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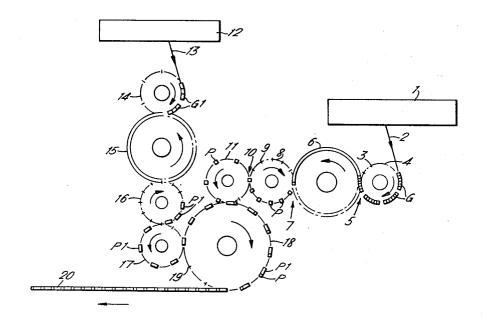
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[21]	Appl. No.	741.186	
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[45]	Patented	Dec. 29, 1970	
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[32]	Priority	July 12, 1967	
[33]		Great Britain	
[31]		No. 32,075/67	
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[54]		G RODLIKE ARTICLES 7 Drawing Figs.	
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[50]	Field of Sea	rch	
		30, 31(A1), 32, 34; 131/94; 83/158; 93/10	Ċ

ABSTRACT: Filter plugs abutted end to end and moving in line are separated endwise by two pairs of rotatable, side-byside discs, the discs of each pair being inclined to each other and having peripheral carriers which alternate with each other. The carriers of the first two discs are at one position in line to receive successive plugs, then diverge to stagger the plugs and transfer them to similar carriers on the second pair of faster moving discs, which accelerate the plugs and then converge to bring them back into line but spaced apart end-

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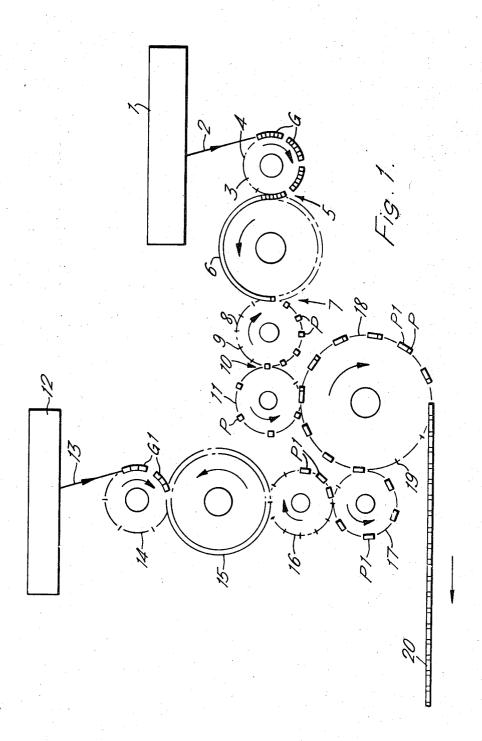
Primary Examiner-Edward A. Sroka Attorney-Craig, Antonelli, Stewart & Hill



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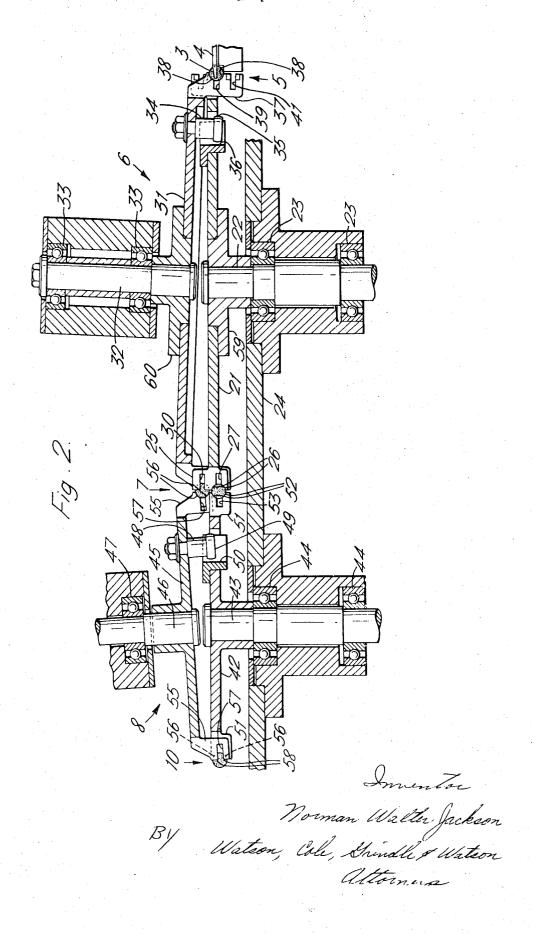
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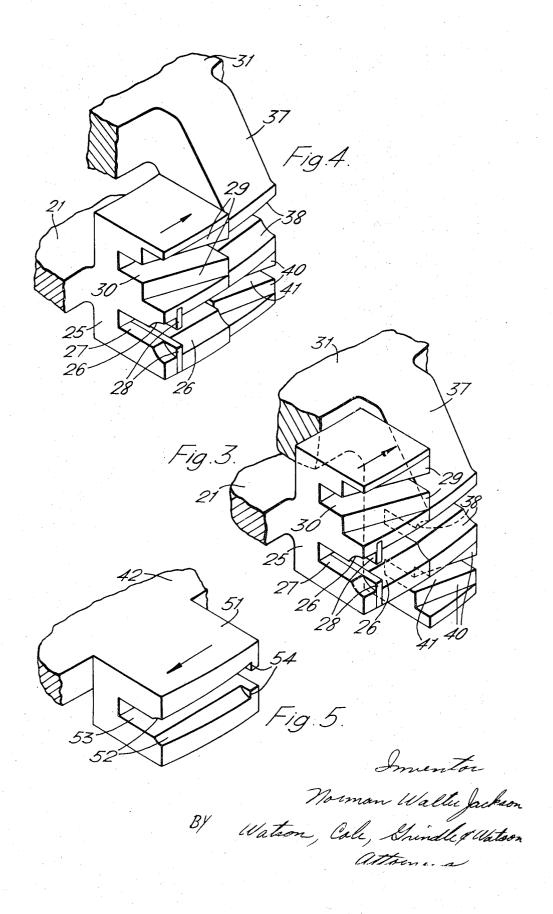


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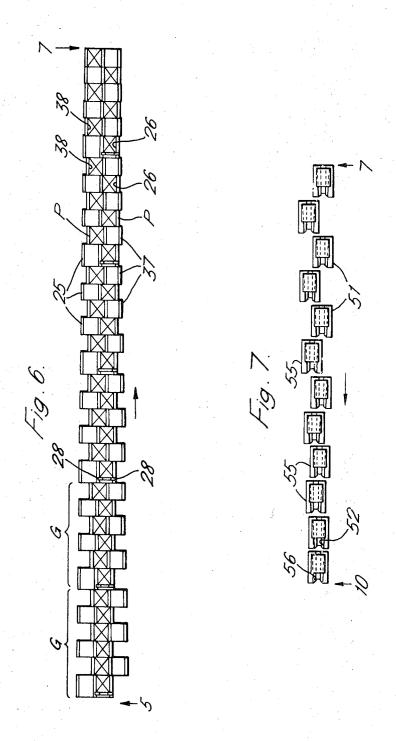
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Moman Walter Jackson

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HANDLING RODLIKE ARTICLES

BACKGROUND OF THE INVENTION

This invention concerns improvements in or relating to handling rodlike articles and in particular to methods of and apparatus for feeding rodlike articles, such as filter plugs.

In the manufacture of mouthpiece cigarettes it is frequently desired to feed endwise filter plugs, i.e. rods of material suitable for incorporation in the mouthpiece of a cigarette and of a length equal to or double that required in the final mouthpiece, endwise (i.e. with one end face leading and the other end face trailing) in spaced succession. For example, in the manufacture of a continuous composite filter rod, filter plugs of one material may be fed endwise in spaced succession 15 into spaces between filter plugs of another material similarly fed endwise in space succession, to produce a line of endwise moving filter plugs of different materials in alternation. This line of plugs can then be wrapped as a continuous rod from which multiple length composite rods can be cut for later sub- 20 division into composite mouthpieces, i.e. mouthpieces each containing at least two filter plugs of different materials. Difficulties may sometimes be encountered in feeding short filter plugs, i.e. plugs having a length comparable with (for example equal to or only slightly greater than) their diameter, which it 25 may be desired to incorporate in a composite filter rod.

Filter plugs are frequently produced by cutting multiple length filter rods into segments so that a group of filter plugs in endwise abutment is formed from each filter rod. To feed these filter plugs endwise in spaced succession it is obviously 30 necessary to effect an endwise spacing between them. A desired endwise spacing can be effected by the action of a pusher or the like against the end face of a plug to space it from the adjacent plug, but the end face against which the pusher is to act must first be exposed. The exposure of the end 35 face may be effected by causing lateral displacement of the plug relative to the adjacent plug so as to move the axes of the two plugs out of alignment. In U.S. Pat. No. 3,009,557 there is disclosed an arrangement wherein each plug in succession of a group of endwise moving plugs is laterally displaced from the 40 next following plug by means of an inclined surface or ramp and a lifting finger or pusher element over which the plugs travel.

SUMMARY OF THE INVENTION

According to the present invention there is provided a method of spacing endwise a line of endwise moving and endwise abutted rodlike articles, comprising the steps of staggering the articles by displacing alternate articles sideways rela- 50 tively to the others, accelerating all the articles while they are so staggered, and then bringing all the articles into line again by displacing alternate articles relatively to the others.

The articles may be spaced far enough apart endwise to receive further articles between them. The method may in- 55 clude the further steps of inserting, between and in line with the spaced articles, further rodlike articles of different character from the first said articles, and then reducing the speed of endwise movement of all the articles to cause them to abut endwise.

The invention further provides a method of feeding rodlike articles comprising the steps of feeding articles endwise in a first planar path, preferably forming part of a circle, and feeding further articles endwise in a second planar path, preferably forming part of a circle, wherein said first and second paths lie 65 in relatively inclined planes and pass through a common position at which said articles are interposed between said further articles.

Further according to the present invention there is provided a method of feeding rodlike articles, such as filter plugs, com- 70 prising the steps of feeding endwise a succession of articles in endwise abutment along a common path, then conveying alternate ones of said articles endwise along a first path, and conveying the other ones of said articles endwise along a second path which diverges from said first path so that said 75 one to the other so that the receivers on one member travel in

other ones become laterally displaced from said alternate ones of said articles.

The method may further comprise the steps of increasing the speed of travel of the articles after said other ones have become laterally displaced from said alternate ones, so as to effect endwise spacing between successive articles, moving said alternate ones and said other ones endwise in paths which converge to a delivery position, and conveying the articles endwise along a common path from the delivery position with said alternate ones in alternation with and in endwise spaced relationship to said other ones.

The invention further provides apparatus for feeding rodlike articles comprising conveyor means to feed a succession of articles endwise, said conveyor means having article receivers each adapted to receive and carry an article, and means to move selected, e.g. alternate, ones of said receivers with a component of movement in a direction transverse to the direction of travel of the other ones of said receivers so as to displace selected, e.g. alternate, ones of said articles laterally relative to the other ones of said articles.

The present invention further provides apparatus for feeding rodlike articles comprising first conveyor means to convey articles endwise and having article receivers each adapted to receive and carry an article and arranged to travel in a first continuous planar, preferably circular, path, and second conveyor means to convey articles endwise and having article receivers each adapted to receive and carry an article and arranged to travel in a second continuous planar, preferably circular, path, wherein said first and second paths lie in relatively inclined planes and diverge from and converge to a common receiving position through which the receivers of both conveyor means pass with the receivers of said first conveyor means interposed between the receivers of said second conveyor means.

Further according to the invention there is provided apparatus for feeding rodlike articles, such as filter plugs, comprising feeding means to feed endwise a succession of articles (e.g. in endwise abutment) along a common path to a receiving position, first conveyor means having article receivers arranged to receive alternate ones of said articles at said receiving position and to convey them endwise therefrom in a first path, and second conveyor means having article receivers arranged to be interposed between the article receivers of said 45 first conveyor means as they travel through said receiving position to receive the other ones of said articles and to convey them endwise from said receiving position in a second path which diverges from said first path so that said other ones become laterally displaced from said alternate ones of said articles.

The apparatus may comprise third conveyor means having article receivers arranged to receive said alternate ones of said articles from said first conveyor means, and fourth conveyor means having article receivers arranged to receive said other ones of said articles from said second conveyor means, said third and fourth conveyor means being arranged to convey the articles endwise at a speed greater than the speed of conveyance by said first and second conveyor means, to effect endwise spacing between successive articles, and in paths which converge to a delivery position at which the article receivers of said third conveyor means become interposed between the article receivers of said fourth conveyor means, the apparatus further comprising delivery means to receive and convey the articles endwise along a common path from said delivery position with said alternate ones in alternation with and in endwise spaced relationship to said other ones.

Said first and second conveyor means may comprise disclike members having peripheral article receivers and rotatable about axes inclined one to the other so that the receivers on one member travel in a path which diverges from that of the receivers on the other member. Said third and fourth conveyor means may similarly comprise disclike members having peripheral article receivers and rotatable about axes inclined

a path which converges towards that of the receivers on the other member.

Further according to the invention there is provided apparatus for feeding a line of rodlike articles endwise and spacing them apart endwise, comprising a pair of side-by-side conveyors each having carriers which alternate with carriers on the other, the conveyors being arranged to diverge from a position at which the carriers of one are interposed between those of the other so that the carriers can receive articles in said line, to a position at which the carriers of one conveyor are separated laterally from those of the other, accelerating means having elements to engage the rear ends of articles so separated and to increase the speed and endwise spacing of said articles, and means to return the spaced articles into a single line in which they are spaced apart endwise.

Further according to the invention there is provided article conveying apparatus for spacing apart endwise a succession of endwise abutted rodlike articles, while carrying articles from a receiving position through a transfer position to a delivery 20 position, the apparatus comprising a first and a second pair of rotatable, side-by-side discs, each disc of each pair having peripheral carriers alternating with, and capable of intercalation with, those of the other disc of the pair, the discs of each pair being inclined to one another so that the carriers of the 25 first pair are intercalated and in line at the receiving position so as to receive said endwise abutted articles, one article to each carrier, and those of the second pair are intercalated and in line at the delivery position so as to deliver spaced articles in line, and so that the carriers of both pairs are laterally separated at the transfer position, the carriers of the first pair being arranged to register at the transfer position with those of the second pair, the second pair of discs being arranged to first pair so as to accelerate the articles and thereby increase their spacing.

BRIEF DESCRIPTION OF THE DRAWING

Apparatus in accordance with the invention will now be described, by way of example, with reference to the accompanying drawing, in which:

FIG. 1 is a diagrammatic plan view of filter plug feeding apparatus in a continuous composite filter rod making machine,

FIG. 2 is a section through part of the apparatus shown in

FIGS. 3, 4 and 5 are perspective views of parts of the apparatus shown in FIG. 2, and

FIGS. 6 and 7 are diagrammatic views of the travel of plugs 50 through the apparatus shown in FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

material are contained in a hopper 1, from which they are received in successive flutes of a rotating fluted drum and, whilst in the flutes, are severed by disc knives to produce, from each filter rod, a group of six filter plugs in endwise abutment. Successive such groups of plugs are fed endwise from 60 the flutes of the drum in the direction indicated by the arrowed line 2 by means of an endless chain carrying pushers. The fluted drum, disc knives and endless pusher chain are not shown in FIG. 1 but are of the form described in the aforementioned patent.

The groups of plugs, indicated as G in FIG. 1, are fed into the range of action of peripheral pusher fingers 3 on a horizontal disc 4 which rotates clockwise as viewed in FIG. 1. For convenience, the directions of rotation of the parts described below with reference to FIG. 1 will be given as viewed and in- 70 dicated by arrows in that FIG. A pusher finger 3 engages against the trailing end face of the rearmost plug of each group G and feeds the succession of plugs in the group endwise to a receiving position, generally indicated at 5, with a small gap between successive groups.

A conveyor device 6, rotating anticlockwise, receives the plugs at the receiving position 5 and conveys them endwise. The device 6 is described in detail below, and has peripheral plug receivers, each adapted to receive and carry a plug, alternate ones of which are arranged to move with a component of movement transverse to the direction of travel of the other receivers so that alternate plugs are displaced laterally relative to the other plugs. The maximum lateral displacement between adjacent plugs is at a transfer position 7 where the plugs are transferred from the conveyor device 6 to a further clockwise rotating conveyor device 8. The device 8 is also described in detail below, and has peripheral plug receivers effectively providing peripheral pushers 9 which can engage against the trailing end faces of the plugs, indicated as P, by reason of the exposure of the end faces through lateral displacement between adjacent plugs achieved by the conveyor device 6. The conveyor device 8 has a peripheral speed greater than that of the conveyor device 6 so that, by engagement of a pusher 9 behind each plug, the plugs P become spaced endwise as shown. The conveyor device 8 is arranged to convey the plugs endwise in spaced succession to a delivery position 10, and, whilst so conveying the plugs, to move the alternate ones which were laterally displaced relative to the other plugs by the conveyor device 6 back into position between said other plugs.

At the delivery position 10 the plugs are transferred to a horizontal anticlockwise rotating disc 11 having peripheral pusher fingers which engage behind the plugs. The disc 11 rotates at a speed greater than that of the conveyor device 8 so that the endwise spacing between successive plugs is increased.

Filter rods of a second material, different from that of the rods contained in the hopper 1, are contained in a second adapted to engage ends of articles carried by carriers of the 35 hopper 12 from which they are fed in the same manner as rods from the hopper 12 are subdivided to produce groups of three filter plugs. The filter plugs in these groups, indicated as G1, are fed endwise in the same manner as described above along a line 13, corresponding to the line 2, to a horizontal rotating disc 14, corresponding to the disc 4, which transfers them to a conveyor device 15, like the conveyor device 6. From the conveyor device 15 the plugs are received on a conveyor device 16, like the conveyor device 8, and having a peripheral speed greater than that of the device 15 so that the plugs, indicated as P1, become spaced endwise, the plugs then being transferred to a rotating horizontal disc 17, corresponding to the disc 11, and rotating with a peripheral speed greater than that of the conveyor device 16 to increase the endwise spacing between the successive plugs.

In this manner a succession of endwise spaced plugs P is fed on the disc 11 and a succession of endwise spaced plugs P1 is fed on the disc 17. The plugs are fed endwise from the discs 11 Referring firstly to FIG. 1, multiple length filter rods of one 55 and 17 on to a horizontal clockwise rotating disc 18 having peripheral pusher fingers 19 which engage behind the plugs P1, which are first received by the disc 18. The plugs P are then delivered into the spaces between the plugs P1, the latter being caused to abut the plugs P by reason of the pushers 19 acting against the plugs P1. A succession of endwise moving plugs P1 and P in alternation is thus fed by the disc 18 in abutted pairs, and delivered on to an endless conveyor belt moving at a speed less than the peripheral speed of the disc 18 such that the successive pairs of plugs become abutted on the belt to produce a continuous line 20 of endwise moving abutted plugs P1 and P in alternation. This line of plugs can then be enclosed and sealed in a continuous wrapper web to produce a continuous composite filter rod. The pushers 19 may, if desired, be retractable at the delivery position to the belt in known manner.

The conveyor devices and discs described above rotate in timed relationship such as to achieve feeding of the plugs in the manner described, and since the groups G1 contain three plugs P1 whereas the groups G contain six plugs P, groups G1 75 are fed from the hopper 12 at twice the rate that groups G are

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fed from the hopper 1, and the disc 14 and conveyor device 15 rotate twice as fast as the disc 4 and conveyor device 6 respectively, so that plugs P1 and P are delivered at the same rate of plugs per unit of time to the disc 18.

The conveyor devices 6 and 8, which are essentially the 5 same as the conveyor devices 15 and 16 respectively, will now be described with reference to FIG. 2, which is a section through the line joining the points 5, 7 and 10 of FIG. 1.

The conveyor device 6 comprises a lower horizontal conveyor disc 21 secured to a vertical driven shaft 22 rotatable in bearings 23 mounted in a frame 24. The disc 21 carries elements 25 at regularly spaced positions round its periphery. Each element 25 (see also FIGS. 3 and 4) has a lower portion provided with recessed part cylindrical surfaces 26 which are separated by a central slot 27, and which together provide a flute in which a plug can be received and carried. Every third element 25 round the disc 21 has pieces 28 projecting from the surfaces 26, as shown in FIGS. 3 and 4, for a purpose explained later. The upper portion of each element 25 has a recess provided with inclined ramplike surfaces 29, separated by a central slot 30, for a purpose described later.

Above the disc 21 is an upper conveyor disc 31 secured to a shaft 32 which is rotatable in bearings 33 and whose axis is inclined to the vertical, i.e. to the axis of the shaft 22. The disc 25 31 is rotated by means of a downwardly depending stub shaft 34 bolted to the disc and carrying a convex roller 35 which is engaged by a surface provided by a part 36 housed in a hole in the disc 21. Thus, rotation of the lower disc 21 effects rotation of the upper disc 31.

The upper disc 31 carries downwardly depending elements 37 at regularly spaced positions round its periphery such that the elements 37 are interposed between and in closely adjacent alternation with the elements 25 carried by the lower disc 21. Each element 37 (see FIGS. 3 and 4) has an upper portion corresponding to the lower portion of the elements 25 and having recessed part cylindrical surfaces 38 which are separated by a central slot 39 and which together provide a flute in which a plug can be received and carried. The lower portion of each element 37 corresponds to the upper portion of the elements 25, having a recess provided with inclined ramplike surfaces 40 separated by a central slot 41.

For convenience, the flutes provided by the part cylindrical surfaces 26 will be referred to hereinafter simply as flutes 26, 45 and the flutes provided by the part cylindrical surfaces 38 will be referred to simply as flutes 38.

Due to the inclination of the shaft 32 relative to the shaft 22 the flutes 38 in the elements 37 carried by the upper disc 31 travel in a circular path lying in a plane inclined to the horizontal plane in which the circular path travelled by the flutes 26 in the elements 25 carried by the lower disc 21 lies. These circular paths travelled by the flutes 38 and 26 diverge from and converge to the common transfer position 5 through which all the flutes 26 and 38 pass at the same level, so that at that position each flute 26 becomes interposed between the two adjacent flutes 38, and vice versa, and each flute 26 or 38 substantially aligns or registers with the next adjacent flute 38 or 26 respectively as it passes through the transfer position 5, as shown in FIG. 3.

The maximum lateral displacement between the divergent paths of the flutes 26 and 38 is at the position generally indicated as 7, which is 180° displaced from the transfer position 5. Thus the flutes 38 pass through the general position 7 laterally (i.e. approximately vertically) displaced from the horizontal path of the flutes 26 through that general position. This maximum displacement is such that a flute 26 in an element 25 passing through the position 7 is in substantial alignment or registry with the recess containing the inclined surfaces 40 in the next adjacent element 37, as shown in FIG. 4. Similarly a flute 38 in an element 37 passing through the position 7 is in substantial alignment or registry with the recess containing the inclined surfaces 29 in the next adjacent element 25.

The surface of the part 36 which engages the roller 35 to drive the upper disc 31 is of a sufficient height to maintain such engagement and drive throughout the rotation of the relatively inclined discs 21 and 31.

The operation of the conveyor device 6 is as follows:

The groups G of plugs P are fed endwise in spaced succession, but with the plugs in each group in endwise abutment, to the receiving position 5 by the pusher fingers 3 on the rotating disc 4. The plugs are received in the flutes 26 and 38 at the receiving position 5 through which both the flutes 26 and the flutes 38 pass in interposed relationship so that alternate plugs are received in flutes 26.

As previously mentioned, the flute 26 of every third element 25 has projections 28, and the apparatus is timed so that the trailing plug of each group G is received in the flute 26 of an element 25 having these projections, (the leading plug of each group therefore being received in the flute 38 of an element 37). The elements 25 whose flutes 26 are provided with projections 28 are slightly longer (considered in their direction of travel) than the other elements 25, whose length is substantially equal to the length of the plugs to be fed. In the case of the elements 25 with projections 28 the distance between the projections and the leading end of the flute 26 is substantially equal to the length of the plugs to be fed. The elements 37, and flutes 38 are of a length substantially equal to that of the plugs to be fed. The plugs are thus received in the flutes 38 and 26 in alternation, the trailing plug of each group being 30 received in a flute 26 having projections 28 which engage against the rear face of the plug. The slot 27, which extends between the projections 28 in the flute, permits the pusher finger 3 to pass between the projections as the plug is transferred. The distance between the trailing end of the flute 26 and the projections 28 corresponds to the gap between successive groups G so that the leading plug of the next succeeding group is received in the next adjacent flute 38.

The endwise travel of the plugs round the conveyor device 6 is illustrated in FIG. 6, which is a developed side view of half of the periphery of the conveyor device. As can be seen from this FIG., in which successive groups G are indicated, the alternate plugs received at the receiving position 5 in the flutes 38 of the elements 37 are moved with a component of movement transverse to the horizontal direction of movement of the other plugs carried in the flutes 26 of the elements 25, due to the relatively inclined and diverging paths of travel of the flutes 38 and 26. At the position 7 maximum lateral displacement between said alternate plugs and said other plugs is achieved.

The conveyor device 8 is generally similar to the conveyor device 6, having a lower horizontal disc 42 secured to a driven vertical shaft 43 rotatable in bearings 44 mounted on the frame 24, and an upper disc 45 secured to a shaft 46, whose axis is inclined to the vertical, and which is rotatable in bearings 47. The upper disc is rotated by means of a downwardly depending stub shaft 48 bolted thereto and carrying a convex roller 49 which is engaged by a surface of a part 50 fixed in a hole in the lower disc 42. Thus rotation of the lower disc 42 effects rotation of the upper disc 45, the part 50 being of sufficient height to maintain engagement with the roller 49 throughout the rotation of the relatively inclined discs 42 and 45.

The lower disc 42 carries, at positions regularly spaced for round its periphery, elements 51, one of which is shown in FIG. 5. Each element 51 has recessed part cylindrical surfaces 52 which are separated by a central slot 53 and which together provide a relatively long flute in which a plug can be received and carried. For convenience the flute provided by the surfaces 52 will hereinafter be referred to simply as the flute 52. At the trailing end of the flute 52, as considered in its direction of travel, are projections 54 which can engage against the end face of a plug carried in the flute.

The upper disc 45 carries, at positions regularly spaced round its periphery and over the spaces between elements 51

on the lower disc 42, downwardly depending elements 55. The elements 55 are similar to the elements 51, each having recess part cylindrical surfaces 56 (see the left-hand side of FIG. 2), separated by a central slot 57, and together providing a relatively long flute in which a plug can be received and carried 5 (which flute will, for convenience, be referred to hereinafter simply as a flute 56). Projections 58, like the projections 54, are provided at the trailing end of each flute 56.

As can be seen from FIG. 2, the shaft 46 is inclined relatively to the vertical shaft 43 in the direction opposite to that in 10 which the shaft 32 is inclined relatively to the vertical shaft 22. The flutes 52 travel in a circular path lying in a horizontal plane while the flutes 56, due to the inclination of the shaft 46 relative to the vertical, travel in a circular path which lies in a plane inclined to the horizontal plane. The circular paths of 15 the flutes 52 and 56 converge to and diverge from the common delivery position 10 through which all the flutes pass at the same level so that adjacent flutes 52 and 56 are in substantial alignment or registry as they travel through that position to interposed alternation. The maximum lateral (i.e. approximately vertical) displacement between the circular paths of the flutes 52 and 56 respectively is at the transfer position 7, so that the flutes 56 pass through that position at a higher level than the flutes 52.

This maximum displacement is arranged to correspond to 25 the maximum lateral displacement between the flutes 26 and 38 of the conveyor device 6 at the transfer position 7, so that the flutes 56 pass through that position at the same level as the flutes 38, and the flutes 52 pass through at the same level as the flutes 26. The conveyor devices 6 and 8 are timed so that each flute 56 registers with a flute 38, and each flute 52 registers with a flute 26 as the flutes travel through the transfer position 7. By such registration, the rear or trailing end face of a plug carried by a flute 38 is engaged by the projections 58 of 35 the registering flute 56. Since, as previously described, the conveyor device 8 has a faster peripheral speed than the conveyor device 6, the projections 58 move the plug forwardly relatively to the flute 38 and on to the inclined surfaces 29 in the recess of the next preceding element 25 (the flute 38 being 40 in substantial registry or alignment with this recess at the position 7 as previously described). These ramplike surfaces 29 move the plug outwardly from the conveyor device 6, thus assisting in the transfer of the plug into the flute 56. In the same way, the rear or trailing end face of a plug carried by a 45 flute 26 is engaged by the projections 54 of the registering flute 52, and is transferred into the flute 52 assisted by the inclined surfaces 40 in the recess of the next preceding element 37 (with which recess the flute 26 is in substantial alignment or registry at the position 7) on to which ramplike sur- 50 faces the plug is pushed because of the greater speed of the projections 54.

In this manner the said alternate plugs carried in the flutes 38 are transferred to the flutes 56, and the said other plugs carried in the flutes 26 are transferred to the flutes 52, and, 55 due to the greater peripheral speed of the conveyor device 8 (i.e. of the discs 42 and 45) relative to that of the conveyor device 6 (i.e. of the discs 21 and 31) a desired endwise spacing of the plugs is achieved. The elements 51 and 55 and flutes 52 and 56 are of course suitably dimensioned to allow this spac- 60

The endwise travel of the plugs on the conveyor device 8 is illustrated in FIG. 7, which is a developed side view of half the periphery of the conveyor device. The alternate plugs carried in the flutes 56 of the elements 55 are moved with a com- 65 ponent of movement transverse to the horizontal direction of movement of the other plugs carried in the flutes 52 of the elements 51, due to the relatively inclined and converging paths of travel of the flutes 56 and 52. At the delivery position 10 replaced between (but in endwise spaced relationship to) the other plugs.

At the delivery position 10 the plugs are delivered to the horizontal rotating disc 11 (FIG. 1) for onward transport in endwise spaced relationship as previously described.

Suitable guide surfaces (not shown) are provided round the conveyor devices 6 and 8, as well as round the other conveyor discs shown in FIG. 1, to ensure that the plugs travel round the discs, and strippers can be provided to assist in the transfer of plugs from one disc to another, for example positioned to pass through the slots 57 and 53 at the delivery position 10.

As can be seen from FIG. 6, the plugs P are of a size such that their length is only slightly greater than their diameter. It will be appreciated that different conveyor discs 21 and 31 with suitably dimensioned elements 25 and 37 can be provided to convey different sizes of plug as required. For this reason the discs 21 and 31 are secured to the shafts 22 and 32 by bosses 59 and 60 respectively (FIG. 2) so as to facilitate the fitting of different discs; the discs can simply be removed from the bosses and replaced by other discs.

It will further be appreciated that although the plug feeding apparatus is described above in a continuous composite filter rod making machine, it can be used in any other suitable machine, for example a mouthpiece cigarette making machine, in which plugs are to be fed endwise. Further, of course, similar apparatus can be used for feeding any other suitable form of rodlike article.

I claim:

1. A method of spacing endwise a line of endwise moving and endwise abutted rodlike articles, comprising the steps of staggering the articles by displacing alternate articles sideways relatively to the others, accelerating all the articles while they are so staggered, and then bringing all the articles into line 30 again by displacing alternate articles relatively to the others.

2. A method according to claim 1 wherein the articles are spaced far enough apart endwise to receive further articles between them.

3. A method according to claim 2, comprising the steps of inserting, between and in line with the spaced articles, further rodlike articles of different character from the first said articles, and then reducing the speed of endwise movement of all the articles to cause them to abut endwise.

4. A method of feeding rodlike articles comprising the steps of feeding articles endwise in a first planar path and feeding further articles endwise in a second planar path wherein said first and second paths form part of separate circles, lie in relatively inclined planes and pass through a common position at which said articles are interposed between said further arti-

5. A method of feeding rodlike articles, such as filter plugs, comprising the steps of feeding endwise a succession of articles in endwise abutment along a common path, then conveying alternate ones of said articles endwise along a first path, conveying the other ones of said articles endwise along a second path which diverges from said first path so that said other ones become laterally displaced from said alternate ones of said articles, increasing the speed of travel of the articles after said other ones have become laterally displaced from said alternate ones, so as to effect endwise spacing between successive articles, moving said alternate ones and said other ones endwise in paths which converge to a delivery position, and conveying the articles endwise along a common path from the delivery position with said alternate ones in alternation with and in endwise spaced relationship to said other ones.

6. Apparatus for feeding rodlike articles comprising first conveyor means to convey articles endwise and having article receivers each adapted to receive and carry an article and arranged to travel in a first continuous planar path, and second conveyor means to convey articles endwise and having article receivers each adapted to receive and carry an article and arranged to travel in a second continuous planar path, wherein said first and second paths lie in relatively inclined planes and the paths of travel meet so that the alternate plugs are 70 diverge from and converge to a common receiving position through which the receivers of both conveyor means pass with the receivers of said first conveyor means interposed between the receivers of said second conveyor means.

7. Apparatus according to claim 6 wherein said first and 75 second continuous planar paths are circular paths.

8. Apparatus for feeding rodlike articles, such as filter plugs, comprising feeding means to feed endwise a succession of articles along a common path to a receiving position, first conveyor means having article receivers arranged to receive alternate ones of said articles at said receiving position and to convey them endwise therefrom in a first path, second conveyor means having article receivers arranged to be interposed between the article receivers of said first conveyor means as they travel through said receiving position to receive from said receiving position in a second path which diverges from said first path so that said other ones become laterally displaced from said alternate ones of said articles, third conveyor means having article receivers arranged to receive said alternate ones of said articles from said first conveyor means, and fourth conveyor means having article receivers arranged to receive said other ones of said articles from said second conveyor means, said third and fourth conveyor means being arranged to convey the articles endwise at a speed greater than the speed of conveyance by said first and second con- 20 veyor means, to effect endwise spacing between successive articles, and in paths which converge to a delivery position at which the article receivers of said third conveyor means become interposed between the article receivers of said fourth means to receive and convey the articles endwise along a common path from said delivery position with said alternate ones in alternation with and in endwise spaced relationship to said other ones.

9. Apparatus according to claim 8, wherein the said third 30 and fourth conveyor means comprise disclike members having peripheral article receivers and rotatable about axes inclined one to the other so that the receivers on one member travel in a path which converges towards that of the receivers on the other member.

10. Apparatus for feeding rodlike articles, such as filter plugs, comprising feeding means to feed endwise a succession of articles along a common path to a receiving position, first conveyor means having article receivers arranged to receive alternate ones of said articles at said receiving position and to 40 convey them endwise therefrom in a first path, and second conveyor means having article receivers arranged to be interposed between the article receivers of said first conveyor means as they travel through said receiving position to receive the other ones of said articles and to convey them endwise 45

from said receiving position in a second path which diverges from said first path so that said other ones become laterally displaced from said alternate ones of said articles, said first and second conveyor means comprising disclike members having peripheral article receivers and being rotatable about axes inclined one to the other so that the receivers on one member travel in a path which diverges from that of the receivers on the other member.

11. Apparatus for feeding a line of rodlike articles endwise the other ones of said articles and to convey them endwise 10 and spacing them apart endwise, comprising a pair of side-byside conveyors each having carriers which alternate with carriers on the other, the conveyors being arranged to diverge from a position at which the carriers of one are interposed between those of the other so that the carriers can receive articles in said line, to a position at which the carriers of one conveyor are separated laterally from those of the other, accelerating means to increase the speed and endwise spacing of said articles and means to return the spaced articles into a single line in which they are spaced apart endwise.

> 12. Apparatus according to claim 11 wherein said accelerating means includes elements for engaging the rear ends of separated articles.

13. Article conveying apparatus for spacing apart endwise a succession of endwise abutted rodlike articles, while carrying conveyor means, the apparatus further comprising delivery 25 articles from a receiving position through a transfer position to a delivery position, the apparatus comprising a first and a second pair of rotatable, side-by-side conveyors, each conveyor of each pair having peripheral carriers alternating with, and capable of intercalation with, those of the other conveyor of the pair, the axes of the conveyors of each pair being inclined to one another so that the carriers of the first pair are intercalated and in line at the receiving position so as to receive said endwise abutted articles, one article to each carrier, and those of the second pair are intercalated and in line at the delivery position so as to deliver spaced articles in line, and so that the carriers of both pairs are laterally separated at the transfer position, the carriers of the first pair being arranged to register at the transfer position with those of the second pair, the second pair of discs being arranged to rotate faster than the first pair, and their carriers being adapted to engage ends of articles carried by carriers of the first pair so as to accelerate the articles and thereby increase their spacing.

> 14. Apparatus according to claim 13 wherein said conveyors comprise rotatable discs.

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