CIGARETTE BLANK FILLING TUBE APPARATUS

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ABSTRACT

A tobacco filling tube having a cylindrical portion having an outside diameter, an inside diameter, a first end and a second end and a hollow tapered portion having a first end with an outside diameter and a second end with an outside diameter. The first end of the tapered portion adjoins the second end of the cylindrical portion, the outside diameter of the first end of the tapered portion is substantially the same as the outside diameter of the cylindrical portion, the outside diameter of the second end of the tapered portion is less than the outside diameter of the first end of the tapered portion, the outside diameter of the first end of the tapered portion is sized to fit inside a tobacco blank, and the tapered portion is flexible to allow the second end of the tapered portion to expand and thereafter return to its initial outside diameter.
CIGARETTE BLANK FILLING TUBE APPARATUS

FIELD OF INVENTION

[0001] This invention relates generally to an apparatus for loading a tobacco blank onto a filling tube. The invention also relates to methods of using a tobacco blank loading apparatus.

BACKGROUND OF THE INVENTION

[0002] Prior to the invention of the electronic rolling machine, rolling your own cigarettes was restricted to manual table top machines, hand held machines, and attempts that have been made to perfect personal single stick electric machines. These machines employ a chamber for loading tobacco, a manual lever that compresses the tobacco, and a spoon mechanism that injects the tobacco into an empty pre-assembled cigarette blank. Many attempts have been made with varying degrees of success to perfect a table top electric machine. These basically employed the same technology, only electronically enhanced. The shortcoming is that the spoon mechanism shreds the tobacco. Secondly, loading the proper amount of tobacco each time is extremely variable. The other obvious drawback is the tedious nature of the process; each cigarette blank must be mounted on a nozzle manually. Moreover, the empty cigarette blanks are extremely fragile and easily damaged during the process.

[0003] While other electronic machines for use in retail settings have been developed, there remain drawbacks with those machines. First, separating the cigarette blanks for individual loading onto a filling tube remains imprecise. Secondly, loading the fragile cigarette blanks unto filling tubes often results in damaged and unusable cigarette blanks.

[0004] What is needed is an apparatus and method for separating and loading the cigarette blanks on a machine in a retail setting.

SUMMARY OF THE INVENTION

[0005] This invention relates to a tobacco filling tube comprising a cylindrical portion having an outside diameter, an inside diameter, a first end and a second end, a hollow tapered portion having a first end with an outside diameter and a second end with an outside diameter, wherein the first end of the tapered portion adjoins the second end of the cylindrical portion, wherein said outside diameter of the first end of the tapered portion is substantially the same as the outside diameter of the cylindrical portion, wherein said outside diameter of the second end of the tapered portion is less than the outside diameter of the first end of the tapered portion, wherein the outside diameter of the second end of the tapered portion is substantially the same as the outside diameter of the cylindrical portion, wherein said outside diameter of the first end of the tapered portion is substantially the same as the outside diameter of the cylindrical portion, wherein said outside diameter of the second end of the tapered portion is less than the outside diameter of the first end of the tapered portion, wherein the outside diameter of the first end of the tapered portion is sized to fit inside a tobacco blank, wherein said tapered portion is flexible to allow the second end of the tapered portion to expand and thereafter return to its initial outside diameter.

[0006] This invention also relates to an apparatus comprising a filling tube holder capable of holding a plurality of filling tubes, a plurality of filling tubes mounted to said filling tube holder, each of a plurality of filling tubes having a cylindrical portion having an outside diameter, an inside diameter, a first end and a second end, and a hollow tapered portion having a first end with an outside diameter and a second end with an outside diameter, wherein the first end of the tapered portion adjoins the second end of the cylindrical portion, wherein said outside diameter of the first end of the tapered portion is substantially the same as the outside diameter of the cylindrical portion, wherein said outside diameter of the second end of the tapered portion is less than the outside diameter of the first end of the tapered portion, wherein said outside diameter of the second end of the tapered portion is substantially the same as the outside diameter of the cylindrical portion, wherein said outside diameter of the first end of the tapered portion is substantially the same as the outside diameter of the cylindrical portion, wherein said outside diameter of the second end of the tapered portion is less than the outside diameter of the first end of the tapered portion, wherein the outside diameter of the first end of the tapered portion is sized to fit inside a tobacco blank, wherein said tapered portion is flexible to allow the second end of the tapered portion to expand and thereafter return to its initial outside diameter.

[0007] This invention further relates to a method of locating a tobacco blank on a tobacco filling tube, said method comprising providing at least one filling tube comprising a cylindrical portion having an outside diameter, an inside diameter, a first end and a second end, and a hollow tapered portion having a first end with an outside diameter and a second end with an outside diameter, wherein the first end of the tapered portion adjoins the second end of the cylindrical portion, wherein said outside diameter of the first end of the tapered portion is substantially the same as the outside diameter of the cylindrical portion, wherein said outside diameter of the second end of the tapered portion is less than the outside diameter of the first end of the tapered portion, wherein the outside diameter of the first end of the tapered portion is sized to fit inside a tobacco blank, wherein the tapered portion is flexible to allow the second end of the tapered portion to expand and thereafter return to its initial outside diameter, and dispensing a tobacco blank over the at least one filling tube.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is a perspective view of a cigarette making apparatus of the invention.
[0009] FIG. 2 is a perspective view of a tobacco input hopper of the invention.
[0010] FIG. 3A is a section view of a tobacco conveying and compressing device of the invention.
[0011] FIG. 3B is an enlarged section view of the compressing device of FIG. 3A.
[0012] FIG. 4A is a perspective view of a filling tube of the invention.
[0013] FIG. 4B is a perspective view of another embodiment of a filling tube of the invention.
[0014] FIG. 5A is a section view of a filling tube holding drum of the invention.
[0015] FIG. 5B is a section view of a filling tube mounted in a drum of the invention showing further a cigarette blank being forwarded to the filling tube.
[0016] FIG. 5C is a section view of a filling tube mounted in a drum of the invention showing further a cigarette blank being fully loaded on the filling tube.
[0017] FIG. 5D is a section view of a tobacco plug being injected into a cigarette blank loaded onto a filling tube of the invention.
[0018] FIG. 5E is a section view of a completed cigarette being ejected from a filling tube of the invention.
[0019] FIG. 5F is a section view of an improperly loaded cigarette blank being ejected from a filling tube of the invention.
[0020] FIG. 6 is a side view of a cigarette blank loading cartridge of the invention.
[0021] FIG. 7 is a perspective view of a cigarette blank separation device of the invention.
[0022] FIG. 8 is a section view of a cigarette blank separation device of the invention having a mounted cigarette blank loading cartridge in the lowered position holding a plurality of cigarette blanks.
FIG. 9 is a section view of a cigarette blank separation device of the invention having a mounted cigarette blank loading cartridge in the raised position holding a plurality of cigarette blanks.

DETAILED DESCRIPTION OF THE INVENTION

The embodiments discussed herein describe the operation of the invention relating to cigarette blanks and making cigarettes. The use of other tobacco blanks in addition to cigarette blanks is also contemplated. Other tobacco blanks include, but are not limited to, cigar blanks and other tubes into which tobacco is inserted.

A cigarette making apparatus 10 as illustrated in FIG. 1 includes a tobacco input hopper 100 (rotated upward for clarity), a tobacco conveying and compressing device 200, a cigarette blank separation device 300, a filling tube holder 400, a material and product transfer mechanism 500, and a discharge container (not shown).

The input hopper 100, illustrated in FIG. 2, has a main body 101 with a tobacco inlet 102. The input hopper has a top end 104, a bottom end 105, a first side 106, a second opposing side 107, a discharge end 108, and an input end 109. A conveyer 103 may be mounted in the bottom end 105 of the main body 101 to convey the tobacco from the input end 109 toward a strand separator 110 mounted generally on the discharge end 108. The conveyor may include a tension adjustment mechanism 116 for adjusting the conveyor belt tension. The strand separator 110, having a shaft 111 and a plurality of pins or combs 112 extending outwardly therethrough, is mounted on the discharge end 108 of the main body 101. The strand separator shaft 111 may be rotatably driven by an electric motor 113. Depending on the desired rotational speed of the strand separator 110, a speed reduction mechanism 114 may be employed to communicate the electric motor 112 with the strand separator shaft 111.

In operation, cut tobacco is poured into the tobacco inlet 102 of the input hopper 100. The cut tobacco falls onto the input end 109 of the conveyor 103 and is thereby transferred toward the strand separator 110 and discharged end 108 of the conveyor 103. After going through the strand separator 110, the cut tobacco is discharged from the input hopper 100 through a discharge opening 115.

FIG. 3A illustrates a tobacco conveying and compressing device 200. The device 200 generally has an input end 201, a receiving hopper 215, and a tobacco conveying zone 210. A tobacco conveying system 210 has a first conveyor 202 having a top end 203 and a lower end 204 and a second conveyor 205 having a top end 206 and a lower end 207. The conveyors 202 and 205 are mounted between a first side plate 217 and a second plate (not shown). Conveyor 202 has a conveyor belt 208, and conveyor 205 has a conveyor belt 209. The conveyor belt 208 and 209 may have sprockets or fingers on them, allowing the moving belts to grip the cut tobacco. The top end 203 of the first conveyor 202 and the top end 206 of the second conveyor 205 communicate with the receiving hopper 215. Typically, the conveyors 202 and 205 converge on each other as they move in the direction of arrows 211 and 212, respectively. At least one electric motor (not shown) may be used to drive the first conveyor 203 and second conveyor 205.

In operation, the receiving hopper 215 receives cut tobacco from the discharge opening 115 of the input hopper 100 described above. As an inward side 213 of conveyor 202 and an inward side 214 of conveyor 205 move downward, cut tobacco is received from the receiving hopper 215, compressed by conveyors 202 and 205, and ultimately transferred to a compressor device 250.

The tobacco compressing device 250 illustrated in FIG. 3B has a first compression plate 251 and a second compression plate 252, which define generally a compression cone 253. The first compression plate 251 is slidable mounted in the tobacco conveying device 250 to allow it to move toward the second compression plate 252. The first compression plate 251 has a first end 254 and a second end 255, the second end defining a semi-circular compression cavity 256 having a top edge 257. A pneumatic cylinder 261 having a piston rod 262 may be mounted to a frame (not shown), with the piston rod 262 of the pneumatic cylinder 261 communicating with the first end 254 of the first compression plate 251, thereby slidable operating the first compression plate 251 towards and away from the second compression plate 252. Other methods may be used to slidable move the first compression plate 251, such as a servo motor or a hydraulic cylinder. The second compression plate 252 has a first end 258 and second end 259 defining a semi-circular compression zone 260. The second compression plate 252 also contains a knife 263 with a cutting edge 264 that is co-planar with the top edge 257 of the semicircular compression cavity 256 of the first compression plate 251 and with a top edge 266 of the semicircular compression cavity 260 of the second compression plate 252. The knife 263 may be mounted so that it is not parallel to the top edge 257 of the first compression plate 251, resulting in the first plate 251 contacting only one portion of the knife edge 264 at a time as the first plate 251 slidably moves towards the second plate 252.

In operation, the downwardly moving inner sides 213 and 214 of conveyors 202 and 205 respectively, partially compress cut tobacco and deliver it to the compression cavity 253. The conveyors 202 and 205 run for a period of time to deliver an amount of cut tobacco into the compression cavity 253, and then stop. The amount of tobacco that is delivered into the compression cavity 253 may be within a predetermined range, with the exact amount being established by the operator of the machine depending on individual preferences, which may include, among other things, the operator's preferred "draw" of the cigarette. Then, the piston 261 pushes the first compression plate 251, by way of piston rod 262, toward the second compression plate 252, further compressing the tobacco in the tobacco cavity 253. As the first compression plate 251 moves toward the second compression plate 252, the top edge 257 of the first compression plate 251 meets the cutting edge 264 of the knife 263. The cut tobacco in the compression cavity 253 is then sheared from the cut tobacco in the tobacco conveying zone 214. The first compression plate 251 continues to move toward the second compression plate 252, thereby forming a tobacco plug 265. The first compression plate 251 then retreats slightly away from the second compression plate 252, allowing a tobacco plug insertion pin 501 (FIG. 1) to push the tobacco plug 265 out of the compression cavity 253 into a filling tube 350 (described later). Typically, the tobacco plug 265 is smaller in diameter than the inside diameter of a filling tube and a cigarette blank to allow for easy insertion into the filling tube and the cigarette blank.

FIG. 4A illustrates a filling tube 350 having a hollow cylindrical portion 851 and a hollow tapered portion 852. The cylindrical portion 851 has an inside diameter 853, an outside diameter 854, a first end 860, and a second end 861. The
tapered portion 852 has a first end 862 with an outside diameter 863 and a second end 864 with an outside diameter 865. The outside diameter 864 of the second end 864 of the tapered portion 852 is typically less than the outside diameter 863 of the first end 862. The outside diameter 854 of the cylindrical portion 851 is substantially the same as the outside diameter 863 of the first end 862 of the tapered portion 852, thereby creating a smooth transition from the cylindrical portion 851 to the tapered portion 852 where the first end 862 of the tapered portion 852 adjoins the second end 864 of the cylindrical portion 851. The outside diameter 863 of the tapered portion 852 is sized to receive a tobacco blank (not shown).

[0033] The second end 864 outside diameter 865 of the tapered portion 852 is less than the outside diameter 854 of the cylindrical portion 851 to guide a cigarette blank (not shown) onto the larger cylindrical portion 851. A tobacco plug (not shown) enters the filling tube 350 through the first end 860 of the cylindrical portion 851, and moves forward into the tapered portion 852, which is constructed of metal, plastic or other materials that are sufficiently flexible to expand and contract. The tobacco plug has an outside diameter that is slightly smaller than the inside diameter 853 of the cylindrical portion 851. Thus, when the tobacco plug is inserted into the filling tube 350, it expands the flexible tapered portion 852 so that the second end 864 of the flexible tapered portion 852 has an outside diameter 865 approximately the same as the outside diameter 854 of the cylindrical portion 851. When a completed cigarette (not shown) is removed from the filling tube, the outside diameter 865 of the second end 864 returns to its initial smaller diameter. In one embodiment, the tapered portion 852 contains a plurality of flexible fingers 870 that are biased inward at the second end 864, thereby forming an outside diameter 865. In FIG. 4A, the plurality of flexible fingers 870 also define a plurality of longitudinal slots 872. The longitudinal slots have a radius 874 at about the first end of the tapered portion 852 to prevent the slots from unintentionally radiating towards and cracking the cylindrical portion 851 of the filling tube 350. Other shapes of tubes may be used as filling tubes, including square or octagonal shaped tubes.

[0034] The filling tubes may be mounted on a filling tube drum 401 shown in FIG. 1. The first end 860 of the cylindrical portion 851 of the filling tube 350 may have a shoulder 855 for securing the filling tube 350 to a filling tube holder (not shown). Alternatively, a filling tube may be secured to a filling tube holder (not shown) by other means, such as a press fit or welding. FIG. 4B shows an embodiment of the filling tube 859 without a shoulder that may be press fitted or welded to a filling tube holder (not shown).

[0035] Referring to FIG. 5A, there is a filling tube holder 400 comprising a drum 401 having a first end 402 and a second end 403. The first end 402 of the drum 401 has a plurality of holes 404 and 405 for receiving a plurality of filling tubes 350. Other holes (not shown) for receiving filling tubes may also be disposed on the first end 402 of the drum 401. 100361 The following describes one embodiment of a filling tube 350 and the features in the drum 401 associated with filling tube 350. Other filling tubes mounted in the drum will typically be mounted in a similar manner, and the drum typically will have similar features for each of the other filling tubes. One method of attaching a filling tube 350 to a drum 401 is a clamping device 408 against the shoulder 855 on the first end 860 of the cylindrical portion 851 of the filling tube 350. Alternatively, other means for attaching the filling tubes to a filling tube holder may be used. For example, the filling tubes and the plurality of holes in the holder for receiving the filling tubes may be threaded. Additionally, other methods instead of a drum may be used for holding a plurality of tubes, for instance, the filling tubes may be mounted on a plate or on a belt.

[0036] Axially aligned with the filling tube hole 404 is a conical directing hole 411, having a proximal end 412 and a distal end 413. The distal end 413 of the cone shaped hole defines the larger diameter of the cone, and the diameter of the proximal end of the cone shaped hole is slightly larger than the outside diameter of a cigarette blank (discussed later). FIG. 5D illustrates a cigarette blank being loaded onto the filling tube 350. A loading pin (not shown) induces a force on the filler end 426 of a cigarette blank 425, causing the cigarette blank 425 to move toward the filling tube 350. In this illustration, an open end 427 of the cigarette blank 425 has been damaged, resulting in the normal circular shape of the end of the cigarette blank 425 becoming oblong. As the cigarette blank 425 moves toward the filling tube 350, the smaller diameter 412 of the conical hole 411 in the drum 401 will operate to return the obl manufacture open end 427 of the cigarette blank 425 to a more circular shape. The cigarette blank 425 continues through the conical hole 411, over the second end 864 of the tapered portion 852, and then onto the filling tube 350.

[0037] FIG. 5C is similar to FIG. 5B, with the exception that the cigarette blank 425 in FIG. 5C has been inserted on the filling tube 350 by a cigarette blank insertion pin 504. The filling tube 350 and cigarette blank 425 are then ready to receive the tobacco plug 265 prepared by the previously discussed compressing device 250.

[0038] FIG. 5D is similar to FIG. 5C, with FIG. 5D showing the additional step of inserting the tobacco plug 265. A sensor 601 (FIG. 1) determines whether a cigarette blank 425 is present and properly loaded onto a filling tube 350 before a tobacco plug 265 is injected into the filling tube 350. After confirming that a filling tube 350 is ready to receive a tobacco plug, an injection pin 501 pushes a tobacco plug 265 out of the compression chamber and into the filling tube 350. As the tobacco plug 265 enters the filling tube 350, the tapered portion 852 of the filling tube 350 expands to receive the tobacco plug 265. FIG. 5D illustrates that the outside diameter 865 of the second end 864 of the tapered portion 852 is substantially the same as the outside diameter 863 of the first end 862 of the tapered portion 852 when a tobacco plug 265 is inside the filling tube 350.

[0039] FIG. 5E illustrates an ejecting pin 503 (FIG. 1) ejecting a completed cigarette 430, having been filled with a tobacco plug 265, from the filling tube 350. Typically, the ejection pin 503 is hollow, and pressurized air may be introduced into the ejection pin 503 during the ejection process. Pressurized air escaping from a forward end 591 of the ejection pin 503 further facilitates the ejection of the completed cigarette 430. After completed cigarette 430 is ejected from the filling tube 350, the outside diameter 865 of the second end 864 of the tapered portion 852 returns to its initial outside diameter and is then ready to receive another cigarette blank 425 (FIG. 5B).

[0040] As noted above, the sensor 601 determines whether a cigarette blank is loaded properly onto a filling tube before injecting a tobacco plug into the filling tube and cigarette blank. If an improperly loaded cigarette blank is found, the cigarette blank is not injected with a tobacco plug and the
improperly loaded cigarette blank continues to rotate on the drum, eventually arriving at the cigarette blank rejection location. FIG. 5F depicts the removal of a rejected cigarette blank from a filling tube. FIG. 5F illustrates a rejection pin 502 forcing a damaged cigarette blank 428 off of the filling tube 350 toward a collection mechanism 510 (FIG. 1). Typically, the rejection pin 502 is hollow, and pressurized air may be introduced into the rejection pin 502 during the rejection process. Pressurized air escaping from the forward end 511 of rejection pin 502 further facilitates removal of the cigarette blank 428 by blowing air against the rejected cigarette blank 428. The collection mechanism 510, such as a vacuum, collects the rejected cigarette blank 428.

[0041] Referring now to FIG. 6, there is cigarette blank holding cartridge 310 having a rectangular-shaped box 321 with first end wall 311, a second end wall 312, side walls 313 and 314 (not shown) disposed between end walls 311 and 312, and a top 322. The first end wall 311 has a lower edge 315, to which a cartridge bottom 316 may be pivotably mounted using a hinge 317 or other similar pivoting mounting means. The first end wall 311 has a handle 318. Mounting tab 319, affixed to the bottom 316 of the cartridge 310, is slidably mountable onto a base plate 326 (FIG. 8). Mounting tab 320, affixed to the second end wall 312 at the cartridge 310, is receivable into a cartridge tab receiving area 337 (FIG. 8) of the cigarette blank separation device 300. Typically, the cartridge 310 may hold a plurality of cigarette blanks, e.g., about 200 cigarette blanks. Typically, the cartridge is of a size so that a user may set an entire carton of cigarette blanks (200 cigarette blanks) into the cartridge without removing the cigarette blanks from the box before loading. The cartridge may also be of a size to hold a carton of 100 cigarette blanks. Alternatively, if one desires to use a carton of cigarette blanks containing less than 200 cigarette blanks in a cartridge designed for 200 cigarette blanks, than a block may be used to take up the extra space in the cartridge.

[0042] In operation, a user turns the cartridge 310 upside down so that the bottom 316 is on the top, and opens fully the bottom 316. The user then sets a full box of cigarette blanks into the cartridge 310. Thereafter, the user may tear the top from the cigarette carton and close the cartridge bottom 316. The loaded cartridge is then ready for loading into the cartridge tab separator device 300.

[0043] FIG. 7 illustrates a perspective view of the cigarette blank separation device 300 having received cartridge 310. Also visible is the sensing mechanism 601 and the collection mechanism 510 for collecting a rejected cigarette blank (not shown).

[0044] FIG. 8 is a partial section view of the cigarette blank separation device 300 having received a cartridge 310 holding a plurality of blank cigarettes 325. The cigarette blank separation device 300 has a base plate 326 that has a lower end 327, an upper end 328, a first side 330, and an opposing second side (not shown). A first side plate 331 is disposed on the first side 330 of the base plate, and an opposing second side plate (not shown) is disposed on the opposing second side of the base plate 326.

[0045] The mounting and operation of the first side plate 331 will be described herein, and the mounting and operation of the opposing second side plate (not shown) is substantially similar to that of the first side plate 331. A cross bar 336 lies the first side plate 331 to the second side plate (not shown). The cross bar 336 has a cartridge tab receiving area 337 for receiving the mounting tab 320 disposed on the second end wall 312 of the cartridge box 321. The first side plate 331 has an upper end 332 that is pivotally mounted at a pivot point 338 adjacent to the upper end 328 of the base plate 326. A portion 335 of the first side plate 331 rides on an eccentric cam 333 that rotates about a camshaft 334. The cam shall be driven by a motor (not shown) or by other means available to impart a rotational action upon the camshaft 334. FIG. 8 depicts the first side plate 331 and the cigarette blank loading cartridge 310 in a down position, the position in which a user would insert a cigarette blank loading cartridge 310 containing a plurality of cigarette blanks. As the cam 333 rotates about the camshaft 334, the first side plate 331 and opposing second side plate 332 and opposing second plate (not shown) pivot about pivot point 338, thereby resulting in the lower end 339 of the first side plate 331 and the lower end of the second side plate moving along an upward arc 340. The cross bar 336, being affixed between the first side plate 331 and the second side plate, moves upward. The cartridge box 321 also moves upward, because the mounting tab 320 of the cigarette blank loading cartridge 310 has been received in the cartridge tab receiving area 337 of the cross bar 336.

[0046] FIG. 9 is a partial section view of the cigarette blank separation device 300 with the cartridge box 321, the first side plate 331 and the second side plate (not shown) in the elevated position.

[0047] The lower end 327 of the base plate 326 abuts a shaking assembly 380. In one embodiment, the shaking assembly 380 has a shaking plate 381 pivotally mounted with a top end 383 to a frame 382. The shaking plate 381 may be shocked by a variety of methods, and one method of shocking the plate is by an eccentric cam 384. In operation, the rotation of the eccentric cam pivots the plate about the top end 383 of the shaking plate 381, thereby shocking a plurality of cigarette blanks 390. Typically, a lower end 385 of the shaking plate 381 is at a sufficient distance above the base plate 326 to allow a lowest plurality of cigarette blanks 396 to pass between the base plate 326 and the lower end 385 of the shaking plate 381.

[0048] The plurality of cigarette blanks 390 has a first row 387, a second row 388 and upper rows 389. As the shaking plate 381 advances towards the upper end 328 of the base plate 326, because of the rotation of the cam 384, the shaking plate 381 pushes the plurality of cigarette blanks 390 toward the upper end 328 of the base plate 326. The base plate 326 has a retainer 391 for maintaining the position of the cigarette blanks once they move to the lower end 392 of the retainer 391. By shaking the second row 388 and the upper rows 389 of a plurality of cigarettes blanks 390, the shaking plate breaks up the pyramidal structure 393 that ordinarily forms between successive rows of cigarettes. Additionally, the retainer 391 keeps the lower plurality of cigarette blanks 396 from moving toward the upper end 328 of the base plate 326, furthering the shaker’s effectiveness in breaking the pyramidal structure 393.

[0049] The cigarette blank loading area 394 has in it a cigarette blank 395 ready to be loaded onto a filling tube 350 as depicted in FIG. 5B and FIG. 5C. After a cigarette blank loading pin 504 pushes the cigarette blank 395 out of the cigarette blank loading area 394, the lowest plurality of cigarette blanks 396 advance forward, moving another cigarette blank into the cigarette blank loading area 394.

[0050] Referring back to FIG. 1, there is the material and product transfer mechanism 500 that has on it the tobacco plug injection pin 501, the completed cigarette ejection pin 503, and the improperly loaded cigarette blank rejection pin.
Typically, the pins 501, 502 and 503 are linearly moved along their axis by a plurality of pneumatic cylinders (not shown). The injection pin 501 and the pneumatic cylinder associated therewith is mounted in a slideable fixture 507. The fixture 507, slideably mounted in a frame 505, is slideable by a hand crank 506. The slideably mounted injection pin 501 allows for adjustment of the pin to accommodate various lengths of cigarette blanks.

Fig. 1 illustrates the general operation of the cigarette making apparatus. In operation, a user fills a cigarette blank cartridge with a plurality of cigarette blanks and loads the cartridge 310 into the cigarette blank separation assembly 300. The user also pours tobacco into the tobacco inlet 102 of the input hopper 100. The user then starts the operation of the cigarette making apparatus 10. The automatic operation of the cigarette making apparatus is typically controlled by electronics such as a computer or a programmable logic controller (“PLC”) (not shown) adapted to interface with the various components of the cigarette making apparatus 10.

The cigarette blank separating device 300 separates a cigarette blank 395 from the plurality of tubes in the cartridge 310, allowing a cigarette blank to flow into the loading area 394 as shown in Fig. 9. A filling tube 350 mounted on a drum 401 is axially aligned with the cigarette blank 395. Thereafter, a cigarette blank loading pin 504 pushes the cigarette blank onto the filling tube 350. The drum 401 then rotates forward in the direction shown by arrow 602.

Referring again to Fig. 1, when the filling tube 350 having on it a cigarette blank reaches a position 603, a sensor 601 ensures that a cigarette blank is loaded properly. If the sensor finds a tube properly loaded, then an injection rod 501 injects a previously compressed tobacco plug 295 into the filling tube 350 (as discussed above regarding Fig. 5D). If the sensor 601 finds an improperly loaded tube, then the cigarette making apparatus skips the tobacco plug injection process, and the drum 401 continues to index forward in the direction of arrow 602. After a tobacco plug is successfully injecting into a filling tube 350 having on it a cigarette blank, the drum 401 continues to index forward in the direction of arrow 602, whereupon the filling tube 350 will arrive at a completed cigarette ejection position 604. Once there, an ejection rod 503 will eject the completed cigarette from the filling tube 350, as shown in Fig. 5E. The completed cigarettes may then fall into a collection device (not shown), where they may be retrieved by the operator.

If the sensor 601 has found an improperly loaded cigarette blank, then the drum 401 with the filling tube 350 holding the improperly loaded cigarette blank will continue to index forward in the direction of arrow 602, skipping the tobacco injection process and the completed cigarette ejection process, whereupon it arrives at an improperly loaded tube rejection area 605. Thereafter, a rejection pin 502 pushes the improperly loaded cigarette blank off of the filling tube (Fig. 5F).

After the above discussed process is complete and a completed cigarette is made (or an improperly loaded cigarette blank is rejected), the filling tube is ready to receive a new cigarette blank. Typically, the above discussed process will produce 25 completed cigarettes a minutes with less than 4 rejected cigarettes per 100 completed.

The plurality of filling tubes on the drum 401 allows the above steps to take place concurrently. For instance, a cigarette blank may be inserted on a filling tube at the same time a tobacco plug is being injected into another filling tube, which may be occurring at the same time a completed cigarette is being rejected from a filling tube, which may be occurring at the same time an improperly loaded cigarette blank is being rejected. Additionally, the tobacco conveying and compressing and the cigarette blank separating may also be occurring concurrently with the above steps.

While the present invention has been illustrated by the description of embodiments thereof, and while the embodiments have been described in considerable detail, it is not intended to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will be readily apparent to those skilled in the art. The invention is therefore not limited to the specific details, representative apparatus and method, and illustrated examples shown and described. Accordingly, departures may be made from such details without departing from the scope or spirit of the invention.

What is claimed is:

1. A tobacco filling tube comprising:
   a cylindrical portion having an outside diameter, an inside diameter, a first end and a second end,
   a hollow tapered portion having a first end with an outside diameter and a second end with an outside diameter,
   wherein the first end of the tapered portion adjoins the second end of the cylindrical portion,
   wherein said outside diameter of the first end of the tapered portion is substantially the same as the outside diameter of the cylindrical portion,
   wherein said outside diameter of the second end of the tapered portion is less than the outside diameter of the first end of the tapered portion,
   wherein the outside diameter of the first end of the tapered portion is sized to fit inside a tobacco blank,
   wherein said tapered portion is flexible to allow the second end of the tapered portion to expand and thereafter return to its initial outside diameter.

2. The filling tube according to claim 1, wherein said tapered portion comprises a plurality of flexible fingers.

3. The filling tube according to claim 1, wherein said tapered portion is flexible to allow the second end of the tapered portion to expand to substantially the same diameter as the first end of the tapered portion and thereafter return to its initial outside diameter.

4. The filling tube according to claim 2, wherein said tapered portion is flexible to allow the second end of the tapered portion to expand to substantially the same diameter as the first end of the tapered portion and thereafter return to its initial outside diameter.

5. The filling tube according to claim 1, said filling tube further comprising a cigarette making apparatus to which the filling tube is mounted, said cigarette making apparatus further comprising a tobacco loading apparatus, a cigarette plug compression apparatus, a tobacco blank separation apparatus, and a tobacco blank loading apparatus mounted to said cigarette making apparatus.

6. An apparatus comprising:
   a filling tube holder capable of holding a plurality of filling tubes,
   a plurality of filling tubes mounted to said filling tube holder, each of a plurality of filling tubes having a cylindrical portion having an outside diameter, an inside diameter, a first end and a second end, and a hollow tapered portion having a first end with an outside diameter and a second end with an outside diameter,
wherein the first end of the tapered portion adjoins the second end of the cylindrical portion,
wherein said outside diameter of the first end of the tapered portion is substantially the same as the outside diameter of the cylindrical portion,
wherein said outside diameter of the second end of the tapered portion is less than the outside diameter of the first end of the tapered portion,
wherein the outside diameter of the first end of the tapered portion is sized to fit inside a tobacco blank,
wherein the tapered portion is flexible to allow the second end of the tapered portion to expand and thereafter return to its initial outside diameter.

7. The apparatus according to claim 6, wherein the tapered portion comprises a plurality of flexible fingers.

8. The apparatus according to claim 6, wherein said tapered portion is flexible to allow the second end of the tapered portion to expand to substantially the same diameter as the first end of the tapered portion and thereafter return to its initial outside diameter.

9. The apparatus according to claim 7, wherein said tapered portion is flexible to allow the second end of the tapered portion to expand to substantially the same diameter as the first end of the tapered portion and thereafter return to its initial outside diameter.

10. The apparatus according to claim 6, wherein the tube holder is a drum.

11. The apparatus according to claim 10, wherein the drum is rotatable.

12. The apparatus according to claim 7, wherein the tube holder is a drum.

13. The apparatus according to claim 12, wherein the drum is rotatable.

14. The apparatus according to claim 6, said apparatus further comprising a cigarette making apparatus to which the filling tube is mounted, said cigarette making apparatus further comprising a tobacco loading apparatus, a cigarette plug compression apparatus, a tobacco blank separation apparatus, and a tobacco blank loading apparatus mounted to said cigarette making apparatus.

15. A method of locating a tobacco blank on a tobacco filling tube, said method comprising:
providing at least one filling tube comprising a cylindrical portion having an outside diameter, an inside diameter, a first end and a second end, and a hollow tapered portion having a first end with an outside diameter and a second end with an outside diameter, wherein the first end of the tapered portion adjoins the second end of the cylindrical portion, wherein said outside diameter of the first end of the tapered portion is substantially the same as the outside diameter of the cylindrical portion, wherein said outside diameter of the second end of the tapered portion is less than the outside diameter of the first end of the tapered portion, wherein the outside diameter of the first end of the tapered portion is sized to fit inside a tobacco blank, wherein the tapered portion is flexible to allow the second end of the tapered portion to expand and thereafter return to its initial outside diameter, and dispensing a tobacco blank over the at least one filling tube.

16. The method according to claim 15, wherein the tapered portion comprises a plurality of flexible fingers.

17. The method according to claim 15, wherein said tapered portion is flexible to allow the second end of the tapered portion to expand to substantially the same diameter as the first end of the tapered portion and thereafter return to its initial outside diameter.

18. The method according to claim 16, wherein said tapered portion is flexible to allow the second end of the tapered portion to expand to substantially the same diameter as the first end of the tapered portion and thereafter return to its initial outside diameter.

19. The method according to claim 15, further comprising providing a filling tube holder wherein said at least one filling tube is mounted to said filling tube.

20. The method according to claim 19, wherein said filling tube holder is a drum.

21. The method according to claim 20, wherein said drum is rotatable.

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