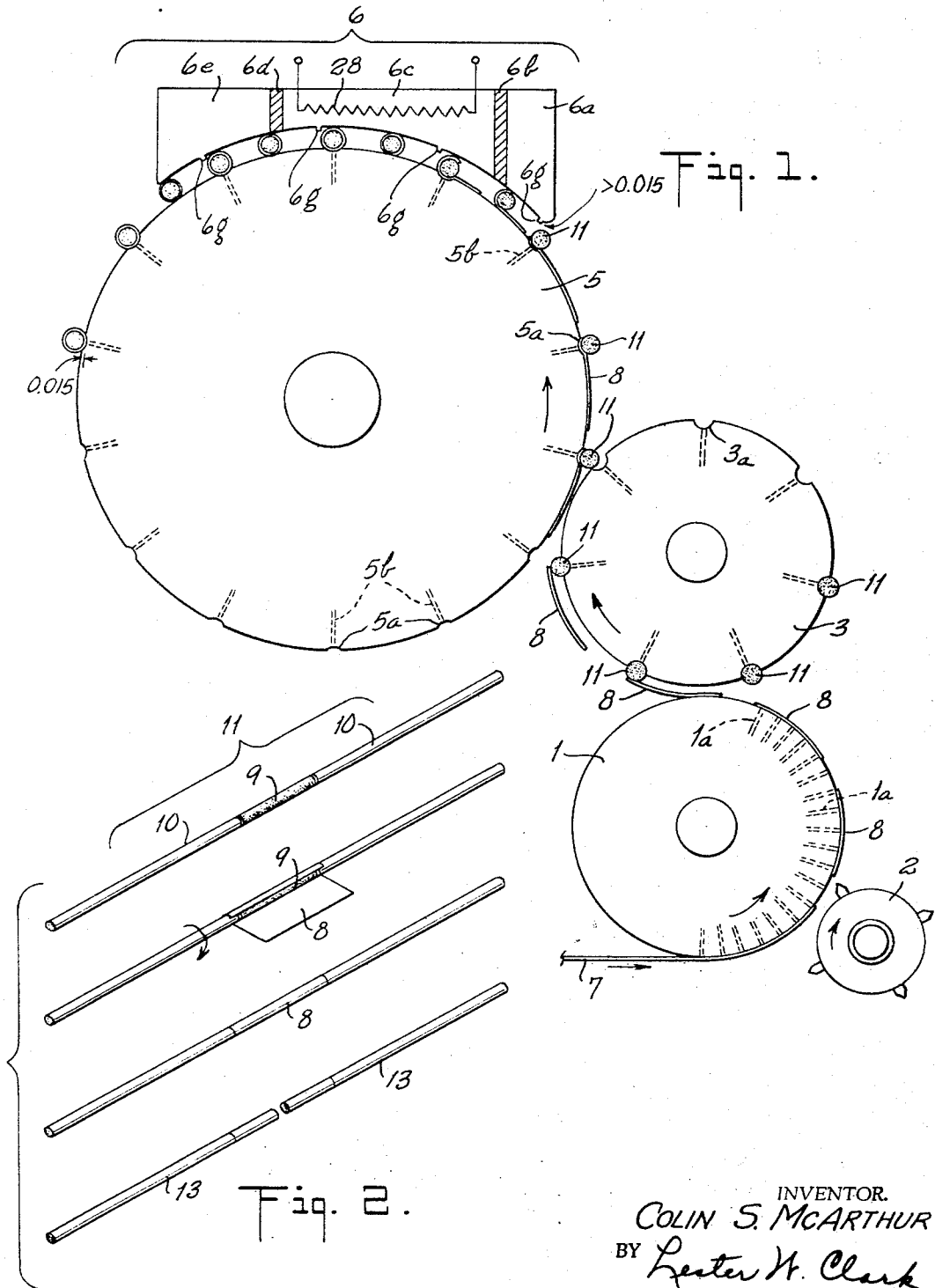


Fig. 1.

Fig. 2.

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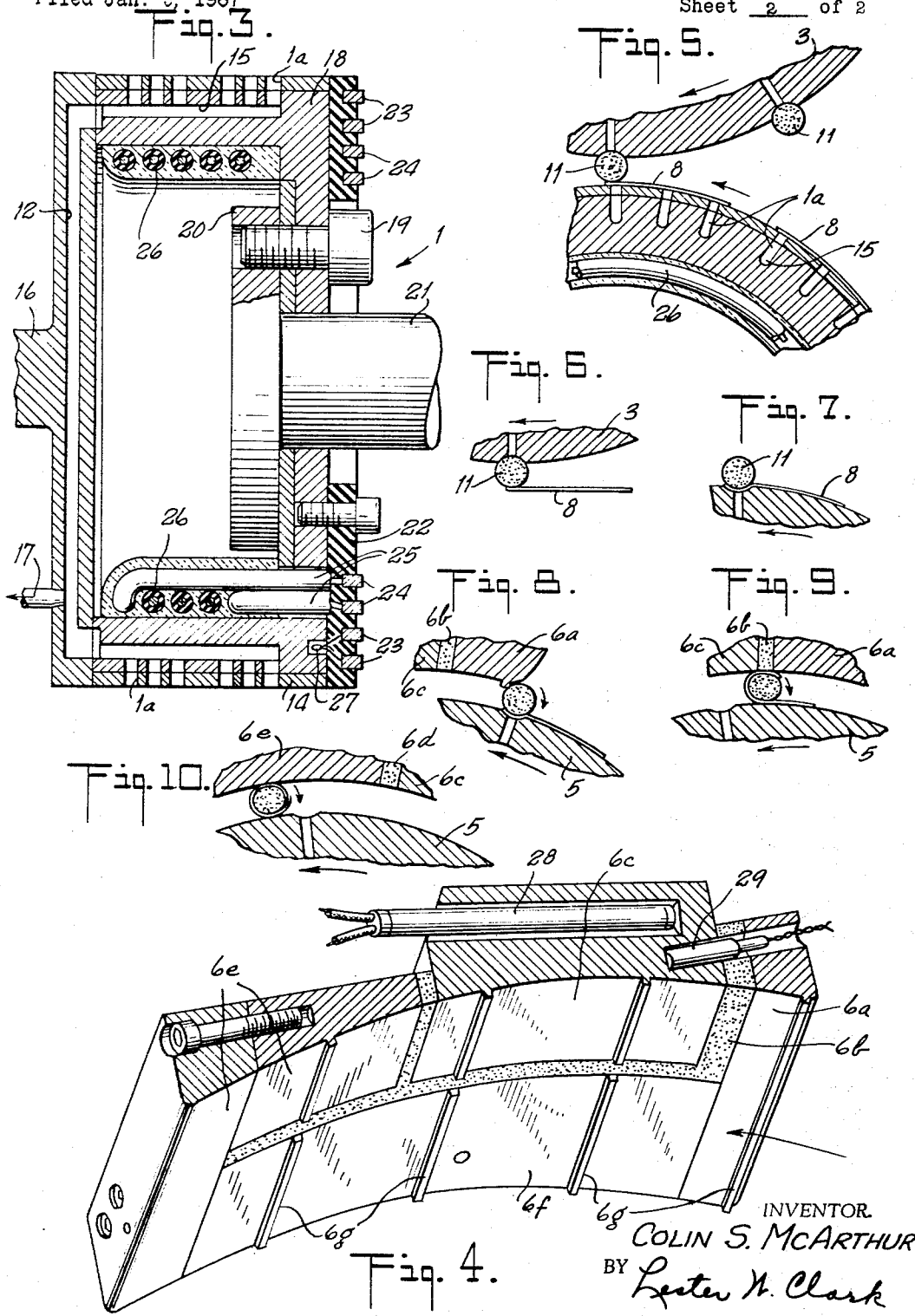
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**APPARATUS FOR MAKING FILTER TIP
 CIGARETTES**

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13 Claims

ABSTRACT OF THE DISCLOSURE

Apparatus and method for covering assembled cigarette units (each comprising at least one cigarette rod section and at least one filter section) with patches of tipping material coated with heat-activatable adhesive. The patch is first heated, then its leading edge is applied to the assembled cool unit so as to span abutting ends of rod and filter sections. Local cooling of the adhesive completes the bond. The unit with the attached patch is then cooled, rolled for a partial revolution while cool, then rolled for plural revolutions on a heated shoe which reactivates the adhesive, and finally rolled for plural revolutions on an unheated shoe to freeze the adhesive.

Background of the invention

In the manufacture of filter tip cigarettes, it has been the practice in the past to assemble a section of cigarette rod with a section of filter material, and to connect the two sections by wrapping around their abutting ends a patch of sheet material, commonly called tipping material. This tipping material is coated with a liquid bonding agent before it is wrapped around the cigarette unit, and the bond is set by drying the liquid bonding agent after the connection is completed. The handling of the tipping material coated with the liquid bonding agent entails some spilling of the bonding material, with the resultant necessity to stop the machine occasionally to clean up the spilled material.

There have been available for many years, a class of heat-activatable (or "heat-sealing") bonding materials, which are dry at room temperatures, but which are rendered tacky by heating to about 150°–200° F. These materials have not heretofore been used for manufacturing filter tip cigarettes, because the machinery of the prior art has not been adapted to heating the material before the bonding, and cooling it after the bonding. Furthermore, when such a bonding material is used, the bond is not secure until the bonding material is cooled. Consequently, there is a tendency for the bond to separate after it is initially formed, with the result that the finished cigarette is defective.

Summary of the invention

The present invention uses patches of tipping material coated with heat-activatable bonding material. It overcomes the difficulties encountered in the prior art by first tacking one edge of a heated patch of bonding material to an assembled cigarette and filter unit. This tacking is accomplished without any immediately following attempt to roll the cigarette and to wrap it in the tipping material. The cigarette then travels along an unheated path for a distance sufficient to cool the bonding material and allow the initial tack to set. Thereafter the cigarette is rolled through a partial revolution so as to bring the initial tack to an angular position where it is out of alignment with a heating shoe that is next engaged by the cigarette and is effective to roll it through a plurality of revolutions, thereby heating the bonding material and making it tacky throughout the patch of tipping material. Finally, the

cigarette is rolled over another unheated rolling shoe which is effective to cool the bonding material and set the bond.

Description of the drawing

FIG. 1 is a somewhat diagrammatic view illustrating the apparatus and method of the invention;

FIG. 2 is a series of four successive perspective views of a cigarette unit as it is handled in the apparatus and method of the invention;

FIG. 3 is an enlarged cross-sectional view of a patch heating drum forming part of the apparatus of the invention;

FIG. 4 is an enlarged view partly in perspective, taken from below, and partly in central cross-section, showing the rolling shoe of FIG. 1;

FIG. 5 is an enlarged cross-sectional view showing the initial contact between the cigarette units on a transfer drum and the patches on the patch heating drum;

FIG. 6 is a view similar to FIG. 5, showing the cigarette unit with tack patch connected, moving along the transfer drum after separation from the heating drum;

FIG. 7 shows the assembled unit on the periphery of the rolling drum;

FIG. 8 is a view showing the cigarette on the periphery of the rolling drum as it moves into contact with the initial section of the rolling shoe;

FIG. 9 is a view similar to FIG. 8, but showing the cigarette as it passes the end of the initial section of the rolling shoe;

FIG. 10 is a view similar to FIG. 9, showing the movement of the cigarette as it passes under the heated section of the rolling shoe.

Description of the preferred embodiment

The apparatus illustrated in FIG. 1 includes a tipping material heating drum 1, a cutter 2, cooperating with that drum, a transfer drum 3 to which assembled filter cigarette units are supplied by conventional apparatus, not shown, a rolling drum 5 and a rolling shoe cooperating with the rolling drum and generally indicated at 6.

The tipping material is supplied as a strip or sheet, as illustrated at 7, and passes around the periphery of the heating drum 1. The material 7 is coated on its outer surface with a suitable heat-activatable bonding material, e.g., one of the vinyl acetate acrylic-copolymers. The drum 1 is provided with spaced apertures 1a which communicate with an evacuated chamber, and which are effective to hold the strip material 7 on the surface of the drum. The drum 1 cooperates with a cutter 2 which cuts the strip material into patches 8, each big enough to wrap a single cigarette. The drum 1 is operated at a peripheral speed slightly greater than the linear speed of the supply of the strip material 7 so that the patches 8 become separated on the surface of the drum 1, as shown. Each cigarette unit 11 typically consists of a double length filter section, as shown at 9 in FIG. 2 and two cigarette rod sections 10, with each cigarette rod section having one of its ends abutting an end of the filter section 9. The term "cigarette unit" as used in this specification is intended to be generic to: (a) such a double length unit; and (b) single length units as shown at 13.

The transfer drum 3 and the heater drum 1 are so mounted and spaced that each cigarette unit 11, which is held in a recess 3a by vacuum means on the periphery of the transfer drum 3, touches tangentially and with light pressure the leading edge of one of the patches 8 carried by the heater drum 1. At the same time, the apertures 1a under that leading edge pass out of communication with a vacuum manifold 12 so that the tipping patch, whose heat-activatable bonding material has become

tacky by the effect of the heat of the drum 1, sticks to the abutting cigarette unit along one elongated cylindrical element thereof. The patch is gradually released from the heater drum as the rotation of that drum and the transfer drum continues, so that the cigarette unit 11 continues with the periphery of the transfer drum 3, having the patch 8 attached thereto and following behind it. The transfer drum 3 cooperates tangentially with a rolling drum 5 also provided with recesses 5a to receive cigarette units. Each recess 5a communicates with a passage 5b, in which a vacuum is maintained to hold the cigarette units on the periphery of the drum. The recesses 5a are somewhat shallower than corresponding recesses 3a on the transfer drum, so as to make it easier for the rolling mechanism to begin to roll a cigarette unit out of one of the recesses 5a. Preferably, the depth of each recess 5a is about 0.015". This depth is exaggerated in the drawing, for purposes of clarity. As the cigarette unit with attached patch 8 approaches the top of the rolling drum 5, it encounters the rolling shoe 6 which comprises an initial unheated section 6a separated by an insulating spacer 6b from a heated rolling section 6c. The section 6c and the opposite end of the shoe are separated by another heat insulating spacer 6d from a third, unheated rolling shoe section 6e.

The heated shoe section 6c is somewhat narrower than the unheated sections 6a and 6e, being just slightly wider than the patch 8 which it is intended to heat. The section 6c is flanked on either side by another unheated section 6f, one of which is shown in FIG. 4, so that the entire length of the cigarette unit is rolled evenly, while only the patch 8 is subjected to heat.

The bottom of the shoe 6 is provided with a plurality of ridges 6g, extending parallel to the axis of rotation of drum 5. The ridges 6g are spaced apart along the arcuate surface of the shoe 6, so that the central angle at the axis of drum 5, between radii drawn to the centers of successive ridges, is equal to the central angle between the centers of successive recesses 5a. The ridges 6g project from the surface of shoe 6 by a distance slightly greater than the depth of a recess 5a. The purpose of each ridge 6g is to engage the periphery of a passing cigarette unit resting in one of the recesses 5a, and start it rolling out of that recess, and between the periphery of the drum 5 and the arcuate surface of the shoe 6.

The ridges 6g are preferably provided with angular edges, as shown, to give them a good grip on the peripheries of passing cigarettes.

Each cigarette rolling between the shoe 6 and drum 5 moves at one-half the peripheral speed of drum 5. Hence, there are twice as many cigarettes under the shoe 6 as there are recesses 5a, at any given time.

The first ridge 6g is at the leading edge of the shoe section 6a, and the locations of the others are determined by the angular relationship described above. With this spacing of the ridges, each time that a cigarette falls into a recess 5a, it soon thereafter encounters a ridge effective to roll out of that recess. The spacers 6b and 6d may either be of solid, heat insulating material, or may simply be an air space, which has adequate heat insulating qualities for the purpose. Where an air space is used, the ends of the cigarette unit, being rolled between the drum and the unheated sections 6f of the shoe 6, keep the cigarette rolling as it crosses the gap at the spacers 6b and 6d.

The shoe 6 is separated from the periphery of drum 5 by a distance slightly less than the diameter of a cigarette unit, so that when the cigarette unit 11 encounters the initial shoe section 6a, it is rolled out of its associated recess 5a, by ridge 6g, as shown in FIG. 8. The vacuum in the passage 5b is released at the same time, by conventional means. The peripheral length of the section 6a is sufficient so that when the cigarette reaches the end of section 6a, it has rotated more than one half revolution, and the tack at its leading edge has passed

beyond the point of contact with the rolling shoe 6. (See FIG. 9). After passing the insulating section 6b, the cigarette unit encounters heated shoe section 6c, which is effective to roll the cigarette through a plurality of revolutions, at the same time heating the cigarette and making the bonding material on the inner surface of the patch tacky so that it sticks to the cigarette rod section and the filter section. During this heating, the cigarette unit is always firmly held between the drum 5 and the shoe 6, so that the patch cannot come loose. After the cigarette unit passes the heater section 6c of the rolling shoe, it then passes the insulator section 6d of the cooling section 6e, where the cigarette is further rolled for a plurality of revolutions.

At the cooling shoe section 6e, the heat-activatable material is set by the cooling action of the shoe. At the point where the cigarettes pass from the cooling section 6e, the vacuum is again restored to the passages 5b, so that the cigarettes are held by the vacuum in the nearest groove 5a and pass to further manufacturing operations, which commonly include cutting each unit into two individual cigarettes 13, as shown at the bottom of FIG. 2.

FIG. 3

This figure illustrates the heating drum 1 which includes an outer cylinder shell of hard-resistant material, for example, tungsten carbide, shown generally at 14. The passages 1a are arranged in rows, and each row communicates with a passage 15 that extends axially of the drum. The axial passages communicate, during a portion of their rotation, with a manifold 12 mounted on a fixed support 16, and connected by means of a conduit 17 to a suitable source of subatmospheric pressure. The outer shell 14 is mounted on an inner shell 18 which is in turn mounted by means of bolts 19 to a flange 20 attached to the end of a driving shaft 21.

On the right-hand outer face of the inner shell 18 is mounted an insulating plate 22, which may be of suitable plastic material, and in which are embedded two sets of slip rings 23 and 24. The slip rings 24 communicate through wires 25 with a heater winding 26 located internally of the shell 18. A thermocouple 27, or other suitable temperature sensitive element is embedded in the shell 18 and connected through suitable wires to the other set of slip rings 23. Brushes (not shown) cooperate with the slip rings 23 and 24. The temperature indicated by the thermocouple 27 may be used to control the current to the heater winding 26 and alternatively, the temperature indication from thermocouple 27 may be used simply to operate an indicator or recorder, and the current flow to the winding 26 may be manually controlled.

As shown in FIG. 4, the heater section 6c of the rolling shoe 6 is provided with a heater winding 28 and with a temperature measuring thermocouple 29. The thermocouple 29 may be used for purposes analogous to those of the thermocouple 27 discussed above.

I claim:

1. Apparatus for connecting a filter tip to a cigarette, comprising:

(1) means for assembling cigarette units for tipping, each unit including a section of cigarette rod and a section of filter rod having one of its ends abutting an end of the cigarette rod section;

(2) means for wrapping around the abutting ends of each assembled unit a patch of tipping material coated with bonding material to form a filter tip cigarette; wherein the improvement comprises:

(a) means for supplying patches of tipping material coated with heat-activatable bonding material;

(b) means to heat said patches, thereby activating the bonding material;

(c) means to apply the leading edge of each heated patch to the periphery of an assembled, unheated cigarette unit, with the patch spanning the abutting rod ends, thereby locally cooling and setting the ad-

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hesive along said leading edge and attaching the patch to the unit along a linear element thereof;

(d) first rolling means to roll the unit with the attached patch through a partial revolution without further heating;

(e) second rolling means including:

(1) a second heating means positioned to engage initially a locality of the unit spaced peripherally thereof from said linear element; and

(2) means to continue the rolling of the unit for a plurality of revolutions while applying heat to said patch to form a completed filter tip cigarette unit.

2. Apparatus as defined in claim 1, wherein the improvement further comprises:

(a) third rolling means to continue rolling of the unit without heating, so as to set the bonding material.

3. Apparatus as defined in claim 1, wherein the improvement further comprises means defining an unheated path of travel between the patch applying means and the rolling means.

4. Apparatus as defined in claim 1, in which said partial revolution rolling means is effective to roll the unit through an angle greater than 180°.

5. Apparatus as defined in claim 1, in which said patch heating means comprises a heated drum and vacuum means to hold the patches on the surface of the drum with their coated surfaces outward.

6. Apparatus as defined in claim 5, in which the patch applying means includes:

(a) a transfer drum;

(b) vacuum means in said transfer drum to hold the assembled units on the periphery thereof;

(c) said transfer drum being spaced from the heating drum so that said assembled units on the transfer drum and the heated patches on the heating drum approach one another tangentially.

7. Apparatus as defined in claim 6, including:

(a) vacuum release means on the heated drum effective to release each patch therefrom upon contact of an assembled cigarette unit with the leading edge of the patch.

8. Apparatus as defined in claim 1, in which said first rolling means comprises:

(a) a rolling drum having shallow recesses in its periphery for receiving said cigarette units;

(b) vacuum means in said rolling drum for lightly retaining said units in said shallow recesses; and

(c) unheated shoe means having a surface concentric with and spaced radially outwardly from the periphery of the rolling drum and means effective to engage units in said recesses and roll them along the drum periphery, regardless of the retaining effect of the vacuum means.

9. Apparatus as defined in claim 8, in which said second rolling means comprises a heated second shoe means separated circumferentially relative to said rolling drum from said unheated shoe means by a heat insulating space, and cooperating with cigarette units leaving said unheated shoe means and traveling on the periphery of said rolling drum to continue the rolling of said units for a plurality of revolutions while heating them.

10. Apparatus as defined in claim 9, in which said sec-

ond rolling means further comprises a third shoe means separated circumferentially relative to the periphery of the rolling drum from said heated second shoe means and cooperating with cigarette units leaving the heated second shoe means to continue the rolling of said units, said third shoe means being unheated and effective to cool and set the adhesive on said units.

11. Apparatus for wrapping an assembled cigarette unit, including a section of cigarette rod and a section of filter rod, within a patch of sheet material coated with heat-activatable bonding materials, comprising:

(a) a drum having shallow recesses in its periphery for receiving cigarette units with patches adhering thereto along linear elements thereof;

(b) vacuum means within the drum for holding the cigarette units in said recesses;

wherein the improvement comprises:

(c) first shoe means spaced radially outwardly from the periphery of the drum, said first shoe means being unheated, and being adapted to engage cigarette units on the drum periphery and roll them through a partial revolution as the drum rotates;

(d) second shoe means spaced radially outwardly from the periphery of the drum and circumferentially relative to the drum, in the direction of rotation thereof from said first shoe means, and adapted to roll said units through a plurality of revolutions;

(e) means for heating said second shoe means; and

(f) third shoe means spaced radially outwardly from the periphery of the drum and circumferentially relative to the drum in the direction of rotation thereof, from said second shoe means, said third shoe means being unheated and adapted to engage cigarette units leaving said second shoe means and effective to roll said cigarette units through a plurality of revolutions.

12. Apparatus as defined in claim 11, in which said first, second and third shoe means comprises a unitary shoe with first, second and third sections corresponding respectively to said three shoe means and separated from one another by heat insulating spaces.

13. Rolling shoe means for use in apparatus for wrapping cigarette units in patches coated with heat-activatable bonding material, wherein the improvement comprises:

(a) a unitary shoe having first, second and third sections separated by heat insulating spaces; and

(b) heater means associated with said second section.

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