

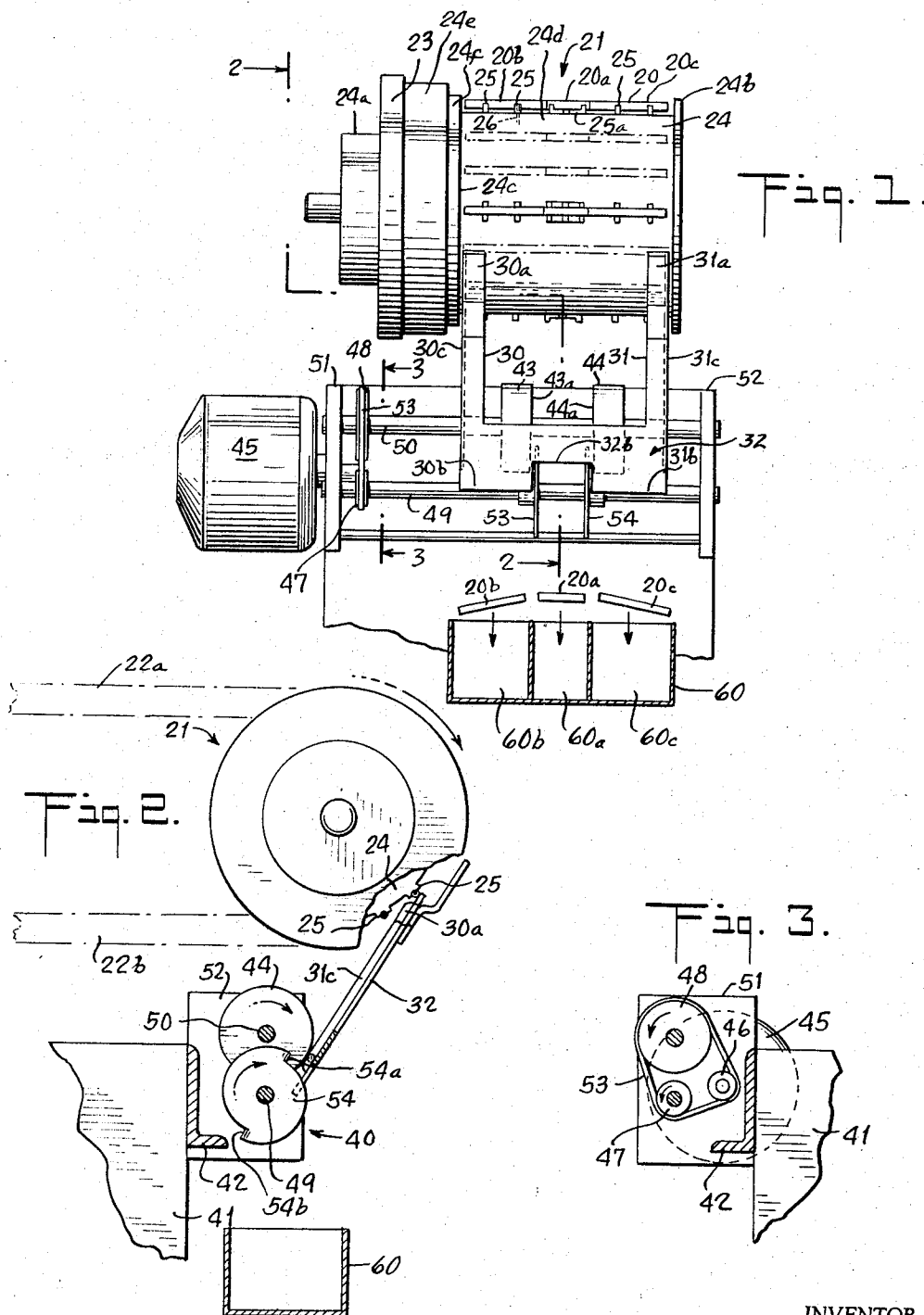
Oct. 10, 1967

J. R. PINKHAM
DISASSEMBLING APPARATUS FOR CIGARETTE
AND FILTER ASSEMBLIES

3,345,991

Filed June 4, 1965

3 Sheets-Sheet 1



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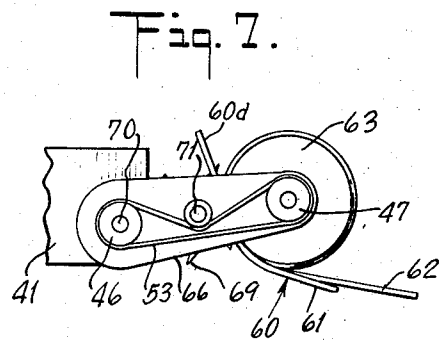
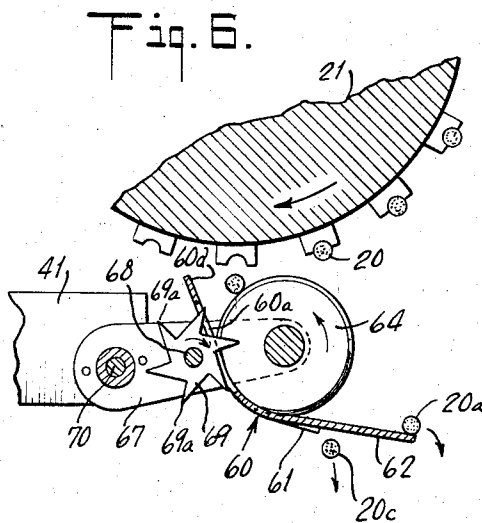
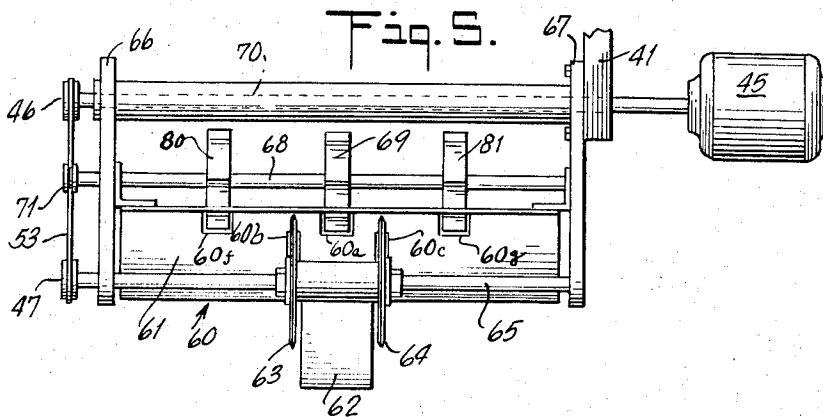
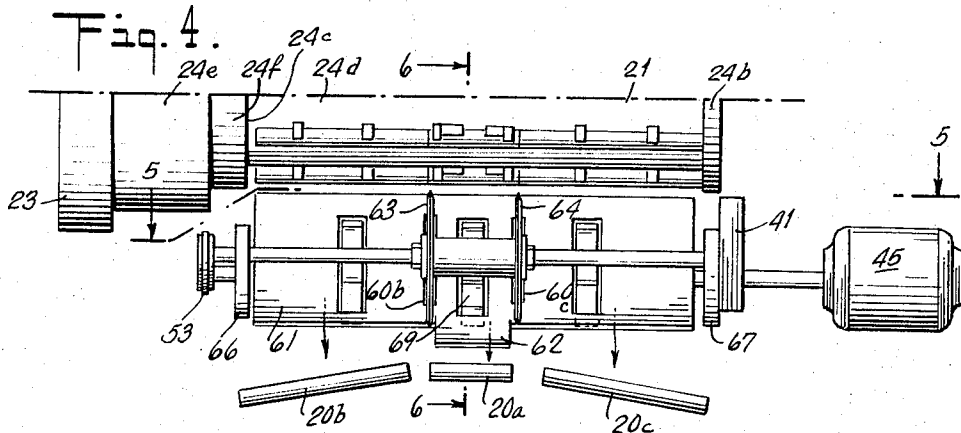
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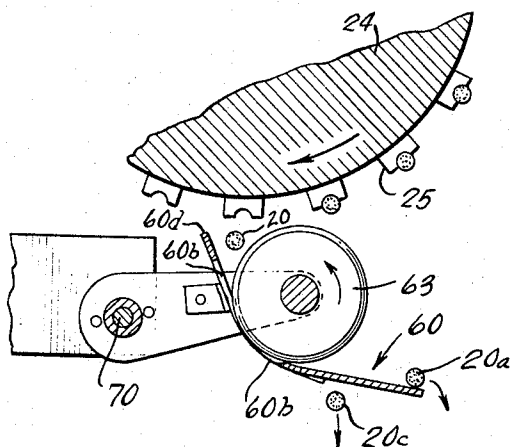
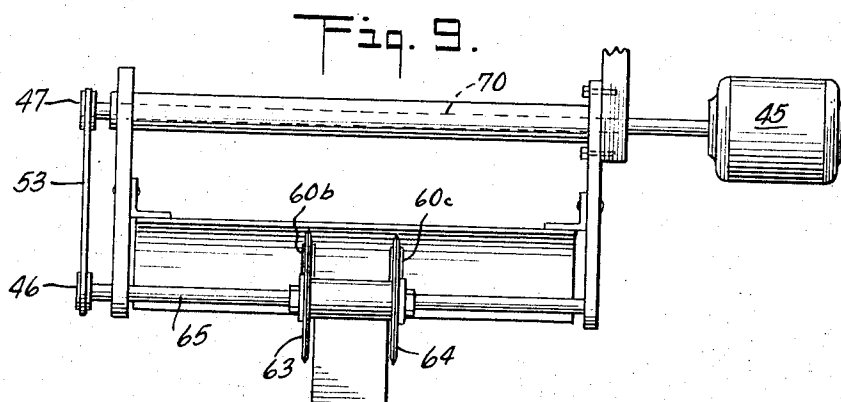
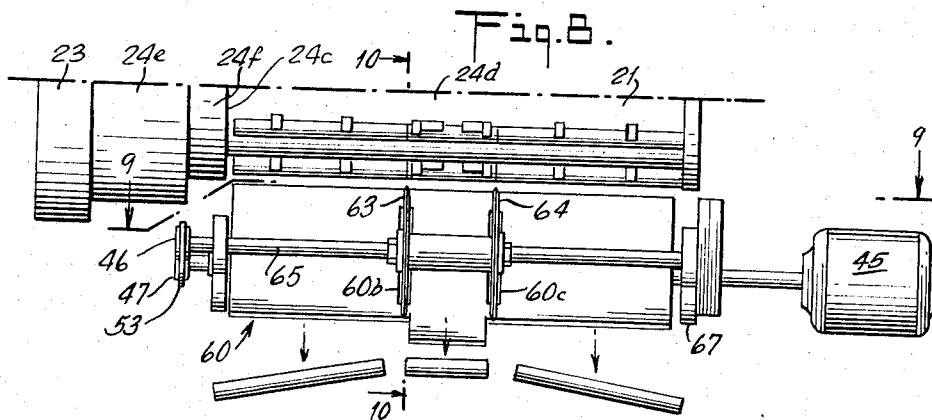
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3 Sheets-Sheet 3



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DISASSEMBLING APPARATUS FOR CIGARETTE AND FILTER ASSEMBLIES

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Filed June 4, 1965, Ser. No. 461,478

7 Claims. (Cl. 131—20)

This invention relates to an apparatus for disassembling filter and cigarette assemblies, and more particularly relates to an apparatus adapted continuously to accept composite cigarette and filter assemblies preparatory to separately reclaiming the tobacco values thereof and the filter values thereof.

In an intermediate stage during the manufacture of filter tipped cigarettes, it is common practice to assemble in alignment two cigarettes of desired length and a double length section of filter material located between the two cigarettes. The ends of the two cigarettes are brought into abutting relationship with the filter section. A band of sealing material is then placed around the section of filter material with its edges overlapping the ends of the cigarettes, thereby forming a double-unit consisting of two cigarette tobacco rods with a double length filter section between them. Ultimately these double-units are cut transversely at their center, resulting in the formation of two individual filter tipped cigarettes from each double-unit.

The individual filter tipped cigarettes are then automatically collected and stored in large transport trays for ultimate transfer to packaging machinery. Use of such automatic tray-filling machines has been economical, since it eliminates much hand labor, but the manual inspection function previously performed at the same time has thereby been lost. Automatic inspection devices have been developed to overcome this aspect of the use of automatic tray-filling machines. There is shown in U.S. Patent 2,951,364, issued Sept. 6, 1960, to J. H. Sherrill, an automatic inspection device for testing the double-unit filter cigarettes by subjecting them to an internal air pressure different from the external pressure, to test for holes or leaks in the cigarette paper of filter. Double-units that fail the test are rejected, and those that pass the test are allowed to travel onward to the aforesaid transverse cutting operation.

The tobacco contained within rejected cigarettes is quite valuable, and must be salvaged. The filters have a lesser but still a significant salvage value. In order to have value, the salvaged tobacco must not be contaminated with fibers from the filter. In cigarette machinery employed before the advent of the automatic inspection devices described above, the cigarettes were inspected visually. Unsatisfactory cigarettes were manually removed and placed by the inspector in trays for transfer to salvage operations. In so doing, the inspector would orient the cigarettes in the tray for economical salvage, segregating any bits and pieces. With the automatic inspection devices described above, the rejected cigarettes are unoriented and either in double length form, or in bits and pieces, and no inspector is normally present to segregate the bits and pieces and to orient the double length cigarettes. Salvage of material rejected by automatic inspection equipment by use of prior art salvage equipment is thus very unsatisfactory.

It is an object of the present invention to provide an apparatus adapted continuously to disassemble double-unit cigarette and filter assemblies and to segregate the cigarette sections from the filter sections.

Another object of the present invention is to provide such an apparatus wherein tobacco values may be re-

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claimed in substantially pure form and without the incorporation therein of filter material.

Another object of the present invention is to provide such an apparatus wherein rejected double-unit cigarette and filter assemblies are subjected to a cutting and segregating operation during the rejection phase so as to facilitate the separate reclamation of tobacco values and filter values.

Another object of the present invention is to provide means for rapidly reclaiming cigarette values from cigarettes rejected during high speed cigarette manufacture operations.

These and further objects and advantages of the invention will be more fully appreciated as the description of apparatus according to the invention proceeds.

In the drawings:

FIG. 1 is an elevation view of apparatus according to the invention incorporating a first embodiment of means for disassembling selected ones of a series of cigarette and filter assemblies;

FIG. 2 is a partial section view of the apparatus of FIG. 1 taken along line 2—2 therein;

FIG. 3 is a partial detail section view of a portion of the apparatus of FIG. 1 taken along section line 3—3 therein;

FIG. 4 is a partial elevation view of a second embodiment of means for disassembling selected ones of a series of cigarette and filter assemblies;

FIG. 5 is a plan view of certain elements shown in FIG. 4 and viewed along line 5—5 therein;

FIG. 6 is a partial detail section view of the elements shown in FIG. 4 and taken along line 6—6 therein;

FIG. 7 is a left-hand end view of the apparatus of FIG. 5;

FIG. 8 is a partial elevation view of a third embodiment of means for disassembling selected ones of a series of cigarette and filter assemblies;

FIG. 9 is a plan view of certain elements shown in FIG. 8 and viewed along line 9—9 therein; and

FIG. 10 is a partial detail section view of the elements shown in FIG. 6 and taken along line 10—10 therein.

Referring now to the drawings, and especially to FIGS. 1 and 2, there is shown transport means 21, which in the illustrated embodiments takes the form of a drum assembly. These means 21 may be employed with, but do not form a part of, the present invention. The drum assembly 21 is adapted to receive a series of cigarette and filter assemblies 20 from conveyor 22a indicated in simplified outline in phantom detail in FIG. 2. The assemblies 20, after deposition upon drum assembly 21 from conveyor belt 22a, are thereafter transported or carried on the outer circumference of the revolving portion of drum assembly 21 to a point where selected ones thereof are transferred to the disassembling means. Those assemblies 20 that are not disassembled according to the invention continue on the drum assembly 21 until they are delivered to conveyor 22b for further processing, e.g. for packaging. The construction of drum assembly 21 is shown in greater detail in the copending application of Pinkham, McArthur, and Speas, Jr., Ser. No. 461,291, filed June 4 1965 and assigned to a common assignee with the present invention. It is to be understood that conveyors 22a and 22b may take any form capable of carrying and transferring assemblies 20 and are not restricted to belt-type conveyors. In the aforesaid copending application drum-type conveyors are illustrated.

According to the present invention the cigarette and filter assemblies 20 will have been individually tested for quality on drum assembly 21 or before reaching drum assembly 21. However, while the disassembling apparatus of the present invention is useful in disassembling cig-

arette and filter assemblies which have been previously tested and found defective as aforesaid, the invention is not restricted thereto. Rather the invention finds application whenever selected ones of a series of cigarette and filter assemblies 20 are to be cut in a manner to separate the center filter section 20a from the cigarette sections 20b and 20c.

The drum assembly 21 comprises a fixed head 23 which serves to mount the entire drum assembly 21 to the general framework (not shown) of the cigarette processing equipment with which it is employed. Journalled within head 23 is a rotatable drum 24 which extends at one end through annular fixed drum portion 23 as a reduced diameter rotatable drum portion 24a, which includes intermediate stepped surfaces 24e, 24f, and 24d, and which is terminated at its opposite end by flange 24b. Rotatable drum 24 is connected to drive means (not shown) for rotation in the direction indicated in FIG. 2. Preferably the drive means for conveyor belts 22a and 22b are either the same as, or are synchronized with, the drive means for drum assembly 21 and for the disassembly means to be described hereinafter. The surface 24d of rotatable drum 24 bounded by face 24c and by flange 24b thereof constitutes a nesting surface for the cradling and transport of cigarette and filter assemblies 20.

Rotatable drum 24 carries a plurality of longitudinal rows of carding means 25, said rows being arranged around the circumference of rotatable drum 24 upon the surface 24d. Each cradling means 25 is shown in the form of a semi-circular flute adapted to cradle a portion of the cylindrical surface of an assembly 20. The central pair of cradling means in a row are connected to form an elongated cradling means 25a which is thereby adapted to receive the cylindrical surface of substantially the entire filter section 20a of a cigarette and filter assembly 20.

Each cradling means 25 has a central orifice 26 (FIG. 1) opening at a position underlying any cigarette and filter assembly cradled thereby. Central elongated cradling means 25a has a pair of these orifices 26. The orifices 26 in each row, i.e. the orifices 26 associated with a row of cradling means 25 and 25a for cradling a single cigarette and filter assembly 20, are connected in common by internal passageways (not shown) so as to be valved as a group to either a positive source of air pressure or a source of air vacuum. Thus each cigarette and filter assembly 20 may be subjected either to positive air pressure at orifices 26 of the cradling means 25 and 25a in which it is nested, or it may be subjected at those same orifices to an air vacuum. Each such assembly 20 is thus individually subjected at its associated orifices 26 to pressure tending to eject it from the cradling means 25, 25a, or to vacuum tending to retain it. Suitable valving means shown in the aforesaid copending application are provided such that each row of cradling means 25, 25a may be individually valved between air pressure and air vacuum as aforesaid, in response to a selecting command which may for example indicate that a certain assembly 20 is defective and thus suitable for disassembly. When this command to the valving means reflects such a quality control decision, there will be a delay during which the assembly 20 will travel from the point at which the quality control decision is made to the point at which the ejection will occur. The delay can be in the valving itself, or it can be by mechanical restraint, but in any case ejection must be effected at a predetermined position in the rotation of drum 24. In the aforesaid copending application, a guide bar is shown which constitutes an example of a delay by mechanical restraint. There the assembly 20 is restrained against the positive air pressure jets thereon emanating from orifices 26, until the circumferential point is reached where the guide bar ends, and at that point ejection is effected. While the transport means 21 forms a preferred source of assemblies 20 for the disassembling and segregating means constituting the present

invention, any other source of assemblies 20 may be substituted.

The disassembling and segregating means forming the present invention will now be described in connection with the example transport means 21 described above. As is shown in FIGS. 1 through 3, the first embodiment of disassembling means comprises an inclined ramp indicated generally at 32, and a roller and knife assembly 40 indicated generally at 40. As is indicated, the drum assembly 21 rotates in the clockwise direction as viewed in FIG. 2. Roller and knife assembly 40 is mounted to general framework 41 by angle bracket 42 so that the assembly 40 is offset relative to the center of drum assembly 21. Inclined ramp 32 is generally U-shaped, including a pair of legs 30 and 31 forming the main portion of the ramp, and portions 30b, 31b, joining the legs at their lower ends. Legs 30 and 31 are arranged so that their upper ends 30a, 31a, respectively, lie slightly outside the annulus swept out by assemblies 20 in cradling means 25, and are positioned in the quadrant immediately preceding the lowermost portion of drum 24. At portions 30b, 31b, ramp 32 lies in the proximity of the pair of rollers 43 and 44. The arrangement thus is that ramp 32 forms a plane leading from drum 24 to just outside the periphery of rollers 43, 44. The plane of the ramp at its lower end is essentially parallel and slightly spaced from a tangent to rollers 43, 44, at the ramp lower portions 30b, 31b, and at its upper end is slightly more steep at portions 30a, 31a, than the tangent to the annulus swept out by cradling means 25.

Ramp legs 30 and 31, as may be best seen in FIG. 1, are spaced apart to occupy the extremes of the area 24d embraced between face 24c and flange 24b of drum 24. Lower portions 30b, 31b occupy the entire width of ramp 32 in the vicinity of rollers 43, 44, so as to act as a full ledger for the support of assemblies 20 under rollers 43, 44. A central notched portion 32b in ramp 32 accommodates knives 53, 54. Each of ramps 31 and 32 includes a right angled flange at the edge thereof closest respectively to face 24c or flange 24b, respectively flange 30c and flange 31c. These flanges help to guide an assembly 20 as it rolls or slides down ramps 30, 31, 32. It has been found that satisfactory operation can be achieved without flanges 30c, 31c.

The roller and knife assembly 40 includes a motive means 45, which may conveniently comprise an electric motor, having a motor pulley 46 which through a belt 53 drives a pair of shaft pulleys 47 and 48 to drive a knife shaft 49 and a roller shaft 50 respectively. Shafts 49, 50 are journaled for rotation in end plates 51 and 52. The rotatable knives 53 and 54 are carried on knife shaft 49 in spaced arrangement, the spacing between the knives being slightly greater than the length of a filter section 20a of a cigarette and filter assembly 20. The pair of knives 53 and 54 are positioned on shaft 49 relative to ramp 32 so as to lie in the path of the filter section 20a of a descending cigarette and filter assembly 20. Knives 53, 54 are each double-eccentric in outline so as to present two pairs of aligned radial knife edges, spaced apart 180°. The radial edges 54a, 54b of knife 54 are shown in FIG. 2. As is best seen in FIG. 2, the radial knife edges of knives 53, 54 pass through notched portion 32b to intercept and sever the assembly 20 just outside the ends of filter section 20a while the cigarette sections 20b, 20c are supported by ramp portions 30b, 31b.

The arrangement of shaft 50 and rollers 43, 44 is such as to bring the periphery of rollers 43, 44 into contact with the cigarette sections 20b and 20c respectively of a cigarette and filter assembly 20 when it reaches the lower portions 30b, 31b, of ramp 32. The inner facing portions 43a, 44a of rollers 43, 44 are in close proximity to the sides of knives 53 and 54 respectively. The shaft 50 is positioned slightly up the ramp from the outline of knives 53, 54 so that the nip of rollers 43, 44 on an assembly 20 is released slightly before the assembly rests against the

generally circular portions of knives 53, 54. The assembly 20 is then loosely held in the pocket formed by rollers 43, 44, ramp 32, and the circular portions of knives 53, 54. This prevents abrasion of the assembly 20 during the period before a radial edge 54a or 54b is rotated into position to sever it. Two assemblies 20 may be severed just outside the ends of the filter section 20a during every revolution of knives 53, 54.

When assemblies 20 roll or slide down ramp 32 to rollers 43, 44, they arrive in generally transverse orientation to knives 53, 54. The distance down ramps 30, 31, 32 is sufficiently short, the momentum of cigarette and filter assemblies 20 is sufficiently great, and the release by cradling means 25 is sufficiently uniform, so that random skewing of a cigarette and filter assembly 20 while descending on ramps 30 and 31 will be either non-existent or very slight. However if any skewing does occur the assembly 20 will be intercepted first by the roller nearest the downwardly skewed end thereof. Thus if desired, the rollers 43 and 44 may be driven at an angular rate such that their peripheral velocity is appreciably less than the velocity of a free rolling or sliding filter and cigarette assembly 20 on ramps 30 and 31. Under that optional arrangement, the roller which first intercepts such a skewed assembly 20 drives that end of the assembly toward the associated knife at a slower rate than that end had been travelling, thus allowing the other end of that assembly to partially catch up. The overall effect is to straighten out slightly skewed assemblies 20 so that knives 53 and 54 address themselves to cigarette and filter assemblies 20 perpendicularly or at a very slight angle from the perpendicular.

Upon disassembly of a cigarette and filter assembly 20 by knives 53 and 54 the individual pieces 20a, 20b, and 20c freely fall from the roller and knife assembly 40 and may be individually intercepted by receiver means in the form of reclamation chutes or bins for individual storage prior to further processing. Any simple chute or bin arrangement is suitable, since the sections 20a, 20b, 20c will always occupy the same spatial arrangement during their free fall, and consequently no danger of mixing occurs. In FIGS. 1 and 2 a bin 60 is shown by way of example of the receiver means. The compartments 60a, 60b, 60c receive respectively the sections 20a, 20b, 20c. In the aforesaid copending application example chutes are shown for effecting segregation of the sections 20a, 20b, 20c.

Referring now to FIGS. 4 through 10, there is shown therein two further embodiments of the disassembling and segregating means. These two embodiments are closely related, and will be described together. In the second embodiment shown in Figs. 4 through 7, means are provided which do not appear in the third embodiment shown in FIGS. 8 through 10, which means constitute a positive drive, in the form preferably of one or more star wheels, for advancing the assemblies 20 through the knives. In both the second and third embodiments ramp 60 comprises a main surface portion 61 which extends from face 24c to flange 24 b of drum 24, thus accommodating the entire length of any cigarette and filter assembly 20. A pair of knives 63, 64 are arranged to intersect with the central area of surface portion 61. This central area is curved so as to follow the curvature of the knives at that point. A tongue 62 is tangent to this curved portion and extends between the pair of circular knives 63 and 64. Tongue 62 is of sufficient width to accommodate severed filter sections 20a of cigarette and filter assemblies 20. A bin 60 or other receiver means may also be employed in the present embodiments, and tongue 62 helps to separate the sections 20a from the sections 20b, 20c for deposit in such a bin. The upper portion 60d of ramp 60 is only slightly curved, or is actually planar (tangent to the curved portion), thus providing considerable separation from knives 63, 64 at the upper ramp end 60d. As is best shown in FIGS. 6 and 10, each of a pair of end plates 66 and 67 are affixed to general framework 41 and in

turn carry ramp 60 and journal the ends of a knife shaft 65. Circular knives 63, 64 are carried on and driven by shaft 65. In each of the second and third embodiments the cutting edge of knives 63, 64 penetrates the ramp 60 at slots 60b, 60c therein. This provides a complete and clean cut of each assembly 20.

In the third embodiment shown in FIGS. 8 through 10, the motor 45 drives a shaft 70 mounted in plates 66, 67 so as to drive pulley 47 and thereby pulley 46 through belt 53. Pulley 46 is mounted on shaft 65, and thus motor 45 is effective to drive shaft 65 and knives 63, 64 mounted thereon. As is shown in FIG. 10, an assembly 20 is ejected from cradling means 25 of drum 24 into the wedge-shaped space just before the nip between the upper portion 60d of ramp 60 and knives 63, 64. The friction action of knives 63, 64 draws the assemblies 20 downward after they reach the crotch between portion 60d and the knife edge, and the assemblies 20 are completely severed. The sections 20a, 20b, 20c fall off their respective portions of ramp 60 for collection.

In the second embodiment shown in FIGS. 4 through 7, a positive drive is employed to assist the passage of assemblies 20 past knives 63, 64. Carried between end plates 66 and 67 is a star wheel drive shaft 68 upon which are mounted three star wheels 69, 80, 81, in alignment, respectively, with openings 60a, 60f, 60g in ramp 60. Each star wheel carries a plurality of arms 69a. Shaft 68 with star wheels 69, 80, 81 is mounted in spaced arrangement relative to ramp 60, knife shaft 65, and knives 63, 64, so that the star wheel arms 69a reach through openings 60a, 60f, 60g in ramp 60 and into the cylindrical envelope defined by the pair of circular blades 63 and 64, as is best shown in FIG. 6.

In this second embodiment, motor 45 drives knives 63, 64 on shaft 65 by the same sequence of elements described with respect to the third embodiment, and also drives a pulley 71 on star wheel shaft 68. Because pulley 71 rides on the outside of belt 53, shaft 68 rotates opposite to shaft 65. Thus star wheels 69, 80, 81 rotate opposite to knives 63, 64, and thereby act to advance assemblies 20 against blades 63, 64. It will be clear that the star wheels may take many forms, the essential feature being that a sequence of pushing members are introduced to push assemblies 20 through the nip of knives 63, 64. One or more star wheels may be employed, e.g. one only to drive each assembly 20 at filter section 20a, or e.g. additional ones to also drive cigarette sections 20b and 20c (as illustrated). The action is a positive displacement of assemblies 20 through the knives. The sections 20a, 20b, 20c are released from ramp 60 in the same fashion as already described with regard to the third embodiment, and may also be received by bins or chutes.

While the invention has been described with reference to certain illustrative embodiments, it will be apparent to those skilled in the art that the specific elements may be varied and rearranged without departing from the invention. The embodiments are illustrative, not limiting.

What is claimed is:

1. Apparatus for accepting from a source, double cigarette and filter assemblies each consisting of two cigarette sections, one at each end of the assembly and a double length filter section between them, and disassembling and segregating the cigarette sections and the filter sections comprising, a generally downwardly extending ramp for guiding and supporting said assemblies during descent thereof; a pair of spaced generally circular knives for severing said assemblies just outside the ends of the filter section, said ramp and knives being arranged so that at least a portion of each of said knives penetrates the outline of said ramp; and a driven member cooperating with the surface of said ramp to intercept and drive each of said assemblies into said pair of knives.

2. Apparatus for accepting from a source, double cigarette and filter assemblies each consisting of two cigarette sections, one at each end of the assembly and a double

length filter section between them, and disassembling and segregating the cigarette sections and the filter sections comprising, a generally downwardly extending ramp for guiding and supporting said assemblies during descent thereof; a pair of spaced generally circular knives for severing said assemblies just outside the ends of the filter section, said ramp and knives being arranged so that at least a portion of each of said knives penetrates the outline of said ramp; and a pair of driven rollers each cooperating with the surface of said ramp to intercept and drive said assemblies into said pair of knives, said pair of rollers being spaced apart so that each intercepts one of said cigarette sections on either side of said filter section.

3. Apparatus for accepting from a source, double cigarette and filter assemblies each consisting of two cigarette sections, one at each end of the assembly and a double length filter section between them, and disassembling and segregating the cigarette sections and the filter sections comprising, a generally downwardly extending ramp for guiding and supporting said assemblies during descent thereof; a pair of spaced generally circular knives each having radial cutting edges for severing said assemblies just outside the ends of the filter section, said ramp and knives being arranged so that at least a portion of each of said knives penetrates the outline of said ramp; and a driven member cooperating with the surface of said ramp to intercept and drive said assemblies against the generally circular portions of said pair of knives for severing by said radial edges.

4. Apparatus for accepting from a source, double cigarette and filter assemblies each consisting of two cigarette sections, one at each end of the assembly and a double length filter section between them, and disassembling and segregating the cigarette sections and the filter sections comprising, a generally downwardly extending ramp for guiding and supporting said assemblies during descent thereof; a pair of spaced generally circular knives for severing said assemblies just outside the ends of the filter section, said ramp and knives being arranged so that at least a portion of each of said knives penetrates the outline of said ramp, the knife edges being disposed radially at eccentric portions of the knives outline; and a pair of driven rollers each cooperating with the surface of said ramp to intercept and drive said assemblies toward the eccentric portions of said pair of knives for severing by said radial edges, said rollers being spaced slightly up said ramp from said knives so as to allow each said assembly to be free of the nip of said rollers while touching the eccentric portions of said knives, said pair of rollers being spaced apart so that each intercepts a cigarette portion on either side of said filter portion.

5. Apparatus for accepting from a source, double cigarette and filter assemblies each consisting of two cigarette sections, one at each end of the assembly and a double length filter section between them, and disassembling and segregating the cigarette sections and the filter sections comprising, a pair of spaced generally circular knives for severing said assemblies just outside the ends of the filter section; a curved generally downwardly extending ramp for guiding and supporting said assemblies during descent thereof, a portion of said ramp including means defining a discontinuity in the surface thereof sufficient to accom-

modate at least a portion of the edge of each of said knives, an upper portion of said ramp cooperating with said knives to define an upwardly open and generally wedge-shaped space therebetween adapted to receive said assemblies, and a lower portion of said ramp below said knives having separate ramp portions acting to discharge the severed cigarette sections and filter sections at different portions therealong.

6. Apparatus for accepting from a source, double cigarette and filter assemblies each consisting of two cigarette sections, one at each end of the assembly and a double length filter section between them, and disassembling and segregating the cigarette sections and the filter sections comprising, a pair of spaced generally circular knives for severing said assemblies just outside the ends of the filter section; a curved generally downwardly extending ramp for guiding and supporting said assemblies during descent thereof, a portion of said ramp including means defining a discontinuity in the surface thereof sufficient to accommodate at least a portion of the edge of each of said knives, an upper portion of said ramp cooperating with said knives to define an upwardly open and generally wedge-shaped space therebetween adapted to receive said assemblies, and a lower portion of said ramp below said knives having separate ramp portions acting to discharge the severed cigarette sections and filter sections at different portions therealong; and driven means for intercepting each said assembly as it descends into said wedge-shaped space and positively displacing it along said ramp through cutting contact with said knives.

7. Apparatus for accepting from a source, double cigarette and filter assemblies each consisting of two cigarette sections, one at each end of the assembly and a double length filter section between them, and disassembling and segregating the cigarette sections and the filter sections comprising, a pair of spaced generally circular knives for severing said assemblies just outside the ends of the filter section; a curved generally downwardly extending ramp for guiding and supporting said assemblies during descent thereof, a portion of said ramp including means defining a discontinuity in the surface thereof sufficient to accommodate at least a portion of the edge of each of said knives, an upper portion of said ramp cooperating with said knives to define an upwardly open and generally wedge-shaped space therebetween adapted to receive said assemblies, and a lower portion of said ramp below said knives acting to discharge the severed cigarette sections and filter sections to respective receiver means; and a rotatably driven member having a plurality of radial arms disposed to be driven downward in turn inward of said knife edges so as to intercept each said assembly and force it through cutting contact with said knives.

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