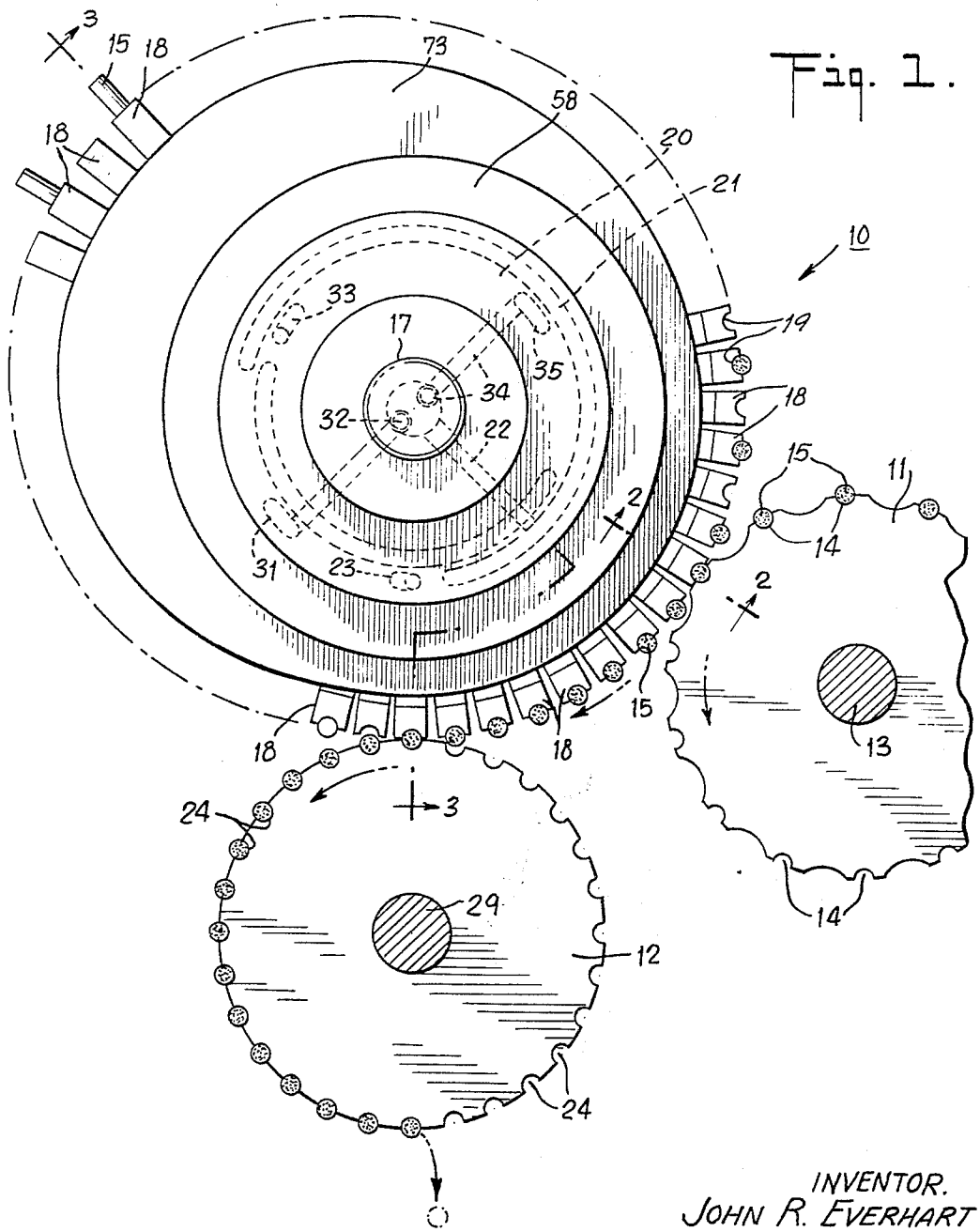
Dec. 23, 1969 J. R. EVERHART 3,485,337

HIGH SPEED CIGARETTE TURNAROUND AND CONVEYOR DRUM

Filed Feb. 20, 1968 3 Sheets-Sheet 1

Fig. 1.



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HIGH SPEED CIGARETTE TURNAROUND AND CONVEYOR DRUM

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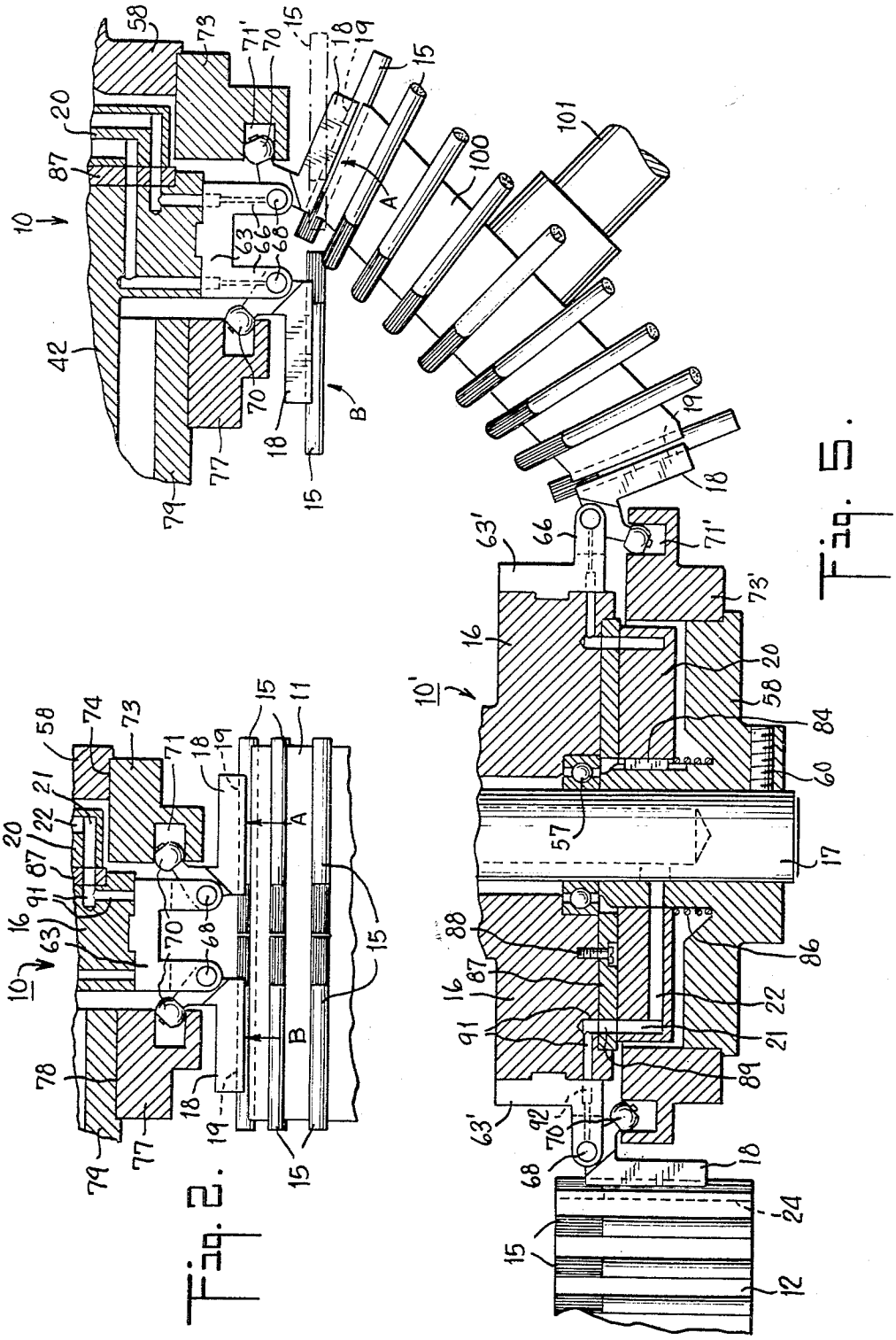

Fig. 5.

Fig. 2.

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HIGH SPEED CIGARETTE TURNAROUND AND CONVEYOR DRUM

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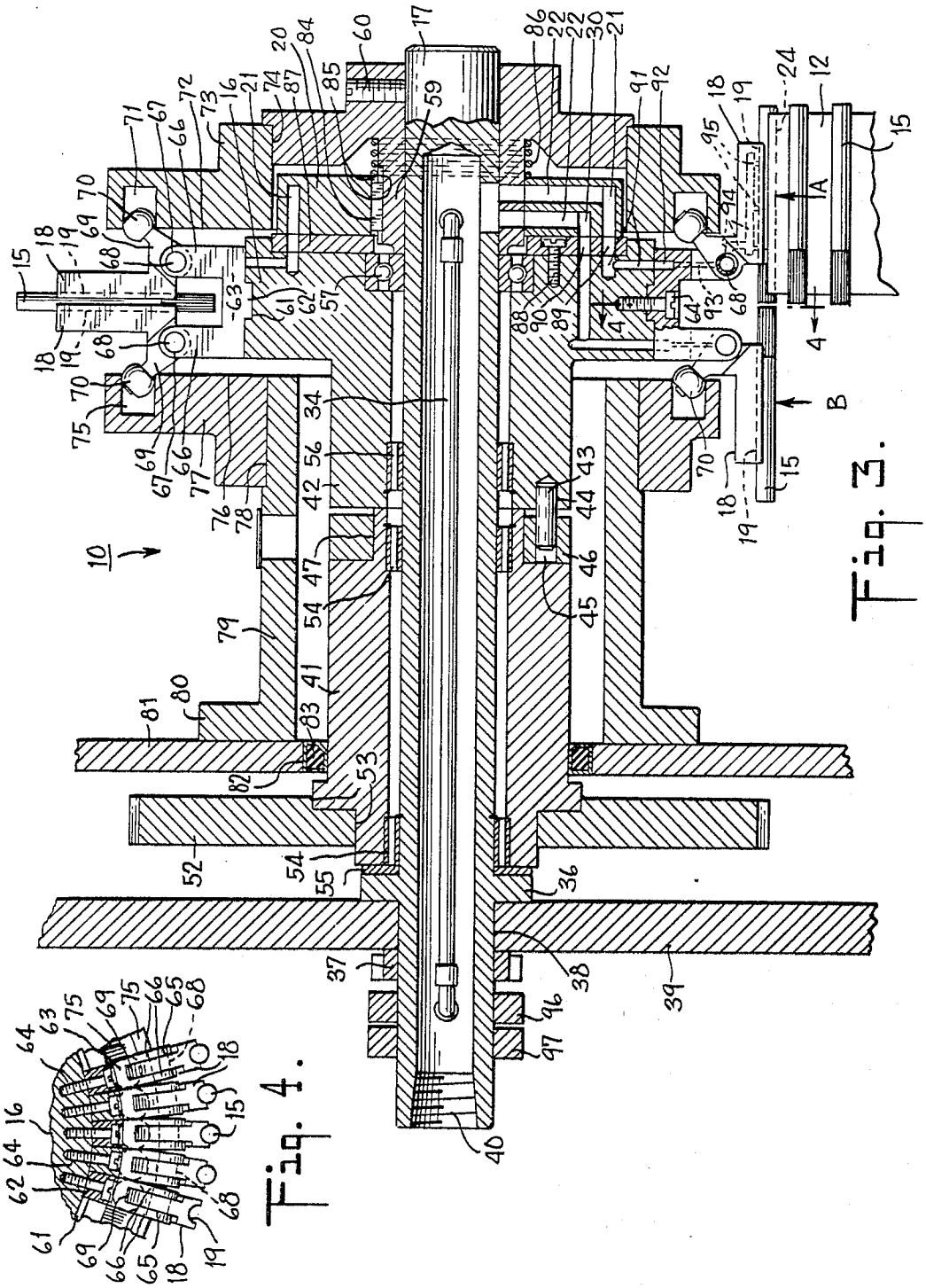

Fig. 3.

Fig. 4.

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3,485,337

HIGH SPEED CIGARETTE TURNAROUND AND CONVEYOR DRUM

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U.S. Cl. 198—32 15 Claims

ABSTRACT OF THE DISCLOSURE

A cigarette turnaround and conveyor drum has peripheral pivotally supported cigarette transport members each provided with a semi-cylindrical groove or flute into which a cigarette is placed and retained by air vacuum as the drum moves past a supply location. Thereafter the axes of the cigarettes are tilted in succession by pivotal motion of the transport members in succession. This pivotal motion permits the cigarettes to be deposited into flutes of a fluted drum of conical frustum configuration and having an axis of rotation at an angle to that of the conveyor drum. A modified turnaround drum structure utilizes fluted transport members pivotally supported in axially aligned pairs to provide two rows thereof around the periphery of the drum, and a pair of aligned cigarettes (fabricated in double length and center cut to have adjacent filter tip structures) are placed in the flutes of each alternate pair of transport members moving past the supply location. After a partial revolution of the turnaround drum, the cigarettes in one row of the transport members are deposited at a second location onto a fluted conveyor drum of cylindrical or conical frustum configuration. During the major portion of the next complete revolution of the turnaround drum, the transport members are successively and reciprocally tilted by pairs into opposing relation with one another and the cigarettes carried by the other row of transport members are thereupon transferred to the one row thereof. After being turned around end-for-end, the transferred cigarettes are deposited on the fluted conveyor drum at the second location. The latter accordingly receives only cigarettes oriented to having their filter tip structures at a common end.

The present invention relates to the field of cigarette manufacturing and is particularly concerned with fluted drum conveyor or turnaround structures useful in cigarette handling and transport arrangements employed therein.

Filter cigarettes are conventionally produced as single length cigarettes spaced a double-length filter apart and are transported sideways onto a fluted drum where double-length filters are inserted between pairs of the single-length cigarettes. Tipping paper is then wrapped around and sealed to the filter and to the single-length cigarettes to form a double-length cigarette assembly. The double-length cigarette assemblies are then cut through the center of the filter to form single-length filter-tip cigarettes. Following this cutting operation, it is often desired to align the cigarettes into a single row with filter tips oriented in the same direction. It has been heretofore proposed that such alignment be accomplished by a structure which employs a helical rail around a fluted drum and operates to plow one cigarette of each pair around end-for-end. This prior proposed structure does not hold the cigarettes under positive control at all times, and its operational speed is limited by reason of the fact that centrifugal force will cause the cigarettes to leave the drum if the latter is operated at desirably high rotational speeds. This prior structure further has the further disadvantage that there is erratic alignment of the turned

cigarettes which also is occasioned by reason of the lack of positive control in holding the cigarettes through the turnaround cycle of operation.

It is an object of the invention to provide a new and improved machine useful in cigarette manufacture for rapidly conveying a succession of cigarettes from one location to another while pivoting the cigarette axes in succession, and under positive control, through any preselected angle during transport from the one location to the other thereof.

It is a further object of the invention to provide a novel cigarette machine operating at high cigarette handling rate to receive successive cigarettes at one location and rapidly convey them to a second location while pivoting the cigarette axes either through a preselected angle or end-for-end or both as the cigarettes move between the one and other locations.

It is an additional object of the invention to provide an improved cigarette turnaround drum adapted for operation at high cigarette handling rate to receive at one location successive pairs of axially aligned filter-tip cigarettes fabricated in double length and cut apart with their filter-tip ends adjoining and to convey the cigarettes under positive control to a second location while automatically turning a corresponding cigarette of each pair end-for-end in transit to provide a common orientation of their filter-tip ends.

Other and further objectives and advantages of the invention will appear as the detailed description thereof proceeds in light of the drawings forming a part of this application and in which:

FIG. 1 illustrates in end view the cooperative relation between a cigarette turnaround conveyor drum, embodying the present invention in a particular form, and fluted cigarette supply and discharge drums;

FIG. 2 is a fragmentary partially cross-sectioned view illustrating the cooperative relation between certain structural components of the turnaround drum and the supply drum;

FIG. 3 is an elevational cross-sectional view illustrating the detailed construction of the turnaround drum;

FIG. 4 is a fragmentary view showing certain details of construction of the turnaround drum; and

FIG. 5 illustrates a cigarette conveyor machine structure which uses modified forms of conveyor drums embodying the invention.

FIGS. 1 and 2

Referring now more particularly to FIG. 1 of the drawings, a cigarette turnaround drum **10** embodying the present invention is illustrated in a representative machine arrangement in which it receives cigarettes from a rotationally driven supply drum **11** and transports them to a rotationally driven cigarette discharge drum **12**. To this end, the supply drum **11** is supported for rotational motion on a shaft **13** and is provided with equally spaced and axially extending circumferential flutes **14** which receive from a conventional cigarette manufacturing machine (not shown) successive pairs of axially aligned individual filter-tip cigarettes **15** oriented in double-length fashion with their filter-tip ends in proximity to one another as illustrated more clearly in FIG. 2. The cigarettes **15** are conveniently held in the flutes of the drum **11** by conventional air vacuum techniques (not shown) with vacuum release at the point of transfer of cigarettes from the drum **11** to the turnaround drum **10**. The turnaround drum **10** includes a drum flange **16** (FIG. 2) which is supported for driven rotational motion, in a manner presently to be described more fully, on a stationary hollow spindle **17** (FIG. 1) and peripherally supports a plurality of equally spaced and axially aligned pairs of cigarette trans-

port flute members **18** having pair aligned surface grooves or flutes **19**.

The relative angular driven velocities of the turnaround drum **10** and supply drum **11** are selected such that the flutes **19** of the turnaround drum **10** have the same peripheral velocity as the flutes **14** of the supply drum **11**. The flutes **14** of the latter have twice the angular pitch distance as do the flutes **19** of the flute members **18** provided on the turnaround drum **10**, and an even number of peripheral flutes **14** is provided on the supply drum **11** whereas an odd number of peripheral flutes **19** is provided on the turnaround drum **10**. By reason of these constructional relationships, pairs of axially-aligned cigarettes are transferred by the supply drum **11** to alternate axially-aligned pairs of the flutes **19** of the flute members **18** on the turnaround drum **10** and with the transfer progressing by one flute-member-pair pitch during successive complete rotations of the drum **10**.

As will be evident from FIG. 2, corresponding transport flute members **18** in each pair thereof are positioned in one of two axially spaced peripheral rows A and B on the turnaround drum **10**. The cigarettes supplied by the supply drum **11** to one such flute-member row, for example the row A nearest the end of the spindle **17**, are retained in the flutes **19** thereof by a construction more fully described hereinafter and which includes a stationary vacuum control valve plate **20** having an arcuately concentric vacuum control port **21** which communicates through radical vacuum supply ports **22** with the hollow interior of the spindle **17** upon which a negative or vacuum air pressure is impressed from a conventional vacuum source (not shown). These retained cigarettes of the flute members **18** in the row A thereof are transported to and are deposited in flutes **24** of the discharge fluted drum **12** by release of the flute-member vacuum through a vacuum-release port **23** of the valve plate **20**. The drum **12** is driven for rotation about an axis **29** at such angular velocity as to have a flute peripheral velocity equal to that of the flutes **19** of the flute members **18**. The cigarettes supplied by the supply drum **11** to the flutes **19** of the other flute members **18** in the row B thereof are not deposited on the discharge drum **12**, but are retained by vacuum impressed on the flutes of these flute members through an arcuately concentric vacuum-control port **30** (also communicating with the hollow interior of the spindle **17** through a radial supply port hereinafter identified more fully) of the valve plate **20** for transport beyond the discharge drum **12**.

The discharge of cigarettes onto the discharge drum **12** from the flute members **18** in the row A thereof leaves these flute members available to receive cigarettes from the flute members **18** in the row B, and the flutes in the flute members of row A are cleaned of possible tobacco particles by positive air pressure supplied to a port **31** of the valve plate **20** through a conduit **32** from an air pressure source (not shown). During the next aproximately 140° rotation of the turnaround drum flange **16**, each pair of transport flute members **18** are successively pivotally moved (by a structure described more fully hereinafter) from their positions wherein their flutes **19** have axial alignment with one another to positions where their flutes are in opposing relation to one another after which the flute members are pivotally moved in opposite direction and returned to their positions of axial flute alignment. At the flute-opposing position of the transport flute members **18**, the cigarette retained and transported by each transport flute member **18** in the row B thereof is released by release of the flute vacuum through a vacum release port **33** of the valve plate **20** and is thereupon transferred to the corresponding flute member **18** in the row A thereof since the latter has a vacuum impressed on its flute through the vacuum-control port **21** of the valve plate **20**. Following the cigarette transfer from a flute member **18** of row B to a flute member **18** of row A, the flute member of row B has its flute cleaned of possible tobacco particles by positive air pressure supplied from a pressure source (not shown) through a conduit **34** to a pressure port **35** of the valve plate **20**. The transferred cigarettes are thus turned about end-for-end and thereafter pass the supply drum **11** to be deposited in the flutes **24** of the discharge drum **12** with their filter-tip ends oriented in the same direction as the filter-tip ends of the cigarettes which are transported directly from the supply drum **11** to the discharge drum **12**.

It will be evident from the foregoing description of the cigarette transfer operation that all of the flute members **18** in the row A thereof transport cigarettes as they approach the discharge drum **12**, and that these cigarettes are transferred to successive flutes **24** of the latter. Cigarettes thus transferred to the discharge drum **12** are retained in its flutes conveniently by conventional controlled vacuum techniques until discharge of the cigarettes from this drum, with uniform filter-tip orientation, for packaging or for further processing of their filter-tip ends as by filling the ends with a granular filter material and plugging the ends with a fibrous filter material.

FIGS. 3 and 4

The construction of the turnaround drum **10** is illustrated in the cross-sectional view of FIG. 3. As earlier explained, it is rotationally supported on the hollow spindle **17** which is secured by an integral shoulder **36** and a spanner nut **37** in an aperture **38** of a stationary, rigid, machine plate member **39**. The spindle **17** has an internal pipe thread **40** at its open end to receive the externally threaded end of a pipe through which a negative or vacuum air pressure is impressed interiorally of the spindle. The turnaround drum **10** is conveniently fabricated of two cylindrical hollow sleeve members **41** and **42** which are mechanically joined, for convenience of assembly of the turnaround drum, by angularly spaced and axially extending locating pins **43** which are press fit into angularly spaced end bores **44** of the sleeve member **42** and have sliding fit with mating apertures **45** provided in a ring **46** pressed onto a shoulder **47** of the sleeve member **41**. A rotational drive gear **52** is affixed by press fit onto a stepped end shoulder **53** of the sleeve member **41**, and the latter is rotationally supported on the spindle **17** by end roller bearing assemblies **54** and is axially located on the spindle by a thrust bearing washer member **55** positioned between the end of the sleeve member **41** and the shoulder **36** of the spindle. The sleeve member **42** is rotationally supported on the spindle **17** by a roller bearing assembly **56** at one end and a ball bearing assembly **57** at its other end. An axially bored end plate member **58**, having an integral hub portion **59**, is fixedly secured by a set screw **60** on the end of the spindle **17** as shown and with the end of its hub portion **59** abutting the stationary raceway of the roller bearing assembly **57** to retain the sleeve members **41** and **42** in assembled relation on the spindle **17**.

The drum flange **16** is fabricated as an integral end flange on the sleeve member **42** and has a concentric peripheral edge groove **61** of rectangular cross-section to receive mating locating tongues **62** of a plurality of U-shaped brackets **63**. The latter have base portions of slightly tapered width and are secured by machine screws **64** in abutting side-by-side relation so that they are equally spaced around the periphery of the drum flange **16** as illustrated more clearly by the fragmentary view of FIG. 4. As also shown more clearly in FIG. 4, the U-shaped brackets **63** are provided with longitudinal slots **65** to provide pairs of spaced end arms **66**. Each such pair of arms **66** is provided with aligned end apertures **67** to receive a hollow pin **68** hermetically closed at its ends and providing pivotal support of a cam-follower arm portion **69** fabricated as an acutely angled extension on the end of each flute member **18** as shown. This provides pivotal support of the flute members **18**, by way of the brackets **63**, on the drum flange **16** of the turn-around drum **10** so that the flute members **18** may be reciprocally

pivoted by axially aligned pairs from a position in which their flute grooves 19 are in axial alignment as shown at the lower right of FIG. 3 to a position where the flute grooves 19 of each pair are in cigarette encircling opposing relation as shown at the upper right in FIG. 3. To this end, the end of each cam follower arm portion 69 rotationally supports a cam roller 70. The cam rollers 70 associated with the flute members 18 in the row A thereof engage an eccentric cam groove 71, providing cam rise and dwell and fall cam surface portions, formed in a face 72 of a cam plate member 73 pressed onto a peripheral concentric shoulder 74 on the end plate member 58. The cam rollers 70 associated with the flute members 18 in the row B thereof similarly engage an eccentric cam groove 75, also providing cam rise and dwell and fall cam surface portions, formed in a face 76 of a cam plate member 77 pressed onto a concentric end shoulder 78 of a cylindrical sleeve member 79. The latter is concentrically supported by an integral flange 80 affixed as by machine screws (not shown) on a stationary, rigid, machine plate member 81 having a concentric aperature 82 to receive the sleeve member 41 and forming an end wall of a housing having side walls (not shown) enclosing the drive gear 52 and secured on the machine plate member 39. The space between the concentric aperture 82 and the sleeve member 41 is closed by a metal-clad resilient ring gasket 83 to prevent the escape of gear lubricant from the housing last mentioned. The cam grooves 71 and 75 of the turnaround drum just described have identically opposed rise, fall and dwell cam surface portions to effect identical reciprocal pivotal movements of the flute members 18 by each of successive peripheral pairs thereof.

It was explained in relation to FIG. 1 that cigarettes are retained in and released from the flutes 19 of the flute members 18 by application and release of vacuum to the flutes under control of the valve plate 20. The latter is retained against rotation on the spindle 17 by a key 84 seated in cooperating keyways 85 formed axially in the valve plate 20 and end plate hub portion 59, but may slide longitudinally of the spindle and is biased by a helical compression spring 86 into engaging relation with a hardened wear-resistant steel plate 87 secured by machine screws 88 on the end of the drum flange 16 as shown.

The plate 87 has outer and inner concentric rows of apertures 89 and 90 which communicate with the respective vacuum control ports 21 and 30 of the valve plate 20 and, although not particularly shown in FIG. 3, with the respective valve release ports 23 and 33 and respective pressure ports 31 and 35 of the valve plate. Each aperture 89 communicates with the flute 19 of an individual flute member 18 in the row A thereof through individual right-angled intersecting bores 91 provided in the drum flange 16, through a closed-end lateral slot 92 in the base of the individual flute member bracket 63, through radial bores 93 provided at each end of the slot 92 and extending through the pair of opposed end arms 66 of the individual flute member bracket 63, through circumferential wall slots of the associated hollow pin 68 to intersecting right-angled bores 94 provided in the individual flute member 18, and through spaced distribution ducts 95 which provide communication between the bores 94 and the flute 19 of the individual flute member. In this manner, the valve plate 20 controls the application and release of an air vacuum and of positive air pressure to the flutes 19 in each flute member 18 in a row A thereof as heretofore described. Each aperture 90 of the plate 87 communicates with the flute 19 of an individual one of the flute members 18 in the row B thereof through a similar system of communicating bores and ducts as shown to permit control by the valve plate 20 over the application and release of air vacuum and of positive air pressure to the flute 19 of individual ones of the flute members 18 in the row B thereof as before described.

The pressure port conduits 32 and 34, described in relation to FIG. 1, extend radially through the valve plate 20 as shown in FIG. 1 and longitudinally through the hollow interior of the spindle 17 on opposite sides of the axis of the latter, see pressure port conduit 34 in FIG. 3. These conduits are hermetically sealed at their remote ends in radial bores of individual coupling collars 96 and 97 secured on the spindle 17 near the end thereof as shown and having suitable coupling nipples or like devices (not shown) by which to couple the conduits 32 and 34 to a conventional source of positive air pressure (not shown).

FIG. 5 illustrates a cigarette conveyor machine structure which utilizes both a slightly modified turnaround conveyor drum of the type just described and a further modified form of conveyor drum having a construction essentially similar to that described. Machine components in FIG. 5 which correspond to the same components in the structure described in relation to FIGS. 1–4 are identified by the same reference numerals and analogous components are identified by the same reference numerals primed. The turnaround conveyor drum 10 of FIG. 5 has essentially the same construction and mode of operation as the turnaround drum just described. It functions to convey single-length cigarettes from a supply drum, such as the drum 11 of FIG. 1, and cigarettes turned around end-for-end to a conveyor drum 100 of conical frustum configuration and which is supported for drive rotation on a drive shaft 101 forming an angle of 45° to the rotational axis of the drum 10. By reason of the conical frustum configuration of the conveyor drum 100, the eccentric configuration of the cam groove 71′ of the drum 10 is so modified that the flute members 18 in row A thereof receive from the supply drum axially aligned pairs of cigarettes (as indicated in FIG. 5 by the cigarettes identified in solid and broken lines) after which the cam groove 71′ angularly moves the successive flute members 18 in row A thereof through an angle of 22.5° so that the cigarettes conveyed by these flute members may be deposited in successive flutes of the conveyor drum 100 by application and release of vacuum air pressure on the flutes 19 of the flute members 18 in the same manner as previously described in relation to the transfer of cigarettes from the turnaround drum 10 to the discharge drum 12 of FIG. 1. The cigarettes thus deposited in the flutes of the conveyor drum 100 are retained therein by conventional vacuum techniques and are deposited in the flutes 19 of successive flute members 18 of a conveyor drum 10′ which has the same construction as the turnaround drum previously described except that its peripheral brackets 63′ have only one pair of opposed end arms 66 for pivotal support of only one row of flute members 18. Further, the cam groove 71′ of the drum 10′ has such eccentric configuration that the flute members 18 are angularly pivoted in succession to an angle of 22.5° to receive cigarettes from the conveyor drum 100 and during a further angle of rotation of the drum 10 are returned to parallism with the axis of rotation of the latter to permit deposit of the cigarettes into successive flutes 24 of the discharge drum 12 in the same manner as described in relation to FIG. 1. In thus conveying cigarettes from the turnaround conveyor drum 10′ to the discharge drum 12 in the FIG. 5 arrangement, the cigarettes received horizontally during rotation of the turnaround drum 10 about a horizontal axis are supplied with vertical positioning to the discharge drum 12 rotating about a vertical axis and with the filter-tip ends of the ciagarettes oriented in the same direction. This arrangement is particularly suitable in one type of cigarette manufacture where in the cigarettes supplied to the drum 12 have a hollow tip tubing into which granular filter material is deposited by gravity feed and the end of the hollow tubing is then closed by an inserted plug of fibrous filter material.

It will be apparent from the foregoing description of the invention that a cigarette turnaround or conveyor

drum embodying the invention operates rapidly to convey a succession of individual cigarettes from one location to another while pivoting the cigarette axes in succession and under positive control through any preselected angle during transport of the cigarettes from the one location to the other thereof. The cigarette turnaround or conveyor drum of the invention has the further advantage that it is characterized by conveyor operation at high cigarette handling rate with positive cigarette control at all times regardless of whether the axes of successive cigarettes are merely tilted through a small angle during their transport from one location to another or are turned around end-for-end during transport between such locations.

While there have been described herein differing forms of the invention for purposes of illustration, it is contemplated that numerous changes may be made without departing from the spirit of the invention.

What is claimed is:

1. A conveyor machine for pivoting the axes of a preselected sequence of cigarettes during transfer thereof from one location to another location, comprising a rotationally supported transfer member having a circular periphery rotationally movable past said one and said other locations, a plurality of cigarette transport members, means for pivotally supporting said transport members with equidistant spacing on the periphery of said transfer member, means operative during each rotation of said transfer member for pivoting in succession each said transport members disposed in said preselected sequence from a first position to a second position and for pivotally moving said each said transport members from said second position back to said first position, said pivoting movement being effected after movement of said each said transport members from said one location and prior to its return to said one location, means for supplying individual cigarettes to said transport members at said one location, and means for retaining each cigarette in said preselected sequence on said transfer member for deposit at said other location after a pivotal change of its cigarette axis by reason of the angular pivotal motion of said transport members.

2. A conveyor machine as defined in claim 1 wherein said cigarette transport members include a flute into which a cigarette is placed by said supply means during movement of said transport members past said one location and in which the cigarette is retained by said retaining means for deposit at said other location.

3. A conveyor machine as defined in claim 2 wherein said retaining means includes means operative during said angular pivotal motion of said transport members for impressing a vacuum in said flutes substantially between said one and other locations to retain cigarettes on said transport members during movement thereof between said locations.

4. A conveyor machine as defined in claim 3 wherein said retaining means includes means for releasing said vacuum in the flutes of said transport members at said other location to permit deposit of said cigarettes at said other location.

5. A conveyor machine as defined in claim 1 wherein said transport member pivoting means includes cam-follower means mechanically coupled to and movable with individual ones of said transport members to effect said angular pivotal motion thereof and stationary cam means for actuating said cam-follower means.

6. A conveyor machine as defined in claim 5 wherein each said cam-follower means includes an arm fixedly secured to and projecting from the associated transport member and a follower roller rotatably secured at the end of said arm, and wherein said cam means includes a stationary cam member having a cam surface engaged by each said follower roller and having surface portions providing cam rise and dwell and fall defining said successive angular pivotal motions of said transport members.

7. A conveyor machine as defined in claim 5 wherein said cam means includes opposing cam surfaces providing a continuous cam groove confiningly engaged by said follower rollers.

8. A conveyor machine for pivoting the axes of one cigarette in each pair of a succession of pair-aligned cigarettes during transfer thereof from one location to another comprising a rotationally supported transfer member having a circular periphery rotationally movable past said one and said other locations, a plurality of cigarette transport members having cigarette retaining flute grooves, means for pivotally supporting said transport members in opposed pairs and with equidistant pair spacing on the periphery of said transfer member, said support means permitting each said transport member to pivot about an individual axis normal to an individual radial plane of said transfer member and permitting the transport members of each pair to pivot between a paired-groove-alignment first position at said one and other locations and a paired-groove-opposing second position, control means operative during each rotation of said transfer member for conveying cigarettes by one transport member of each pair thereof from said one location to be deposited at said other location and for thereafter reciprocally pivoting successive pairs of said transport members between said first and second positions thereof to transfer cigarettes from the other to the one transport member of each pair, and means for supplying at said one location axially aligned pairs of cigarettes to said cigarette-retaining flute grooves of alternately succeeding pairs of said transport members.

9. A conveyor machine as defined in claim 8 wherein said control means includes valve means for impressing an air vacuum on the cigarette retaining flute groove of said other transport member of each pair beginning approximately at said one location and continuing substantially through a succeeding half revolution of said transfer member and for impressing an air vacuum on the cigarette retaining flute groove of said one transport member of each pair beginning approximately at completion of said half revolution of said transfer member and continuing substantially to said other location.

10. A conveyor machine as defined in claim 9 wherein said valve means releases said air vacuum on the cigarette retaining flute groove of said other transport member of each pair upon substantial completion of said half revolution of said transfer member and releases said air vacuum on a cigarette retaining flute groove of said one transport member of each pair at said other location.

11. A conveyor machine as defined in claim 8 wherein said transport-member pivoting means includes cam-follower means mechanically coupled to and movable with individual ones of said transport members to effect said pivotal motions thereof and stationary cam means actuating said cam-follower means.

12. A conveyor machine as defined in claim 11 wherein each said cam follower means includes an arm fixedly secured to and projecting from the associated transport member and a follower roller rotatably secured at the end of said arm, and wherein said cam means includes a pair of opposed stationary cam members having cam surfaces engaged by said follower rollers and each having surface portions providing cam rise and dwell and fall individually defining the pivotal motions of said one and said other transport members of each pair thereof.

13. A conveyor machine as defined in claim 12 wherein said cam members each include opposing cam surfaces providing individual continuous cam grooves confiningly engaged by said follower rollers.

14. A conveyor machine as defined in claim 13 wherein said cam grooves of said cam members face one another and provide matching cam rise and dwell and fall cam surface portions at corresponding values of angular rotation of said transfer member.

15. A conveyor machine as defined in claim 14 wherein each of said cam grooves has with respect the axis of rotation of said transfer member and between said one and said other locations a dwell cam portion of preselected constant mean radius value and has between said other and said one locations successive rise and fall cam portions respectively of progressively larger and smaller mean radii in relation to said constant mean radius value.

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