

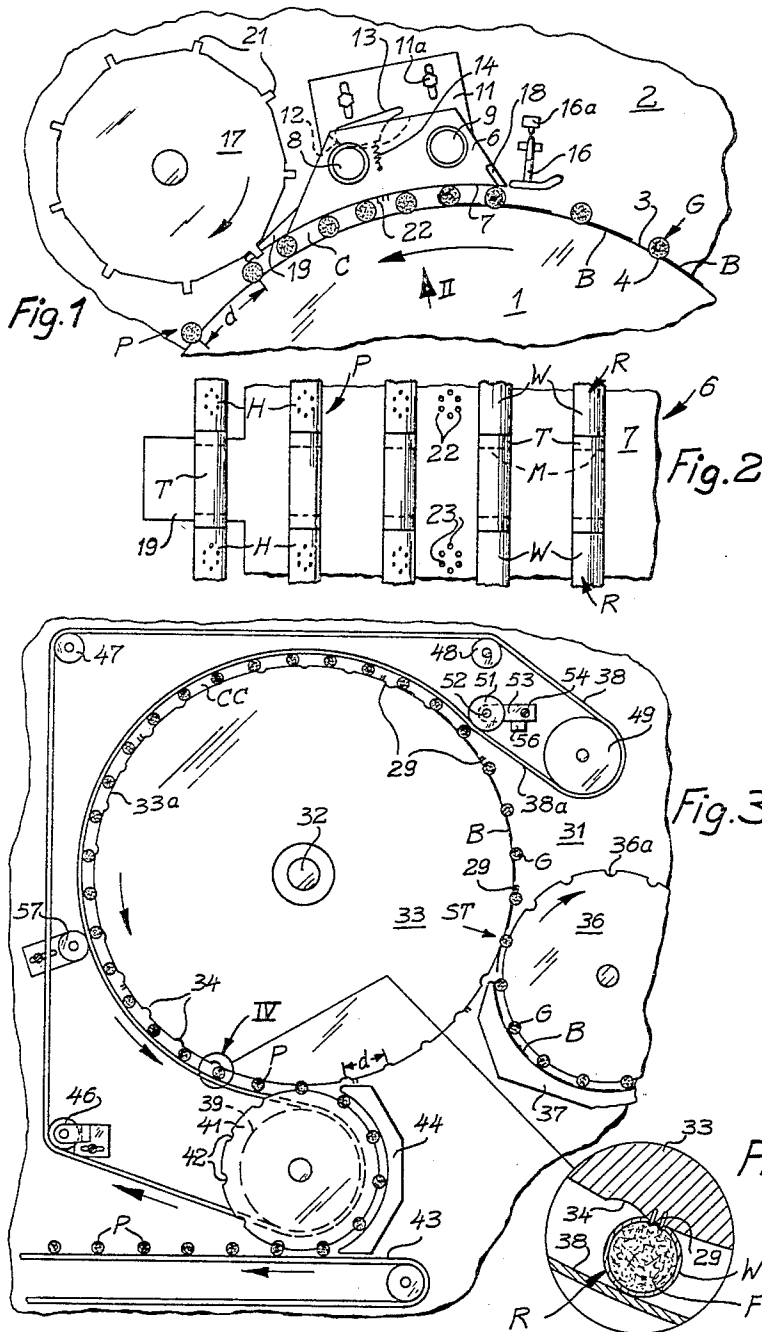
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A. HINZMANN

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APPARATUS FOR MAKING HOLES IN TOBACCO RODS OR THE LIKE

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INVENTOR:
Alfred Hinzmänn

BY Michael S. Striker
ATTORNEY

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3,483,873 APPARATUS FOR MAKING HOLES IN TOBACCO RODS OR THE LIKE

Alfred Hinzmann, Richmond, Va., assignor to Hauni-
Werke, Koerber & Co. KG, Hamburg-Bergedorf,
Germany

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11 Claims

ABSTRACT OF THE DISCLOSURE

Wrappers of tobacco rods are punctured while the tobacco rods roll in a gap between two rolling surfaces at least one of which travels with reference to the other surface. The means for puncturing the wrappers comprises one or more arrays of needles which extend beyond at least one of the surfaces and form in each wrapper holes close to one end of the respective tobacco rod. The puncturing is carried out while the tobacco rods are assembled with mouthpieces to form therewith filter cigarettes of multiple unit length.

BACKGROUND OF THE INVENTION

The present invention relates to an apparatus for the production of cigarettes, filter cigarettes, cigars, cigarillos, filter rods and/or like rod-shaped smoking products. More particularly, the invention relates to an apparatus for forming holes in tubular wrappers of rod-shaped smoking products wherein the wrappers surround air-permeable fillers of tobacco and/or filter material. Still more particularly, the invention relates to an apparatus which can be employed with particular advantage in the production of improved filter cigarettes or like rod-shaped smoking products wherein a wrapped tobacco rod is joined end-to-end with one or more rod-shaped filter mouthpieces.

In certain filter cigarettes, it is desirable to provide the wrapper of the tobacco rod with one or more holes which admit cool atmospheric air when the user draws smoke into his or her mouth. The holes cannot be too numerous or too large in order to avoid excessive weakening of wrappers and/or admission of excessive amounts of air. Furthermore, the holes must be made at the same rate at which the tobacco rods and/or filter cigarettes are produced in a modern high-speed automatic cigarette machine or filter cigarette machine.

SUMMARY OF THE INVENTION

Accordingly, it is an important object of my invention to provide an apparatus for puncturing the wrappers of rod-shaped smoking products in such a way that each wrapper is punctured in a predetermined area, that each wrapper is formed with holes whose combined area is the same as in each other wrapper, and that such puncturing can be carried out at the same rate at which the rod-shaped products are produced or processed in a modern cigarette machine, filter cigarette machine or a like machine for the manufacture of smoking products.

Another object of the invention is to provide an apparatus of the just outlined character which can be carried out simultaneously with other treatment of rod-shaped smoking products, particularly in the course of joining such products with filter mouthpieces by means of adhesive-coated uniting bands.

A further object of the invention is to provide an apparatus according to which the wrapper of each smoking product can be provided with a predetermined pattern or array of holes to show that such holes are not defects in the products but are formed on purpose in order to en-

hance the quality of products and the enjoyment of the user.

Still another object of the invention is to provide an apparatus which can be incorporated in or combined with presently known machines for the production and/or processing of rod-shaped smoking products.

The apparatus of my invention is employed to form holes or punctures in rod-shaped smoking products wherein a tubular wrapper surrounds a filler of air-permeable material. The apparatus provides basically for imparting to rod-shaped products a rolling movement, and puncturing the wrappers in the course of such rolling movement. Each wrapper is preferably punctured close to one end of the respective smoking product and each such wrapper may be punctured at several points to form therein a predetermined array of holes. The apparatus provides for introducing a succession of equidistant smoking products into an elongated gap between two rolling surfaces which contact each wrapper at the opposite sides of the respective product, and moving at least one surface with reference to the other surface in a direction at right angles to the longitudinal directions of the smoking products.

The rolling movement may be preceded by means for placing each smoking product into axial alignment with at least one additional rod-shaped product which forms therewith a group of rod-shaped products and attaching an adhesive-coated uniting band to each group so that the bands extend across the abutting ends of products in the respective groups. The bands are convoluted around the products of the respective groups in the course of the rolling movement. The smoking products are preferably punctured in close proximity of the respective uniting bands and the additional rod-shaped products may constitute filter mouthpieces which are connected with the smoking products to form therewith filter cigarettes or filter cigars of unit length or multiple unit length. Each smoking product is preferably rolled about its axis two or more times, particularly if such products are united with mouthpieces to form therewith filter cigarettes or filter cigars.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved apparatus itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary front elevational view of an apparatus which embodies one form of my invention and wherein the puncturing means is provided on a stationary rolling member;

FIG. 2 is an enlarged fragmentary bottom plan view of the stationary rolling member as seen in the direction of arrow II in FIG. 1;

FIG. 3 is a fragmentary front elevational view of a second apparatus wherein the puncturing means is provided on a travelling rolling member; and

FIG. 4 is an enlarged fragmentary transverse vertical sectional view of the travelling rolling member in a zone within the circle IV shown in FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a portion of an apparatus which can be utilized in a filter cigarette machine to apply adhesive-coated uniting bands B around groups G of coaxial rod-shaped articles. Each group G comprises two axially

spaced wrapped tobacco rods R of unit length (see FIG. 2) and a filter mouthpiece M of double unit length. The mouthpieces M are located between and abut against the adjoining inner ends of the respective tobacco rods R. The bands B are convoluted around the groups G in such a way that they form tubes T each of which surrounds the respective mouthpiece M and the adjoining inner end portions of the respective tobacco rods R. The apparatus comprises a plate-like frame member or support 2 which carries the drive shaft (not shown) of a rotary drum-shaped rolling member 1 having an endless travelling peripheral rolling surface 3 provided with axially parallel equidistant and relatively shallow flutes 4. The depth of flutes 4 need not exceed a few tenths of a millimeter. A stationary second rolling member or block 6 is adjustably secured to the frame member 2 and is provided with a concave rolling surface 7 which defines with the surface 3 an elongated arcuate rolling gap or clearance C whose length equals several times the distance d between the centers of two adjoining flutes 4. A detector 16 is installed on the frame member 2 immediately upstream of the gap C and can actuate a switch 16a which is connected into the control circuit of the filter cigarette machine and serves to arrest the machine when the groups G pile up in front of the gap. A rotary aligning wheel 17 is mounted on the frame member 2 downstream of the gap C and its paddles or vanes 21 cooperate with a rake 19 at the left-hand end of the block 6 to align filter cigarettes P of double unit length if such cigarettes happen to be misaligned when they are about to leave the gap C. The bottom zone of each flute 4 is provided with suction ports (not shown) serving to retain the groups G during travel toward and to retain cigarettes P during travel beyond the gap C. Some of the suction ports are provided laterally of the bands B, i.e., in those portions of the flutes 4 which accommodate the tobacco rods R. The mouthpieces M need not be held by suction because they adhere to the adhesive-coated sides of the respective bands B at the time when they reach the peripheral surface 3 of the drum 1. The feed which supplies bands B and groups G into successive flutes 4 upstream of the gap C will be described in connection with FIG. 3. Finished filter cigarettes P of double unit length are transferred from the flutes 4 into the flutes of a receiving drum (not shown) which is mounted in a region downstream of the gap C. The receiving drum can be replaced by a take-off belt of the type to be described in connection with FIG. 3. The median portions of flutes 4 are provided with additional suction ports which are connected with a suction generating fan or the like while the respective flutes 4 travel from the feed toward the intake end of the gap C. Such ports are employed to hold the bands B in abutment with the rolling surface 3 while the bands travel toward the concave rolling surface 7.

The block 6 is removably supported by two guide posts 8, 9 which are affixed to a carriage 11. The latter is adjustably fixed to the frame member 2 by means of screws 11a. The carriage 11 is adjustable radially of the drum 1 and is preferably mounted in such a way that the width of the gap C is slightly less than the diameter of a group G. As a rule, the distance between the rolling surfaces 3 and 7 is such that it equals the diameter of a group G minus the depth of a flute 4. This insures that the groups G are caused to roll during travel through the gap C. The post 8 is formed with a circumferential groove 12 for the pallet of a pawl 13 which is pivotally secured to the block 6 and is biased in a counterclockwise direction by a spring 14. The pawl 13 constitutes a quick-release connector between the block 6 and the carriage 11.

The right-hand end portion of the concave surface 7 is provided with a spinning or turning rib 18 which is parallel with the flutes 4 and extends toward the surface 3 to reduce the width or height of the intake end of the gap C in order to start the rolling of successive groups G on entry into the gap. The paddles 21 of the aligning

wheel 17 pass along the prong of the rake 19 when the wheel 17 rotates. The distance between the paddles 21 equals the distance d .

The heretofore described parts of the apparatus are identical with those shown in FIG. 4 of my copending application Ser. No. 639,351. In accordance with my present invention, the block 6 is provided with a puncturing or perforating unit which includes two sets or arrays of protuberances in the form of needles 22 and 23. These needles extend beyond the concave rolling surface 7 and toward the rolling surface 3. They are disposed laterally of the path for the bands B so that they automatically puncture the tubular wrappers W of successive tobacco rods R while such rods travel through the gap C. As shown in FIG. 2, the needles 22, 23 are closely adjacent to the respective edges of the bands B so that they puncture the wrappers W of tobacco rods R in regions which are close to the respective filter mouthpieces M. In a manner which is well known from the art of filter cigarette making, finished filter cigarettes P are severed midway across their tubes T to yield pairs of filter cigarettes of unit length and each such cigarette of unit length is provided with an array of perforations or holes H which are shown in FIG. 2. The holes H are provided in the wrappers W of the respective rods R.

The operation is as follows:

Successive flutes 4 of the revolving drum 1 receive groups G and bands B at a transfer station which is located upstream of the gap C. The bands B and the groups G can be fed separately or together. When transferred into the flutes 4, the mouthpieces M of the groups G adhere to the leading edges of the respective bands as shown in the left-hand part of FIG. 1. Each band B extends rearwardly of the respective group and is caused to abut against the adjoining portion of the rolling surface 3 in response to suction in the aforementioned suction ports of the drum 1. Other suction ports hold the wrappers W of tobacco rods R against movement with reference to the respective mouthpiece M. Suction in the ports is terminated when the groups G reach the spinning rib 18 at the intake end of the gap C. This rib sets the groups G in rolling motion (in a clockwise direction, as viewed in FIG. 1) whereby the mouthpieces M and the adjoining inner end portions of the tobacco rods R roll along the adhesive-coated outer side of the respective band B and convolute the latter therearound so that each band forms a tube T. The groups G and the resulting filter cigarettes P of double unit length continue to roll during travel through the gap C. The height of the gap C and the depths of flutes 4 are selected in such a way that the groups roll into and out of several flutes during travel through the gap. The wrappers W of tobacco rods R roll over the respective arrays of needles 22, 23 and are provided with holes or perforations H. The length of the rolling surface 7 is $3d$; therefore, each group G completes several complete revolutions about its own axis and each thereof enters a flute 4 at the discharge end of the gap C. Cigarettes P which happen to be slightly misaligned at the discharge end of the gap C are engaged by the paddles 21 of the wheel 17 and are compelled to enter the adjoining flutes 4 so that they can be properly transferred into the flutes of the receiving drum. Such slight misalignment will be observable if a group G happens to slip during travel through the gap C.

It is clear that the apparatus of FIGS. 1 and 2 can be modified to provide holes H in the wrappers W of tobacco rods R in filter cigarettes of unit length or to form such holes in wrappers of cigarettes which are not intended to be connected with mouthpieces or which are to be connected with mouthpieces at a later stage of treatment. Also, the block 6 can be provided with more than two arrays of needles 22, 23 or with differently configurated puncturing protuberances. Such protuberances can be provided on the drum 1 to be with-

drawn into the drum during travel toward the gap and to be moved radially outwardly beyond the rolling surface 3 during travel through the gap.

FIG. 3 illustrates a second apparatus which is similar to the one shown in FIG. 7 of my copending application Ser. No. 639,351. This apparatus comprises a frame member 31 which supports a driven shaft 32 serving to rotate a drum-shaped rolling member 33 having an endless peripheral rolling surface 33a provided with equidistant axially parallel flutes 34. The shaft 32 is driven by the motor of a filter cigarette machine which embodies or is combined with the apparatus of FIG. 3. The number of flutes 34 is divisible by three without a remainder, i.e., the number of such flutes is $3m$ wherein m is a whole number. The drum 33 is further provided with several pairwise arranged arrays or sets of protuberances in the form of needles 29. The number of such pairs of arrayed needles 29 is m , i.e., one pair of arrayed needles is provided on the drum 33 and extends beyond the peripheral surface 33a behind each third flute 34.

The feed which delivers groups G and adhesive-coated uniting bands B into successive flutes 34 comprises an assembly drum 36 which assembles the groups with uniting bands in such a way that one edge of each band adheres to the respective mouthpiece and to the adjoining inner end portions of the corresponding tobacco rods. Instead of being held by suction, the groups G can be retained in the flutes 36a of the assembly drum 36 by one or more arcuate baffles or shields 37 which are affixed to the frame member 31.

The second rolling member of the apparatus shown in FIG. 3 comprises an endless belt 38 having an endless external rolling surface 38a and being trained around a series of rollers or pulleys including a driving roller 39 located at a level below the drum 33. The rolling surface 38a of the belt 38 is preferably roughened so as to insure satisfactory frictional engagement with the groups G and uniting bands B while such parts travel through an elongated clearance or gap CC between the rolling surfaces 33a and 38a. This gap extends along an arc of approximately 220 degrees. The driving roller 39 is coaxial with a transfer conveyor having two flanges 41 which flank the roller 39 and are provided with registering notches or flutes 42 whose spacing is the same as the distance d between two adjoining flutes 34. An endless take-off belt 43 is mounted directly below the flanges 41 to receive from the flutes 42 filter cigarettes P of double unit length. The diameters of flanges 41 exceed the diameter of the driving roller 39 so that the flutes 42 can receive cigarettes P directly from the flutes 34 of the drum 33. Portions of the flanges 41 are adjacent to stationary baffles or shields 44 which prevent ejection of cigarettes P from the flutes 42 while such cigarettes travel from the discharge end of the gap CC toward the upper stretch of the take-off belt 43.

The rolling belt 38 is further trained around idler rollers 47, 48, 49 and around an adjustable tensioning roll 46 located downstream of the driving roller 39. The roll 46 tensions that portion of the belt 38 which is remote from the gap CC. In the region where the belt 38 approaches the peripheral surface 33a of the drum 33, there is provided a spinning roller 51 rotatable on a shaft 52 mounted on a one-armed lever 53 which is rockably secured to the frame member 31 by a pivot pin 54. The minimum distance between the peripheral surface of the spinning roller 51 and the rolling surface 33a is determined by a stop 56 which can be engaged by the lever 53. If the weight of the roller 51 does not suffice to effect requisite deformation of the adjoining portion of the belt 38, the lever 53 can be provided with an adjustable or detachable weight or mass (not shown). The bias of the roller 51 should be such that the belt 38 cannot be deformed into direct engagement

with the rolling surface 33a of the drum 33. A further adjustable tensioning roll 57 is mounted on the frame member 31 adjacent to an intermediate portion of the gap CC to hold the adjoining portion of the belt 38 at a predetermined distance from the rolling surface 32a.

The drums 33, 36 and flanges 41 are driven at the same peripheral speed. Since the diameter of the driving roller 39 is less than the diameters of the flanges 41, the belt 38 is driven at a lesser speed. The difference between the speeds of the drum 33 and belt 38 is selected in such a way that, during the interval in which a point on the rolling surface 38a advances from the spinning roller 51 to zone where the belt 38 moves away from contact with a filter cigarette P of double unit length, a point on the rolling surface 33a covers the same distance plus $3d$.

The assembly drum 36 delivers a group G and a band B into each successive flute 34 at a transfer station ST. The tobacco rods of each group G abut against the respective ends of the mouthpiece. When a group G enters a flute 34, the corresponding band B extends rearwardly and abuts against the adjoining portion of the rolling surface 33a. However, such bands do not overlie the needles 29. The tobacco rods of the groups G and the bands B are held by suction in the same way as described in connection with FIG. 1. Suction is terminated when a flute 34 reaches the spinning roller 51. This roller performs the same function as the rib 18 on the block 6 of FIG. 1, i.e., it reduces the width of the intake end of the gap CC and sets the groups G in rolling motion in a clockwise direction, as viewed in FIG. 3. Each group G lifts the roller 51 and the latter thereupon returns to a position nearer to the rolling surface 33a so as to be engaged and lifted by the oncoming group G. The aforementioned difference between the speeds of the rolling surfaces 33a and 38a insures that each group G rolls backwards through a distance $3d$ whereby the wrappers W of its tobacco rods R roll over the adjoining needles 29 and are provided with holes in the same way as shown in FIG. 2. The exact moment when a set of needles 29 penetrates the tubular wrapper W of a tobacco rod R is shown in FIG. 4. The air-permeable filler F of the rod R consists of tobacco. The difference between the speeds of rolling surfaces 33a, 38a further insures that each filter cigarette P of double unit length enters a flute 34 when it is about to reach the flanges 41 of the transfer conveyor. Also, and since the needles 29 are provided on such portions of the drum 33 which are located immediately ahead of the adjoining flutes 34, and since the distance d exceeds the length of a band B, the bands are converted into tubes T (see FIG. 2) before the respective wrappers W reach the corresponding needles 29.

The purpose of the tensioning roll 57 is to compress the seam between the overlapping edge portions of a tube T. The position of this roll 57 can be readily selected in such a way that it invariably compresses the seams on successive tubes while the corresponding cigarettes P travel toward the flanges 41. Puncturing of wrappers W on the tobacco rods R preferably takes place immediately upstream of the flanges 41.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of my contribution to the art.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended:

1. Apparatus for forming holes in rod-shaped smoking products wherein a tubular wrapper surrounds a filler of air-permeable material, comprising a first rolling member having a travelling first rolling surface; a second rolling member having a second rolling surface forming with said first surface a gap whose width at most equals

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the diameter of a smoking product; a feed for supplying a succession of smoking products substantially transversely to the longitudinal axes of said products to said first surface upstream of said gap so that the products are set into rolling motion on entry into and during travel through said gap; and puncturing means provided on at least one of said rolling members and extending from the respective surface, said puncturing means comprising at least one protuberance positioned to form in the wrappers of successive smoking products at least one hole during travel of smoking products through said gap.

2. Apparatus as defined in claim 1, wherein said second rolling member is stationary and wherein said puncturing means is provided on said second rolling member, said protuberance extending beyond said second rolling surface and into said gap.

3. Apparatus as defined in claim 1, wherein said puncturing means comprises several protuberances arranged to form in each wrapper a predetermined pattern of holes.

4. Apparatus as defined in claim 1, wherein said puncturing means is positioned to form holes in each wrapper adjacent to one end of the respective smoking product.

5. Apparatus as defined in claim 1, wherein said puncturing means comprises a plurality of protuberances provided on said first rolling member and spaced from each other in the direction of travel of said first rolling surface.

6. Apparatus as defined in claim 1, wherein the width of said gap is slightly less than the diameter of a smoking product.

7. Apparatus as defined in claim 1, wherein said first rolling member is an endless belt an elongated portion of surface is the peripheral surface of said drum.

8. Apparatus as defined in claim 7, wherein said second rolling member is an endless belt an elongated portion of

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which is adjacent to but spaced from a portion of said peripheral surface to form herewith said gap.

9. Apparatus as defined in claim 8, further comprising driving means for moving said belt at a speed which is different from the peripheral speed of said drum.

10. Apparatus as defined in claim 1, wherein said feed is arranged to supply to said first rolling surface a succession of equidistant groups of coaxial rod-shaped products each of which includes one of said smoking products and an adhesive-coated uniting band which is attached to the respective group and extends across the abutting ends of rod-shaped products therein so that such bands are convoluted around the respective groups during travel of said groups through said gap.

11. Apparatus as defined in claim 10, wherein said puncturing means is arranged to form holes in said smoking products in the proximity of the respective uniting bands.

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SAMUEL KOREN, Primary Examiner

JAMES H. CZERWONKY, Assistant Examiner

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