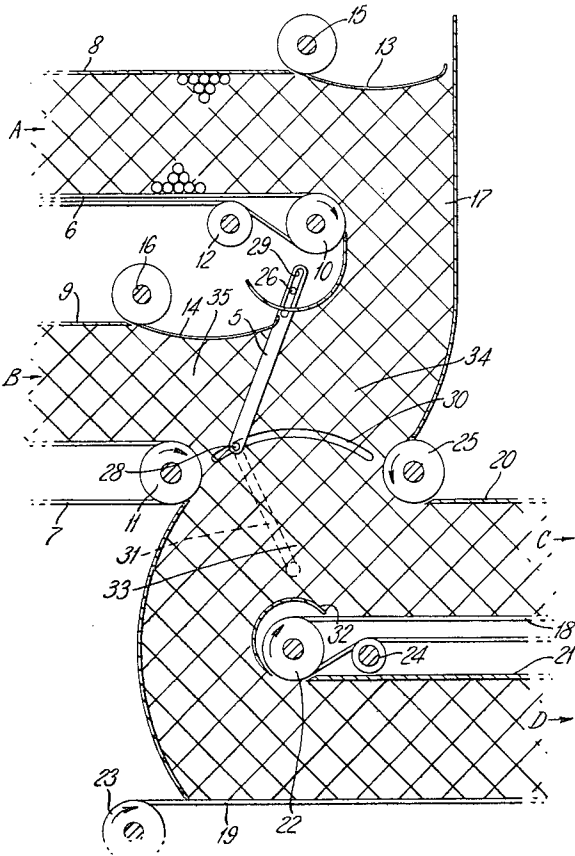


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[32] Priority **May 10, 1968**
[33] **Great Britain**
[31] **22,413/68**

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[54] **ARTICLE-HANDLING APPARATUS**
11 Claims, 7 Drawing Figs.
[52] U.S. Cl. **198/78,**
198/35, 198/102
[51] Int. Cl. **B65g 57/16,**
B65g 57/32
[50] Field of Search **198/35, 37,**
75-76, 78, 81, 102; 53/148; 131/25

ABSTRACT: This invention is concerned with merging two stacks of cigarettes or other rodlike articles by carrying the stacks continuously into a merger zone from which a merged stack or a divided merged stack is delivered. The preferred arrangement includes flow sensors in both input channels to control the feed rates, and a flap to control automatically the relative rates of feed of the two stacks into the merger zone.



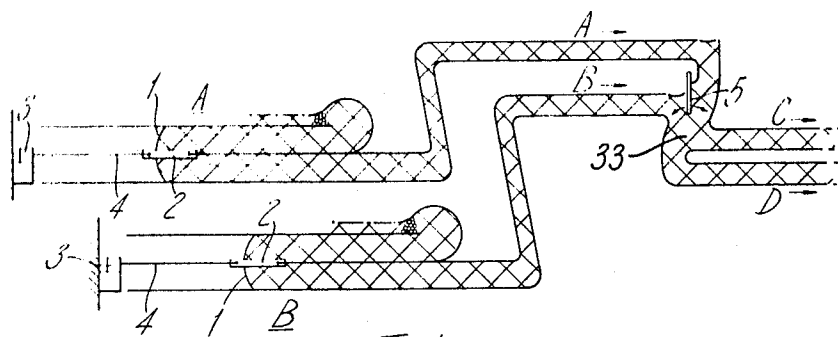


FIG. 1.

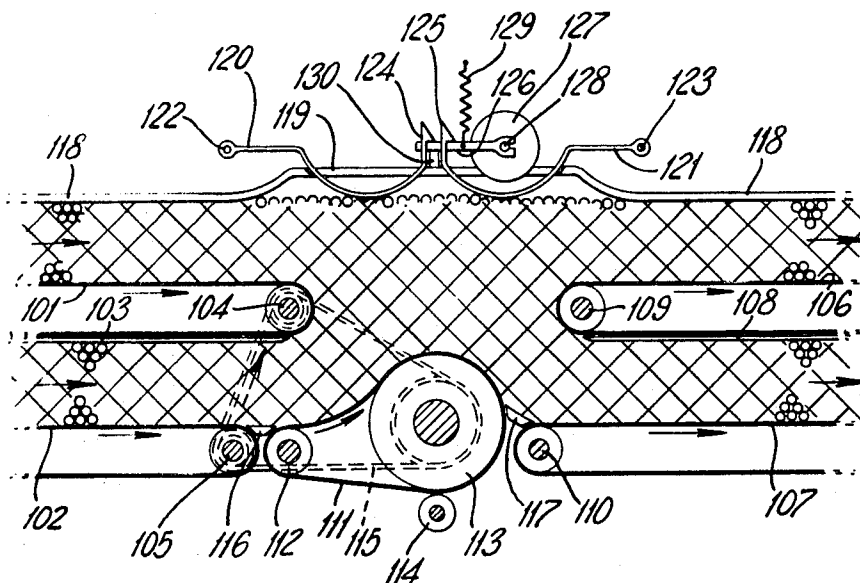


FIG. 3.

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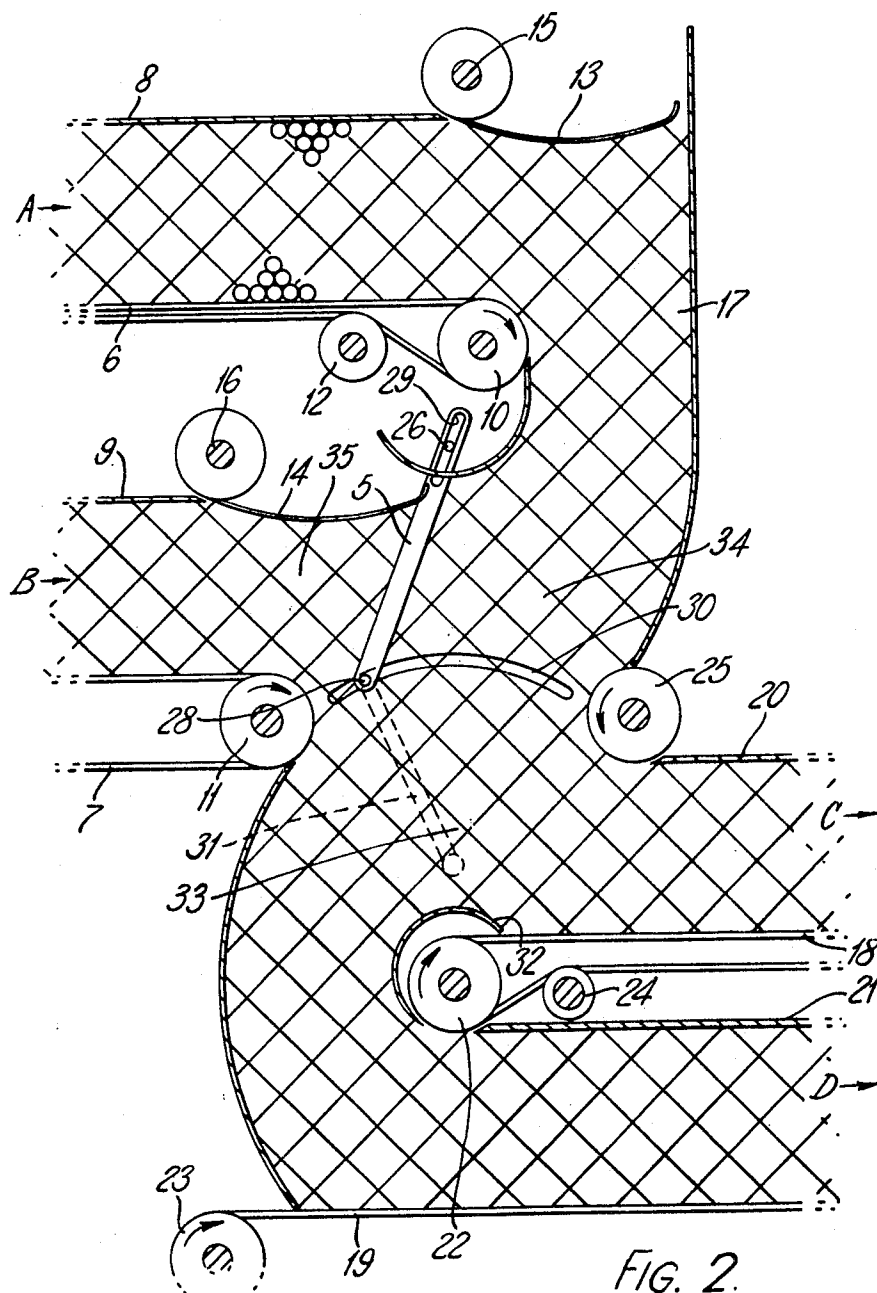
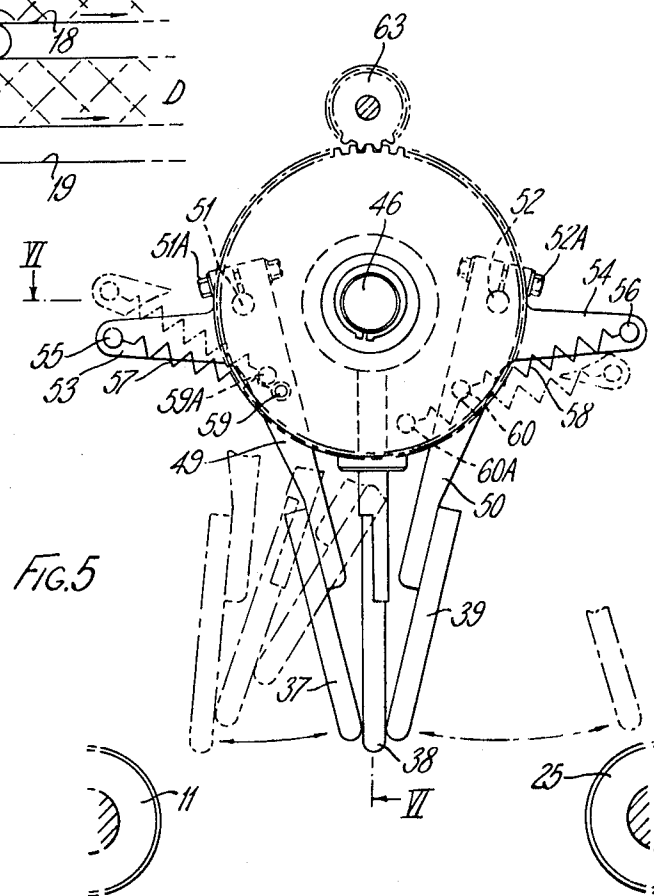
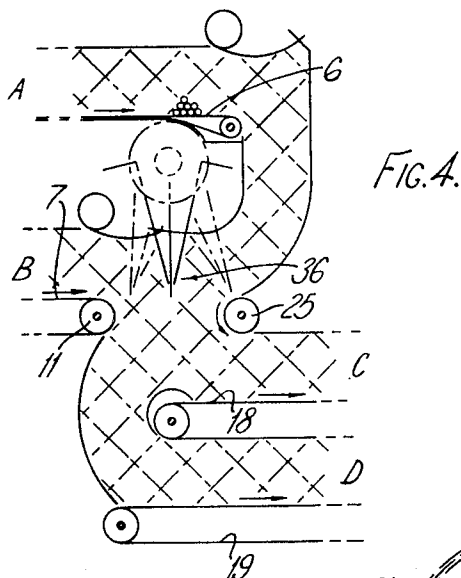
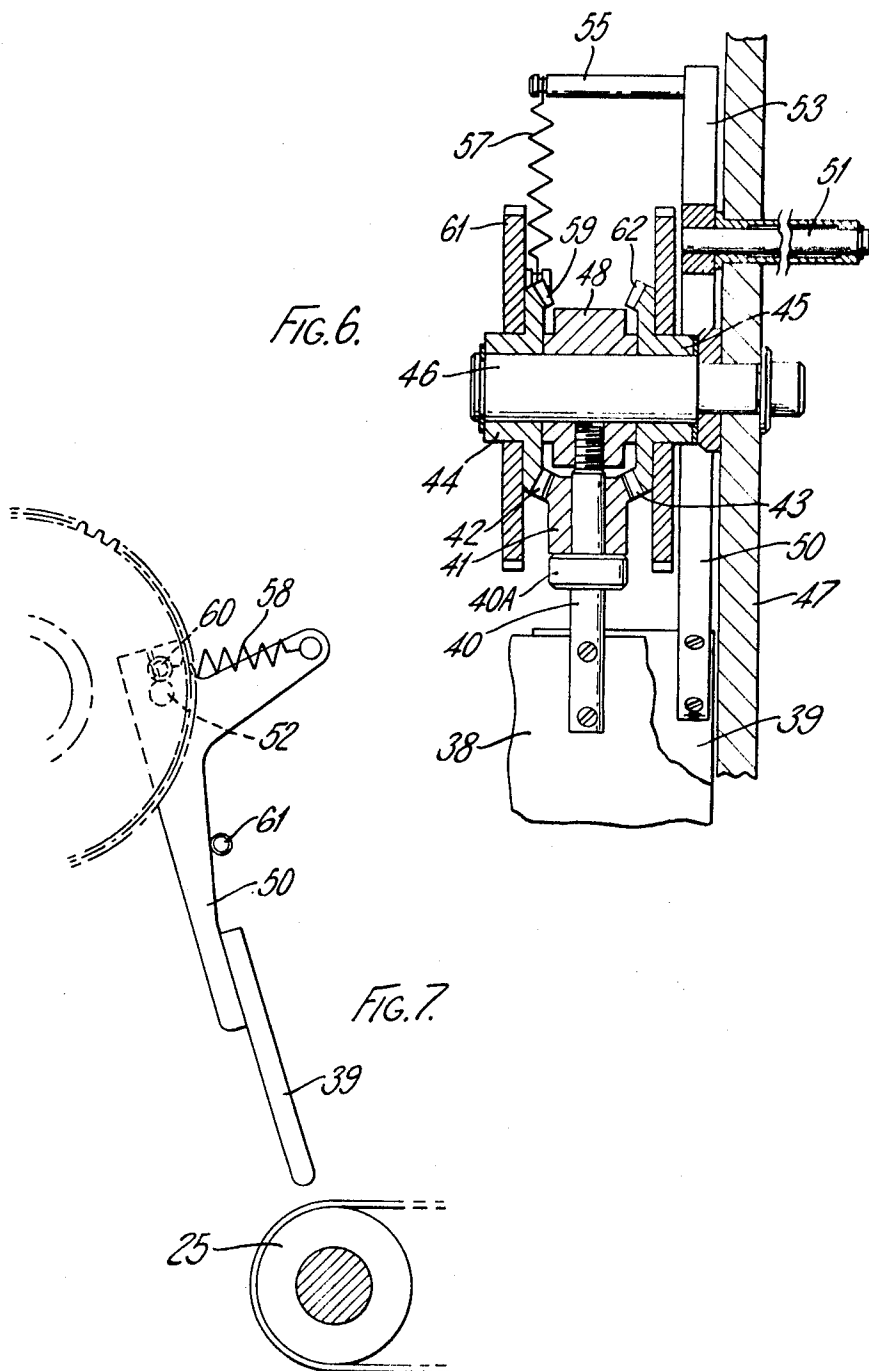


FIG. 2.

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ARTICLE-HANDLING APPARATUS

This invention is concerned with feed systems for cigarettes and other similar rodlike articles, including for example rods for cigarettes.

A feed system according to one aspect of this invention comprises at least two substantially horizontal flow channels through which stacks of laterally extending articles are fed into a merger zone in which the stacks are merged, each flow channel being formed by a conveyor to carry the stack, and a top wall which is parallel to the conveyor to confine the upper surface of the stack.

In a preferred system there is a movable flap which partly defines throats on opposite sides of the flap through which the stacks enter the merger zone, and in which movement of the flap in one direction or the other has the effect of varying the proportions of the article flows from the two channels entering the merger zone. This enables the system to be usefully incorporated in an overall system including reservoirs in accordance with a second aspect of this invention.

According to the second aspect of this invention a feed system comprises two flow channels for stacks of laterally extending articles, each flow channel having an associated reservoir which is variable in capacity and expands and contracts so as to absorb or make up for the difference between the input and output feed rates in the channel, and including a merger zone into which the flows from both channels pass, and means for varying the relative flow rates from the two channels in accordance with the states of the reservoirs, so that the flow channel of which the reservoir is less full at any given moment of time automatically delivers articles to the merger zone at a slower rate than the other channel.

Preferably according to this second aspect of the invention the means for varying the relative flow rates from the two channels comprise a movable flap which partly defines throats on opposite sides of the flap through which the articles from the two channels enter the merger zone.

The cigarette flows are in all cases preferably fluidized to enable them to pass smoothly into the merger zone and to ensure that they merge successfully. Fluidizing may for example be by means of a pair of surfaces arranged to constrain the flow between them, one of the surfaces being disposed to support some of the weight of the articles and being arranged to move with a velocity different from that of the stack so as to cause some relative movement such, for example, as rolling movement between the articles.

There is preferably in all cases a sensor to control the delivery of articles in each flow channel.

Examples of feed systems according to this invention are shown in the accompanying drawings, in which:

FIG. 1 is a schematic view of one feed system for feeding cigarettes from cigarette-making machines to cigarette-packing machines,

FIG. 2 is an enlarged sectional elevation of the flow merging part of the system shown in FIG. 1,

FIG. 3 is a sectional elevation of another flow merging arrangement,

FIG. 4 is a diagrammatic view similar to FIG. 1, but showing another example with a different movable flap,

FIG. 5 is an enlarged view of the flap,

FIG. 6 is a section on the line VI—VI in FIG. 5, and

FIG. 7 is a view of part of the flap, showing one of the flow channels closed off.

Referring to FIGS. 1 and 2 of the drawings, cigarettes are fed in continuous streams from cigarette-making machines into cigarette reservoirs RA and RB from which they are delivered as continuous moving stacks A and B respectively. Each reservoir has a construction generally similar to what is shown in Molins British Pat. No. 995,663 and is of variable capacity so that it can accommodate different quantities of cigarettes while always remaining filled with cigarettes. This variation is achieved by means of a movable backwall 1 supported on a carriage 2. For the purpose of the present apparatus a detector device 3 is mounted near the end of the

travel of the carriage 2 and is connected thereto by means of a line 4; it operates to determine the position of the carriage 2 according to the length of line 4 which is retracted or paid out.

This enables the detector device 3 to give a signal indicating the capacity of the reservoir at any given moment. Alternatively the detector may comprise a contact sliding on an extended linear electrical resistance, in the manner of a rheostat; this resistance could be a series of small individual resistances.

The moving stacks of cigarettes A and B delivered from the reservoirs A, B are fed into a flow-merging apparatus which includes a movable flap plate 5 disposed between the streams A and B to meter the admission of the respective stacks A and B to a merger zone 33 according to the signals from the detectors 3. The flap 5 defines with adjacent parts of the merger apparatus two throats 34 and 35 through which the stacks A and B enter the merger zone. The flap is shown in FIG. 1 in a vertical position in which the two throats are of approximately equal size; FIG. 2 on the other hand shows the flap in a position in which the throat 34 is larger than the throat 35.

Cigarettes are discharged from the flow-mixing apparatus in continuous stacks C and D which are fed respectively to two packing machines. Various modes of operation can be achieved: for example it is possible for cigarettes to be fed simultaneously from stack A to stack C and from stack B to stack D; and the respective rates of feed may vary, as will be further described. It is also possible for stack A or B to be stationary and for all the cigarettes from the other stack to be distributed between stacks C and D.

For the details of the flow-merging apparatus, reference is made to FIG. 2 from which it can be seen that the stacks A and B are delivered in flow channels formed respectively by horizontal conveyors 6 and 7 with parallel top wall members 8 and 9 respectively. The conveyors 6 and 7 each comprise endless bands which run around rollers 10 and 11 respectively, a further deflecting roller 12 being provided for the conveyor 6.

Sensors 13 and 14 respectively for the stacks A and B are provided to bear on the incoming stacks and partly to confine the upper surfaces of the stacks. The speeds of the conveyors 6 and 7 are controlled automatically according to the positions of the respective sensor 13 or 14. Each sensor comprises a convex plate which rides on the cigarettes at the end of the band and is pivoted on a shaft 15 or 16 respectively which is connected to a rotary speed control device which controls the speed of the motor (not shown) driving the conveyor 6 or 7. Any deficiency of cigarettes in the stacks causes the sensors to drop, and the corresponding conveyor is speeded up to bring more cigarettes in to maintain the packing of the stack, while excessive pressure of cigarettes causes the control plate to rise and this displacement is used to slow down the corresponding conveyor to reduce the rate of supply of cigarettes. All this also helps to ensure that the channels defined by the conveyor 6 and 7 and top walls 8 and 9 are kept full, in other words the upper surface of the cigarette stacks are confined by the top wall members so that the heights of the stacks are well controlled.

The discharge stacks C and D from the flow-mixing apparatus are carried away on belt conveyors 18 and 19 respectively, beneath parallel top wall members 20 and 21 respectively. The conveyors 18 and 19 travel around rollers 22 and 23 and the lower run of the conveyor 18 is held clear of the lower stream D by means of a further roller 24. The speeds of movements of these conveyors are controlled by sensors in the region of the packing machinery which detect the demand for cigarettes and adjust the conveyor speeds to maintain the required flow.

A chute 17 extends downwards from the end of the conveyor 6 to feed the stack A to the merger zone 33. Between the end of the chute and the point where the stack C leaves the apparatus there is a further roller 25 which is rotated to assist in causing fluidization of the cigarette flow at this point.

The flap plate 5 is mounted between the streams A and B by means of support pins 26 and 28 of which the pins 26 are fixed

and extend into slots 29 in the sides of the flap, while pins 28 are carried on the flap and run in horizontally extending arcuate slots 30 formed in side panels (not shown) which extend across both sides of the apparatus to contain the cigarettes against lengthwise movement. The flap plate 5 is rectangular in shape and has sufficient range of movement to enable it to close off the flow either from stream A or from stream B. A link arm 31 is connected externally of the apparatus to control the movement of the lower part of the flap plate 5 as the pins 28 run in the slots 30. This arm is also used to set the position of the flap and this position is chosen according to the proportions of cigarettes available from A and B respectively. The flap is mounted with some backlash at its lower end to assist in control of the movement of small flows of cigarettes.

The apparatus also includes a part-cylindrical cowl 32 which extends over the whole of the width of the roller 22 and is mounted so as to be able to move slightly about both a horizontal and a vertical axis at one end of the cowl, each of which lies parallel with the plane of the paper. This cowl 32 has two functions; one of these is to screen the upcoming band 18, as it passes over the roller 22, from the downcoming cigarettes (passing into the stack D); the second function, for which purpose it is designed to be pivotable, is to take up the gap which tipped cigarettes tend to produce at their ends remote from the tips when they are handled in stacks. Thus in the present apparatus, with the cowl 32 being pivotable at one end; tipped cigarettes would be fed in with their tipped ends lying at the end of the cowl remote from the pivot.

Control apparatus is provided to control the speeds of the conveyors 6 and 7 feeding the stacks A and B and to control the position of the flap plate 5 according to the signals received from the detector devices 3 (FIG. 1) and to control the speeds of the conveyors 6 and 7 according to the signals received from the sensors 13 and 14, so as to maintain a constant orderly flow of cigarettes and in order also, so far as possible, to arrange that the volumes of the cigarettes in the reservoirs A and B remain approximately equal.

In operation, the cigarettes in the stack A are conveyed on the conveyor band 6 to the mouth of the chute 17 where they move downwards in stack formation to the region of the flap plate 5 where the stack B also arrives. At this point some fluidization occurs; that is to say the cigarettes are caused to undergo some movement relative to one another as a result of the combined effects of their downward motion, of the various moving surfaces, and of the interaction of the two stacks. The cigarettes then travel for a short distance in a single stream through the merger zone, after which they may undergo redistribution and move into either the stack C or the stack D. The band 7 and the roller 25 tend to promote fluidization in the region of the throats 34 and 35.

One feature of the construction shown is that with either of the stacks C and D stationary, it is possible for cigarettes moving into the other stack to move across a stationary downwardly inclined surface of cigarettes. This surface will occur either generally between the rollers 11 and 22 if the stack D is stationary, or between rollers 25 and 22 if the stack C is stationary. In either event the whole flow from the stacks A and B (or the single flow if one of these stacks is stationary) can proceed smoothly into the other stack. This feature greatly increases the flexibility of the cigarette-handling system and in particular it can enable production to continue even though one of the reservoirs is emptied or some stoppage has occurred.

If it is desired to use the apparatus on occasion to convey two separated flows, one from A into C and one from B into D, then the flap plate 5 can be provided with or replaced by an extension plate which can be set to form a vertical partition between the two flows, extending vertically down to the cowl 32.

As an alternative, instead of two stacks being delivered from the merger zone 33, the arrangement may be such that only one stack is delivered permanently from the merger zone e.g. by the conveyor 18, with the channel to the stack D being

closed off). In this case two (or more) packing machines may be fed with cigarettes through vertical chutes extending downwards from the stack delivered by the conveyor 18, for example as described in Molins French Pat. No. 1,509,322.

In the example shown in FIG. 3 of the drawings there are two horizontally extending endless band input conveyors 101 and 102, each of which supports a moving stack of cigarettes. The return run of the upper band 101 is prevented from interfering with the top of the stack of cigarettes moving in the opposite direction on the lower band 102 by means of a guardplate 103. The bands 101 and 102 are carried at their downstream ends on rollers 104 and 105 respectively. The cigarettes are delivered from the apparatus in two separate streams on output conveyors 106 and 107, a guardplate 108 being provided to protect the return run of the conveyor 106 from interfering with the cigarettes moving out on the conveyor 107. The upstream ends of conveyors 106 and 107 are carried on rollers 109 and 110 respectively.

Between the input conveyor 102 and the output conveyor 107, and above a merger zone 131 there is disposed a flow-breaking device comprising an endless band 111 carried on a small idler roller 112 and a larger drive roller 113. The band 111 is provided with some slack so that it can move along a curved path between the rollers 112 and 113, and a pressure roller 114 is provided to press it against the roller 113. A curved guide plate could be provided to support the upper curved run of the band 111 as it moves from the idler roller 112 to the drive roller 113. The roller 113 is driven by a chain 115 extending around a gear carried on its shaft and extending also around gears carried on the shafts of drive rollers 104 and 105 for the conveyors 101 and 102. Each of the connections between the chain 115 and the rollers 104 and 105 is through a one-way sprag clutch (not shown) so that the roller 113 is driven by the faster one of the rollers 104 and 105. The speed ratios are chosen so that the band 111 travels at a speed such as to provide the best flow of cigarettes through the apparatus, and this speed may in fact be somewhat greater than the faster of the conveyors 101 and 102. The gaps between the flow-breaking band 111 and the input conveyor 102 and between the output conveyor 107 are closed by bridges 116 and 117 respectively.

The upper part of the apparatus is closed off by a top wall member 118 which extends above the upper conveyors 101 and 106 and is formed with an aperture 119 between the conveyors to accommodate a flow-sensing device. This flow-sensing device comprises two plates 120 and 121 pivoted at 122 and 123 respectively and having convex parts 120A and 121A which extend through the aperture 119 and rest on the cigarettes in the merger zone. At their extremities remote from the pivots 122 and 123, the plates 120, 121 are formed with upward extensions 124, 125 which are hooked so as to be able to engage the upper surface of a feeler arm 126 which is carried on a disc 127 for pivotal movement about a center 128, and which is urged upwards by a spring 129, downward movement of the feeler arm being limited by a stop 130. The mechanism is arranged so that the feeler arm 126 moves upwards under the influence of the spring 129 when the cigarette flow raises both of the plates 122 and 123, but it does not move if only one of the plates is raised.

Each of the conveyors 101 and 102 delivers cigarettes from a separate reservoir (not shown) which is supplied by one or more cigarette-making machines. These reservoirs may each be basically as described in British Pat. No. 995,663.

Each of the output conveyors 106 and 107 carries a continuously moving stack of cigarettes to a packing machine or to a number of packing machines. The speed of each conveyor is adjusted according to the demands of the packing machines so as to keep the channels through which the cigarettes are conveyed filled with cigarettes, thereby helping to maintain an orderly flow.

The movement of the feeler arm 126 is used to control the speeds of the conveyors 101 and 102 to reduce the feed when there is a buildup of cigarettes. Thus, as long as the plates 120

and 121 hold the arm 126 in its horizontal position, the level of cigarettes in the apparatus is either normal or a little below normal. In either event the supply of cigarettes requires to be maintained and the control signal is therefore continued until an excess buildup of cigarettes occurs; the excess buildup causes both the plates 120, 121 to be raised, releasing the feed arm 126 to move upwards under the action of spring 129 and causing a control signal for the conveyors 101 and 102 to reduce the feed rate until the excess accumulation has been eliminated and the normal level has been restored, whereupon feeler arm 126 returns to its horizontal position and the supply feed continues. If required, the flow-sensing device and the control means for the conveyors 101 and 102 can be arranged so that the feed rate of conveyors 101 and 102 is increased as the feeler arm 126 drops below the normal position.

The control means for the conveyors 101 and 102 is arranged so that, at any given instant, their speeds are in a fixed ratio to one another. This ratio is adjusted, however, so as to balance the feed of the cigarettes from their associated reservoirs to ensure as far as possible that during normal running each reservoir contains approximately the same number of cigarettes. This can be done by arranging for the speed of each band to be proportional to the volume of cigarettes contained in the associated reservoir from which it is taking cigarettes. A convenient way of doing this is by means of a control device which measures the reservoir length. Such a device might be a drum arranged to take in and pay out a wire or line extending between a fixed and a movable part of the reservoir, the speed ratios of the conveyors 101 and 102 being controlled according to the displacement of the drum, possibly by direct gearing.

Cigarettes travel along the pairs of conveyors 101, 102 and 106, 107 in closely packed stacks in each of which the cigarettes are arranged in parallel alignment end to end across the conveyors and with no movement relative to one another in the stack. However in order that there can be exchange of cigarettes between the flows, it is desirable to "fluidize" the flows between the input and output conveyors. This is done by means of the band 111 which accelerates the cigarettes coming in on the conveyor band 102 and causes them to start rolling relative to one another, the effect of which is to cause this stack to roll this batch of the stack and to cause the flow of cigarettes to be fluidized over a considerable area which corresponds very roughly with the shaded area. The band 111 also imparts an upward component of movement to the cigarettes to enable them, if required, to move from the lower input conveyor 102 to the upper output conveyor 106.

In this way the apparatus enables the proportion of cigarettes flowing on the conveyors 106 and 107 to be varied independently of the proportions of cigarettes being fed in on the conveyors 101 and 102. The apparatus also increases the flexibility of the system of machinery which comprises the packing machine 103 supplied from the conveyors 106 and 107, the reservoirs feeding the conveyors 101 and 102, and the cigarette-making machines feeding the reservoirs. Thus if for example the cigarette-making machine or machines supplying the upper conveyor 101 were out of action for a prolonged period of time such that the store of cigarettes in the associated reservoir becomes excessively depleted, then the supply of cigarettes to the packing machine along the conveyor 106 could be made up from the cigarettes from the input conveyor 102. Otherwise prolonged failure of the cigarette-making machine supplying the conveyor 101 would eventually bring to a standstill the operation of the packing machine supplied by the conveyor 106. In this way the two cigarette reservoirs are effectively combined and can be considered as one reservoir of double the capacity of the individual reservoirs.

In FIG. 4 the same reference numerals are used as in FIG. 1 to identify similar parts. The principal difference in this example is in the flap 36 which in this case is of a composite construction made up of three separate plates 37, 38 and 39 (see FIG. 5). As shown particularly in FIG. 6, the center plate 38 is

carried by a rod 40 which is screwed into a collar 48 and passes through a member 41 formed with a set of bevel gear teeth 42 meshing with cooperating bevel gears formed on two annular members 44 and 45. The members 41, 44 and 45 in effect form a sort of differential in that the position of the member 41 about the axis of rotation of the annular members 44 and 45 depends upon the positions of both of the members 44 and 45, which rotate about a shaft 46 mounted on a structural member 47.

The member 41 rotates on the rod 40 and in effect rolls on the members 44 and 45. In other words, rotation of either of the members 44 and 45 causes the member 41 to move bodily about the axis of the shaft 46 and to carry with it the rod 40 and center plate 38. A collar 40A on the rod 40 holds the member 41 in mesh with the gears on the members 44 and 45.

The plates 37 and 39 are secured respectively to crank members 49 and 50 which are pivotally mounted respectively on pivot pins 51 and 52. These crank members include parts 53 and 54 respectively which at their outer ends have pins 55 and 56 which serve as anchorages for coil springs 57 and 58. The opposite ends of the coil springs are anchored to pins 59 and 60 on gearwheels 61 and 62 which are secured to the annular members 44 and 45.

Each of the gearwheels 61 and 62 is driven by a pinion 63 (see FIG. 5) so as to rotate about its axis (i.e., the axis of the shaft 46) in direct proportion to the linear movement of the end wall 1 of the associated reservoir (as shown in FIG. 1). For this purpose the shaft driving each pinion 63 may be directly geared to a member driving the associated carriage 2 controlling the end wall 1; alternatively, for example, a separate positioning motor may drive each pinion 63 to maintain an angular position directly dependent upon the position of the reservoir wall.

The springs 57 and 58 normally hold the plates 37 and 39 against the center plates 38 by producing the necessary turning moments on the crank members 53 and 54. FIG. 5 shows the three plates in solid outline in a mean flap position, and shows also for example (in broken outline) one side position which is closer to the pulley 11 than to the pulley 25.

It will be seen that the differential drive on the member 41 through the bevel gears on the members 44 and 45 has the desired effect, as mentioned in relation to FIG. 2, of positioning the flap in an appropriate position sensitive to the positions of the end walls of both reservoirs. In other words, if both reservoir end walls are in similar positions (i.e., signifying that both reservoirs then contain the same volume of cigarettes) then the plate 33, and consequently the flap as a whole, will always be in the mean position in which it defines similar flow throats with the pulleys 11 and 25. However, if the end wall of one reservoir moves while the other remains stationary, then the gearwheel corresponding to the altered reservoir moves in one direction or the other, and the plate 38 moves in the same direction, but through half the angle. In other words, taking the pins 59 and 60 as datum points on the gearwheels 61 and 62, the center plate 38 always assumes a mean position between those datum points. FIG. 5 shows for example in broken outline a situation in which the pin 60 has moved slightly to the left to a position 60A, while the pin 59 has moved rather further to the left to a position 59A representing an increase in the capacity of the first reservoir (feeding the stack B) and a decrease in that of the reservoir feeding the stack A. Accordingly the position of the center plate 38 has moved from the vertical mean position to a position which bisects the angle subtended at the axis of rotation by radial lines passing through the pin positions 59A and 60A.

In general, movement of the pin 60 towards the pivot 52 of the crank member 53 represents a reduction in the capacity of the reservoir which delivers cigarettes through the stack A into the junction zone through the throat defined by the flap and by the pulley 25. Correspondingly, movement of the pin 59 towards the pivot pin 51 represents a reduction in the capacity of the other reservoir which feeds cigarettes through the stack B.

The turning moment applied to the crank member 53 or 54 by its spring 57 or 58 decreases as the spring anchorage pin 59 or 60 approaches a point in alignment with the corresponding pivot pin 51 or 52. Movement of either pin 59 or 60 beyond the pivot pin 51 or 52 results in the associated spring producing the opposite turning moment on its crank member 50. FIG. 7 shows for example the crank member 50 and plate 39 after this has happened. It will be seen that the spring 58 now applies an anticlockwise turning moment to the crank member, which is thus held against a stop 61 (i.e., away from the center plate 38). In this position, the plate 39 lies radially with respect to the pulley 25 and closes off the flow of cigarettes from the stack A into the merger zone. There is a corresponding stop (not shown) against which the crank member 49 is held when the anchorage pin 59 passes the pivot pin 51; at this stage the plate 37 lies radially with respect to the pulley 11 so as to close off the flow of cigarettes from the stack B.

The two sideplates 37 and 39 can operate independently in closing the flow channels from the two reservoirs. Each sideplate closes the flow channel when its associated reservoir becomes empty or reaches its minimum capacity, which results in the corresponding anchorage pin 59 or 60 moving to a position just past the pivot pin 51 or 52 (as shown in FIG. 7). Moreover, the arrangement may be such that if either reservoir stops delivering cigarettes for any reason, the associated sideplate 37 or 39 of the composite flap automatically closes off that flow channel; for this purpose the gearwheel 61 or 62 may automatically be driven in a clockwise or anticlockwise direction, as the case may be, to the position in which the associated anchorage pin 59 or 60 just passes the pivot pin 51 or 52, as shown in FIG. 7.

In order to enable the gearwheels 61 and 62 to be set in precisely the correct positions in relation to the members 44 and 45, the gearwheels may be secured to the members 44 and 45 by means of screws (not shown) engaging in the members 44 and 45 and passing through curved slots in the gearwheels.

In the event of the two reservoirs being required to handle different brands of cigarettes, the center plate 38 of the flap may be locked in a vertical position and may be replaced by a longer plate which extends all the way down to the cowl 32 so that the stack A feeds permanently into the stack C, and the stack B feeds permanently into the stack D.

What I claim as my invention and desire to secure by Letters Patent is:

1. A feed system for cigarettes and other similar rodlike articles, comprising at least two substantially horizontal flow channels through which stacks of laterally extending articles are fed into a merger zone in which the stacks are merged, each flow channel being formed by a conveyor to carry the stack, and a top wall which is parallel to the conveyor to confine the upper surface of the stack, in which each flow channel includes a sensor which bears against one face of the stack of articles in that flow channel and is movable towards and away from the opposite face of the stack in accordance with the pressure exerted on the sensor by the articles, and in which the sensor controls a speed control device which determines the conveyor speed, the speed being decreased or increased auto-

matically when the pressure on the sensor respectively increases or decreases.

2. A feed system according to claim 1 in which one or each sensor is movable up and down and rests on top of the articles so as to partly confine the upper surface of the stack.

3. A feed system according to claim 1 including a movable flap which partly defines throats on opposite sides of the flap through which the stacks enter the merger zone, and in which movement of the flap in one direction or the other has the effect of varying the proportions of the article flows from the two channels entering the merger zone.

4. A feed system according to claim 3 in which the flows from the two substantially horizontal channels both pass downwards into the merger zone, and in which the flap has a mean position which is substantially vertical.

5. A feed system according to claim 1 in which the merged stack is carried away substantially horizontally from the merger zone by one or more horizontal conveyors.

6. A feed system for cigarettes and other similar rodlike articles, comprising two flow channels for stacks of laterally extending articles, each flow channel having an associated reservoir which is variable in capacity and expands and contracts so as to absorb or make up for the difference between the input and output feed rates in the channel, and including a merger zone into which the flows from both channels pass, and means for varying the relative flow rates from the two channels in accordance with the states of the reservoirs, so that the flow channel of which the reservoir is less full at any given moment of time automatically delivers articles to the merger zone at a slower rate than the other channel.

7. A feed system according to claim 5 in which the means for varying the relative flow rates from the two channels comprise a movable flap which partly defines throats on opposite sides of the flap through which the articles from the two channels enter the merger zone.

8. A feed system according to claim 7 in which the position of the flap is determined by two gears which are independently rotatable and which both mesh with a planetary gear which rotates on a member controlling the flap position.

9. A feed system according to claim 8 in which the flap is of composite construction including two separate plates which can independently control the flow from the two channels.

10. A feed system according to claim 9 in which each plate is pivoted and is normally held against a center member by a spring which has one end anchored to a member which is or can be arranged to be moved in direct proportion to the movement of a member controlling the capacity of an associated reservoir from which the corresponding flow of articles is received, the arrangement being such that the spring anchorage, as the corresponding reservoir decreases in capacity, can move to a position in relation to the plate pivot in which the turning moment applied by the spring is reversed so as to swing the plate to a position against a stop, in which position the plate closes off the flow from the corresponding flow channel into the merger zone.

11. A feed system according to claim 10 in which the two members carrying the spring anchorages are the two gears according to claim 9.

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