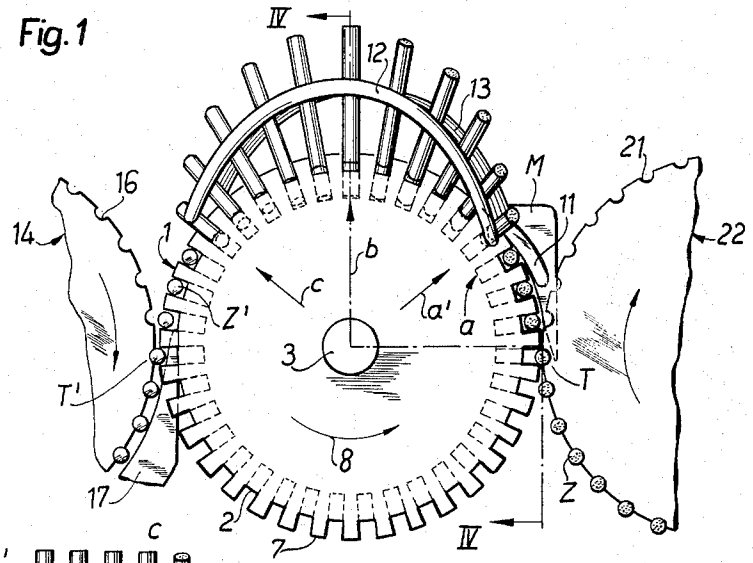
April 6, 1965 W. RUDSZINAT ETAL 3,176,825

METHOD OF AND APPARATUS FOR REVERSING STICK-SHAPED ARTICLES

Filed Feb. 12, 1962 5 Sheets-Sheet 1

Fig. 1



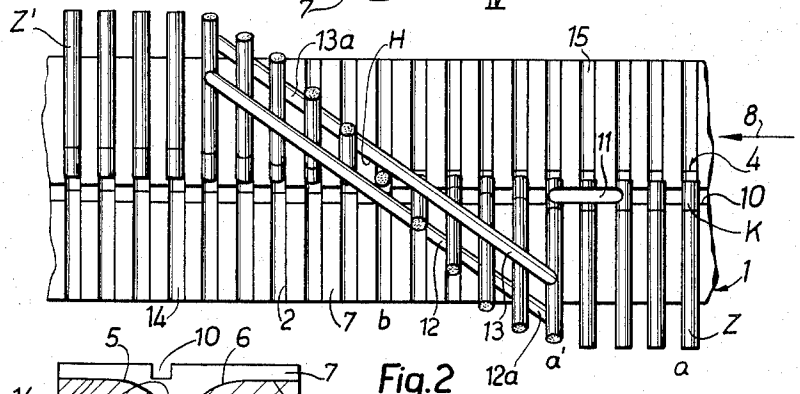


Fig. 2

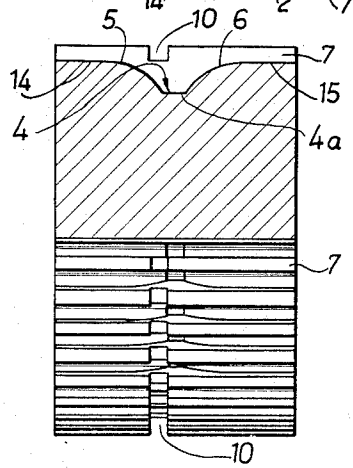


Fig. 4

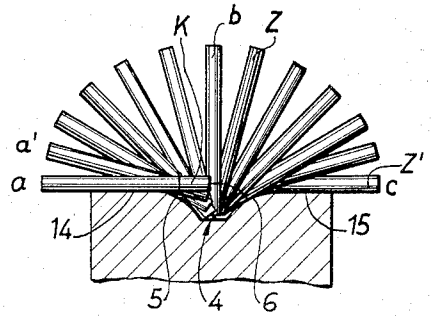


Fig. 3

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METHOD OF AND APPARATUS FOR REVERSING STICK-SHAPED ARTICLES

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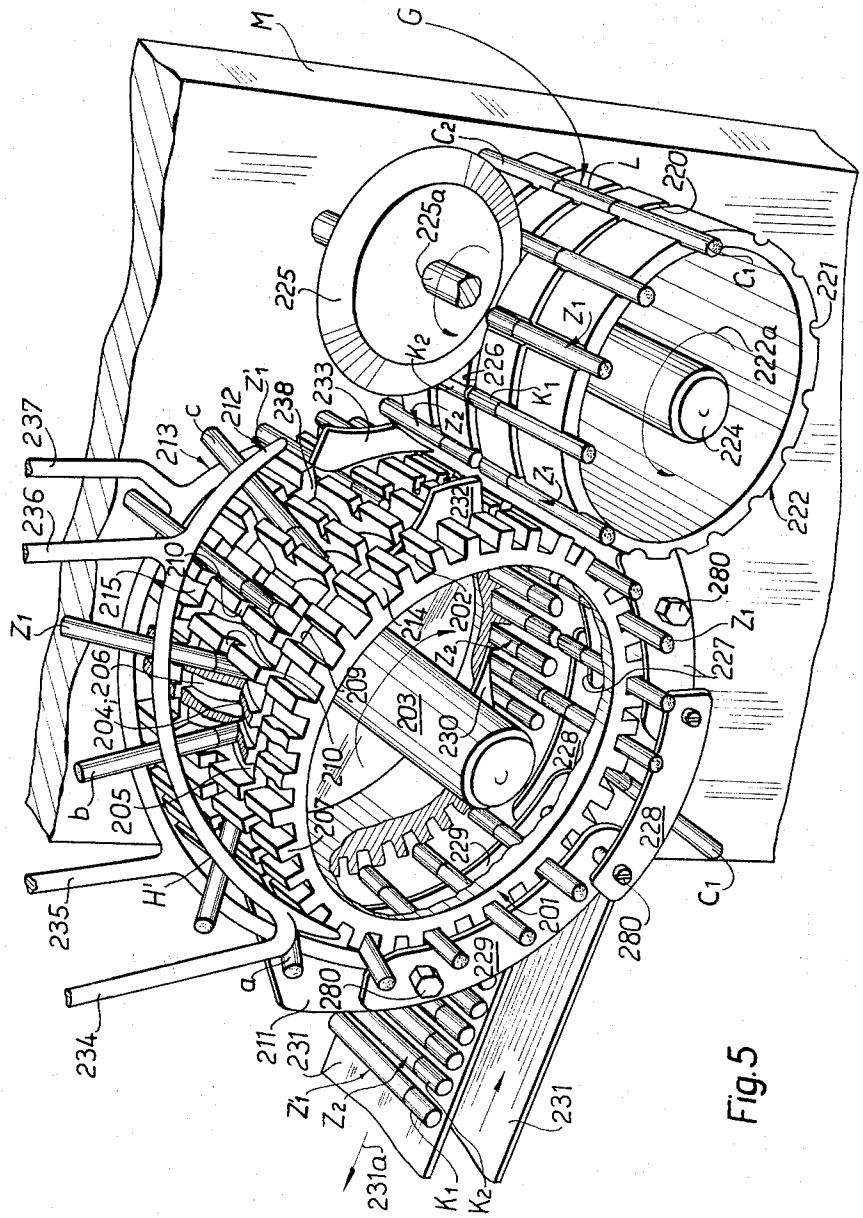


Fig.5

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METHOD OF AND APPARATUS FOR REVERSING STICK-SHAPED ARTICLES

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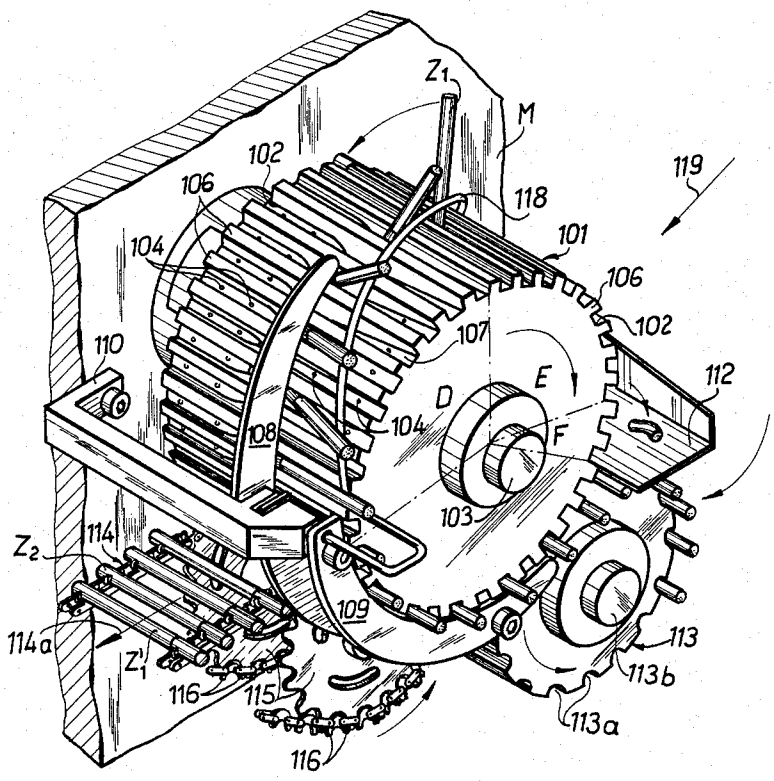


Fig.6

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METHOD OF AND APPARATUS FOR REVERSING STICK-SHAPED ARTICLES

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Fig. 7

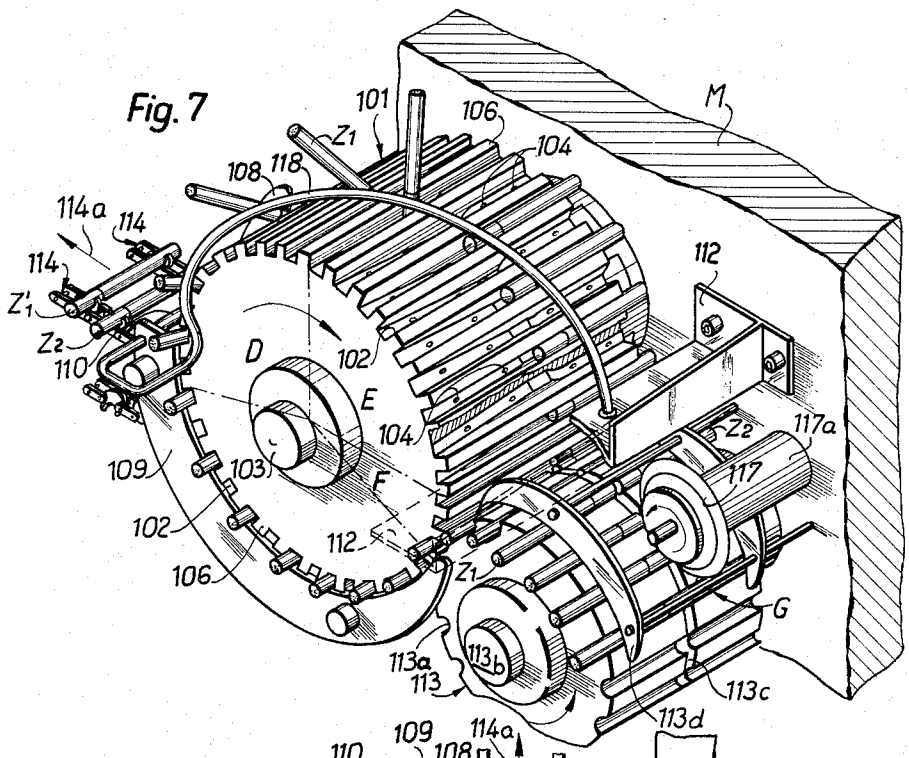
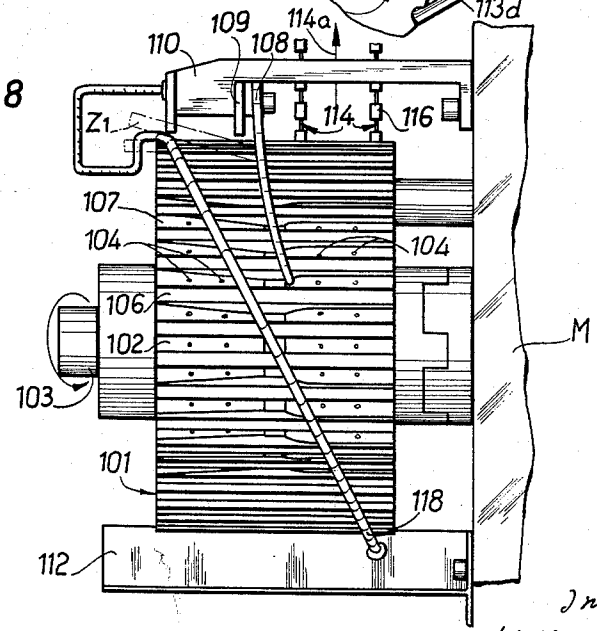


Fig. 8



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METHOD OF AND APPARATUS FOR REVERSING STICK-SHAPED ARTICLES

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Fig. 13

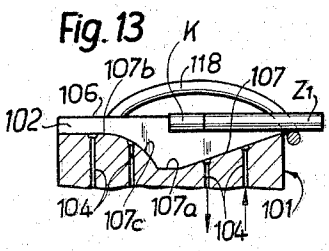


Fig. 14

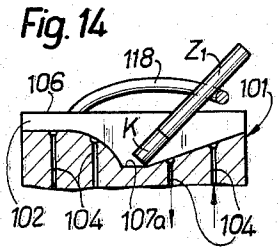


Fig. 15

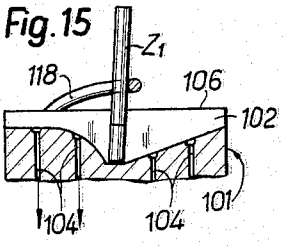


Fig. 16

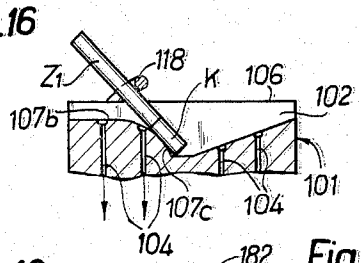


Fig. 17

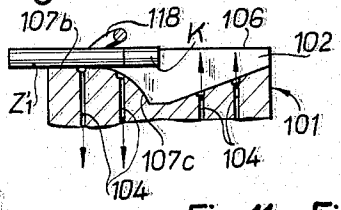


Fig. 10

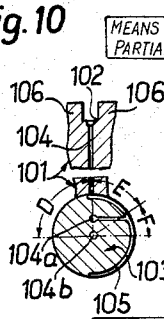


Fig. 9

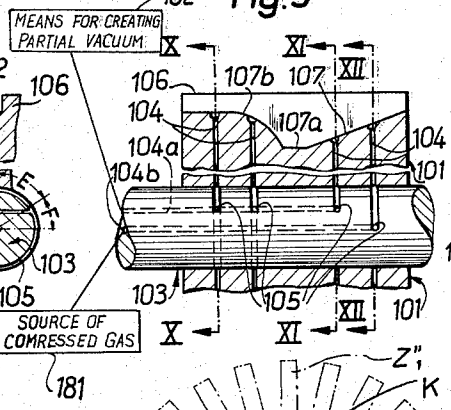


Fig. 11 Fig. 12

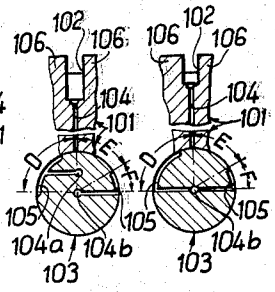
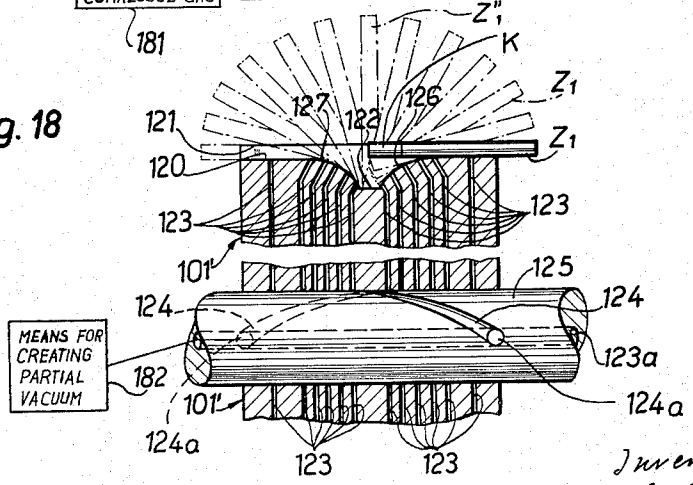


Fig. 18



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United States Patent Office 3,176,825 Patented Apr. 6, 1965

3,176,825

METHOD OF AND APPARATUS FOR REVERSING STICK-SHAPED ARTICLES

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Filed Feb. 12, 1962, Ser. No. 172,457
Claims priority, application Germany, Feb. 13, 1961, H 41,713; Aug. 28, 1961, H 43,496
21 Claims. (Cl. 198—32)

The present invention relates to a reversing arrangement for elongated stick-shaped objects, and more particularly to an arrangement which is especially suited for reversing elongated stick- or rod-shaped articles constituting or forming part of tobacco-containing products. For example, the reversing arrangement of our invention may be utilized in connection with cigarettes, filter tip cigarettes, cigars, cigarillos, filter tips and similar articles which by themselves or in combination with other components constitute tobacco-containing products.

An important object of the invention is to provide a reversing arrangement wherein the holders which support the sticks need not be reversed with the sticks and wherein the length of holders need not substantially exceed the length of the sticks.

Another object of the invention is to provide a reversing arrangement for plain or filter tip cigarettes and like stick-shaped articles which is constructed and assembled in such a way that only undamaged cigarettes are reversed whereas the damaged or destroyed cigarettes are automatically ejected to make sure that all reversed cigarettes leaving the reversing arrangement are in condition for packaging or storage.

A further object of the invention is to provide a reversing arrangement for sticks and like elongated objects in which a large number of sticks may be consecutively reversed within exceptionally short periods of time and while the sticks remain in continuous motion so that the reversing arrangement is especially suited for use in mass-manufacture of tobacco-containing products.

An additional object of the instant invention is to provide an arrangement of the above outlined characteristics wherein the sticks are reversed without any likelihood of damage thereto and wherein the reversed sticks are automatically aligned in positions in which they are ready for further processing.

Still another object of our invention is to provide a reversing apparatus for cigarettes, cigarillos, cigars, filter tips and like articles constituting or utilized in connection with tobacco-containing products, which is constructed and assembled in such a way that it may be readily installed in many types of tobacco processing machines of conventional design without necessitating any or by necessitating only minimal changes in the construction and operation of such machines.

A further object of the invention is to provide a reversing arrangement for filter tip cigarettes of the type obtained by halving twin-length filter elements of twin-length filter tip cigarettes, which is constructed and arranged in such a way that only one of each pair of filter tip cigarettes obtained upon halving of the respective filter elements is reversed and that the reversed cigarettes are automatically aligned with the nonreversed cigarettes.

With the above objects in view, the invention resides in the provision of a reversing arrangement for elongated sticks, particularly for articles which by themselves or together with other articles constitute tobacco-containing products, comprising a plurality of elongated holding means preferably in the form of axially parallel peripheral pockets provided on a rotary advancing drum, means for transferring the sticks into the holding means so that one

end of each stick is located intermediate the ends of the respective holding means, and means for automatically reversing the sticks by tilting the sticks about the ends thereof in planes passing through the respective holding means so that each stick is tilted away from a first section and comes to rest in a different section of the respective holding means.

The reversing means may assume the form of one or more reversing guides constituting a purely mechanical reversing device, of a combined mechanical and pneumatic reversing system in which a source of compressed air and a device for creating partial vacuum cooperates with one or more guides, or of a purely pneumatic system in which a device for creating partial vacuum (combined with suitably arranged ducts leading to the holding means) brings about a reversal of the sticks.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following detailed description of certain specific embodiments with reference to the accompanying drawings, in which:

FIG. 1 is a front elevational view of reversing arrangement which embodies an advancing means in the form of a rotary drum and which comprises purely mechanical reversing means;

FIG. 2 is a developed top plan view of the advancing drum and of the reversing means;

FIG. 3 is a fragmentary axial section through the advancing drum, showing a series of elongated sticks in positions they assume in various stages of the reversing operation;

FIG. 4 is a part side elevational and part axial sectional view of the advancing drum as seen in the direction of arrows from the line IV—IV of FIG. 1;

FIG. 5 is a perspective view of a modified reversing arrangement which again utilizes purely mechanical reversing means and which is associated with a dividing drum adapted to continuously transfer into the pockets of the advancing means a series of properly positioned sticks and a series of sticks which must be reversed before leaving the advancing means;

FIG. 6 is a perspective view of a partly mechanical and partly pneumatic reversing arrangement which is analogous to that shown in FIG. 5 in that it also reverses certain sticks while the other sticks pass therethrough without changing their position with respect to the holding means;

FIG. 7 is a different perspective view of the reversing arrangement which is illustrated in FIG. 6, showing in greater detail the transfer station between the dividing drum and the advancing means;

FIG. 8 is a top plan view of the structure shown in FIGS. 6 and 7;

FIG. 9 is a fragmentary radial section through the advancing means of the arrangement shown in FIGS. 6–8;

FIG. 10 is a fragmentary section as seen in the direction of arrows from the line X—X of FIG. 9, showing the arrangement of air admitting and air evacuating ducts, grooves and channels formed in the advancing means and in the shaft on which the advancing means is mounted;

FIG. 11 is a similar fragmentary section taken along the line XI—XI of FIG. 9, showing different portions of channels and grooves in the shaft of the advancing means;

FIG. 12 is an additional fragmentary section as seen in the direction of arrows from the line XII—XII of FIG. 9, showing still further portions of channels and grooves in the shaft of the advancing means;

FIG. 13 is a fragmentary section through the advancing means of FIGS. 6 to 8, showing a pocket and a stick in a position the stick assumes immediately after being transferred from a dividing drum forming part of the reversing arrangement;

FIG. 14 is a similar section showing the stick in a partly tilted position;

FIG. 15 is a similar section through the advancing means of FIGS. 6 to 8, showing the stick, in a further position in which it is substantially perpendicular to the axis about which the advancing means rotates;

FIG. 16 is an additional section, similar to the sections of FIGS. 9 and 13 to 15, showing the stick in nearly reversed position in which the stick is subjected to the action of mechanical and pneumatic reversing means;

FIG. 17 illustrates the stick in fully reversed position; and

FIG. 18 is a fragmentary axial section through a modified reversing arrangement which utilizes purely pneumatic reversing means.

Referring now in greater detail to the illustrated embodiments, and first to FIGS. 1 to 4, there is shown an arrangement which is utilized for reversing or inverting the position of elongated sticks or rods in the form of filter tip cigarettes Z. As shown in FIG. 1, the sticks Z are supplied by a rotary transfer drum 22 which is formed with axially parallel holding means in the form of peripheral grooves or pockets 21 each of which may receive a stick Z, and the pitch circle of the drum 22 is tangential to the pitch circle of an advancing means or conveyer here shown in the form of a driven rotary drum 1. This last mentioned drum is provided with a plurality of equally spaced axially parallel peripheral holding means in the form of grooves or pockets 2 and is mounted on a horizontal shaft 3 which may but need not constitute the means for driving the drum 1 so that the pockets 2 travel in a circular path about the axis of the shaft 3.

At the transfer station T, the sticks Z are consecutively transferred from the pockets 21 of the drum 22 and are introduced into the pockets 2 of the drum 1, and the sticks thereupon advance in anticlockwise direction indicated by the arrow 8. It will be noted that one end of each newly transferred stick Z is located intermediate the ends of the respective pocket 2.

FIGS. 2 and 3 show that the length of the pockets 2 exceeds the length of the sticks Z, and FIGS. 2 to 4 show that each of these pockets has a central retaining recess 4 which is bounded by a substantially flat central bottom surface 4*a* and by a pair of convex lateral bottom surfaces 5, 6. The sticks Z to be reversed come to rest on the supporting surfaces 14 in the left-hand or lower portions of the respective pockets 2, as viewed in FIGS. 2 to 4, and when the reversal of the sticks is completed, the reversed sticks Z' nest on the supporting surfaces 15 in the upper or right-hand portions of the respective pockets 2. It will be noted that the length of the pockets 2 is somewhat less than twice the length of a stick Z so that the outer end portions of the sticks may project beyond the respective end faces of the drum 1.

The pockets 2 are separated from each other by smooth-surfaced axially parallel partitions or walls 7 each of which is formed with a cutout or notch 10, and these notches are aligned with each other in the circumferential direction of the drum 1 and are located closer to the supporting surface 14 than to the supporting surface 15. In other words, the notches 10 are located radially outwardly of the filter tips K which form part of the sticks Z and which are adjacent to the recesses 4 of the respective pockets 2. The purpose of the notches 10 is to receive a stationary tilting or lifting guide 11 which is shown in FIGS. 1 and 2 and which is secured to a member M forming part of the machine frame. The tilting guide 11 depresses the filters K of the consecutive sticks Z so that the outer end portions of the sticks resting on the supporting surfaces 14 in the respective pockets 2 are lifted by simultaneous depression of the respective filters K into the associated recesses 4. This causes the outer ends of the non-reversed sticks Z to enter the gap H defined by a pair of spaced mechanical reversing or lifting means in the form of stationary arcuate guides 12, 13 which are fixed to the frame member M or to another part of the machine frame, for example, in a manner to be described in connection with FIG. 5. As shown in FIG. 2, the reversing guides 12, 13 extend in planes which are inclined with respect to the axis of the shaft 3 and with respect to the common plane of the notches 10. These guides 12, 13 are located above the upper portion of the advancing drum 1 and their projections onto a horizontal plane passing through the axis of the shaft 3 assume the form of straight lines. The guide 12 has an outer or front end portion 12*a* which projects beyond the respective end face of the advancing drum 1 so that this outer end portion supportingly engages the outer end portions of the partially lifted or tilted sticks Z which are tilted in their respective pockets 2 by the stationary tilting guide 11, and the tilting of the sticks Z is thereupon continued as they travel through the gap H between the guides 12 and 13. The guide 13 has a rear end portion 13*a* which projects beyond the opposite end face of the advancing drum 1 so that it actually deposits the reversed sticks Z' at the other sides of the respective recesses 4 onto the right-hand or upper supporting surfaces 15 of the respective pockets 2, as viewed in FIGS. 2 to 4. The reversed sticks Z' are thereupon advanced to a second transfer station T', shown in FIG. 1, at which they are deposited into peripheral holding means or pockets 16 of a take-off drum 14 which may advance the reversed sticks Z' to a further processing station.

It will be noted that the stationary tilting guide 11 is comparatively short and that it terminates at a point where the outer ends of the non-reversed sticks Z reach the front end portion 12*a* of the reversing guide 12.

The reversing arrangement of FIGS. 1 to 4 operates as follows:

Immediately after being transferred from the pockets 21 and before reaching the stationary tilting guide 11, the sticks Z rest on the supporting surfaces 14 in the respective pockets 2 and assume the positions *a* shown in FIG. 3. When their inner ends are engaged by the tilting guide 11, the sticks Z are partially tilted by rolling with their filter tips K about the respective convex bottom surfaces 5 and assume the positions *a'* shown in FIG. 3. Once they are engaged by the reversing guides 12, 13, the tilting of the sticks Z continues until, preferably at the uppermost point of the advancing drum 1, they reach the positions corresponding to the position *b* of the median stick shown in FIG. 3. As the drum 1 continues to rotate in anticlockwise direction, the sticks Z begin to become tilted in the opposite direction and their filter tip K roll along the respective convex bottom surfaces 6 so as to finally reach the supporting surfaces 15 and to assume positions corresponding to the position *c* of the vertical stick Z' shown in FIG. 3. It will be noted that the reversal of sticks Z takes place in planes which are radial with respect to the drum 1, which pass through the respective pockets 2, and which also pass through the axis of the shaft 3. The sticks are retained in their respective pockets 2 by the smooth radial surfaces of the partitions 7 so that they slide along the inner guide faces of the reversing guides 12, 13 while advancing from the positions *a* to the positions *c*. It is preferred to form the reversing guides 12, 13 with arcuate guide faces so that they are in a mere point contact with the sticks to reduce friction. Preferably, the reversing guides 12, 13 are of circular cross section and consist of metallic stock.

The height of the partitions 7, as viewed in the radial direction of the advancing drum 1, depends on the peripheral speed of this drum and is selected in such a way that the centrifugal force acting on the sticks Z during

travel through the gap H between the guide faces of the reversing guides 12, 13 cannot eject the sticks from the respective pockets.

The drums 14 and 22 rotate in clockwise direction, and the spacing between the pockets 16 or 21 is the same as the spacing between the pockets 2. The drums 14 and 22 may be axially offset with respect to each other and their axial length may be less than the axial length of the advancing drum 1. This is due to the fact that the length of pockets 2 must exceed the length of the pockets 16 or 22 since the pockets 2 must support the sticks in non-reversed (Z) and reversed positions (Z').

A wedge-shaped stationary ejecting element 17 extends with its upper end portion beyond the outer end portions of the sticks Z' at a point adjacent to the second transfer station T' so as to make sure that the reversed sticks are actually transferred into the pockets 16. Alternately, the drum 1 may be formed with a circumferential notch extending to the supporting surfaces 15, and the ejecting element 17 then extends into this notch so as to lift the reversed sticks Z' from their respective pockets.

FIG. 5 illustrates a modified arrangement which is again assumed to constitute a means for reversing the position of elongated sticks in the form of filter tip cigarettes Z_1. This reversing arrangement comprises a stick transferring means in the form of a dividing or cutting drum 222 which rotates in anticlockwise direction (arrow 222*a*) and which cooperates with a rotary disc knife 225 mounted on a drive shaft 225*a* so as to halve consecutive groups G of twin filter tip cigarettes into pairs of filter tip cigarettes or sticks Z_1, Z_2. The purpose of the reversing arrangement is to reverse the sticks Z_1 so that, when they reach the take-off conveyer 231, the sticks Z_1 are reversed and assume positions Z'_1 shown in the left-hand half of FIG. 5 in which their filter tips F_1 are disposed at the same side of the conveyer as the filter tips F_2 of the non-reversed sticks Z_2. The groups G are manufactured and assembled in a manner not forming part of this invention, and each thereof comprises two tobacco-filled cigarettes C_1, C_2 and a twin-length filter L therebetween. The knife 225 halves the twin-length filters L into pairs of shorter filter tips K_1, K_2 by extending into a circumferential groove or slit 226 provided in the central portion of the dividing drum 222. The latter is formed with axially parallel peripheral holding means or pockets 221 each of which receives a group G (in advance of the knife 225) or a pair of sticks Z_1, Z_2 (past the knife 225). The drive shaft 224 of the dividing drum 222 and the drive shaft 225*a* of the disc knife 225 are supported by an upright frame member or wall M which forms part of the machine frame. This frame member also supports the preferably horizontal shaft 203 of an advancing means in the form of a rotary drum 201 corresponding to the drum 1 of FIGS. 1 to 4 and having a plurality of equidistant axially parallel peripheral holding means or pockets 202 separated from each other by smooth-surfaced radially outwardly extending partitions 207 which are parallel with the axis of the drum 201. The configuration of the pockets 202 is analogous to that of the pockets 2, i.e. each pocket 202 has a substantially centrally located recess 204 bounded by a substantially flat central bottom surface and by a pair of convex lateral bottom surfaces 205, 206 with smooth transitions into the supporting surfaces 214, 215 which latter respectively receive the sticks Z_1, Z_2 at the transfer station between the drums 222, 201.

Each partition 207 is formed with a cutout or notch 210 which is located radially outwardly of the respective convex supporting surface 205, and with a circumferential groove 209 which may extend radially inwardly to the supporting surfaces 214 of the pockets 202. It will be noted that the angular distance between the centers of adjacent pockets 202 equals one-half the angular distance between the centers of the adjacent pockets 221 in the dividing drum 222.

Adjacent to the underside of the advancing drum 201, there is provided a series of retaining shield means 227, 228, 229 which are located in the space between the dividing drum 222 and the take-off conveyer 231. The purpose of these shield means is to retain the sticks Z_1 in the respective pockets 202 while the sticks travel to the transfer station between the drum 201 and the conveyer 231. Furthermore, certain of these shield means prevent the non-reversed sticks Z_1 from dropping onto the conveyer 231 prior to actual reversal which takes place along the upper half of the drum 201. Additional shields (not shown) are provided to retain the sticks Z_2 in their respective pockets 202 while the sticks Z_2 move clockwise from the right-hand to the left-hand transfer station, as viewed in FIG. 5.

The shield means 227 comprises a pair of spaced arcuate components which are closely adjacent to the drum 222 and which retain the sticks Z_1 during the initial stage of their advance toward the conveyer 231. These components are outwardly adjacent to the supporting surfaces 214 so that they automatically retain each stick Z_1 as long as one thereof engages with the stick. The shield means 227 terminates short of the conveyer 231 at the front ends of two spaced arcuate components forming part of the second of median shield means 228. The distance between the components of the shield means 228 is greater than the length of a cigarette C_1 so that, should the filter tip K_1 fail to adhere to the respective cigarette C_1, both the cigarette C_1 and the filter tip K_1 will be free to drop by gravity into a suitable collecting tray or another receptacle (not shown) located beneath the advancing drum 201. One such cigarette C_1 is shown beneath the outer component of the shield means 228.

The shield means 228 terminates short of the transfer station between the drum 201 and the conveyer 231 and is followed by the third shield means 229 which comprises a pair of spaced arcuate components extending upwardly beyond the upper run of the conveyer 231 so as to prevent the sticks Z_1 from dropping onto this conveyer. In other words, the sticks Z_1 advancing along the upper or inner sides of the shield means 227, 228, 229 are not deposited onto the conveyer 231 but are compelled by the shield means 229 to travel along the upper part of the advancing drum 201 and toward the dividing drum 222. The spacing between the components of the shield means 229 may be the same as that between the components of the shield means 227, i.e. less than the distance between the components of the median shield means 228. The parts which connect the components of the shield means 227–229 to the frame member M may assume the form of elongated rods or bolts 280.

The spacing between the components of the non-illustrated shield means for the sticks Z_2 preferably corresponds to the spacing between the components of the shield means 227 or 229, and these non-illustrated components are located below the supporting surfaces 215 intermediate the drum 222 and the conveyer 231 at the underside of the advancing drum 201.

An ejector 230 is provided at the underside of the drum 201 and comprises a wedge-shaped front end portion or tip which extends into a circumferential groove 238 provided in the partitions 207 and extending radially inwardly to the supporting surfaces 215. The positioning of the ejector 230 is such that it automatically ejects the sticks Z_2 and the reversed stick Z'_1, so that, along the upper half of the drum 201, the right-hand portions of the pockets which previously accommodated the sticks Z_2 always remain empty, and all pockets 202 are empty at a point immediately adjacent to the transfer station between the drum 201 and conveyer 231.

The foremost end of the inner component of the shield means 227 extends into a circumferential groove 220 of the dividing drum 222 to make sure that all sticks Z_1 are transferred into the corresponding pockets 202 or the advancing drum 201. At a level above the transfer sta-

tion between the drums 222, 201, there is provided an ejector 232 which extends into the circumferential groove 209 of the drum 201 and ejects such cigarettes Z_1 which were not deposited on the conveyer 231. The rejects removed by the ejector 232 may be collected in a pan or tray, such as the element 112 shown in FIG. 7, which prevents the rejects from dropping onto the dividing drum 222.

An additional retaining shield 233 is provided above the transfer station between the drums 222, 201, and its purpose is to retain the reversed sticks Z'_1 in their respective pockets 202 as the reversed sticks being to travel for the second time about the axis of the shaft 203. The radius of curvature of the inner face of the shield 233 is only slightly greater than the maximum radius of the drum 201.

The drum 201 is formed with an odd number of pockets 202, whereas the dividing drum 222 comprises an even number of pockets 221. Consequently, the drum 222 will transfer a pair of aligned sticks Z_1, Z_2 into the first, third, fifth, etc. pockets 202 when the drum 201 performs a first, third, etc. revolution, and into the second, fourth, sixth, etc. pockets 202 during the second, fourth, etc. revolutions of the advancing drum. The advantages of such distribution of pockets 202, 221 will be readily understood as the description of the operation of the arrangement shown in FIG. 5 proceeds.

The arrangement of FIG. 5 further comprises a tilting guide 211 which is located at a level above the conveyer 231 and which extends into the aligned notches 210 of the partitions 207 so as to tilt the sticks Z_1 advancing beyond the third shield means 229 by causing the sticks Z_1 to roll along the convex supporting surfaces 205 and to move their outer end portions away from the respective supporting surfaces 214. At the downstream side of the tilting guide 211, there is provided a pair of stationary reversing guides 212, 213 which are suspended on suporting rods 234 to 237, the latter secured to the frame member M in a manner not shown in FIG. 5. The mounting and configuration of the reversing guides 212, 213 respectively correspond to the mounting and configuration of reversing guides 12, 13 in the arrangement of FIGS. 1 and 2. The guide 212 has a front end portion which is adjacent to the tilting guide 211 and which engages the inner side of a partially tilted stick Z_1 to thereupon guide this stick in a manner shown in FIG. 5, i.e. between the positions *a* and *c* and through the position *b*. While passing through the gap H' defined by the guide faces of the reversing guides 212, 213, the sticks have a mere point contact with these guides because the guides are preferably of a circular cross section. Alternately, at least the guide faces of these guides may be of arcuate shape to reduce friction with the advancing sticks Z_1. The manner in which the tilting guide 211, the retaining shield 233 and the ejectors 230, 232 are supported by the frame member M is not shown in FIG. 5.

The arrangement of FIG. 5 operates as follows:

The groups G delivered to and received in the pockets 221 of the rotary dividing drum 222 advance toward and are halved by the blade of the knife 225 so that each group G is divided into a pair of sticks Z_1, Z_2. The axially aligned pairs of sticks Z_1, Z_2 are thereupon transferred into alternate pockets 202 of the advancing drum 201 and travel along the lower half of this drum while passing above the consecutive shield means 227, 228, 229 and above the non-illustrated shield means for the sticks Z_2. During such advance, any sticks which are defective and which travel in the left-hand portions of the pockets 202 (i.e. those which rest on the supporting surfaces 214) are permitted to drop from the pockets 202 between the spaced components of the median shield means 228 so that only perfect sticks Z_1 are permitted to advance along the third shield means 229 and toward the tilting guide 211.

The sticks Z_2 are deposited on the conveyer 231 and advance in the direction indicated by the arrow 231*a* toward a stacking station, not shown. Consequently, the

right-hand portions of the alternate pockets 202 accommodating the sticks Z_1 advancing upwardly from the upper run of the conveyer 231 are now empty so that they may ultimately receive the reversed sticks Z'_1 before these sticks reach the first transfer station between the drums 222, 201.

As the sticks Z_1 continue to advance upwardly along the inner faces of the components forming part of the shield means 229, they reach the tilting guide 211 which depresses the respective filter tips K_1 into the recesses 204 of the alternate pockets 202 whereby the outer ends of the sticks Z_1 are lifted away from the periphery of the drum 201 and may be engaged by the front end portion of the reversing guide 212. The reversal of the sticks Z_1 thereupon progresses in the illustrated manner while the sticks travel through the gap H' formed by the guide faces of the guides 212, 213. At the time the sticks reach the retaining shield 233, they are completely reversed, i.e. they come to rest on the supporting surfaces 215 of the respective pockets 202. The fully reversed sticks (identified in FIG. 5 by reference characters Z'_1) now advance along the inner or upper faces of the non-illustrated shields for the sticks Z_2 and toward the upper run of the conveyer 231 where they are deposited to alternate with the newly deposited sticks Z_2.

It will be noted that, after the drum 201 completes two full revolutions, each of its pockets 202 receives a stick Z'_1 or Z_2. In other words, once the dividing drum 222 has delivered sticks into alternate grooves of the drum 201, the reversing mechanism including the guides 211, 212, 213 and the smooth-surfaced partitions 207 makes sure that each pocket 202 receives a stick Z'_1 or Z_2 so that the sticks Z'_1 and Z_2 alternate with each other and are disposed at the right-hand sides of the respective recesses 204, namely, on the supporting surfaces 215. This is due to the fact that the drum 201 is formed with an odd number of pockets 202 and that the dividing drum 222, which latter serves as a means for transferring sticks to the pockets 202, is provided with an even number of pockets. Furthermore, such operation of the arrangement shown in FIG. 5 is due to the fact that the angular spacing between the pockets 221 is twice as large as the spacing between the pockets 202 of the drum 201.

It will be noted that, while advancing about the drum 201, each stick Z_2 travels only through about one half of one full revolution, whereas the sticks Z_1 perform more than one full revolution while travelling with the drum 201. In the first stage of such travel, the sticks Z_1 are not reversed but merely travel in their respective pockets 202 (on the supporting surfaces 214 of the alternate grooves 202) and, once they reach the tilting guide 211, the reversing operation begins and is carried on to a point immediately in advance of the retaining shield 233 which latter insures that the reversed sticks Z'_1 are retained in contact with the respective supporting surfaces 215 while they advance toward the non-illustrated shields for the sticks Z_2. Of course, it will be readily understood that the arrangement of FIG. 5 may be provided with additional shields, such as the shield means 228, so as to automatically eject any defective sticks Z_2 which may be delivered by the dividing drum 222.

During reversal, the sticks Z_1 are supported by the smooth radial surfaces of the adjacent partitions 207 and by the guide faces of the guides 212, 213 so that they travel in arcs of 180 degrees and in planes passing through the axis of the shaft 203. The guides 212, 213 are inclined with respect to the direction in which the sticks move and extend substantially between the opposite end faces of the advancing drum, i.e. between the planes common to the longitudinal ends of the pockets 202.

FIGS. 6 to 8 illustrate a modified reversing arrangement which differentiates from the arrangements of FIGS. 1 to 5 in that the sticks are reversed in part mechanically and in part by pneumatic means. The arrangement of FIGS. 6 to 8 comprises an advancing means in the form of a rotary drum 101 which is formed with axially parallel peripheral holding means or pockets 102 and which is

mounted on a coaxial shaft **103** supported by an upright frame member M. The drum **101** is assumed to rotate in clockwise direction, as viewed in FIGS. 6 and 7. The pockets **102** are separated from each other by smooth-surfaced axially parallel radially extending partitions **106**.

Each pocket **102** is shaped in a manner as shown in FIGS. 9 and 13 to 17. The recesses in the median portions of these pockets are bounded by the smooth radially extending surfaces of the respective partitions **106** and by axially parallel flat central supporting surfaces **107***a* which are located intermediate convex supporting surfaces **107***c* and inclined substantially flat supporting surfaces **107**. In the illustrated embodiment, the advancing drum **101** is formed with a plurality of substantially radially extending ducts **104** which terminate in the supporting surfaces **107** and **107***c*. Each pocket **102** communicates with four ducts **104**, two or more ducts terminating in the supporting surface **107***c* and two or more ducts terminating in the supporting surface **107**. The supporting surface **107***c* forms part of a substantially flat supporting surface **107***b* (see FIG. 13) which extends all the way to the adjacent end face of the drum **101** and which supports reversed sticks Z_1 (see FIG. 17).

The drum **101** is disposed intemediate a dividing or transfer drum **113** and a take-off conveyer **114**. The drum **113** is formed with a plurality of equally spaced axially parallel holding means or pockets **113***a* and is mounted on a shaft **113***b* which is supported by the frame member M. The function of this drum **113** is the same as the function of the drum **222** illustrated in FIG. 5. Thus, the drum **113** receives groups G which are delivered into its pockets **113***a* and are thereupon halved by a rotary disc knife **117** which is mounted on a horizontal shaft **117***a* and whose cutting edge extends into a circumferential slot **113***c* of the drum **113**. The drum **113** is assumed to revolve in anticlockwise direction. Suitable shield means **113***d* are disposed about a portion of the drum **113** to retain the groups G and the sticks Z_1 and Z_2 in their respective pockets **113***a*. FIG. 7 illustrates only the shield **113***d* for the groups G and for the sticks Z_1.

The conveyer **114** assumes the form of two endless chains which are driven by a pair of sprockets **115** and whose links carry cradles **116** for reversed sticks Z'_1 and for non-reversed sticks Z_2. The properly aligned and spaced sticks Z'_1 and Z_2 advance in the direction indicated by the arrows **114***a* toward the next processing station, for example, to storage where the sticks are packed into boxes or into other types of receptacles. The sprockets **115** are driven in anticlockwise direction, i.e. in a direction counter to the direction in which the advancing drum **101** rotates.

The frame member M supports a stationary carrier **110** which in turn supports a curved blade-like retaining shield **108** extending upwardly from the conveyer **114** and substantially to the uppermost point of the drum **101**. The purpose of the retaining shield **108** is to prevent ejection of sticks Z_1 during the reversing operation under the action of centrifugal force in the event that the drum **101** is rotated at a speed exceeding a precalculated speed. The carrier **110** also supports one end of a single reversing guide **118** which is of arcuate shape and whose other end is connected to a collecting device in the form of a pan or tray **112** secured to the frame member M and located at a level above the dividing drum **113**. The purpose of the pan **112** is to collect any rejects which might have remained in certain pockets **102** and which, in the absence of this pan, would drop onto the dividing drum **113**, thus hindering proper operation of the reversing arrangement.

The carrier **110** further supports pairwise arranged retaining shields **109** one pair of which is illustrated in FIG. 6. The purpose of the illustrated shields **109** is to retain the sticks Z_1 on their way between the drum **113** and the take-off conveyer **114**. The construction of the shields associated with the left-hand or rear portion of the drum **101**, as viewed in FIG. 6, is the same as the construction and mounting of the shields **109** for the sticks Z_1.

The front end portion of the reversing guide **118** extends radially inwardly and beyond the inclined supporting surfaces **107** of the pockets **102** and thereupon forms a loop whose free end is connected to the carrier **110**. As can be observed in FIG. 8, the projection of the guide **118** onto a horizontal plane passing through the axis of the shaft **103** is a straight line. The blade **108** is bent and terminates at a point slightly to the right of the central plane of the drum **101**, as viewed in FIG. 8, i.e. to the right of the flat bottom surfaces **107***a*.

FIGS. 6 and 7 illustrate in phantom lines certain zones through which the pockets **102** travel while moving about the axis of the shaft **103**. These zones include a zone D which extends substantially from the front end portion of the single reversing guide **118** and to the uppermost point of the drum **101**, a second zone E which extends from the uppermost point of the drum **101** and to a point slightly above the transfer station between the drums **113**, **101**, and a third zone F which is located at the downstream side of the zone E. While advancing through the zone D (FIGS. 13 and 14), certain of the ducts **104** communicating with the respective pockets **102** receive compressed air from a source **181** and the remaining ducts **104** are connected to a means **182** which creates partial vacuum (FIG. 9). In the zone E (FIGS. 16 and 17), the pockets **102** communicate with the means **182** which is then connected to the ducts **104** terminating in the respective supporting surfaces **107***b*, **107***c*. While advancing through the zone F, the ducts **104** are connected to the source **181** of compressed air so as to automatically eject any particles or non-evacuated sticks which might have remained in the respective pockets **102**. Thus, the ducts **104**, together with the associated source **181**, replace the ejecting devices shown in FIG. 5. The zone F is adjacent to the upper side of the pan **112** so that any impurities or sticks ejected from the pockets **102** are automatically collected in the pan before dropping onto the dividing drum **113**.

The drum **101** is formed with an odd number of pockets **102** in contrast to the drum **113** which is formed with an even number of pockets **113***a*. In addition, and as explained in connection with FIG. 5, the angular distance between the pockets **102** equals one-half of the angular distance between the pockets **113***a*. The spacing between the cradles **116** carried by the chains of the conveyer **114** equals the spacing between the pockets **102**.

As shown in FIG. 9, the stationary shaft **103** of the advancing drum **101** is formed with an axially parallel suction channel **104***a* connected to the vacuum creating means **182** and with a second channel **104***b* which latter delivers compressed air from the source **181** to the ducts **104**. In addition, the shaft **103** is formed with a plurality of radially extending bores (shown in FIGS. 10, 11 and 12) which respectively connect the channels **104***a*, **104***b* with specially configurated peripheral grooves **105** provided in the shaft **103** (see FIGS. 10–12). The grooves **105** communicate with selected ducts **104** of certain pockets **102** when the drum **101** rotates about its shafts **103**. In FIGS. 10 to 12, the position of the grooves **105** is shown in relation to the zones D, E, F.

The arrangement of FIGS. 6 to 8 operates as follows:

The groups G delivered to the dividing drum **113** are halved by the knife **117** so that each group is transformed into a pair of coaxial sticks Z_1, Z_2. These sticks thereupon advance toward and are transferred into alternate pockets **102** of the advancing drum **101**. The sticks Z_2 advance along the respective shields corresponding to the shields **109** and are transferred into alternate cradles **116** carried by the chains of the conveyer **114**. The sticks Z_1 advance along the upper faces of the shields **109** shown in FIGS. 6 to 8 and their outer ends are en-

gaged by the front end portion of the single reversing guide 118. This guide causes the sticks Z_1 to pivot about their inner ends which, as shown in FIG. 14, rest on the flat bottom surfaces 107*a* of the respective pockets 102, so that each stick Z_1 is gradually inverted by moving from the non-reversed position shown in FIG. 13 through intermediate positions of FIGS. 14, 15 and 16 to the reversed position Z'_1 of FIG. 17.

FIG. 13 shows a stick Z_1 in a position it assumes at the very moment when it is engaged by the front end portion of the single reversing guide 118. This occurs at a time when the inner end of the stick Z_1 begins to descend toward the surface 107*a* under the action of gravity. In other words, the arrangement of FIGS. 6 to 8 is such that it takes advantage of the natural tendency of the sticks Z_1 to move with their inner end portions toward the bottom surfaces 107*a* without requiring any means for bringing about such initial tilting movement. As explained hereinabove, the purpose of the shield 108 is to retain the sticks Z_1 during the reversing operation in the event that the centrifugal force would tend to eject the sticks or to move their outer end portions away from sliding contact with the outer face of the reversing guide 118. The tendency of sticks Z_1 to leave their respective pockets 102 under the action of centrifugal force is reduced as the sticks continue to travel toward the uppermost point of the advancing drum 101. In fact, as the sticks continue to travel toward the uppermost point of the drum 101, the force of gravity tends to maintain them in the pockets 102 so that the shield 108 can actually terminate at a point slightly or substantially below the uppermost point of the advancing drum.

Once the reversing guide 118 tilts a stick Z_1 beyond the position of FIG. 15, the inner end portion of the stick (i.e. the fiilter tip K) rolls along the arcuate supporting surface 107*c* so that the stick is automatically deposited on the supporting surface 107*b* of the respective pocket 102 and assumes the position Z'_1 which is illustrated in FIG. 17. Since the arrangement of FIGS. 6 to 8 utilizes a single guide 118, the defective sticks are not reversed and are free to drop by gravity into the pan 112 before returning to the transfer station between the drums 113, 101.

The bottom surfaces 107*a* act as stops for the filter tips K and prevent sliding of the sticks Z_1 during reversal under the action of the guide 118. Should a stick begin to slide along the inclined surface 107, its filter tip comes into abutment with the convex surface 107*c* so that any further sliding movement is prevented in a fully automatic way.

The arrangement of FIGS. 6 to 8 operates in the above described manner in the event that the pneumatic component of the reversing means is inactive. However, if the operator desires to utilize the pneumatic component, he may remove or dispense with the shield 108 because the function of this shield is then performed solely by compressed air and by the vacuum creating means 182. Again referring to FIGS. 13 to 17, it will be noted that these illustrations do not show the shield 108 because this shield is an optional feature since the sticks Z_1 may be reversed by the guide 118 and/or by the action of air, namely by compressed air discharged through one group of ducts 104 and by air sucked into another group of ducts 104. The direction in which the air is admitted or evacuated in indicated by arrows in each of FIGS. 13 to 17.

When a pocket 102 enters the zone D, the duct 104 nearest to the surface 107*a* and terminating in the inclined supporting surface 107 communicates with the vacuum creating means 182 (see FIG. 13), whereas the other duct 104 also terminating in the supporting surface 107 communicates with the source 181 so that the two streams of air (one entering the inner right-hand duct 104 and the other passing outwardly through the outer right-hand duct 104) bring about a tilting movement of the stick Z_1 in that the filter K of this stick moves toward the bottom surface 107*a* to assume the position illustrated in FIG. 14. The stream of air drawn into the inner right-hand duct 104 replaces the shield 108 because it actually sucks the filter tip K of the stick Z_1 against the bottom surface 107*a* in the respective pocket 102 and thereby prevents the centrifugal force from ejecting the stick radially outwardly with respect to the advancing drum 101. The blast of air discharged through the rightmost duct 104 in the pocket 102 of FIG. 13 serves as a means for bringing the filter tip K into the range of the air drawn into the other right-hand duct 104. During the initial phase of travel of the pocket 102 through the zone D, the left-hand pair of ducts 104, as viewed in FIGS. 13 and 14, need not be connected with the source 181 and/or with the means 182. Of course, while being subjected to the action of air streams passing through the ducts 104 which terminate in the supporting surface 107, the outer end portion of the respective stick Z_1 may be guided by the guide face of the guide 118 and is also guided by the smooth radial surfaces of the adjacent partition 105 which latter insures that the stick Z_1 cannot be tilted in a plane other than the radial plane passing longitudinally through the respective pocket 102.

FIGS. 15 to 17 illustrate the stick Z_1 in positions it assumes while the respective pocket 102 travels through the zones E and F. The right-hand pair of ducts 104, as viewed in FIGS. 15 and 16, is now sealed from the source 181 and from the means 182, whereas the left-hand pair of ducts 104 is free to communicate with the means 182 so that the air streams flowing into the left-hand pair of ducts 104 assist the guide 118 or by themselves reverse the stick Z_1 by drawing the filter tip K of the stick against and by causing the filter tip to roll along the convex supporting surface 107*c* so that the stick ultimately comes to rest on the substantially horizontal supporting surface 107*b*. The left-hand ducts 104 remain in communication with the means 182 through the entire zone E so that the inverted or reversed stick Z'_1 (FIG. 17) adheres to the supporting surface 107*b* until it reaches the upper run of the take-off conveyer 114.

FIG. 17 illustrates a pocket 102 which is assumed to travel through the zone F. It will be noted that the right-hand pair of ducts 104 which terminate in the inclined supporting surface 107 discharges blasts of compressed air which flows radially outwardly so as to automatically expel any fragments of tobacco or other impurities which might have accumulated in the pocket 102. In other words, when the pocket 102 reaches the transfer station between the drums 113, 101, it is ready for reception of another pair of sticks Z_1, Z_2. The particles or impurities ejected from the pockets 102 by the blasts of air admitted in the zone F drop onto the pan 112 whence they may be removed in a fully automatic way or at certain intervals whenever it becomes necessary.

As explained in connection with FIG. 5, the movements of the advancing drum and of the dividing drum may be synchronized in such a way that the dividing drum transfers sticks Z_1, Z_2 into first, third, fifth, etc. pockets during a first revolution of the advancing drum, and into the second, fourth, sixth etc. pockets during the next revolution of the advancing drum. Such synchronization renders it possible to deliver non-reversed sticks Z_2 together with the reversed Z'_1 without any interference on the part of sticks Z'_1.

FIG. 18 illustrates a reversing arrangement which embodies purely pneumatic reversing means, i.e. which operates without any mechanical reversing means such as the guides 12, 13 of FIG. 1, the guides 212, 213 of FIG. 5 or the single guide 118 of FIGS. 6 to 8. The slightly modified advancing drum 101′ is formed with a plurality of peripheral pockets 120 whose configuration corresponds substantially to that of the pockets 2 shown in FIGS. 1 to 4. Thus, the composite bottom surface of each pocket

120 comprises a flat median bottom surface 122, two arcuate bottom surfaces 126, 127 which extend outwardly from opposite sides of the median surface 122, and two substantially straight or flat surface portions adjacent to the outer ends of the pocket 120. The pockets 120 are separated by smooth-surfaced partitions 121 which assist the pneumatic means in reversing the position of the sticks Z_1.

The interior of the advancing drum 101' is formed with a large number of substantially radially extending ducts 123 which terminate in the supporting surfaces 126, 127 and which are preferably concentrated in the areas immediately or closely adjacent to the median bottom surface 122.

The periphery of the fixed shaft 125 on which the drum 101' is mounted is provided with a helical groove 124 which communicates with radially extending bores 124*a* leading to an axially parallel channel 123*a* serving as a means for connecting the groove 124 with a means 182 for creating partial vacuum.

The arrangement of the ducts 123 and the configuration of the helical groove 124 in the periphery of the shaft 125 are such that a stick Z_1 is automatically reversed while the drum 101' rotates about the axis of the shaft 125. Thus, in the initial stage of reversing operation, suction is created in the ducts 123 adjacent to the right-hand end of the bottom surface 122 so that the filter tip K of the stick Z_1 is caused to descend into the recess of the pocket 120 and that the stick simultaneously slides along the smooth surface of the adjacent partition 121. The stick is tilted at such rate of speed that it automatically moves through and beyond its dead-center position Z''_1 and starts to roll with its filter tip K along the arcuate surface 127. During such tilting movement, the stick Z_1 is assisted by suction created at that time in the left-hand ducts 123 leading to the respective supporting surface 127 so that the moving stick may be reversed without the assistance of any mechanical means other than the partitions 121 bounding the respecting pocket 120. Of course, it may be desired to provide in the arrangement of FIG. 18 a guide analogous to the guide 118 of FIGS. 6 to 8 in order to make sure that, provided some of the ducts 123 become clogged after a certain period of actual use, the arrangement is still capable of reversing the position of the sticks Z_1.

Since the arrangement of FIG. 18 is not assumed to utilize mechanical reversing means, such as arcuate guides, and the like, the axial length of the drum 101' may be increased so that the length of the pockets 120 may equal or may even exceed the combined length of two aligned sticks Z_1. The means 182 may assume the form of a conventional fan or blower.

A very important advantage of the improved reversing arrangement is that, in contrast to certain conventional arrangements utilized in the manufacture of tobacco-containing products, the holding means for the sticks need not pivot with the sticks during the reversing operation. Therefore, the construction of the advancing means may be simplified and the entire arrangement is much less prone to malfunction since the holding means may simply assume the form of pockets formed in the periphery of the drum and the reversing operation may be carried out without any moving means other than the advancing drum and the means which transfer the sticks to the advancing drum and which receive the sticks from the pockets of the advancing drum. All that is necessary is to provide means which retain the sticks in the planes of the respective pockets (i.e. the radial surfaces of the partitions which separate the pockets from each other) and to provide means which compel the sticks to describe arcs of 180 degrees while remaining with one end thereof in the pockets of the advancing means.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic and specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. A reversing arrangement for elongated sticks, comprising a plurality of elongated holding means each having a first end and a second end; means for transferring sticks into said holding means so that one end of each stick is located intermediate the ends of the respective holding means; and combined pneumatic and mechanical means for automatically reversing the sticks in the respective holding means by tilting the same about said ends thereof in planes passing through the respective holding means, said reversing means comprising at least one fixed reversing guide.

2. A reversing arrangement for elongated sticks, particularly for rod-shaped articles constituting or forming part of tobacco-containing products, comprising advancing means including a plurality of elongated parallel pockets each having a first end and a second end, and smooth-surfaced partition means for separating said pockets from each other; means for moving said advancing means in a direction substantially perpendicular to the longitudinal extensions of said pockets; means for consecutively transferring sticks into said pockets so that one end of each stick is located intermediate the ends of the respective pocket; and means for automatically reversing the sticks in the respective pockets by tilting the same about said ends thereof in radial planes passing through the respective pockets so that the smooth-surfaced partition means retain the sticks in the respective planes during tilting.

3. A reversing arrangement for elongated sticks, particularly for rod-shoped articles constituting or forming part of tobacco-containing products, comprising a plurality of elongated parallel holding means each having a first end and a second end; means for moving said holding means in a direction substantially perpendicular to the longitudinal extensions thereof; means for consecutively transferring sticks into said holding means so that one end of each stick is located intermediate the ends of the respective holding means and that the other end of each stick is adjacent to one end of the respective holding means; and means for automatically reversing the sticks in the respective holding means by tilting each stick about said one end thereof in a plane passing through the respective holding means and substantially perpendicular to the direction of movement of said holding means, said reversing means comprising at least one fixed reversing guide adjacent and inclined with respect to the longitudinal extensions of said holding means and located past said transferring means, said guide having guide face means engaging the consecutive sticks for guiding the sticks in said planes while the sticks move in said direction so that, upon reversing its position, each stick has its other end adjacent to the other end of the respective holding means.

4. A reversing arrangement for elongated sticks, comprising a plurality of elongated holding means each having a first end and a second end; means for transferring sticks into said holding means so that one end of each stick is located intermediate the ends of the respective holding means; and pneumatic means cooperating with said holding means for automatically reversing the sticks by tilting the sticks in the respective holding means about said ends thereof in planes passing through the respective holding means, said reversing means comprising means for creating partial vacuum and duct means provided in said holding means and connected with said vacuum creating means.

5. An arrangement as set forth in claim 4, wherein said holding means are pockets having stick-supporting bottom surfaces and said duct means terminate in said bottom surfaces.

6. An arrangement as set forth in claim 5, wherein each of said pockets has an inclined substantially flat bottom surface for supporting the sticks prior to the reversal thereof and an at least partially convex bottom surface for supporting the sticks after reversal thereof.

7. An arrangement as set forth in claim 5, wherein each of said pockets has a first bottom surface for supporting the sticks prior to the reversal thereof and a second bottom surface for supporting the sticks after reversal thereof, said reversing means further comprising a source of compressed gas and second duct means provided in said holding means, said second duct means terminating in said first bottom surfaces and connected with said source of compressed gas so that compressed gas may assist in tilting of the sticks and, upon reversal of the sticks, evacuates impurities which might accumulate in said pockets.

8. A reversing arrangement for elongated sticks, comprising a rotary advancing drum having a plurality of elongated axially parallel peripheral holding means, each of said holding means having a first end and a spaced second end; means for consecutively transferring into alternate holding means pairs of axially aligned sticks so that the adjacent ends of the pairwise arranged sticks are located between the ends of the respective holding means, that the pairwise arranged sticks are transferred into the oddly numbered holding means during a first revolution of said drum and that the pairwise arranged sticks are transferred into evenly numbered holding means during the next revolution of said drum; take-off means located past said transferring means for receiving from said holding means one of each pair of said sticks before said one stick returns to said transferring means; and means for automatically reversing the other of each pair of said sticks in the respective holding means while said other sticks advance from said take-off means to said transferring means so that each other stick is tilted about said end thereof in a plane passing through the axis of said drum and, upon reversal, occupies space previously occupied by the originally aligned one stick of the respective pair.

9. A reversing arrangement as set forth in claim 8, wherein said transferring means is a revolving drum having an even number of elongated axially parallel peripheral pockets for the pairwise arranged sticks and wherein said advancing drum is provided with an odd number of holding means.

10. A reversing arrangement as set forth in claim 9, wherein said drums are rotatable about parallel horizontal axes and said reversing means comprises at least one fixed reversing guide located above said advancing drum and inclined with respect to the longitudinal extensions of said holding means, said guide having a front portion located in the path of said other sticks and guide face means engaging and compelling the sticks to turn in the respective planes and about said ends thereof.

11. A reversing arrangement as set forth in claim 10, wherein each of said holding means has a substantially centrally located recess and said drum comprises axially parallel partitions separating said holding means from each other, said partitions having circumferentially aligned notches adjacent to the respective recesses, said reversing means further comprising a stationary tilting guide extending into said notches for automatically tilting said other sticks into engagement with said guide face, said tilting guide located intermediate said take-off means and said reversing guide.

12. A reversing arrangement as set forth in claim 10, wherein said take-off means is a conveyer having a stick-receiving upper run and adjacent to one side of said advancing drum opposite said transfering means.

13. A reversing arrangement as set forth in claim 10, wherein the angular distance between the pockets of said transferring means equals one-half the angular distance between the holding means of said advancing drum.

14. A method of automatically reversing one of each pair of pairwise arranged elongated parallel sticks, comprising the steps of moving the pairwise arranged sticks in a circular path about an axis which is parallel with the longitudinal extensions of said sticks; removing the other of each pair of sticks from said path before the other stick completes a full revolution about said axis; and reversing said one stick of each pair of sticks by tilting the one stick in a radial plane passing through said axis so that the one stick is turned through 180 degrees and occupies space previously occupied by the corresponding other stick.

15. A method as set forth in claim 14, wherein said sticks are cigarettes having filter tips and the filter tips of each pair of cigarettes are adjacent to each other prior to removal of said other cigarettes.

16. An inverting arrangement for cigarettes and similar rod-shaped articles, comprising a conveyer; a plurality of elongated holding means provided on and extending substantially transversely to the direction of movement of said conveyer; means for introducing rod-shaped articles into said holding means in such a way that one end of each article is located intermediate the ends of the respective holding means; means for retaining the articles against substantial sliding in the longitudinal direction of the respective holding means so that said one end of each article is kept at a substantially constant distance from the ends of the respective holding means; and lifting means for tilting the thus retained articles through substantially 180 degrees and about said one end thereof to thereby transfer the articles from a portion of the corresponding holding means at one side to a portion of the same holding means at the other side of said one end thereof.

17. An inverting arrangement as set forth in claim 16, wherein said portions of each of said holding means are aligned with each other and wherein such aligned portions are at least slightly spaced from each other so that said one end of each rod-shaped article is located intermediate the spaced portions of the corresponding holding means.

18. An inverting arrangement as set forth in claim 17, wherein each of said holding means is provided with a recess located intermediate the aligned portions thereof, said one end of each rod-shaped article extending into the corresponding recesses during tilting in response to engagement by said lifting means.

19. An inverting arrangement for cigarettes and similar rod-shaped articles, comprising a conveyer having a plurality of grooves extending substantially transversely to the direction of movement thereof; means for introducing rod-shaped articles into consecutive grooves of said conveyer in such a way that one end of each article is located intermediate the ends of the respective grooves; means cooperating with said grooves for retaining the articles against substantial sliding in the longitudinal direction of the respective grooves so that said one end of each article is kept at a substantially constant distance from the ends of the respective groove; and lifting means for tilting the thus retained articles through substantially 180 degrees and about said one end thereof to thereby transfer the articles from a portion of the corresponding groove at one side to a portion of the same groove at the other side of said one end thereof.

20. An inverting arrangement for cigarettes and similar rod-shaped articles, comprising a conveyer having a plurality of elongated holding means extending substantially transversely to the direction of movement of said conveyer; means for introducing rod-shaped articles into holding means in such a way that one end of each article is located intermediate the ends of the respective holding means and that an end portion of each article extends

outwardly and beyond one end of the respective holding means; means for retaining the articles against substantial sliding in the longitudinal direction of the respective holding means so that said one end of each article is kept at a substantially constant distance from the ends of the respective holding means; and lifting means for lifting the outwardly extending end portions of the thus retained articles and for thereby tilting each article through substantially 180 degrees about said one end thereof to thereby transfer each article from a portion of the corresponding holding means at one side to a portion of the same holding means at the other side of said one end thereof.

21. An inverting arrangement for cigarettes and similar rod-shaped articles, comprising a rotary drum having a plurality of equidistant axially parallel peripheral grooves; means for introducing rod-shaped articles into said grooves in such a way that one end of each article is located intermediate the ends of the respective groove; means for retaining the articles against substantial sliding in the longitudinal direction of the respective grooves so

that said one end of each article is kept at a substantially constant distance from the ends of the respective grooves; and lifting means for tilting each of the thus retained articles through substantially 180 degrees and about said one end thereof to thereby transfer each article from a portion of the corresponding groove at one side to a portion of the same groove at the other side of said one end thereof.

References Cited by the Examiner

UNITED STATES PATENTS

2,355,597	8/44	Pond	198—33 X
2,857,039	10/58	Whitecar	198—33
2,974,774	3/61	Stuart	198—33
2,988,198	6/61	Pinkham	198—33 X
3,000,488	9/61	Rowlands	198—33

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