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(54) **METHOD AND APPARATUS FOR ASSEMBLY OF MULTI-SEGMENTED CYLINDRICAL PRODUCTS, SUCH AS TOBACCO PRODUCTS**

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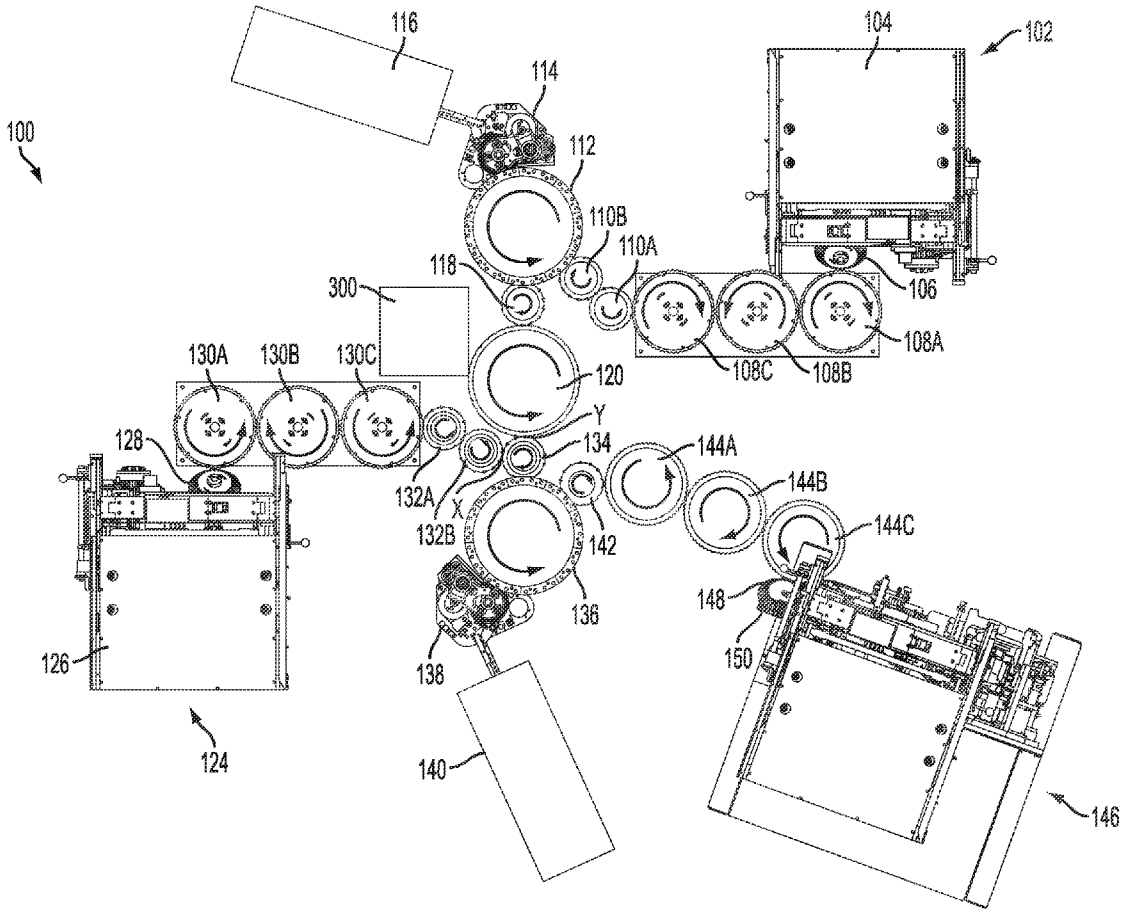
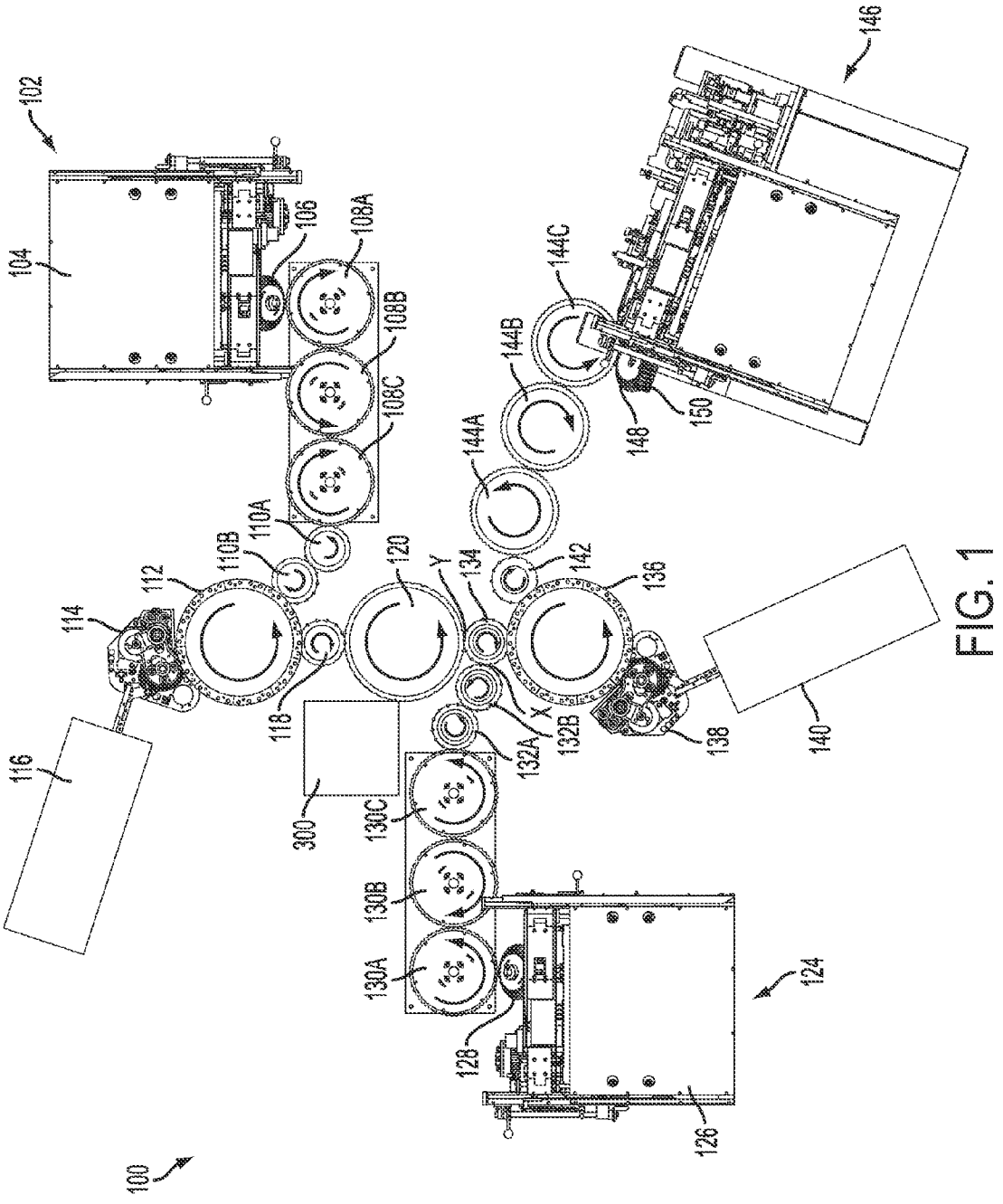
USPC **131/76**; 131/58; 131/280; 131/108

(57) **ABSTRACT**

An apparatus for assembling a multi-segmented cylindrical product is described. The apparatus can include a feeder adapted to supply segments of a pliable material; and a rotating drum having an outer periphery and a plurality of fixtures distributed around the outer periphery, each fixture adapted to support a substantially cylindrical object, and wrap a segment of the pliable material around the substantially cylindrical object and a portion of the fixture to form a fill tube defining a pocket in the pliable material. Other features and related methods are also described.




100
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130A
130B
130C
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X
Y

FIG. 1

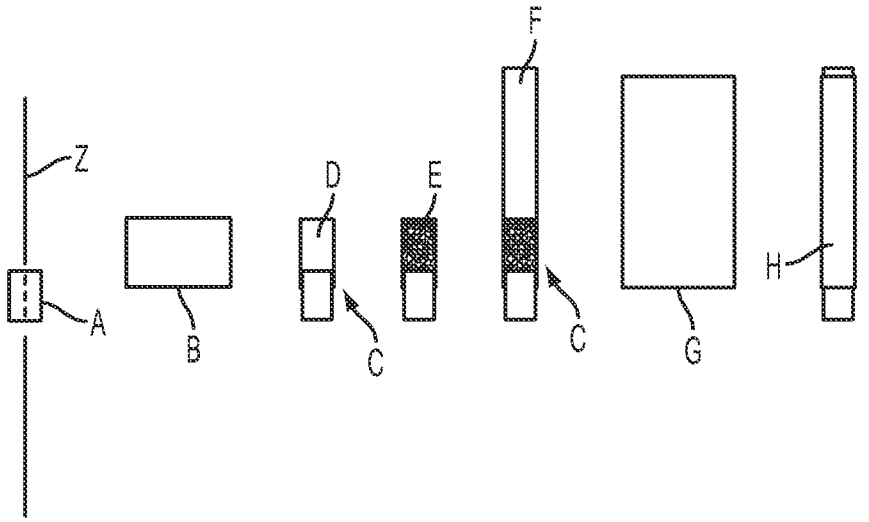

FIG. 2

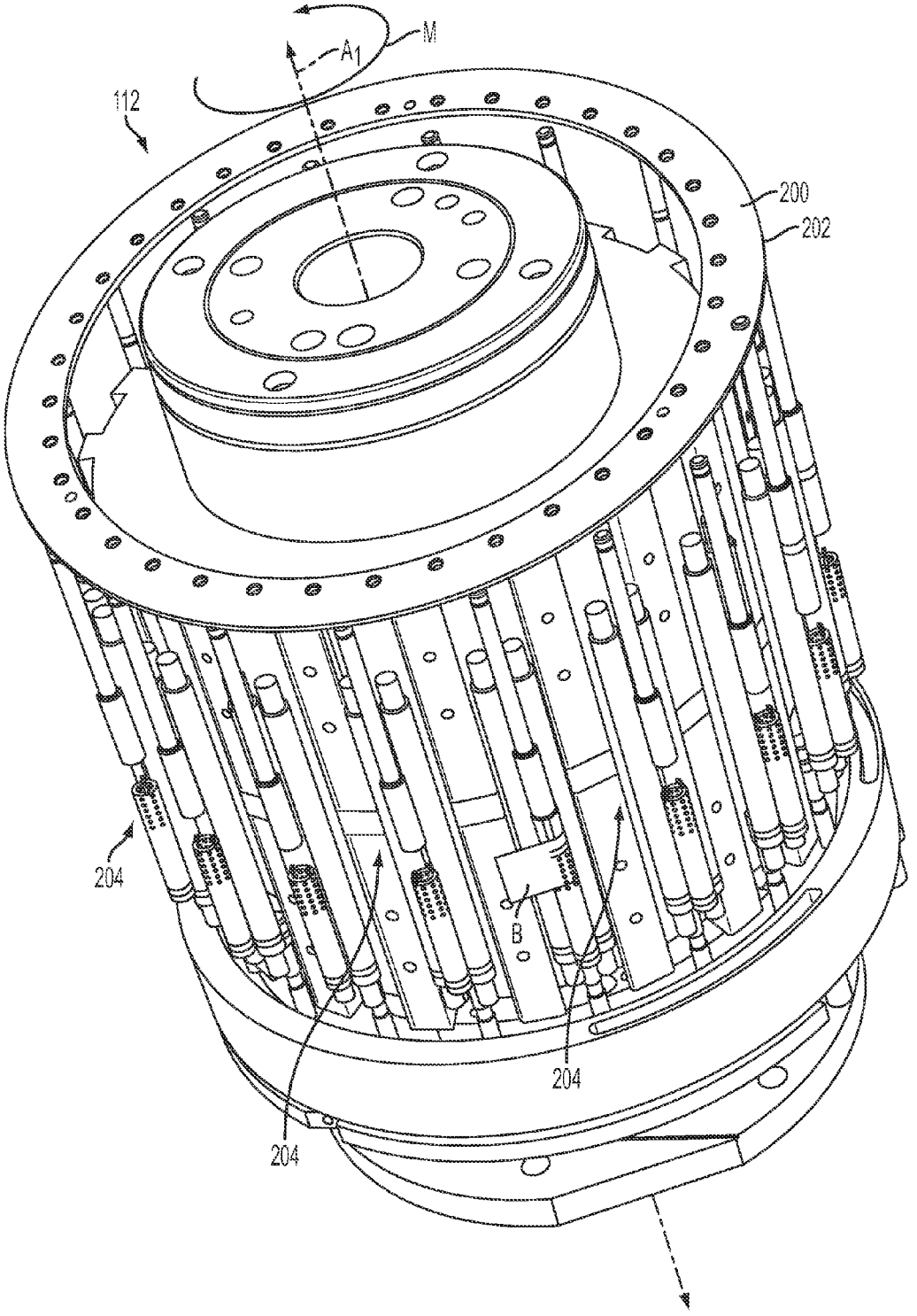

FIG. 3

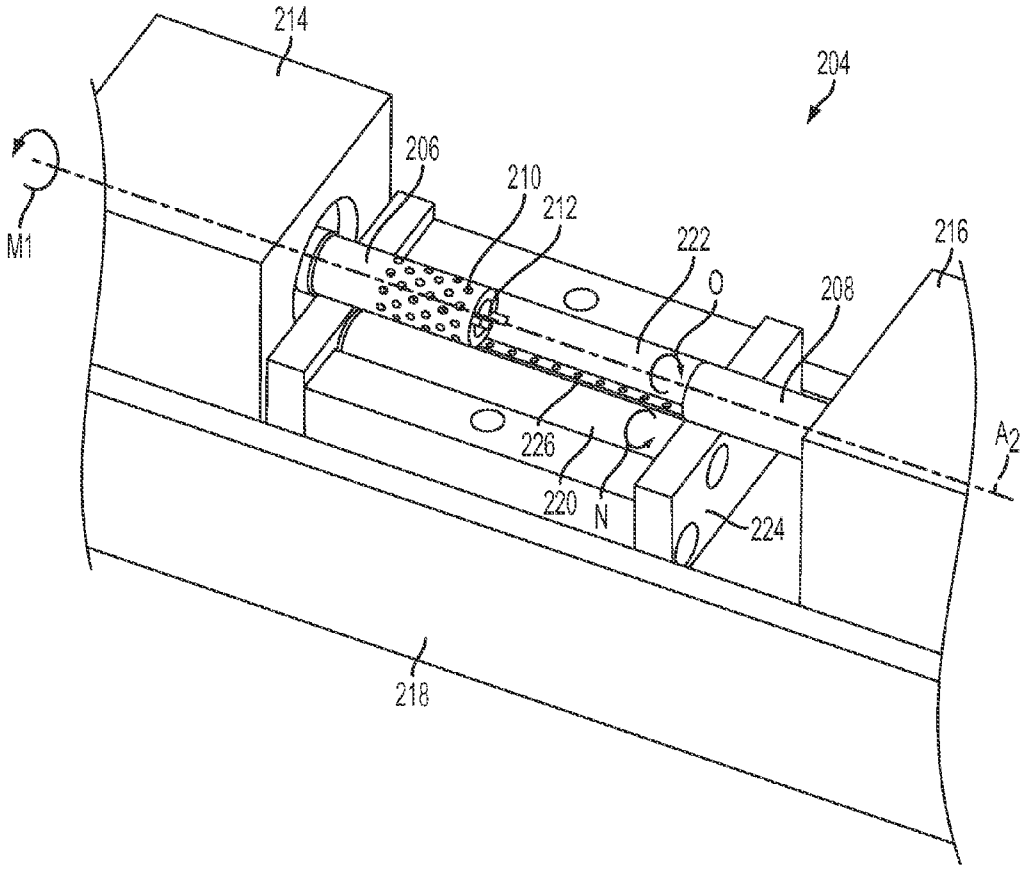

FIG. 4

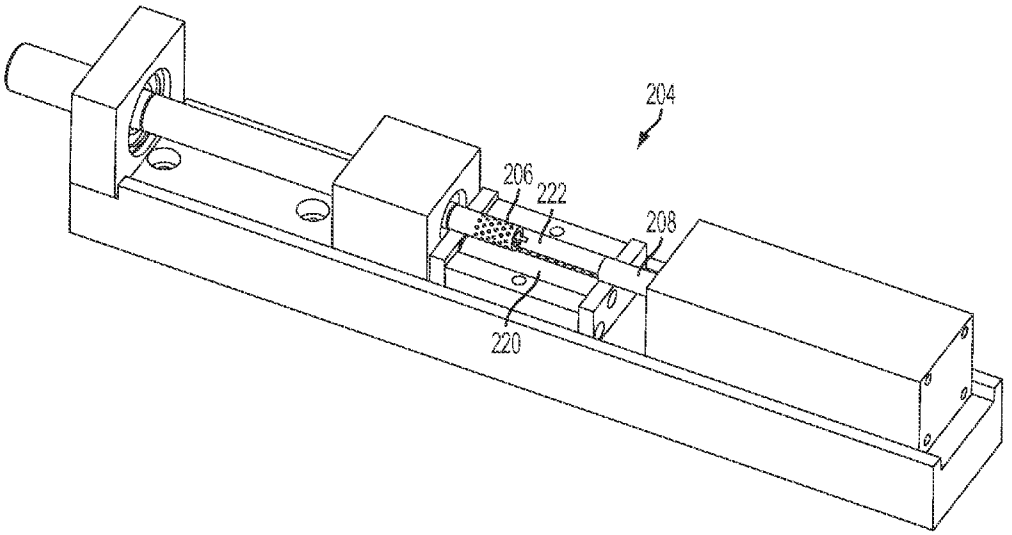

FIG. 5A

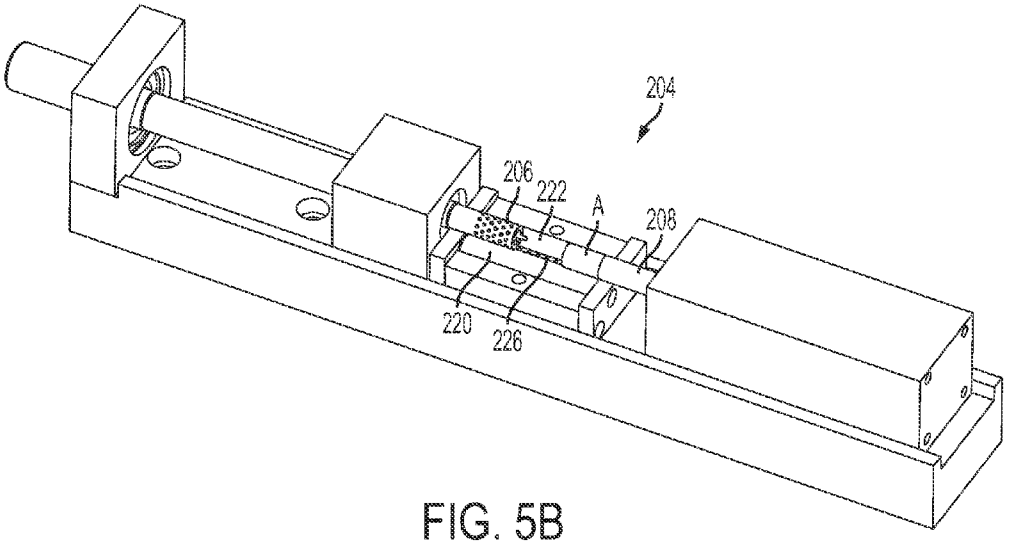

FIG. 5B

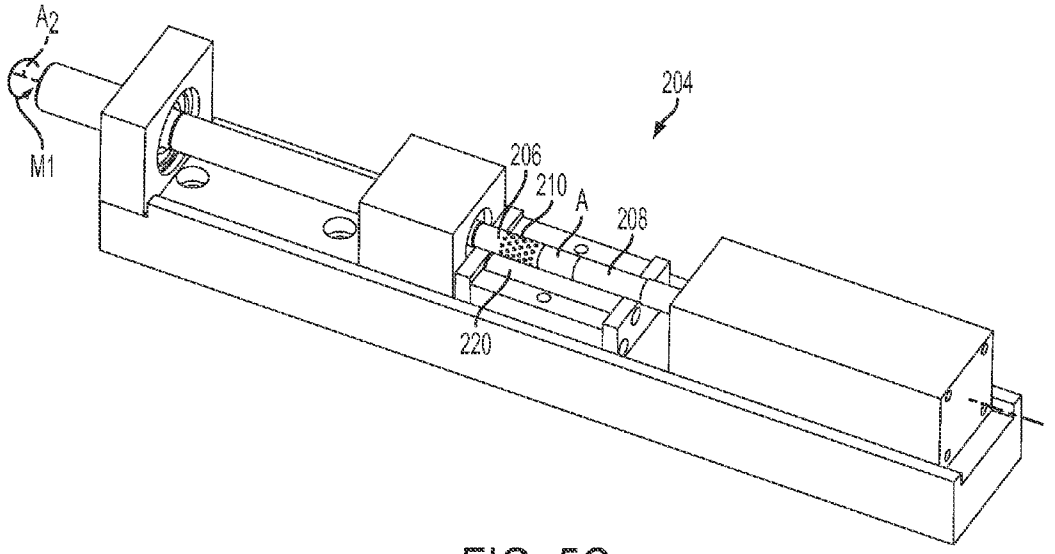

FIG. 5C

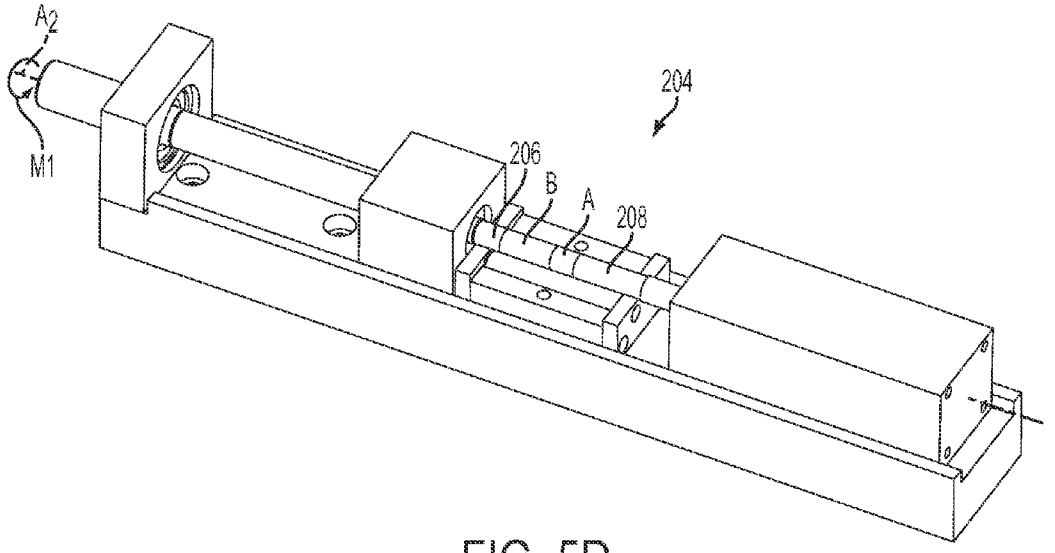

FIG. 5D

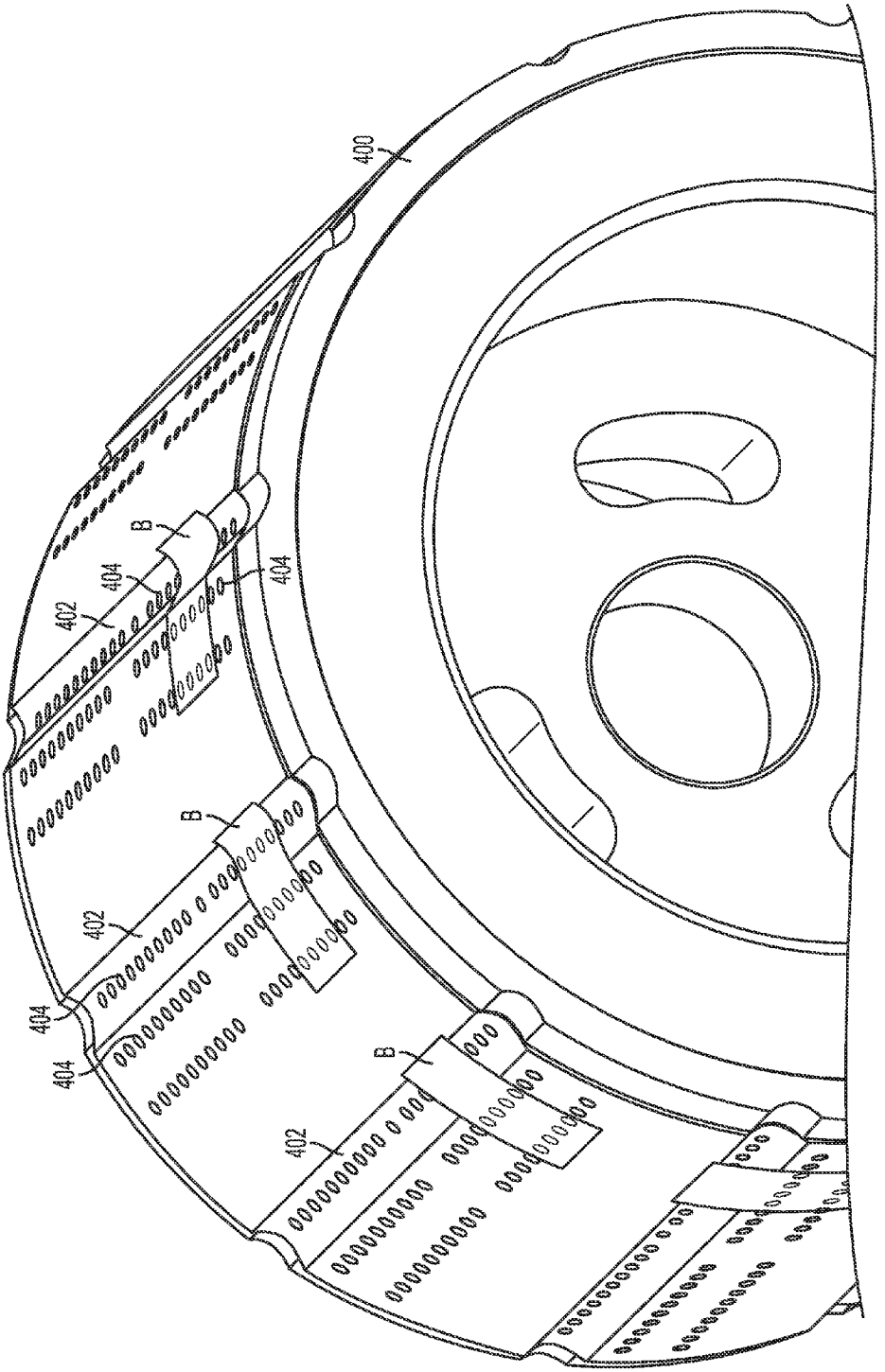

FIG. 6

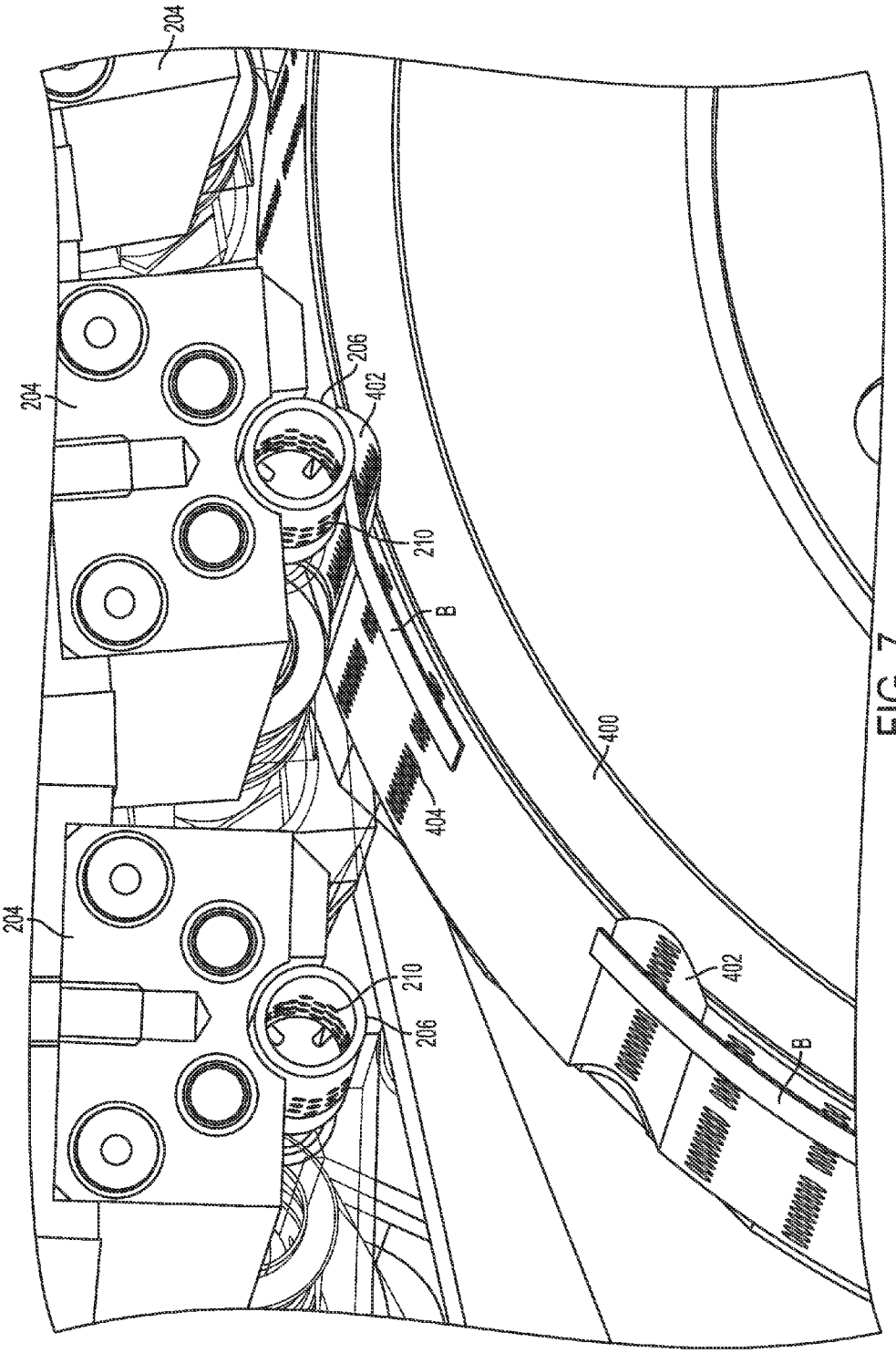

FIG. 7

METHOD AND APPARATUS FOR ASSEMBLY OF MULTI-SEGMENTED CYLINDRICAL PRODUCTS, SUCH AS TOBACCO PRODUCTS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Application No. 61/962,287, filed on Mar. 15, 2013, the entire content of which is incorporated herein by reference.

TECHNICAL FIELD

[0002] This patent application relates generally to apparatuses and methods for manufacturing cylindrical products, such as tobacco products. More specifically, this patent application relates to methods and apparatuses for assembling the components of multi-segmented smoking articles, such as cigarettes.

BACKGROUND

[0003] Conventional smoking articles, such as cigarettes, typically include a tobacco rod, a filter, and a layer or layers of paper surrounding the tobacco rod and filter. However, the design of cigarettes has evolved to include other components or segments, such as solid heat sources, flavor pellets, flavor capsules, and/or other items. Some of these components may be small in size, difficult to manipulate, and/or difficult to combine. Accordingly, the demands on cigarette manufacturing techniques and related equipment have increased as a result of the evolution in cigarette design.

SUMMARY

[0004] According to an embodiment, an apparatus for assembling a multi-segmented cylindrical product is described. The apparatus can comprise: a feeder adapted to supply segments of a pliable material; and a rotating drum having an outer periphery and a plurality of fixtures distributed around the outer periphery, each fixture adapted to support a substantially cylindrical object, and wrap a segment of the pliable material around the substantially cylindrical object and a portion of the fixture to form a fill tube defining a pocket in the pliable material.

[0005] According to another embodiment, a method for assembling a multi-segmented cylindrical product is described. The method comprises wrapping a segment of pliable material around a substantially cylindrical object to form a fill tube with a pocket extending from the substantially cylindrical object.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The foregoing aspects and other features and advantages of the invention will be apparent from the following drawings, wherein like reference numbers generally indicate identical, functionally similar, and/or structurally similar elements.

[0007] FIG. **1** is a top, elevational view of an embodiment of a system for making multi-segmented cylindrical products, such as cigarettes.

[0008] FIG. **2** is a flow diagram depicting an embodiment of a process of making a multi-segmented cigarette.

[0009] FIG. **3** is a perspective view of an embodiment of a fill tube maker including a plurality of fixtures for wrapping a pliable material around a substantially cylindrical object. In FIG. **3**, portions of the fill tube maker are removed for illustration purposes.

[0010] FIG. **4** is a perspective view of a portion of an embodiment of the fixture of FIG. **3**.

[0011] FIGS. **5**A, **5**B, **5**C, and **5**D are perspective views of the fixture of FIG. **3**, shown in various stages of wrapping the pliable material around the substantially cylindrical object.

[0012] FIG. **6** is a perspective view of a portion of a pliable material inserter of FIG. **1**.

[0013] FIG. **7** is another perspective view of a portion of the pliable material inserter of FIG. **1**.

DETAILED DESCRIPTION

[0014] Embodiments of the invention are discussed in detail below. In describing embodiments, specific terminology is employed for the sake of clarity. However, the invention is not intended to be limited to the specific terminology so selected. A person skilled in the relevant art will recognize that other equivalent parts can be employed and other methods developed without departing from the spirit and scope of the invention. All references cited herein are incorporated by reference as if each had been individually incorporated.

[0015] This application relates to methods and apparatuses for making multi-segmented cylindrical products. According to embodiments, this application relates to methods and apparatuses for making tobacco products, such as smoking articles (e.g., cigarettes, cigars, or the like), having multiple components or segments. For example, according to an embodiment to be described in more detail herein, a multi-segmented cigarette can include a solid heat source and a predetermined volume of flavor pellets in addition to loose tobacco and a filter. To facilitate insertion of the pellets (which can be difficult to handle), all or a portion of the cigarette can be oriented substantially vertically during one or more phases of the manufacturing process. For example, the cigarette can be held in the substantially vertical position during insertion of the pellets from above. The cigarette, or portion thereof, can be transferred from a non-vertical position (e.g., horizontal) prior to, and/or after, the substantially vertical processes to accommodate horizontal processing in upstream and/or downstream equipment. One of ordinary skill in the art will appreciate that the present invention is not limited to tobacco products, but can be implemented in other manufacturing processes involving hollow tubular objects, such as, for example, pill capsules.

[0016] When referring to a "vertical" or "substantially vertical" orientation herein, it is generally meant that components having a length that is longer than its width or diameter are oriented with the length in a vertical or substantially vertical orientation. For example, and without limitation, in the context of a cylinder, the cylinder is considered to be in a vertical orientation when its axis is oriented vertically. In certain embodiments, the term "substantially vertical" may encompass deviations from exactly vertical, for example, where the axis is closer to a vertical orientation than to a horizontal orientation, e.g., inclined by greater than 45 degrees.

[0017] FIG. **1** is a top, elevational view of an embodiment of a system **100** for making multi-segmented smoking articles, such as cigarettes. FIG. **2** is a flow diagram depicting an embodiment of a process of making a multi-segmented cigarette. In FIG. **2**, the axis Z represents, without limitation,

the substantially-vertical orientation discussed herein. The circular arrows in FIG. **1** represent examples of direction of rotation.

[0018] For ease of discussion, and without limitation, the methods and apparatuses will be described herein with respect to making "cigarettes." However, as mentioned above, the present application is not exclusive to cigarette manufacturing, but could be used with any type of tobacco product or smoking article, or moreover, to other non-tobacco related products such as pill capsules.

[0019] Referring to FIGS. **1** and **2** in combination, the system **100** can generally include a cylindrical object supply unit **102**, which can supply substantially cylindrical objects, e.g., a solid or semi-solid carbon plug heat source for a cigarette (hereinafter, generally, "heat sources"). The cylindrical object supply unit **102** can include a hopper **104** that holds a plurality of the heat sources. The heat sources can be supplied to the hopper **104** by manual or automatic operations, or by a combination of the two. Although the system **100** is described herein in connection with heat sources as the cylindrical object, the application is not limited to the embodiment described. Rather, the invention can alternatively be used with other cylindrical and substantially cylindrical objects, such as filter rods with or without objects in them, threads or additives. Additionally or alternatively, the substantially cylindrical objects can comprise tubes filled with aromatic substances.

[0020] The cylindrical object supply unit **102** can transport the heat sources from the hopper **104** to a transfer drum **106**, such as a 45° transfer drum, which moves the heat sources from a substantially horizontal orientation to a substantially vertical orientation. The transfer drum **106** can then deposit the heat sources on a chain of primary transfer drums **108**A, **108**B, **108**C and secondary transfer drums **110**A, **110**B, which transport the heat sources downstream in a substantially vertical orientation for later processing. According to an embodiment, the supply unit **102** can subdivide (e.g., cut) bulk heat sources contained in the hopper **104** into smaller heat sources to be used in downstream processing. For example, the unit **102** can subdivide a cylindrical rod of the heat source material into multiple, shorter cylindrical units, however, other embodiments are possible. According to an embodiment, the unit **102** can comprise a hopper and cutting head on the filter feed module of a MAX filter attachment apparatus, available from Hauni Maschinenbau AG of Hamburg, Germany.

[0021] Referring to FIGS. **1** and **2**, the system **100** can also include a fill tube maker **112** that receives the heat sources A and wraps them with segments of a pliable material B (e.g., metallic foil, film, or paper) inserted by a pliable material inserter **114**, to make a fill tube C having a hollow tubular portion D. Further details about the fill tube maker **112** will be provided below. The term pliable material is used herein to describe a metallic foil, film, or paper. However, the term is not limited to the embodiments described. Rather, as used herein, the term pliable material generally refers to a sheet-like material that exhibits some resilience to bending, or which exhibits some degree of plastic deformation, such as a metallic foil or metallic foil laminated with paper. In addition to the examples mentioned above, other embodiments can include, without limitation, thin sheets of plastic, polymers, composites, rubbers, or other materials known in the art. Additionally, while embodiments describe a fill tube as a component of a cigarette, the term is not limited to the embodiments described herein. Rather, as used herein, a fill tube refers generally to any combination of a cylindrical or substantially-cylindrical object with a piece of pliable material to form a tubular component having an open top and a closed bottom formed by the cylindrical or substantially-cylindrical object.

[0022] The pliable material inserter **114** can receive the pliable material from a bobbin and glue pot machine **116**, which cuts the pliable material into segments B of the desired size, and applies adhesive to all or a portion of the pliable material B. The adhesive can be applied, for example, to portions of the pliable material that contact the heat sources A, and/or to portions of the pliable material that overlap with one another. According to an embodiment, the pliable material inserter **114** and the bobbin and glue pot machine **116** can comprise the plug wrap guide system from the MAX filter attachment apparatus, as well as a BOB MAX bobbin holder and bobbin changer, all available from Hauni Maschinenbau AG of Hamburg, Germany.

[0023] The pliable material inserter **114** can insert segments B of the pliable material to the fill tube maker **112**, e.g., at an insertion point where the fill tube maker **112** receives the segments B. According to embodiments, the pliable material inserter **114** can feed the segments B to the fill tube maker **112** in a substantially vertical orientation, however, other embodiments are possible. Likewise, in embodiments, the fill tube maker **112** can make the fill tubes C in a substantially vertical orientation, however other variations are possible.

[0024] A transfer drum **118** can take the fill tubes C from the fill tube maker **112** and transfer them, e.g., while in a substantially vertical orientation, to a granular object filling drum **120**. A volumetric metering device **300**, shown schematically, can fill the hollow tubular portion D of the fill tubes C with a predetermined volume of a granular material E, such as, for example, tobacco pellets or flavor capsules. Any number of known metering devices can be used, as would be appreciated by one of ordinary skill in the art based on this description. For example, according to an embodiment, the metering device can utilize the principles and structures disclosed in European Patent EP 1 228 709 B1, owned by the assignee of this application, the entire content of which is incorporated herein by reference.

[0025] According to an embodiment, the metering device **300** can dispense the granular material E into the hollow tubular portion D of the fill tube C from above, e.g., while the fill tube C is in a substantially vertical orientation. This can occur while the fill tube C is located on the object filling drum **120**.

[0026] While the term granular material is used in embodiments to describe tobacco pellets, flavor capsules, or flavor impregnated granulates, the term is not limited to the described embodiments. Rather, the term granular material refers generally to any material that is made up of small grains, particles, beads, or the like, such as pellets, powders, and capsules, whether regular or irregular in size and/or shape.

[0027] A tobacco rod supply unit **124** can provide a supply of tobacco rods F (e.g., loose tobacco wrapped in paper having a substantially cylindrical shape). The tobacco rod supply unit **124** can include a hopper **126** that holds a plurality of the tobacco rods F. The tobacco rods F can be supplied to the hopper **126** by manual or automatic operations, or by a combination of the two.

[0028] The tobacco rod supply unit **124** can transport the tobacco rods F from the hopper **126** to a transfer drum **128**, such as a 45° transfer drum, which moves the tobacco rods F from a substantially horizontal orientation to a substantially vertical orientation. The transfer drum **128** can then deposit the tobacco rods F on a chain of primary transfer drums **130**A, **130**B, **130**C and secondary transfer drums **132**A, **132**B, which can transport the tobacco rods F to a combiner drum **134**, e.g., in a substantially vertical orientation. According to an embodiment, the supply unit **124** can subdivide bulk tobacco rods contained in the hopper **126** into smaller tobacco rods to be used in downstream processing. For example, the unit **124** can subdivide (e.g., cut) a long tobacco rod into multiple, shorter tobacco rods, however, other embodiments are possible. According to an embodiment, the tobacco rod supply unit **124** can comprise the hopper on the filter feed module of a MAX filter attachment apparatus, available from Hauni Maschinenbau AG of Hamburg, Germany.

[0029] As shown in FIG. **2**, the combiner drum **134** can receive the fill tubes C (filled with the granular material) from the granular material filling drum **120** and combine them with tobacco rods F received from the secondary transfer drum **132**B, for example, in an end-to-end arrangement. For example, referring to FIG. **1**, the secondary transfer drum **132**B can transfer a tobacco rod F to the combiner drum **134** at point X, and the filling drum **120** can subsequently transfer a fill tube C (e.g., with tubular portion D filled with granular material E) to the combiner drum **134** at point Y. According to an embodiment, secondary transfer drum **132**B can supply the tobacco rod F to the combiner drum **134** at a first vertical height, and the filling drum **120** can supply the fill tube C to the combiner drum **134** at a second vertical height, such that the fill tube C and the tobacco rod F are combined substantially coaxially on the combiner drum **134**, for example, in an end-to-end abutting configuration. According to an embodiment, the open end of the fill tube C can abut the tobacco rod F, as shown in FIG. **2**, effectively closing off the hollow tubular portion, preventing the granular material E located therein from escaping in downstream operations, however other configurations are possible.

[0030] A wrapping drum **136** can receive the fill tube C and tobacco rods F combined in end-to-end fashion from the combiner drum **134**, and wrap them in an outer wrap G, such as cigarette paper. This can form a filterless cigarette rod H. As shown in FIG. **1**, an outer wrapper inserter **138** can receive cigarette paper from a bobbin and glue pot machine **140**, which cuts the cigarette paper into outer wraps G of the desired size, and applies adhesive to all or a portion of the outer wraps G. The adhesive can be applied to all or a portion of the outer wrap G, for example, to portions of the outer wrap G that overlap with one another. According to an embodiment, the inserter **138** can comprise a cutter on the filter feed module of a MAX filter attachment apparatus, available from Hauni Maschinenbau AG of Hamburg, Germany. The bobbin and glue pot machine **140** can comprise a BOB ME, also available from Hauni Maschinenbau AG of Hamburg, Germany.

[0031] According to an embodiment, the inserter **138** feeds the outer wraps G to the combined fill tubes C/tobacco rods F on the wrapping drum **136**, where the wrapping drum **136** rolls the outer wraps H around all or a portion of each combined fill tube C/tobacco rod F. According to an embodiment, the outer wraps G are applied to the combined fill tubes C/tobacco rods F while they are in a substantially vertical orientation.

[0032] Referring to FIG. **1**, a take-off drum **142** and a chain of transfer drums **144**A, **144**B, **144**C can remove the filterless cigarette H from the wrapping drum **136**, and transport them to a tipping machine **146**, which adds a filter element and/or tipping paper to the filterless cigarette H. According to an embodiment, the tipping machine **146** can transfer the filterless cigarettes H from substantially vertical to substantially horizontal, e.g., using a 45° transfer drum **148**. The tipping machine **146** can also invert (e.g., flip by about 180°) every other filterless cigarette H, for example, using a transfer drum **150**. The tipping machine **146** can then insert a double-length filter between pairs of end-to-end arranged filterless cigarette rods. The tipping machine **146** can then apply double-length tipping paper around the double-length filter and adjoining cigarette rods, to form a double-ended, filtered cigarette. The tipping machine **146** can subsequently divide the double-ended, filtered cigarette in half, for example by cutting with a rotating blade, to form a pair of filtered cigarettes. One of the filtered cigarettes can be inverted by about 180° to facilitate transporting the finished product in similar orientations, for example, for downstream testing, packaging, etc.

[0033] Referring to FIGS. **3**, **4**, and **5**A to **5**D, an embodiment of the fill tube maker **112** is shown. According to an embodiment, the fill tube maker **112** can include a drum **200** that rotates, e.g., around an axis A1. According to an embodiment, the drum **200** can be supported on a motor-driven shaft (not illustrated) that rotates drum **200** about axis A1 in direction M, however other embodiments are possible as will be apparent to one of ordinary skill in the art based on this disclosure. The drum **200** can define an outer periphery **202**, shown for illustration purposes as being substantially circular, however, other shapes are possible. A plurality of fixtures **204** can be distributed around the outer periphery **202** of drum **200**, for example, spaced equal distances from one another. In FIG. **3**, portions of the fixtures **204** are removed for ease of illustration.

[0034] FIG. **4** is an enlarged, partial view of an embodiment of one of the fixtures **204**. Generally, each fixture **204** can include a first mandrel **206** and a second mandrel **208**. The first and second mandrels **206**, **208** can be substantially cylindrical in shape (e.g., can have a diameter generally equal to that of a cigarette), however other shapes and configurations are possible. According to an embodiment, the first and second mandrels **206**, **208** can be arranged on a common axis A2, and can rotate in synchronicity about the axis A2, for example, in direction M1. At the same time, the drum **200**, and consequently the mandrels **206**, **208** located in its outer periphery **202**, can rotate about axis A1.

[0035] The first and second mandrels **206**, **208** can translate with respect to one another along the axis A2. In the embodiment of FIG. **4**, the second mandrel **208** translates back-and-forth along axis A2 towards, and away from, first mandrel **206**, which does not translate. However, other embodiments are possible, such as both mandrels **206**, **208** translating along axis A2, or the first mandrel **206** translating along axis A2 with respect to the second mandrel **208**.

[0036] As shown in FIG. **4**, the first mandrel **206** can include a plurality of vacuum holes **210** located on its periphery, and/or a vacuum hole **212** located at its distal end. The vacuum holes **210** and/or vacuum hole **212** can be connected to a supply of vacuum or pressure using techniques known in

the art. Similar vacuum holes can additionally or alternatively be located on the second mandrel **208**.

[0037] The first and second mandrels **206**, **208** can be supported by bearing blocks **214**, **216**, respectively, which are coupled to a fixture base **218**. The bearing blocks **214**, **216** can support the mandrels **206**, **208** for rotation and/or translation. The fixture base **218** can, in turn, be mounted to the drum **202**, e.g., using fasteners or other techniques known in the art.

[0038] Still referring to FIG. **4**, each fixture **204** can also include a first support roller **220** and/or a second support roller **222** oriented substantially parallel to the axis A2. The support rollers **220**, **222** can be mounted to a roller support **224** located on fixture base **218**. As shown in FIG. **4**, one or more vacuum holes **226** can be located between the support rollers **220**, **222**, for example, on roller support **224**. The vacuum holes **226** can be connected to a supply of vacuum or pressure using techniques known in the art. As shown in FIG. **4**, the first and second support rollers **220**, **222** can rotate about axes substantially parallel to the axis A2, for example, in directions N and O, respectively.

[0039] According to an embodiment, the mandrels **206**, **208** and support rollers **220**, **222** can each be individually driven for rotation by their own power source, for example, by an electric motor (not shown) coupled thereto using conventional techniques. Alternatively, the mandrels **206**, **208** and rollers **220**, **222** can be driven for rotation by a transmission system (not shown) such as gears, belts, etc., that translates rotation of the drum into rotation of the mandrels **206**, **208** and support rollers **220**, **222**. Alternatively, various combinations of the foregoing techniques can be used to rotate the mandrels **206**, **208** and support rollers **220**, **222**.

[0040] According to an embodiment, translation of the first and/or second mandrels **206**, **208**, e.g., along axis A2, can be driven by a linear drive, hydraulic actuator, screw mechanism, or the like that is coupled to each pair of mandrels **206**, **208**, or to a group of mandrel pairs. Alternatively, a cam mechanism (not shown) can be associated with the drum **202**, and can act on a portion of each first mandrel **206** and/or second mandrel **208**, such as the proximal ends, to impart motion thereto along axis A2. Alternatively, a combination of the foregoing techniques can be used to translate the mandrels **206**, **208**. According to embodiments, a programmable logic controller (PLC) can be used to coordinate rotation of the drum **202**, movement of the first and second mandrels **206**, **208**, rotation of the support rollers **220**, **222**, and application of vacuum or pressure at the vacuum holes. Moreover, according to embodiments, the PLC can be used to control and coordinate the operation of all or some of the components of system **100**.

[0041] Referring to FIGS. **1**, **3**, and **5**A-**5**D, an example of operation of the one of the fixtures **204** is shown. FIG. **5**A depicts a fixture **204** in a ready position, e.g., the position it occupies as drum **200** rotates the fixture **204** between transfer drum **110**B and transfer drum **118** (see FIG. **1**). When in the ready position, the first and second mandrels **206**, **208** are spaced apart from one another along axis A2 sufficiently to receive a heat source A therebetween.

[0042] FIG. **5**B depicts fixture **204** when it is located on the periphery **202** of drum **200** in registry with transfer drum **110**B. At this point, a heat source A is inserted between the first and second mandrels **206**, **208** until it rests against the first and second support rollers **220**, **222**. At or prior to this point, vacuum may be applied to the vacuum holes **226** to help attract and/or retain heat source A against support rollers **220**, **222**.

[0043] FIG. **5**C depicts fixture **204** substantially immediately after the heat source A is inserted between the first and second mandrels **206**, **208**. At or about this time, the second mandrel **208** can translate along axis A2 until heat source A contacts the first mandrel **206**, thereby sandwiching the heat source A between mandrels **206**, **208**. At or about this time, vacuum may be applied to vacuum holes **210** and/or vacuum hole **212**. The mandrels **206**, **208** can remain in this position as the fixture **200** is rotated towards the pliable material inserter **114** by drum **200**. At or before the time the fixture **200** moves into registry with the insertion point of the pliable material inserter **114**, the first and second mandrels **206**, **208** and/or the first and second support rollers **220**, **222** can begin to rotate, thereby causing the heat source A to rotate about axis A2, for example, in direction M1.

[0044] At or slightly before the time the fixture **200** moves into registry with the insertion point of the pliable material inserter **114**, the inserter **114** ejects a segment of the pliable material B, which can be attracted to the first mandrel **206** by the vacuum drawn through holes **210**. The vertical alignment of the heat source A and the pliable material inserter **114** can cause the pliable material segment B to attach around all or a portion of the heat source A, as well as a portion of the first mandrel **206**. Rotation of the mandrels **206**, **208** can wrap the pliable material around the first mandrel **206** and heat source A, e.g., between the support rollers **220**, **222** and the first mandrel **206**/heat source A, until pliable material B is completely wrapped around the heat source A, as shown in FIG. **5**D, thereby creating the fill tube C. Adhesive applied to the pliable material segment A by the pliable material inserter **114** can adhere the pliable material segment B to the heat source A, and/or to areas where the material B overlaps on itself. The portion of the pliable material segment B surrounding the first mandrel **206** can form the hollow tubular portion D once the first mandrel **206** is removed therefrom. Shortly after the fill tube C is formed, the application of vacuum to vacuum holes **210**, vacuum hole **212**, and/or vacuum holes **226** can stop. Additionally or alternatively, pressure can be applied to these holes to facilitate later separation of the fill tube C from the fixture **204**.

[0045] Still referring to FIG. **5**D, the mandrels **206**, **208** can remain in the position shown as the drum **200** rotates the fill tube C into registry with the transfer drum **118**. At a point in time before the fill tube C reaches the transfer drum, the first and second mandrels **206**, **208** can move apart from one another along axis A2 (e.g., to the position shown in FIG. **5**A), thereby removing first mandrel **206** from the hollow tubular portion D of the fill tube C. Vacuum can be applied to a vacuum hole (not shown) located in the distal end of second mandrel **208** to help retain the heat source A on the second mandrel **208** as it pulls away from the first mandrel **206**. Additionally or alternatively, a rod can extend through the distal end of first mandrel **206** to push the fill tube C off of the first mandrel **206**. The fill tube C can then be transferred from drum **200** to transfer drum **118** for downstream processing. Vacuum associated with the transfer drum **118** can help facilitate removal of the fill tube C from the drum **200** to transfer drum **118**. The fixture **200** can remain in the position of FIG. **5**A until the drum **200** rotates it back into registry with transfer drum **110**B, as previously described above in connection with FIG. **5**A.

[0046] Referring to FIGS. **6** and **7**, the pliable material inserter **114** can be configured to contour, or "curl" the segments B of pliable material prior to, or during, transfer to the fill tube maker **112**. By contouring a portion of the segments B to have a curvature that compliments the diameter of the heat sources A (e.g., is about the same or larger in diameter), the consistency with which the segments B wrap onto the heat sources A can be improved.

[0047] As shown in FIG. **6**, the inserter **114** can include a preform drum **400** having a plurality of arcuate recesses **402** distributed about its periphery, e.g., equidistantly. The recesses **402** can define a curvature corresponding to the desired contour of the segments B. According to embodiments, the recesses **402** can define a cross-sectional shape that is a portion of a circle or ellipse, however, other configurations are possible. According to embodiments, the recesses **402** can define an arc that is about equal to or greater than the outer diameter of the heat sources A, e.g., about the same diameter as the mandrels. Still referring to FIG. **6**, the preform drum **400** can include a plurality of vacuum holes **404** distributed over the arcuate recesses **402** and/or areas of the drum **400** adjacent to the recesses **402**. The vacuum holes **404** can be connected to a source of vacuum, and can help secure the segments B on the outer periphery of the preform drum **400**, and/or can help pull portions of the segments B into the recesses **402**.

[0048] Referring to FIG. **7**, the preform drum **400** is shown in combination with the fixtures **204**. The drum **400** can be synchronized with drum **200**, so that the mandrels **206**,**208** move into registry with the recesses **402** and press the segments B into the recesses **402**, thereby helping to contour the segments B to the desired shape. Still referring to FIG. **7**, the mandrels **206**, **208** can have a diameter that complements the shape of the recesses **402**. For example, in embodiments, the mandrels **206**, **208** can have a diameter that is the same as, or smaller than, the diameter of the recesses **402**. However, other configurations are possible.

[0049] The preform drum **400** can serve as the drum that transfers the segments B to the fill tube maker **112**. In other words, after contouring the segments B, drum **400** can directly transfer the segments B to the fill tube maker **112**. Alternatively, an intervening drum or other device can receive the contoured segments B from the preform drum **400** and in turn transfer them to the fill tube maker **112**.

[0050] The embodiments illustrated and discussed in this specification are intended only to teach those skilled in the art the best way known to the inventors to make and use the invention. Nothing in this specification should be considered as limiting the scope of the present invention. All examples presented are representative and non-limiting. The above-described embodiments of the invention may be modified or varied, without departing from the invention, as appreciated by those skilled in the art in light of the above teachings. It is therefore to be understood that, within the scope of the claims and their equivalents, the invention may be practiced otherwise than as specifically described.

1. An apparatus for assembling a multi-segmented cylindrical product, the apparatus comprising:

a feeder adapted to supply segments of a pliable material; and

a rotating drum having an outer periphery and a plurality of fixtures distributed around the outer periphery, each fixture adapted to support a substantially cylindrical object, and wrap a segment of the pliable material around the substantially cylindrical object and a portion of the fixture to form a fill tube defining a pocket in the pliable material.

2. The apparatus of claim **1**, wherein each rolling fixture comprises:

a first mandrel;

a second mandrel oriented substantially coaxially with respect to the first mandrel, the first and second mandrels adapted to receive the cylindrical object therebetween; and

at least one support roller oriented substantially parallel to the first mandrel and the second mandrel, the support roller adapted to wrap the segment of the pliable material around the substantially cylindrical object.

3. The apparatus of claim **2**, wherein the first mandrel and second mandrel are movable with respect to one another along a common axis.

4. The apparatus of claim **2**, further comprising vacuum holes located in at least one of the first mandrel or the second mandrel, the vacuum holes in communication with a vacuum source.

5. The apparatus of claim **2**, wherein the at least one support roller comprises a first support roller and a second support roller, the apparatus further comprising vacuum holes located in between the first support roller and the second support roller, the vacuum holes in communication with a vacuum source.

6. The apparatus of claim **1**, further comprising a volumetric metering device adapted to meter granular material into the fill tube.

7. The apparatus of claim **1**, wherein the cylindrical object comprises a smoking article, the apparatus further comprising:

a wrapping station adapted to support the fill tube and a tobacco rod in an end-to-end arrangement, and wrap the fill tube and tobacco rod with paper.

8. The apparatus of claim **7**, further comprising a source of tobacco rods that supplies tobacco rods to the wrapping station.

9. The apparatus of claim **7**, further comprising a tipping machine that adds a filter to the combined fill tube and tobacco rod.

10. The apparatus of claim **1**, wherein each fixture is adapted to support the substantially cylindrical object in a substantially vertical orientation.

11. The apparatus of claim **1**, wherein the feeder is adapted to feed the segments of pliable material to the rotating drum in a substantially vertical orientation.

12. The apparatus of claim **1**, wherein the substantially cylindrical object comprises a heat source.

13. The apparatus of claim **12**, wherein the heat source comprises a carbon plug.

14. The apparatus of claim **1**, wherein the segments of pliable material comprise segments of paper, metallic foil, or film.

15. The apparatus of claim **6**, wherein the granular material comprises pellets.

16. A method for assembling a multi-segmented cylindrical product, the method comprising wrapping a segment of pliable material around a substantially cylindrical object to form a fill tube with a pocket extending from the substantially cylindrical object.

17. The method of claim **16**, further comprising:
metering a predetermined volume of a granular material into the pocket.

18. The method of claim **17**, further comprising transferring the fill tube from a non-vertical orientation to a substantially vertical orientation prior the step of metering.

19. The method of claim **18**, further comprising transferring the fill tube to a substantially non-vertical orientation after the step of metering.

20. The method of claim **17**, wherein the step of metering comprises dispensing the granular material into the pocket from above the pocket.

21. The method of claim **16**, wherein the step of wrapping comprises rotating the substantially cylindrical object with respect to the outer periphery of a rotating drum, and wrapping the pliable material around the substantially cylindrical object while it rotates.

22. The method of claim **21**, wherein the substantially cylindrical object comprises a heat source.

23. The method of claim **22**, wherein the heat source comprises a carbon plug.

24. The method of claim **16**, wherein the segments of pliable material comprise segments of paper, metallic foil, or film.

25. The method of claim **17**, wherein the granular material comprises at least one of pellets of compressed tobacco, flavor capsules, and flavor impregnated granulates.

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