ABSTRACT OF THE DISCLOSURE

A feeding device for cigarettes, etc., in which the cigarettes descend between rotating horizontal shafts and guides below the shafts are provided with suction ports. Flow of cigarettes, etc., can be stopped by applying suction through the ports so that a cigarette is held in each space between adjacent guides.

This invention relates to feeding devices for cigarettes or other rod-like articles, primarily for use in apparatus for filling boxes, trays or the like with such articles.

While devices embodying the invention may be employed to handle a wide variety of rod-like articles, particular problems arise in the handling of cigarettes because they are of relatively low density, their paper wrappers are of low mechanical strength, and their quality and value may readily be reduced by rough handling which tends to cause loss of tobacco from their open ends. Cigarette-making machines, however, now operate at high speeds, e.g., 2,000 cigarettes per minute, so that high-speed handling of the cigarettes produced is necessary.

In U.S. application Ser. No. 367,826, filed May 15, 1964, now Patent No. 3,320,717, there is disclosed a feeding device for cigarettes or other rod-like articles, comprising a plurality of parallel shafts having their axes in a common horizontal plane, each of said shafts being of polygonal cross-section and being separated from each neighbouring shaft by a space of sufficient width to allow articles to be fed to pass therebetween, driving means connected to all said shafts and adapted to produce rotation thereof, guide members arranged to define passages constituting prolongations of the spaces between neighbouring shafts, said guide members each including at least one port facing one of said passages, and means for applying suction to said ports so that atmospheric pressure urges and holds articles against said ports to block.

While the guide members may be either above or below the shafts it is preferred to arrange the guide members below the shafts in such manner that at least part of each of the passages is inclined at an angle to the vertical, with the ports in position substantially vertically below the spaces between neighbouring shafts. Each article which falls through one of said spaces then comes into contact with one of the guide members, and in the absence of suction at the ports the article is momentarily stationary across the port or ports of that guide member as its changes direction due to the inclination of the passage; if however suction is then being applied to the ports when the article reaches said position across the port or ports atmospheric pressure is effected to retain the article in that position so long as the application of suction is maintained. With such an arrangement, it will be appreciated that part of the weight of the article (and of other articles which come to rest upon it) is carried by the guide member; in contrast, if the passages are vertical, the ports thus being in vertical surfaces, when suction is applied to stop descent of an article in one of the passages, then the force on the article, due to the excess of atmospheric pressure over the pressure in the associated port or ports, acts horizontally and must be sufficient to promote a frictional force between the article and the vertical surface of the guide member equal to the total weight of that article and the maximum number of articles which may come to rest upon, and supported by, that article.

The guide members may be provided with internal ducts connected to the ports and communicating via a common control valve with a single suction pump; as the ports of the various guide members will not all (except by chance) be covered simultaneously by articles being fed when suction is applied by opening said valve, the dimensions of the ports and the rating of the suction pump must be such that even when all the ports are uncovered the pressure in said ducts is sufficiently low for the first article to cover a port after application of suction to be held.

In order that the invention may be well understood, a preferred embodiment thereof will now be desired in more detail, referring to the accompanying drawings in which:

FIGURE 1 is a fragmentary section of a cigarette feeding device embodying the invention, with cigarettes passing through it;

FIGURE 2 is a view similar to FIGURE 1, showing conditions existing when feed is stopped;

FIGURE 3 is a plan view, with parts in section, of the device of FIGURES 1 and 2;

FIGURES 4 and 5 are sections in the planes indicated by lines IV—IV and V—V respectively (FIGURE 3), background detail being omitted; and

FIGURE 6 is a fragmentary view showing a modification.

Referring first to FIGURES 1 and 2, the device shown has a number of parallel rollers 1, each of hexagonal section, which in operation all rotate clockwise as seen in these figures. The remaining rollers 1 is sufficient to permit cigarettes 2 from a bulk supply 3 above said rollers to fall therebetween.
Below each roller 1 is a fixed guide member 4 consisting of a main body 4a and a deflector portion 4b. The body 4a fits closely beneath the associated roller 1, having a recessed top surface accommodating said roller, and has vertical side faces defining (with corresponding faces of adjacent bodies 4a) passageways 5 forming downward prolongations of the spaces between adjoining rollers 1. Each deflector portion 4b is secured to its associated body 4a, in an offset position (to the right as seen in FIGURES 1–3), and the side faces of the portions 4b are inclined to the vertical, so that each deflector portion projects laterally by a distance equal to the width of the passage between its associated body 4a and the next roller 1 to the right. The left lower corner of each body 4a is chamfered off (as indicated at 4c) to provide a continuation of the left side face of the associated portion 4b. The side faces of adjoining deflector portions 4b (together with chamfered corners 4c) thus define further portions 5a of the aforesaid passageways 5, these further portions being however inclined to the vertical.

The bodies 4a of guide members 4 each have pairs of upwardly-projecting tongues 6 received in circumferential channels 7 of the associated roller 1; the tongues 6 assist in preventing the trapping of cigarette ashes, with consequent damage, between the rollers 1 and the top surfaces of associated bodies 4a.

The right side face of each deflector portion 4b has a central port 8 communicating via a bore 9 in said portion 4b with a port 10 and longitudinal bore 11 in the associated body 4a. The bore 11 extends to one end of the body 4a where it communicates with the interior of a manifold 12 common to all the bodies 4a, said manifold 12 and bodies 4a being so mounted that atmospheric air has no access to the interior of the manifold 12 except via ports 8, bores 9, ports 10 and bores 11 just described. The manifold 12 contains a control valve 13 adjacent its left-hand end (FIGURE 3) and at said left-hand end is connected by a pipe 14 to a suction pump 15. The control valve 13, seen more clearly in FIGURE 5, comprises a plate 16 secured to a shaft 17 and a sprung flap 18 engageable by the spaces between adjacent rollers 1 and passageways 5, 5a to the space below guide members 4. It will be noted that due to the form and disposition of deflector portions 4b, which as previously described causes the lower portions 5a of passageways 5 to be inclined to the vertical, each descending cigarette 20 therefrom strikes against the right-hand or upper face of one of the deflector portions 4b at such a position as substantially to cover the port 8 therein.

While feeding is proceeding as in FIGURE 1, no suction is applied to ports 8, valve 13 having its plate 16 in the closed or bypass condition previously described. To stop feeding, valve 13 is operated to bring it to its normal or open position and as explained above suction is then applied to ports 8. When a cigarette next strikes the right-hand face of any of the deflector portions 4b, that cigarette is held stationary by a force pressing it against the said deflector portions, due to the fact that through port 8 part of the surface of the cigarette is exposed to a sub-atmospheric pressure while the remainder of its surface (other than such small area as engages the surface of the deflector portion 4b) is subject to full atmospheric pressure. The cigarette is thus urged against the deflector portion 4b, which supports its weight (and that of other cigarettes resting upon it); sliding movement of the cigarette is prevented by frictional forces developed between the cigarette and the surface of the deflector portion, in consequence of the aforesaid force pressing the cigarette against the deflector.

As soon as valve 13 is moved back to its closed or bypass position, suction ceases to be applied to ports 8, and the force pressing each cigarette lying over one of the ports 8 against the corresponding deflector portion vanishes, the cigarette continues its fall and feeding continues until suction is again applied by a further operation of valve 13.

It will be appreciated that the employment of the invention thus provides a feeding device with simple but effective control of feed, in which stopping and restarting of feeding involves no movement of parts in contact with the cigarettes (or other articles) being fed.

It will be seen that in FIGURE 3 there is also shown a device 25 connected by a pipe to manifold 12. The device 25 may be any form of suction-operated device and may serve to indicate when feeding of cigarettes is or is not proceeding and/or to control other functions of a machine in which the device shown is incorporated. For example, device 25 may be an suction-responsive electric switch controlling drive motors for mechanisms below the rollers 1 and guide members 4 different ones of said mechanisms being required to operate when cigarettes are being fed (suction off) and when they are not in suction on. If a device is incorporated in a tray-filling machine, while cigarettes are feeding may be desired to drive downwardly a platform below guide members 4 on which a stack of cigarettes is accumulated, while feeding of cigarettes is stopped a pusher may be driven to urge said stack from the platform on to a tray. With the switch 25 connected, as shown to the end of the manifold remote from valve 13, said switch may if desired be so adjusted as to operate only when all ports 8 are blocked by cigarettes, when for obvious reasons the pressure in the right-hand end of the manifold 12 will be at its lowest.

In FIGURE 6 is shown a modification which may be employed in place of the device 25 just described. In FIGURE 6 there can be seen the arm 20, pin 21, and disc 22 previously mentioned; as shown in FIGURE 6, the disc 22 has two projecting lugs 26, 27 which are engageable with a fixed stop pin 28 to define the limits of permitted travel of said disc 22; the lug 26 engages the pin 21 and the lug 27 is engaged on the pin 28. Adjacent to the disc 22 a support bracket 29 is secured to any convenient fixed part (not shown) of the apparatus carries a switch 30. Said switch 30 has an operating arm 31 projecting towards disc 22 and so disposed that when the disc 22 rotates anti-clockwise (as seen in FIGURE 6), lug 26 engages the arm 31, and when the disc 22 is operated, just before the lug 27 encounters stop pin 28. Switch 30 is therefore operated whenever the valve 13 is
closed, so that no suction is applied to ports 8. The switch 30 is spring biased so that the arm 31 returns to the position shown (the non-operated position) whenever the lug 26 ceases to be in engagement with the arm 31, i.e., when valve 13 is open so that suction is applied to ports 8. It will be appreciated that in normal operation this modified arrangement can be employed as an alternative to the device 25, but that the two arrangements do not perform identically in all conditions, as the switch 30 of FIGURE 6 operates purely in response to the position of disc 22, and hence of valve 13. If no suction is present in the manifold 12, even though valve 13 is open (e.g., if the suction pump fails) the switch 30 is unaffected, although device 25, if fitted, would respond to the absence of suction.

What we claim as our invention and desire to secure by Letters Patent is:

1. A feeding device for rod-like articles such as cigarettes, comprising a plurality of horizontal shafts having their axes in a common, substantially horizontal plane, each of said shafts being of polygonal cross-section and being separated from each neighbouring shaft by a space of sufficient width to allow articles to be fed to pass there-between, driving means connected to all said shafts and adapted to produce rotation thereof, guide members arranged to define passages constituting prolongations of the spaces between neighbouring shafts, said guide members each including at least one port facing one of said passages, and means for applying suction to said ports so that atmospheric pressure urges and holds articles against said ports to block said passages.

2. A device as claimed in claim 1, in which the guide members are arranged below the shafts in such manner that at least part of each of the passages is inclined at an angle to the vertical; with the ports in positions substantially vertically below the spaces between neighbouring shafts.

3. A device as claimed in claim 2, in which said guide members are provided with internal ducts communicating with the ports, and including a common control valve and a suction pump, said ducts communicating with said pump via said valve.

4. A device as claimed in claim 3, including a switch arranged to be operated when suction is applied to said ports.

5. A device as claimed in claim 4, in which said switch is a suction-operated switch.

6. A device as claimed in claim 4, in which said switch is arranged to be mechanically operated whenever the common control valve is operated.

References Cited

UNITED STATES PATENTS

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