Sept. 2, 1969 J. R. PINKHAM ET AL 3,464,421

INTEGRAL INLINE GRANULAR FILTER CIGARETTE MACHINE

Filed Feb. 14, 1968 3 Sheets-Sheet 1

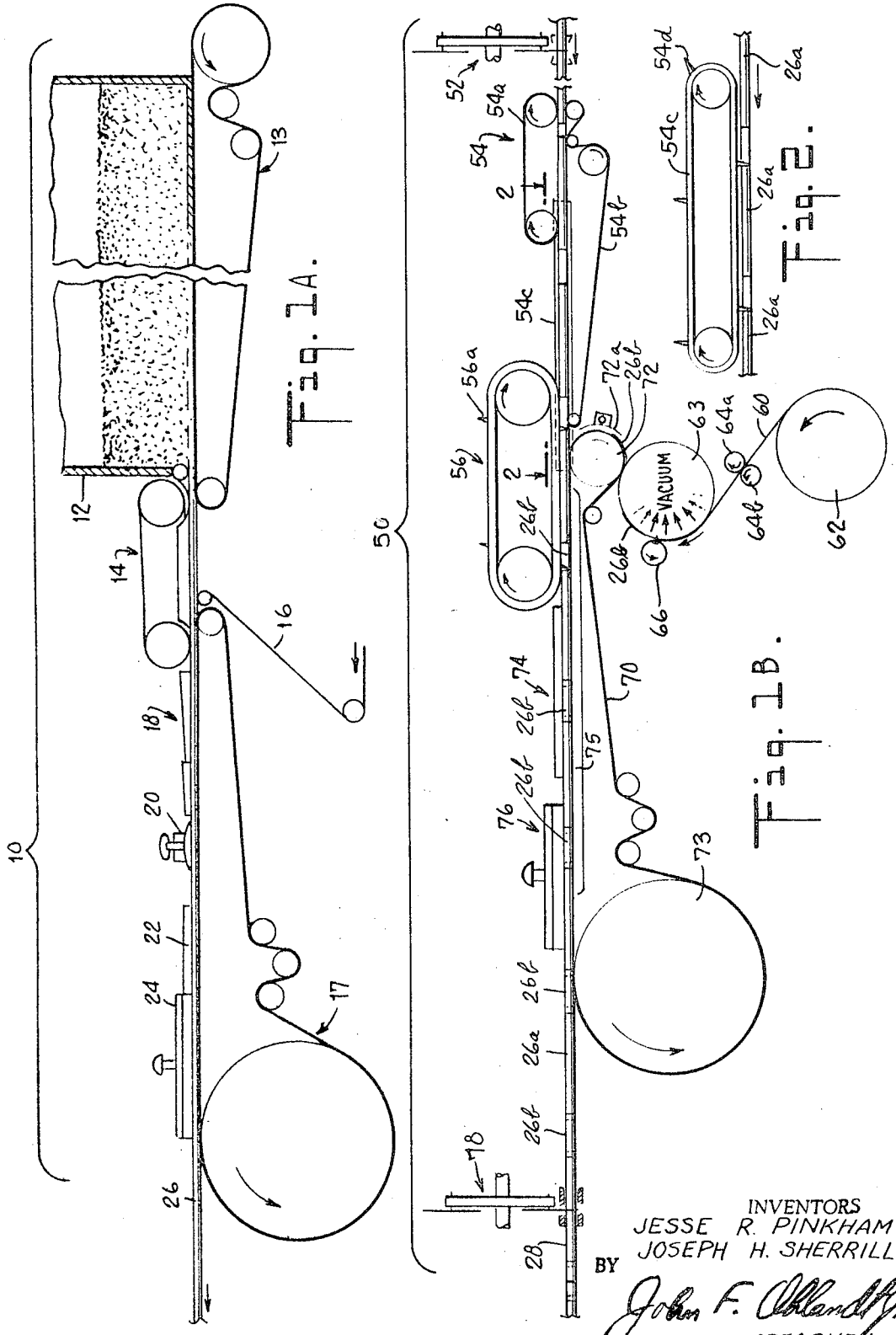


Fig. 1A.

Fig. 2.

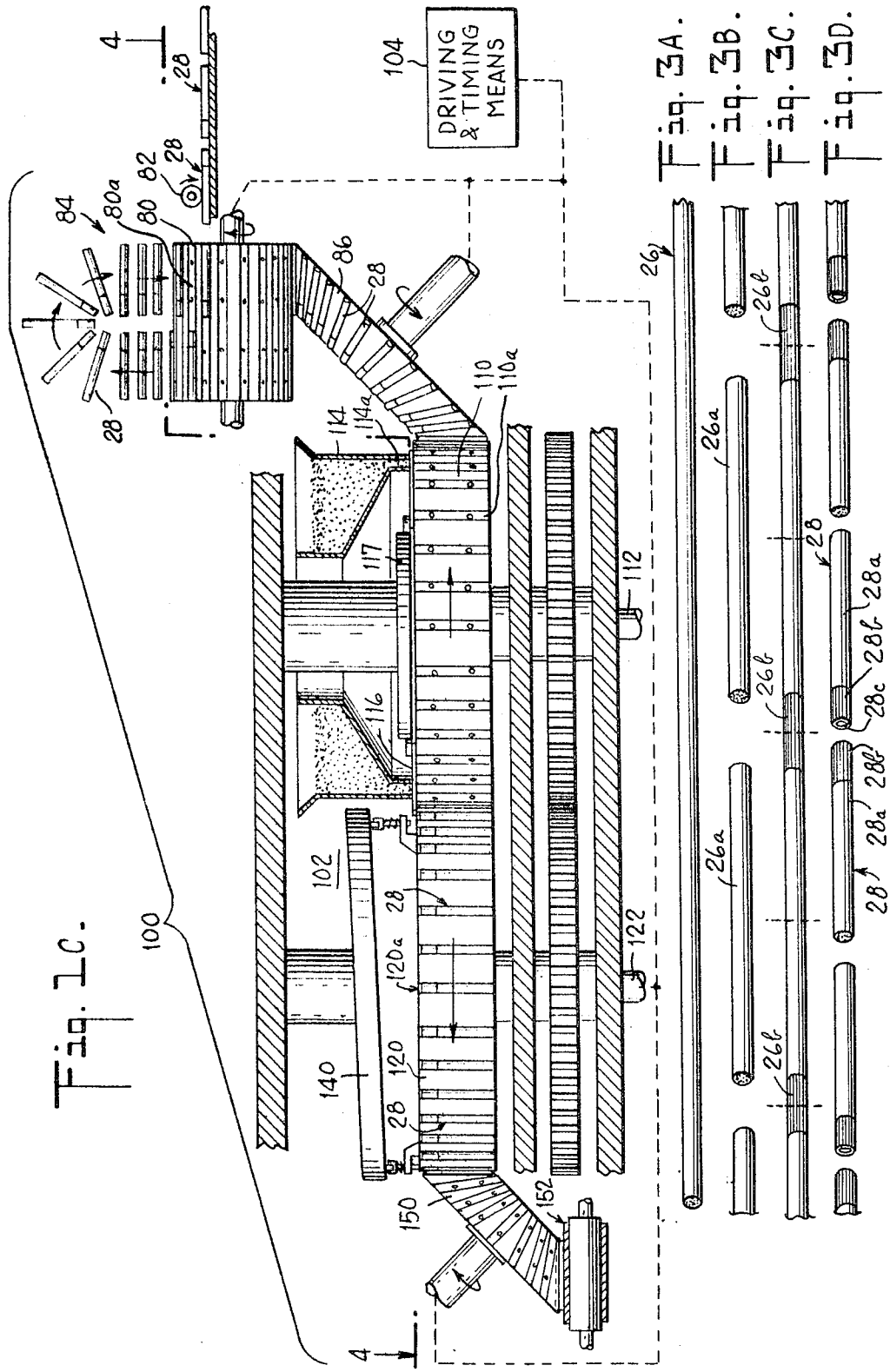
Fig. 1B.

INVENTORS
JESSE R. PINKHAM
JOSEPH H. SHERRILL

BY John F. Oblander Jr.
ATTORNEY

INTEGRAL INLINE GRANULAR FILTER CIGARETTE MACHINE

Filed Feb. 14, 1968 3 Sheets-Sheet 2



Sept. 2, 1969 J. R. PINKHAM ET AL 3,464,421

INTEGRAL INLINE GRANULAR FILTER CIGARETTE MACHINE

Filed Feb. 14, 1968 3 Sheets-Sheet 3

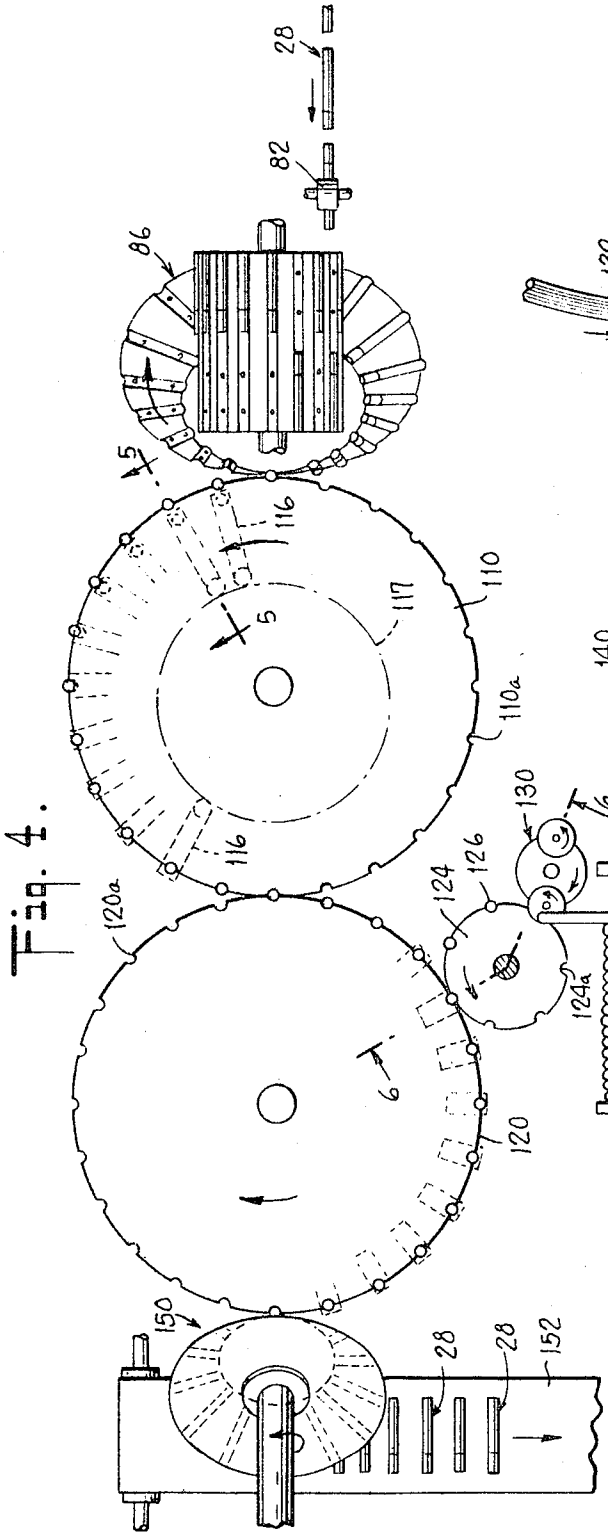


Fig. 4.

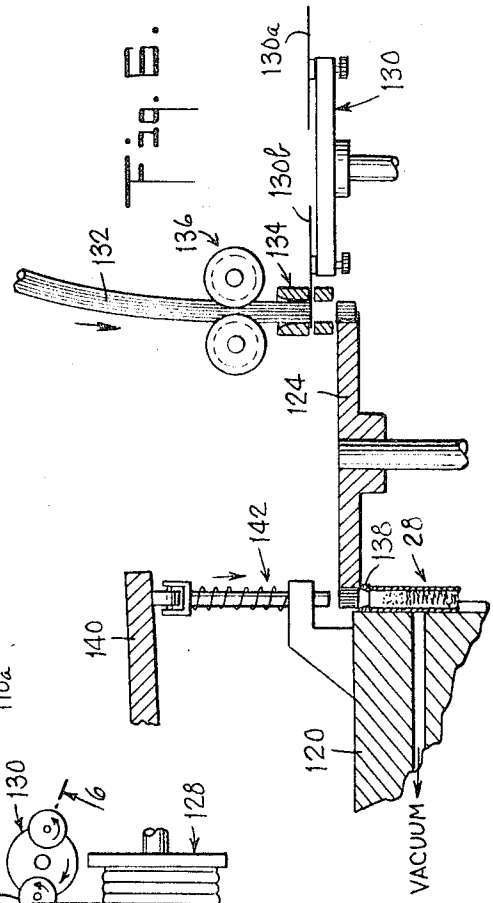


Fig. 6.

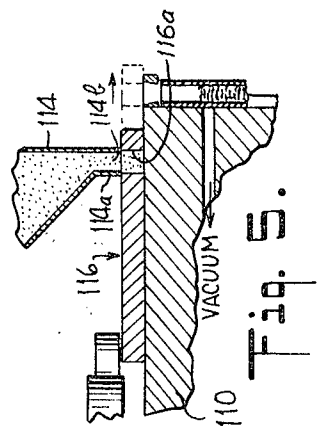


Fig. 5.

United States Patent Office

3,464,421

Patented Sept. 2, 1969

3,464,421

INTEGRAL INLINE GRANULAR FILTER CIGARETTE MACHINE

Jesse R. Pinkham and Joseph H. Sherrill, Winston-Salem, N.C., assignors to R. J. Reynolds Tobacco Company, Winston-Salem, N.C., a corporation of New Jersey

Filed Feb. 14, 1968, Ser. No. 705,450
Int. Cl. A24c 1/32, 5/50, 5/52
U.S. Cl. 131—61
11 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for producing filter tipped cigarettes and the like, the filter tips being composite types which include a chamber of granular material. The cigarettes are made from a continuous rod of wrapped tobacco sections, each interspersed with a mouthpiece portion, in the form of tipping paper, prior to the insertion of the granular material. Discrete tubular elements are then formed, consisting of a wrapped tobacco section and an extended hollow tube attached at one end thereto. These tubular elements are continuously processed such that the granular material completely fills the chamber or void from the other end of the tube; following this, the filled end of the tubular elements are capped.

Background, objects and summary of the invention

It has become a well-known practice, in producing certain types of filter tipped cigarettes, to provide, first of all, a rod of filter material, such as cellulose acetate, and then to cut this rod into suitable lengths for application to cigarettes. After the cutting of the rod lengths, each of them is placed between the two cigarette columns or sections end, after uniting the cigarette sections to the filter element, the total entity is cut in half to furnish two filter tipped cigarettes.

However, when it is desired to produce filter tips of composite type which include as a smoke filtering medium a chamber of granular material, such as charcoal, many difficulties are presented. Generally what is done is that the granular material is inserted in the voids between spaced fibrous plugs of cellulose acetate or the like to form a rod-like filter assembly consisting of an alternating succession of the aforenoted fibrous plugs and chambers of granules. Various techniques for producing these rod-like assemblies may be appreciated by reference to U.S. Patents 3,259,029 and 3,340,775. It should be stressed that the above-cited patents are concerned with the manufacture of the composite tips as an entirely separate operation. In other words, they are directed to systems whereby a series of spaced fibrous plugs are continuously conveyed on a wrapping paper while the granules are inserted and, what eventuates is a rod-like assembly. Therefore, it becomes necessary after forming this rod-like assembly to cut it into discrete lengths to furnish individual tips, and then to unite the discrete filter lengths to the tobacco sections by the attachment techniques previously described.

Accordingly, it is a primary object of the present invention to make integral or to integrate the manufacture of filter tipped cigarettes in which the filter tip is of composite type and includes a section or chamber of granular filter material.

Another difficulty, generally alluded to previously, in the formation of these composite filter tips is that the desired granular material is not easily packed into its chamber or void. In other words, it is extremley troublesome to get a complete filling of the void with the desired amount of granules.

Accordingly, it is another fundamental object of the present invention to overcome this lack of proper filling of the chamber designed for receiving the granular material.

The object of obtaining proper filling of the granular chamber is fulfilled, and, at the same time, the machinery for producing a filter tipped cigarette is substantially reduced in complexity because of the integrated approach. This reduction in complexity further leads to reduction in the need for large numbers of operating personnel; and also eliminates the difficulties which attend the transfer of elements from machine to machine. In other words, the present invention provides an integrated, continuous production-line technique which eliminates the need of transferring, for example, the discrete filter tips for subsequent attachment at another machine to the conventional tobacco sections. This is for the simple reason that the granules are filled directly into a pre-made tipped cigarette.

Briefly stated, then, a primary aspect of the present invention relates to a process, and to the apparatus for carrying out such process, whereby tobacco sections, after being cut from a wrapped tobacco rod turned out by conventional machinery, are first appropriately spaced. It should be noted here that, of course, apparatus for appropriately spacing tobacco sections is per se well-known. However, the present invention provides that the tipping paper, that is, the paper that comprises the mouthpiece, is cut and wrapped so as to overlap two adjacent spaced tobacco sections and leave a chamber or void between them. This is done in a continuous manner so that a rod-like assembly results comprising a series of hollow tubes interspersed between tobacco sections. Thereafter, discrete tubular elements are cut, in suitable lengths, from the rod-like assembly such that each tubular element consists of a conventional tobacco section and attached thereto, and extending longitudinally therefrom, a hollow tube. These tubular elements are then progressed through a filling and sealing mechanism, which may be likened to a twin-carrousel arrangement, in which the tubular elements are held upright and the granules, from a suitably disposed hopper, are poured into the open ends of the tubes which are thereafter sealed.

The carrousel-like arrangement for filling the voids with granular material and for sealing the resultant chambers is similar in many respects to the arrangement described in copending application Ser. No. 705,472 filed Feb. 14, 1968. However, the elements as they emerge from the filling and sealing mechanism are, in accordance with the present invention, completely finished products, except for the step of cutting the emergent elements in half to produce two filter tipped cigarettes.

The basic mechanisms which embody the various features of the present invention are associated with other equipment such as driving means, timing means and the like, in order that the essential functions be carried out. However, for the purposes of clarity and simplicity in explaining the basic principles, it is considered well to highlight certain parts and to keep the associated elements in the background. Therefore, the illustrations which follow in the various figures detail only those parts which are essential to an understanding of the invention. Even though they do not depict in detail each element of the complete apparatus, they suffice to convey the essential functions in accordance with the inventive principles already pointed out. However, the basic parts depicted can not be considered in utter isolation and it must be borne in mind that they are associated with elements presented only schematically.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of preferred embodiments

of the invention, as illustrated in the accompanying drawings.

Brief description of the drawings

FIGS. 1A, 1B and 1C are elevation views, mainly schematic in form, illustrating the entire combination of apparatus in accordance with one embodiment of the present invention.

FIG. 2 is a sectional view taken on the line 2—2 in FIG. 1B, illustrating part of the spacing means.

FIGS. 3A–3D show various stages in the processing of a filter cigarette in accordance with the technique of the present invention.

FIG. 4 is a horizontal sectional view of the apparatus for filling and capping the tubular elements, taken on the line 4—4 in FIG. 1C.

FIG. 5 is a fragmentary view illustrating in detail the plunger mechanism, which is part of the apparatus shown in FIG. 1C.

FIG. 6 is a fragmentary view illustrating in detail the means for feeding and inserting short lengths of fibrous rod for the purpose of end-capping filter elements.

Description of preferred embodiments

Referring now to the figures, and for the moment to FIGS. 1A, 1B and 1C, there is illustrated here the complete layout of the integrated apparatus for producing filter tipped cigarettes having tips of the type which include a chamber of granular material. The numerals **10**, **50** and **100** denote the principal parts of the apparatus. In effect, what is shown is the complete production line, chiefly schematically. It will be appreciated that the numeral **10** designates apparatus that is, per se, well-known for producing conventional cigarette elements. This apparatus **10** comprises the usual tobacco feed **12** and associated conveyor **13**, tobacco rod former **14**, paper feed **16**, conveyor **17**, tongue **18**, sealer **20**, folder **22** and another sealer **24**. As is well understood, the tobacco fed from the feed **12** is continuously formed into a rod and paper is wrapped around the tobacco rod and sealed so that what emerges from the sealer **24** is a continuous rod **26** of cigarette material. The normal procedure following the final sealing operation is to cut the tobacco rod into prescribed lengths to furnish a conventional cigarette.

The apparatus designated **50** constitutes in general the mechanism or means for forming desired lengths of tobacco columns or sections and for combining the lengths with tipping paper that forms a mouthpiece for the filter cigarette. The pieces of equipment comprising the mechanism **50** include the cut-off device **52** and the spacing devices **54** and **56**, which function together to insure that the correct spacing between tobacco sections is established. The device **54** comprises a pair of speed-up belts **54***a* and **54***b* and an associated side chain **54***c*. The side chain **54***c* is furnished with lugs **54***d* which fair in behind each cigarette section. The chain **54***c* is timed with the cut-off device **52** and runs slightly faster than the speed-up belts **54***a* and **54***b*. This permits the lugs to catch up with the cigarette sections and bring them to exact spacing. The exact spacing that is normally desired is the spacing required for two filter lengths.

The other device **56** for providing proper spacing is in the form of an overhead chain which is equipped with lugs **56***a* for maintaining exact spacing.

It will be appreciated that, per se, the accurate spacing of filter or cigarette elements is conventional in the art. However, it should be noted here that, in accordance with the apparatus up to this point, there has been provided the precise spacing required for the particular purposes of the present invention. Thus, the cut-off device **52** acts to cut the emerging cigarette rod **26** into double lengths, that is, into lengths that are sufficient for making two filter tip cigarettes, and the spacing devices **54** and **56** insure that a sufficiently long void is provided between the spaced doublelength tobacco sections **56***a*. (See FIG. 3B.) These spaced sections **26***a* are then presented to the means for applying the tipping material as will now be described.

Tipping material **60**, which is coated on its upper side, is fed from a bobbin **62** on to a conventional suction-type cutting drum **63** by the metering feed rolls **64***a* and **64***b*. The tipping material, which typically may be in the form of cork paper, is payed out from the bobbin such that the cory paper drags on the drum **63** at a slower speed than the speed at which the drum is running. The tipping material is cut to the desired length, as determined by the pay out speed, by the routing pinch knife **66**. The circumference of the cutting drum **63** is selected to be a multiple of the combined length of a double-length cigarette and filter element. This is necessary so that the knife will always cut the tipping material at the same point or points on the cutting drum to avoid cutting over suction holes at any time. The circumference of the rotating knife **66** is proportioned according to the selected multiple for the circumference of the drum **63**.

As a consequence of the above-described arrangement, the peripheral speed of the cutting drum **63** can be made the same as the linear speed of the folder tape **70**.

This relationship permits the cut patches of tipping material **60** as they are removed from the cutting drum **63** to be transferred directly onto the folder tape. The folder tape **70** is constituted of porous material so that the vacuum being utilized will be effective. The folder tape **70** is fed continuously and is driven by the drum **72** from the unwind drum **73**. The tape **70** rides in the bottom of a folder device **74**. The drum **72** and the bottom of the folder device **74** are subjected to a negative pressure through the core of the drum **72** and a plenum **75**.

The mechanism as described is timed so that the tipping patches are positioned under the voids between the tobacco sections **26***a*. The length of these tipping patches **26***b* is such as to provide the required overlap to each of a pair of adjacent sections **26***a*. The temperature of the drum **72** and the air supplied through the associated duct **75** is sufficiently high to activate the adhesive coating on the tipping paper so that each end of a path **26***b* of the tipping paper can be tacked to the two adjacent cigarette sections.

In similar fashion to conventional arrangements for folding paper and the like, a tipping patch **26***b* is completely wrapped around the rod. The sealer **76** then finishes the operation of completing the rod by bonding the patches **26***b* to the tobacco sections **26***a* and to itself.

The last stage of the mechanism **50** comprises another cut-off device **78**. This cut-off device functions to furnish the proper length of tubular elements **28** comprising a single length tobacco section **28***a* and a single length hollow tube **28***b*, defining the end void **28***c*, from the rod-like assembly consisting of the alternating succession of the tobacco sections **26***a* and the tipping paper sections **26***b*. Thus, the cut-off device **78** functions to give equally spaced cuts, but these are alternate cuts in the sense that a first cut is midway along a tobacco section **26***a*, and the next succeeding cut is midway along a tipping patch **26***b*. Accordingly, what goes in as a continuous rod to the cut-off device **78** emerges as a series of tubular elements **28** whose length is equal to the length desired for a finished granular-filled filter tipped cigarette.

The filling of these tubular elements **28** is accomplished by the mechanism generally designated **100**. Since, as explained, the cuts made by the cut for device **78** are successively made midway along the cigarette section and midway of the patch of tipping paper, the result is that at the output of the cut device **78**, successive elements alternate in their orientation. This may be seen, particularly in FIG. 3D, and it becomes necessary to arrange things so that all of the tubular elements **28** have their ends, which are to be filled with granular material, disposed the same way.

The cut tubular elements 28 are first deflected into the receiving slots 80*a* disposed around the periphery of the drum 80. This operation is aided by the kicker cam 82. Such an arrangement involving the use of a kicker cam is, of course, a well-known expedient, and is one of a variety of ways for deflecting cigarettes and the like onto a rotating drum or a moving belt.

The alternate elements, that is, every other element in the string of tubular elements 28 must be turned end-for-end. Device 84 is a "turn around" device for accomplishing this function and may take the form of the device described in co-pending application Ser. No. 708,475, filed Feb. 20, 1968. This device 84 takes the alternate elements 28 as they are received on the left side of the drum 80 and so places them on the right side so as to form a row of elements, all having their voids oriented the same way.

It should be noted at this juncture that the elements 28 are retained in the slots 80*a* at the periphery of the drum 80 by means of a vacuum system. This system has not been illustrated in detail because, per se, it forms no part of the present invention. This vacuum system is arranged not only to retain the elements 28 at the periphery of drum 80, but, likewise, to provide transfer of the elements to the other drums which comprise the mechanism 100, and to retain same for pre-determined intervals at the peripheries of these other drums.

The tubular elements 28 are transferred, in the manner noted before, to the filling and sealing means proper, which is designated 102. Thus, the elements are transferred from the drum 80 by way of the inclined drum 86 which has a bevelled periphery. The filling and sealing means 102 comprises a pair of drums 110 and 120 in an arrangement which may be likened to a twin carrousel. This carrousel-like arrangement, for filling the voids 28*c* at the ends of the tubular elements 28 with granular material and for sealing the resultant chambers, is similar in most respects to that arrangement described in co-pending application Ser. No. 705,472, filed Feb. 14, 1968.

It will be appreciated here and as the description proceeds that the various movable devices or elements are suitably driven and synchronized by conventional drive and timing means, as indicated schematically by the dotted lines connected to the box designated 104.

The drum 110 rotates on a vertical axis, being journaled to a shaft 112 so disposed for the purpose. The drum 110 is termed the granule filler drum because it is at this state that the granular material is fed into the tubular filter elements 28. This is accomplished as follows: The granules are fed from the hopper 114 by means of a series of metering plungers 116 extending radially above the drum 110 and carried by the drum in suitably disposed guides. The hopper 114 is rotated synchronously with the drum 110 by suitable means not shown. A plunger is provided for each of the slots 110*a* in the drum 110. The plungers 116 are actuated, that is, are moved in and out responsive to a stationary cam 117 which is positioned around the axis of the shaft 112.

Reference should be made here particularly to FIG. 5, where the details of one of the plungers 116 are enlarged for clarity. The plunger 116 is designed to move under the lowermost projection of the chute 114*a* which is an integral part of the hopper 114. The chute 114*a* is provided with a series of spaced orifices 114*b*, which are respectively aligned with corresponding apertures 116*a* in the plungers 116.

The plunger 116, as seen in FIG. 5, is generally rectangular in cross section. The aperture 116*a* extends through the plunger for accommodating a prescribed quantity of granular material for the filling of a tubular filter element. The plunger, under spring bias, is shown in retracted position in FIG. 5, whereby the aperture 116*a* is positioned under the corresponding orifice 114*b* in the hopper chute 114*a*. Consequently, the aperture fills up with the metered or prescribed quantity of granules from the hopper. The granules are prevented in this situation from flowing out of the aperture 116*a*. However, when the plunger 116 is pushed out by the cam 117, the granular material falls by force of gravity into the tubular element 28. This occurs in response to the plunger's engaging the high side of the cam 117 in its travel, i.e. as it approaches the meeting point of the drum 110 with the drum 120. This action may be best understood by reference to FIG. 4. Although the filling of the tubular element 28 is thus accounted for solely by gravity, a vertical packing device could be provided at this state to tamp down the charge of granular material.

When the void 28c at the end of a typical tubular element 28 has been filled in the manner described, the element is ready to be transferred to the next station for the end capping operation. Thus, transfer is made of the element 28 from the drum 110 to the cap-inserting drum 120 which in construction is virtually identical to drum 110, being provided with slots 120*a* at its periphery. The transfer is effected by means of release of the vacuum at the meeting point of the two drums. In other words, at this point, a given tubular element 28 is shifted from its upright position in a slot 110*a* and is moved over to a corresponding slot 120*a*. The vacuum applied to the slot 120*a* is effective for this purpose because the vacuum normally being applied to slot 110*a* is released at this juncture.

As a tubular element 28 is carried along by rotation of the drum 120, whose shaft 122 is turned by a suitable gearing arrangement, a cap is inserted at the upper end of the tubular element 28 so that the granules which have been placed in the end void 28*c* will be retained therein. For this purpose, the end-capping device, particularly illustrated in FIG. 4, comprises a rotating transfer plate 124 at whose periphery the caps are inserted and are carried over the tubular elements 28 as they come together with these elements disposed in the slots 120*a*. In this particular exemplification the caps are in the form of short plugs 126 of estron or similar material which is unwound from a reel 128 and suitably cut into the desired short lengths by the knife means 130.

Although the plugs of estron material could be supplied to the end-capping drum 120 in trays or the like and then cut to length in a conventional manner, it has been found preferable to supply such apparatus with the long lengths of rod material supplied in a roll on the reel 128 so as to simplify the process. As is best understood from FIG. 6, the rod 132 is fed to the knife means 130 having the two rotating knives 130*a* and 130*b*. The rod 132 is fed through ledgers 134 by the feed rolls 136 to a stop at the bottom of a slot 124*a* on the rotating plate 124. The correct length of the plug or cylinder 126, which typically is 6–8 millimeters in length, is held in the slot by means of the vacuum, or by guide means, and is moved around in timed relationship with the rotation of the drum 120 and is placed in a corresponding slot 120*a* in that drum. More specifically, it is put in position just over a swaging cone 138.

By the action of the stationary cam 140 which is designed to extend around the axis of the drum 120, and which functions in timed relation with the rotation of the drum 120 a series of individual punches 142 are brought down over the receptive slots 120*a*. Thus, as the drum 120 rotates, a given punch 142 is so engaged by the cam 140 that the punch is pushed downwardly and consequently the plug 126 of estron is pushed through the swaging cone 138 and into the open end of the tubular element 28.

It should be especially noted that the action of the punch 142 is spring-loaded so that the plug 126 is assured of contacting the granular material. By this means, voids are obviated, and yet, the granular material is not overpacked. This feature is particularly advantageous in overcoming the problem of normal variation in granular filling.

The capped filter elements 28 are preferably subjected

to heat so as to bond the plug 126 to the inner wall of the tube. After being finished in this manner, the tubular elements 28 are transferred from the drum 120 by way of the inclined bevelled surface drum 150 to a receiver belt 152. Alternatively, the elements can be conveyed into a tray filling device or into a packing attachment.

Although in the described procedure for end-capping of the tubular elements, where plugs 126 of estron material or the like were used as the end caps, it will be appreciated that other forms of capping means can be utilized. For example, caps in the form of "sunburst" discs, as described in copending application Ser. No. 705,472, filed Feb. 14, 1968, can similarly be employed, using the techniques therein described for transferring these discs and inserting them into the tubular elements.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to the preferred embodiments, it will be understood that various omissions and substitutions and changes in the form and details of the device illustarted and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. Apparatus for producing filter tipped cigarettes, the filter tips being of composite type including a chamber having granular material therein, said apparatus comprising,

means for feeding discrete tubular elements each comprising a wrapped tobacco section, a hollow tube of tipping material for defining said chamber, said tube being attached at one of its ends to said section;

means for filling the hollow tubes from their other ends with said granular material; and

means for forming said tubular elements from a continous rod of spaced axially-aligned wrapped tobacco sections interspersed with hollow tubes attached to adjacent tobacco sections.

2. Apparatus as defined in claim 1, further comprising means for sealing the chambers to insure retention of the granular material.

3. Apparatus as defined in claim 1, wherein said means for filling the hollow tubes comprises a granule filler drum having spaced slots at its periphery for receiving said tubular elements and maintaining said elements in an upright position.

4. Apparatus as defined in claim 3, wherein said means for filling further comprises a hopper containing granular material to be inserted into said tubular elements, and means for metering out quantities of such granular material and for inserting the granular material endwise of the upright tubular elements.

5. Apparatus as defined in claim 2, wherein said means for sealing comprises a cap-inserting drum having slots at its periphery for receiving the tubular elements, and further including means for inserting disc-like caps against the granular material in said chambers.

6. Apparatus as defined in claim 4, further including a cap-inserting drum having slots at its periphery for receiving the tubular elements from said granule filler drum, and further including means for inserting disc-like caps against the granular material in said chambers.

7. Apparatus as defined in claim 1 including means for cutting double length tobacco sections from a continuous wrapped rod of tobacco, and means for separating the double length tobacco sections with equal spacing therebetween.

8. Apparatus as defined in claim 7, including means for forming said hollow tubes by overlapping the inner ends of adjacent ones of said double length tobacco sections with tipping material so as to leave a void corresponding to twice the spacing required for an individual filter tip.

9. Apparatus as defined in claim 8, including means for folding the tipping material, and means for sealing the material to produce said hollow tubes.

10. Apparatus as defined in claim 8, including means for cutting in alternating succession through the middle of the tobacco sections and the middle of the hollow tubes, thereby to produce said tubular elements corresponding in size to an individual finished filter-tipped cigarette.

11. Apparatus as defined in claim 10, further including means for turning around alternate tubular elements, so that all elements are in the same orientation with their voids at the same end.

References Cited

UNITED STATES PATENTS

211,509	1/1879	Hayden	131—71
3,060,814	10/1962	Wagner et al.	
3,245,514	4/1966	Herrmann	131—25 X
3,259,029	7/1966	Hall et al.	93—1
3,308,832	3/1967	Stelzer et al.	
3,370,514	2/1968	Rome.	

FOREIGN PATENTS

688,854	3/1953	Great Britain.

ALDRICH F. MEDBERY, Primary Examiner

J. H. CZERWONKY, Assistant Examiner

U.S. Cl. X.R.

131—88; 93—1