

[54] CIGARETTE FORWARDING APPARATUS

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198/20 C; 198/23; 198/24; 214/1 BB

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214/1 BB, 1 B; 131/25; 53/151, 150, 148

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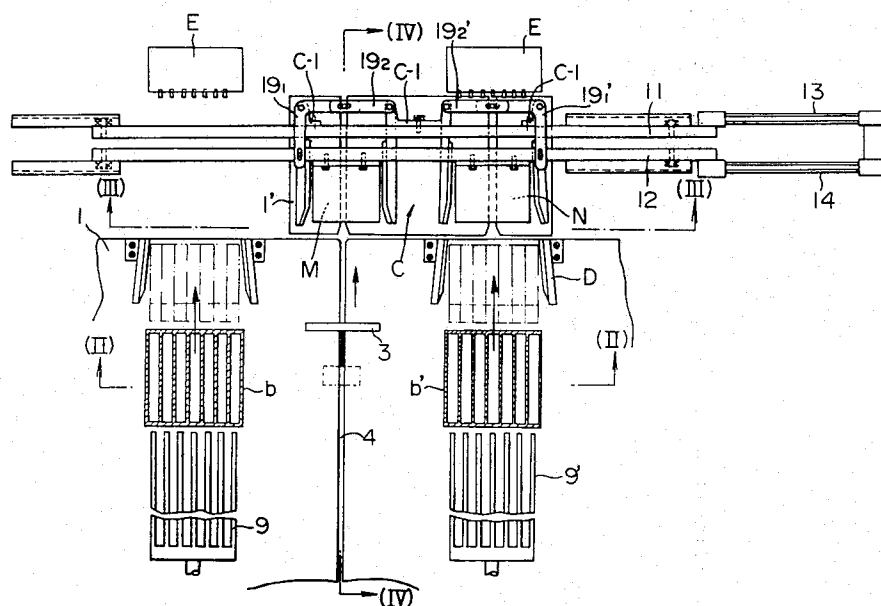
Attorney, Agent, or Firm—Sherman & Shalloway

[57]

ABSTRACT

A cigarette forwarding apparatus comprising a transferring device provided alongside a cigarette transferring passageway extending in a predetermined direction, hoppers for cigarettes above said transfer passageway, two fall-off openings provided under said hoppers so as to interpose said transfer passageway therebetween, two pushers for pushing the cigarettes alternately in the forward direction, a receiving frame holding receiving boxes which receive the cigarettes that have been pushed out and being capable of reciprocating across said transfer passageway, and a reciprocating means which causes one receiving box to face the fall-off opening of the hopper when the other receiving box has reached said transfer passageway; one receiving box containing the cigarettes being forwarded to the transfer passageway while cigarettes are being fed into the other receiving box from the fall-off opening, and a predetermined number of cigarettes being alternately forwarded from the fall-off openings into the transfer passageway.

5 Claims, 12 Drawing Figures



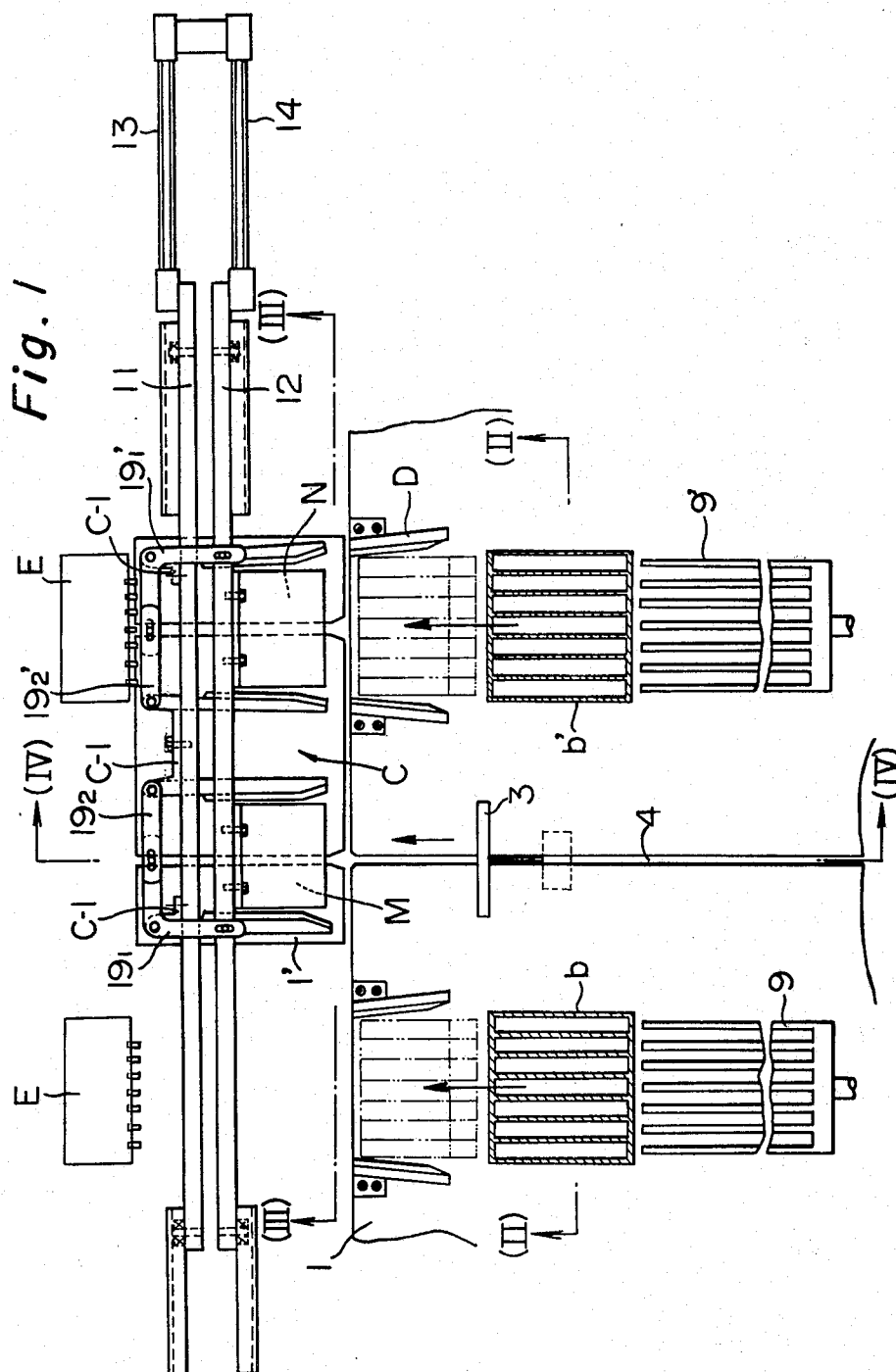
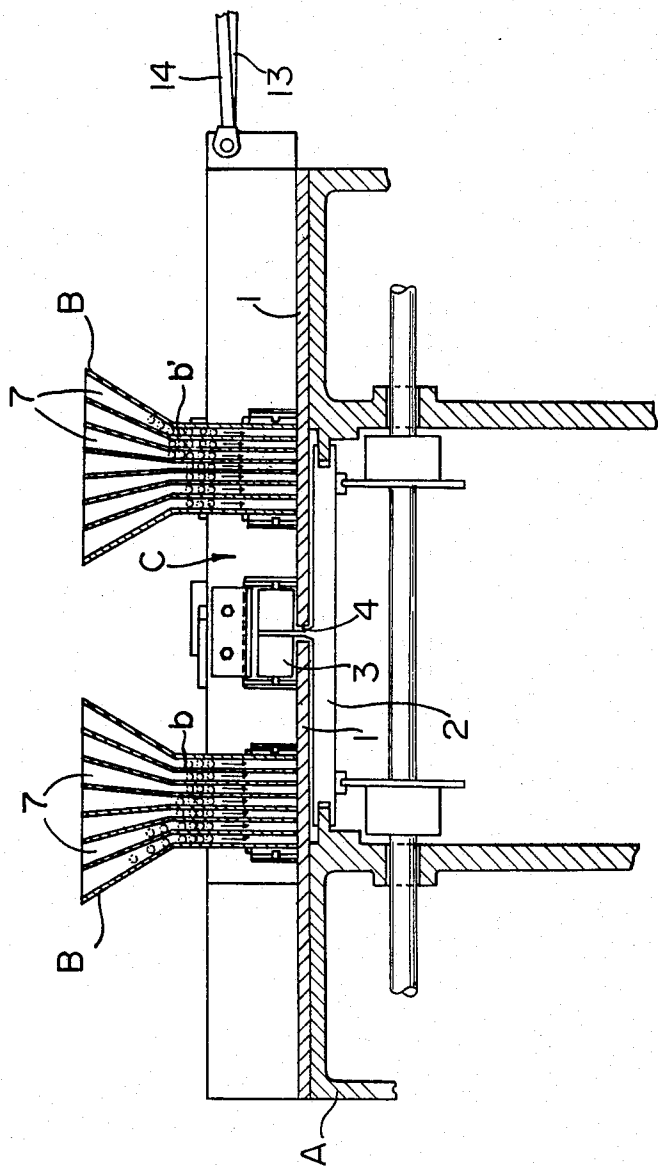


Fig. 2



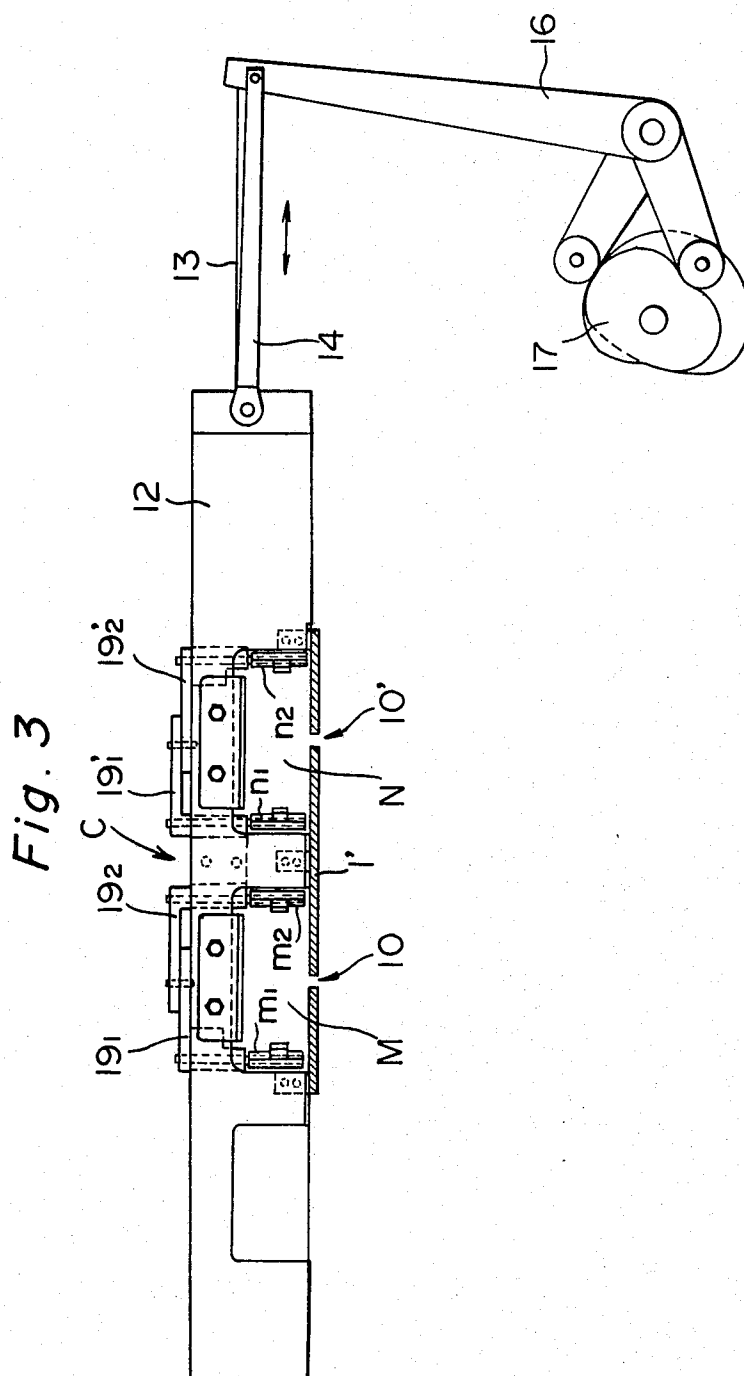
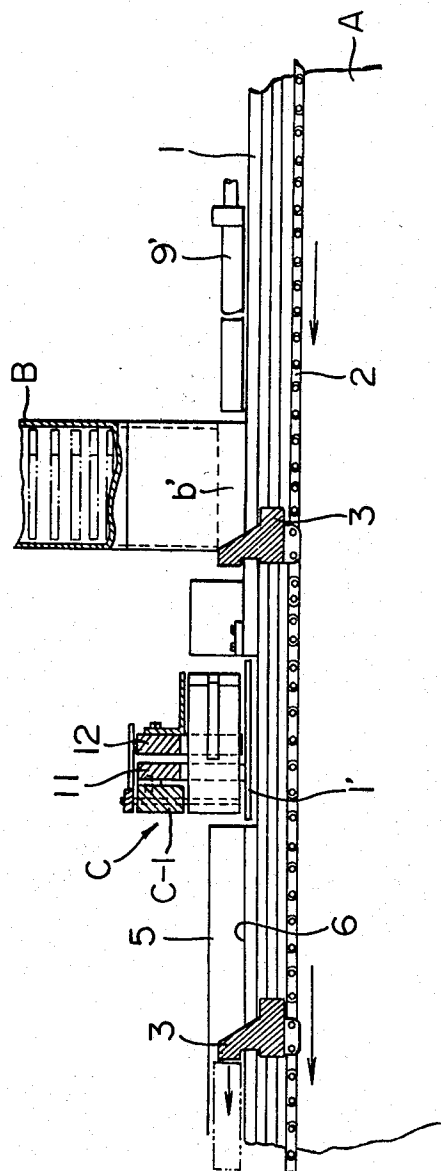
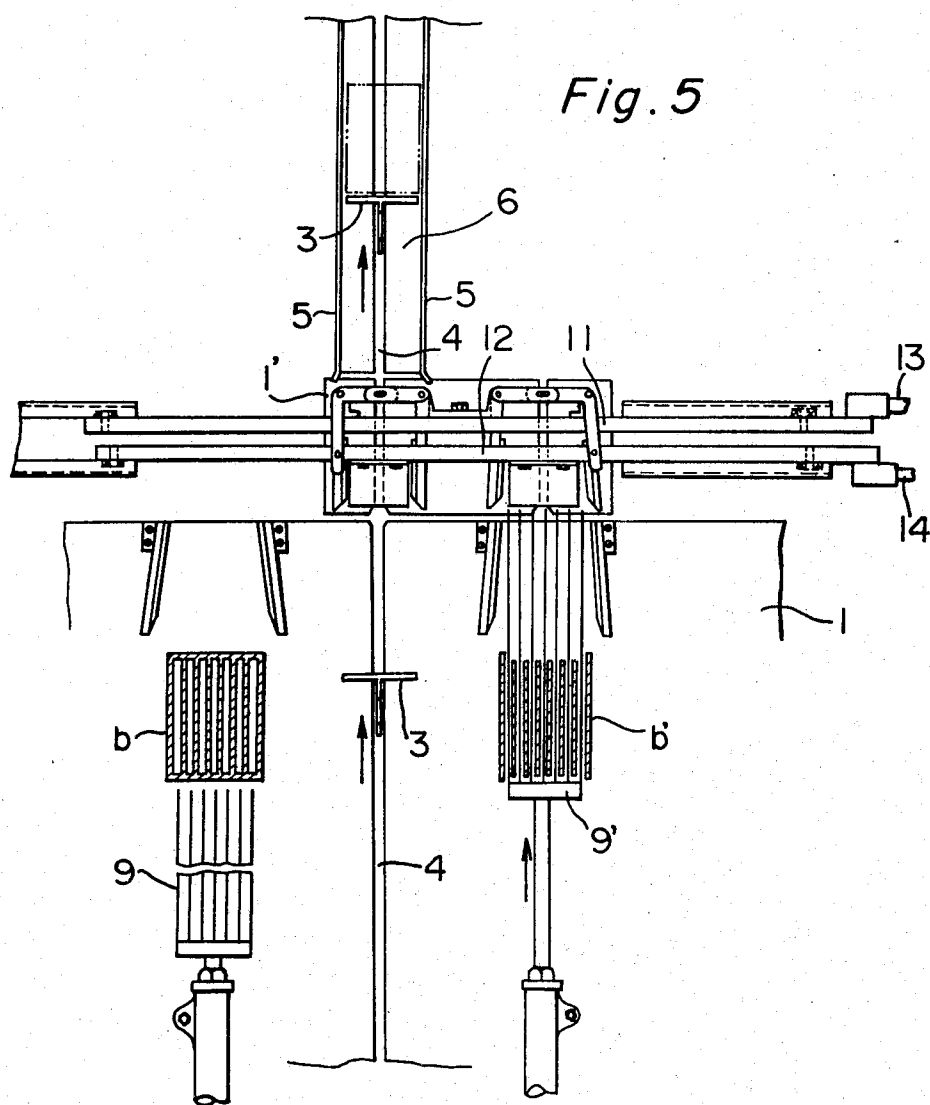


Fig. 4





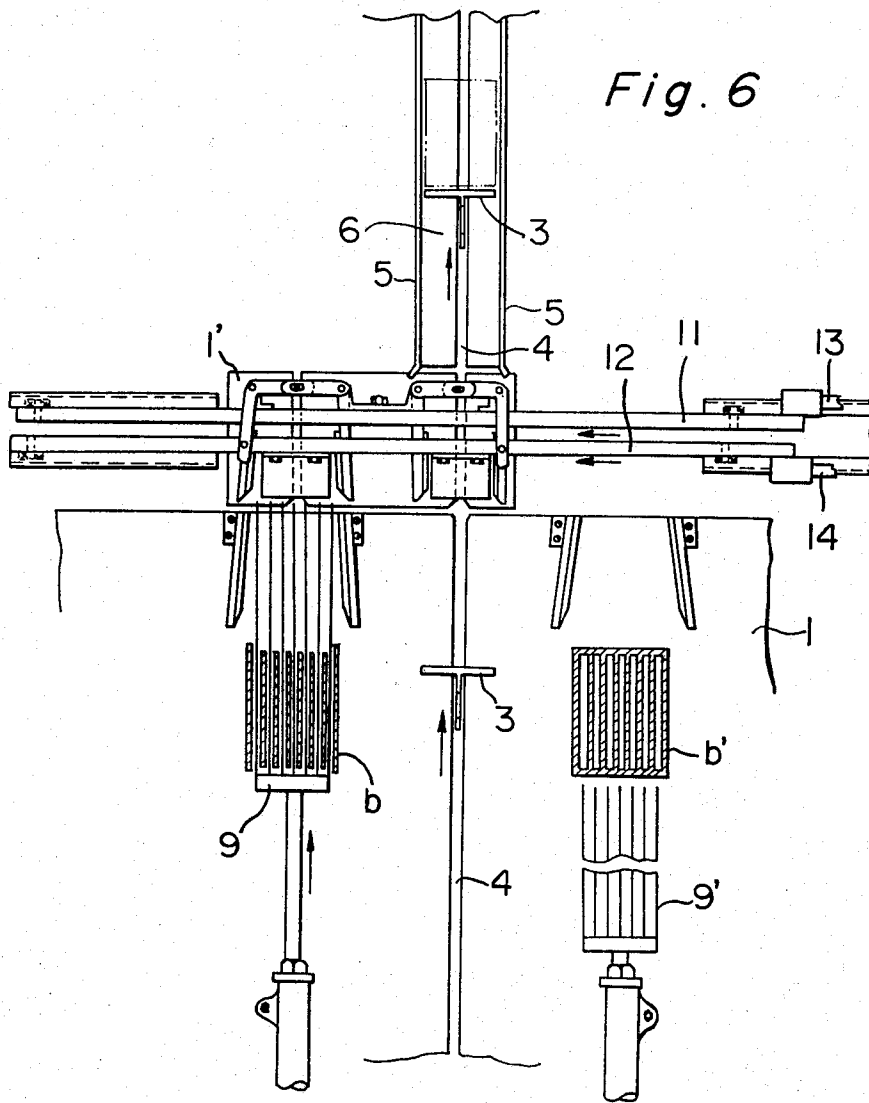


Fig. 10

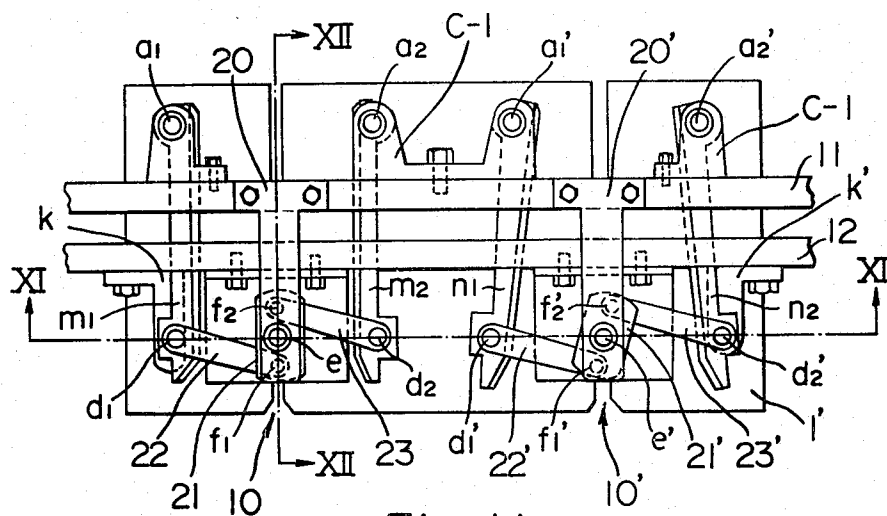


Fig. 11

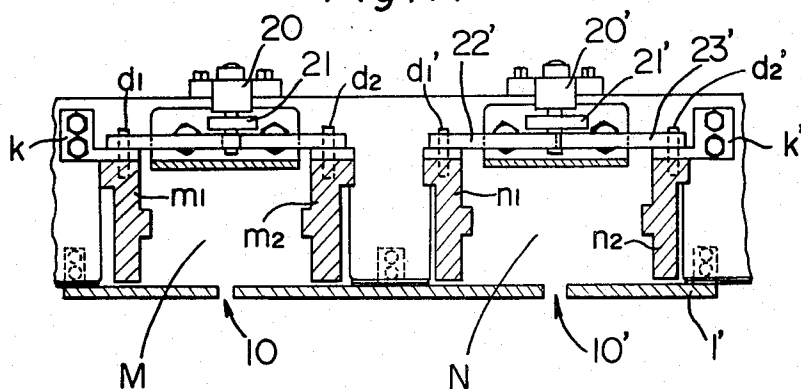
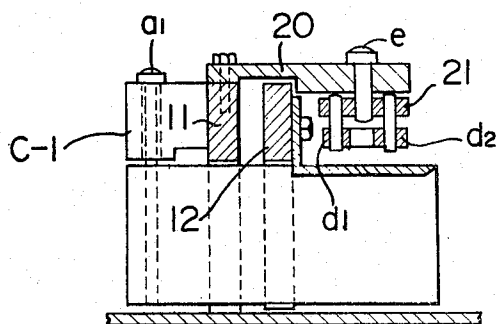


Fig. 12



CIGARETTE FORWARDING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an apparatus for forwarding a predetermined number of cigarettes from a hopper at one time.

2. Technical Considerations and Prior Art

In a conventional apparatus, a predetermined number of cigarettes contained in a hopper are withdrawn from a fall-off opening of the hopper and then fed through a transfer passageway into a packing section in a continuous operation. As will be outlined below, the present invention contemplates an increase in the efficiency of the above operation. The basic concept is that the operation of forwarding cigarettes is carried out alternately in two sections, and the subsequent delivering operation is performed in one step. Specifically, two fall-off openings are provided in the hopper, and cigarettes are forwarded alternately from the two openings. The cigarettes so forwarded are transferred through one transfer passageway. In order to push cigarettes alternately from the two fall-off openings and transfer them through the central transfer passageway, the following device is made in the transfer of the cigarettes. That is to say, a receiving frame for receiving the cigarettes pushed out from the fall-off openings is provided. The frame is an elongated body in the transfer direction of cigarettes and provided with a pair of receiving boxes. The receiving frame is capable of reciprocating in the transverse direction. For example, when the first receiving box is situated ahead of one fall-off opening, the second receiving box is located above the central transfer passageway. When the second receiving box moves and is located ahead of the other fall-off opening, the first receiving box is situated above the central transfer passageway. By repeating the above-described reciprocating movement of the receiving frame, two alternate pushing operations and one transferring operation can be continuously performed without trouble.

Thus, according to the present invention, a predetermined number of cigarettes are allowed to fall from the two openings, and by means of the reciprocating frame provided with receiver boxes at both ends, the cigarettes contained in one receiving box are pushed out into the central transfer while cigarettes are being fed into the other receiving box, thus delivering a predetermined number of cigarettes alternately from the two fall-off openings into the central transfer passageway.

In the conventional apparatus, a predetermined number of cigarettes are pushed out from one fall-off opening provided in a hopper, and delivered to one transfer passageway. In the conventional techniques, cigarettes within the hopper are allowed to fall spontaneously, and therefore, their falling is relatively slow and time-consuming. On the other hand, in the apparatus of the present invention, the number of cigarettes delivered per unit time can be increased as a result of providing two fall-off portions. This allows a continuous cigarette packing operation to be performed at high speed, and thereby increases productivity.

SUMMARY OF THE INVENTION

An object of this invention is to provide a cigarette forwarding apparatus whereby the amount of cigarettes to be allowed to fall from a hopper can be increased

markedly, and the cigarette packing operation can be performed at high speed.

Another object of this invention is to provide an apparatus wherein the receiving boxes themselves have the function of compressing the cigarettes to the desired degree of compactness during the process in which the cigarettes are moved from the receiving positions to the central transfer passageway.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be specifically described with reference to the accompanying drawings in which:

FIG. 1 is a plan of a cigarette forwarding apparatus of this invention;

FIG. 2 is a side elevation taken along the line II—II of FIG. 1;

FIG. 3 is a side elevation taken along the line III—III of FIG. 1;

FIG. 4 is a side elevation taken along the line IV—IV of FIG. 1;

FIGS. 5 and 6 are plan views illustrating the cigarette forwarding operation of the apparatus shown in FIG. 1;

FIG. 7 is a plan view showing the details of a distributing and compressing device;

FIG. 8 is a side elevation taken along the line VIII—VIII of FIG. 7;

FIG. 9 is a side elevation taken along the line IX—IX of FIG. 7;

FIG. 10 is another plan view showing the details of a distributing and compressing device;

FIG. 11 is a side elevation taken along line XI—XI of FIG. 10;

and FIG. 12 is a side elevation taken along line XII—XII of FIG. 10.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1, 2 and 3, a base plate (floor) 1 is provided on a machine frame A, and two hoppers B are provided above the base plate 1 at a predetermined distance therebetween with their fall-off openings *b* and *b'* being in contact with the base plate 1. The hoppers and fall-off openings are partitioned by a plurality of partitions, and cigarettes are aligned in a row in the direction shown by an arrow within the partitioned compartments. The cigarettes in the fall-off openings are pushed in the direction of arrows by comb-like pushers 9 and 9'. The pushers 9 and 9' operate alternately, and accordingly, the cigarettes are pushed out alternately from the fall-off openings *b* and *b'*. A receiving frame C is provided in order to receive the cigarettes that have been pushed out from the hoppers. A pair of guide walls D are provided face-to-face between the receiving frame C and each of the fall-off openings for conducting the cigarettes to the receiving frame C. The distance between the guide walls in each pair becomes somewhat progressively smaller from the portion near the fall-off opening towards the pushing direction.

The receiving frame C reciprocates across the forward direction of the fall-off openings *b* and *b'* (the cigarette transferring direction, that is, the advancing direction of an endless chain to be described will be hereinafter called the forward direction). The receiving frame C assumes the shape of an elongated long box with a width being about the length of the cigarette, and on both ends thereof, receiving boxes or channels M and N are formed. Slits 10 and 10' are provided at the center of a bottom plate 1' of the receiving boxes or

channels M and N, respectively. The receiving frame C reciprocates in the lateral direction at the forward position of the fall-off openings of the hoppers with the central transfer passageway being a center of reciprocation. A mechanism for reciprocating the receiving frame C includes a compound cam 17, two followers engaged with the cam 17, and a lever 16 to which the two followers are secured. By operating the lever 16, a reciprocating motion is imparted. Rods 13 and 14 connected to a shaft provided at one end of the lever 16 are reciprocated in the direction of the arrow. A push arm 11 is connected to the rod 13 and secured to the receiving frame C, whereby the receiving frame C is reciprocated. The rod 14 is connected to an arm 12. The reciprocating amplitude of push arm 12 is a little larger than that of the arm 11. For example, at the forward end of the lever 16, the rod 14 is fitted at a position a little ahead of the rod 13.

When it is desired to stuff cigarettes into the receiving box N from the fall-off openings as shown in FIG. 3, the inlet of the receiving box N is made somewhat diverging. Cigarettes pushed out by the comb-like pusher 9' are guided by the guide walls D, and stuffed into the receiving box N past the guide walls D. At the position of the receiving box M shown in FIG. 3 above the central transfer passageway, the inlet of the receiving box N is somewhat narrow to maintain the cigarettes in the packed state. In order to widen or narrow the inlet of the receiving boxes, the arms 11 and 12 and compressing frames 19₁, 19₂ and 19₁', 19₂' are provided. The structure and operation of these members will be described later in the specification.

As shown in FIG. 1, a detecting device E can be provided, which detects the state of the forward ends of cigarettes when the cigarettes which have been pushed out from the fall-off openings of the hoppers are caused to advance into the receiving boxes M and N. This device can detect those cigarettes in which tobacco at the forward ends has dropped out. The detecting device E is fixed to the floor 1 on a forward extension of each of the fall-off openings in proximity to the front portions of the receiving boxes. The conventional apparatus has no space for providing such a detecting device.

As shown in FIGS. 1 and 4, a transfer passageway 6 with a side wall 5 is provided on the base plate 1, and a slit 4 is perforated at the center of the transfer passageway 6. The slit 4 passes the central position of the fall-off openings *b* and *b'* of the two hoppers, and further extends both forwardly and backwardly. An endless chain is provided beneath said slit 4. Central pushers 3 are secured to the chain at predetermined intervals. Each of the pushers 3 projects upwardly via the above slit 4. The projecting portion is made of a plate at right angles to the slit 4, and have a width corresponding with the width of the central transfer passageway. With the advance of the endless chain, the central pusher 3 pushes cigarettes in the receiving box located above the central transfer passageway, and transfers it forwardly.

The operation of the cigarette forwarding device will be described. First, the reciprocating receiving frame C moves in the transverse direction, and when the receiving box M faces the central transfer passageway 6, the receiving box N faces the fall-off opening *b'*. In this state, the comb-like pusher 9' advances forward, and feeds a predetermined number of cigarettes into the receiving box N. This is shown in FIG. 5. Simultaneously with the above operation, the central pusher 3 ad-

vances through the receiving box M to push out the cigarettes in the receiving box M into the central transfer passageway 6, and transfers them as such. The above two operations are performed simultaneously. When these operations are over, the receiving frame C is subsequently moved in the opposite direction. That is to say, the receiving box N which has received the cigarettes faces the central transfer passageway 6, and the empty receiving box M which has delivered the cigarettes faces the left fall-off opening *b*. This is shown in FIG. 6. Then, as described above, the feeding of cigarettes and their delivering are simultaneously carried out. By repeating the above operations continuously, the cigarettes in the hoppers can be pushed out from the fall-off openings by a predetermined number, and transferred to the central transfer passageway alternately.

FIGS. 7, 8 and 9 show a mechanism for widening or narrowing the inlet of the receiving box M or N. As described above, when the receiving box is situated face to face with the fall-off opening, the inlet of the receiving box is desirably widened in such a state that its opening gradient almost corresponds with that the guide walls D shown in FIG. 1. In other words, the widening of the inlet of the receiving box means that the role of the guide walls D is partly played by the receiving box. As a result, the lengths of the guide walls D can be shortened, and the stroke of the pushers 9 and 9' is reduced. Such a contrivance is required especially when it is desired to increase the speed of feeding cigarettes into the receiving box in order to enhance the working efficiency. When the receiving box containing cigarettes has reached the central transfer passageway, the width of the receiving box is shrunk somewhat to compress and align the cigarettes in readiness for packing. The compressing operation is not abruptly carried out, but the cigarettes can be compressed without any undesired force by utilizing the entire process of the cigarette distributing operation. This will remarkably make it easy to perform the subsequent packing operation. In order to achieve the above object, the following contrivance is made in this invention in the reciprocating receiving frame.

The receiving frame C includes a base plate 1', parallel arms 11 and 12 above the base plate, and side walls *m*₁, *m*₂ and *n*₁, *n*₂ at the lower part of the base plate thus forming receiving boxes or channels M and N. The levers (19₁, 19₂) and (19₁', 19₂') of rectangular type, are disposed above these members. Support C-1 for supporting these compressing levers is fixed to the arm 11.

For describing the compressing levers, the lever 19₁, 19₂ will be considered as an example. In FIG. 7, the lever 19₁ has two sides extending normal to one another. One side intersects the arm 12 perpendicularly and is connected to the arm 12, and the other side extends parallel with the arm 12 and overlaps the linear lever 19₂ at its end. The perpendicular corner of the lever 19₁ is pivoted on the pin *a*₁. The other end opposite the overlapped portion of the lever 19₂ is pivoted on the pin *a*₂. These pins *a*₁, *a*₂ extend through holes of the support C-1 and are secured to side walls *m*₁, *m*₂ with, for example, screws. In other words, the side walls *m*₁, *m*₂ are suspended from the levers 19₁, 19₂ through the pins *a*₁, *a*₂. When one of the levers is operated, it pivots about its respective pin. The overlapped portions of the levers 19₁ and 19₂ have an elliptical hole in which a pin 18 is inserted. The forward end of the lever 19₁ rides on the arm 12 and is rotatably secured thereto.

with a pin-in-slot connection c.

The compressing levers 19₁', 19₂' have the same construction as the aforesaid compressing levers 19₁, 19₂. The levers 19₁, 19₂ are juxtaposed with the levers 19₁', 19₂' and the pin c is situated at the left end, while a pin c' at the right end.

The operations of the compressing levers 19₁, 19₂ and 19₁', 19₂' will be described below. For example, further to FIG. 7, the arm 12 moves in the right direction than the arm 11 at the right end of the reciprocating path. If the distance between the pins a₁ and a₂' is given at l₁, and the distance between the pins c and c' as l₂, the distance over which the arm 12 has moved farther than the arm 11 is expressed by l₂ - l₁. When the line connecting the pins a₁ and c crosses the arms 11 and 12 substantially at right angles, the pin c' is located a little in the right direction from the pin a₂'. Simultaneously with this, the lever rotates a little with the pin a₂' as a pivot. Thus, the pin 18' at the overlapping part moves a little in the direction shown by an arrow. By the movement of the pin 18, the pin a₁' is rotated. The pin a₁' also causes the side wall n₁ to rotate in the same way. Consequently, the distance between the inlet ends of the side walls n₁ and n₂ is widened. At the time, it is desirable that the side walls m₁ and m₂ in the receiving box M located above the central transfer passageway be situated at substantially right angles to the arms 11 and 12. When it is desired to narrow the distance between the inlet ends of the side walls of the receiving box M, the distance between the pins c and c' is further shortened. The above description is based on the assumption that the receiving frame C is situated at the right end. Even when the receiving frame C is at the left end, the inlet end of the receiving box M is widened, and the inlet end of the receiving box N becomes narrower by the same operation as described above.

By virtue of the above construction, when the receiving box M or N faces the fall-off opening, a predetermined number of cigarettes fed from the fall-off opening advance easily into the receiving box from its widened inlet. At the same time, the other receiver box containing cigarettes arrives at the central transfer passageway. When pushed out by the central pusher, the cigarettes within the receiving box are compressed as a result of the narrowing of the distance between the two side walls and are aligned in readiness for casing. There is no likelihood that the cigarettes will pop up or be damaged during transit, and the cigarettes that have been delivered to the central transfer passageway are aligned in readiness for casing. That is to say, the cigarettes can be directly submitted to the subsequent cigarette casing operation after leaving the apparatus of this invention. There is no necessity of providing an additional step such as a cigarette aligning step, and the working efficiency is, therefore, increased.

The device for widening or narrowing the frontages of the receiving box M or N is not limited to that shown in FIGS. 7 to 9, but can be replaced by other similar devices.

For example, devices such as that shown in FIGS. 10, 11 and 12 may be utilized. Arms 11, 12 and side walls m₁, m₂; n₁, n₂ which are basic conditions in the mechanism in FIGS. 10, 11 and 12 are identical with those in FIGS. 7, 8 and 9, but the positions and construction of compressing levers differ from each other. In a receiving box N of FIGS. 10 and 11, pins a₁', a₂' are inserted into holes of the support member C-1 and secured to the upper portions of the side walls n₁, n₂, respectively.

The side walls n₁, n₂ are rotatable about the centers at the pins a₁', a₂'. A support plate 20' is mounted on the upper surface of the arm 11, the plate 20' extending horizontally in the center of the receiving box N up to the neighborhood of entry of the receiving box. Near the tip of the support plate 20', a vertical shaft e' extends downwardly and a rotary plate or bell-crank 21' is pivoted on the shaft e'. A pair of pin holes f₁', f₂' are provided on the rotary plate 21' at equal distances from the hole of the shaft e'. On the other hand, pin holes d₁', d₂' are disposed at the upper ends of side walls n₁, n₂. A lever 22' is extended between the pin hole d₁' and the pin hole f₁' of the rotary plate or bell-crank 21'. The side wall n₁ and the rotary plate 21' are rotatably connected with each other by inserting pins into the holes d₁' and f₁'. In like manner, the side wall n₂ and the rotary plate or bell-crank 21' are connected with each other by means of pins in holes d₂' and f₂'. Further the tip of a support member k' mounted on the push arm 12 is also pinned at the pin hole d₂'.

The operations of the mechanism will be described below. As viewed in FIGS. 10 and 11, the receiving box N is positioned at the right end of the reciprocating route. In this case, as described above, the push arm 12 goes right a little farther than the push arm 11. Since the tip of the support member k' acts together with the push arm 12, the tip of the side wall n₂ moves right. In other words, the side wall n₂ turns right a little with the center at the pin a₂'. At the same time, the side wall n₁ is forced left via a lever 23' the rotary plate or bell-crank 21' and the lever 22', which are in the interlocking relationship with the pin a₂' and turns slightly left with the center at the pin a₁', resulting in the enlarging of the frontage of the receiving box N. At this time, it is preferable to position side walls m₁, m₂ in the receiving box M located at the central transfer passageway almost perpendicular to the push arms 11, 12.

Then, when the receiving box M comes to the left end, the similarities to the aforesaid operations make the front opening of the receiving box M larger and that of the receiving box N smaller.

What is claimed is:

1. An apparatus for advancing cigarettes comprising: a passageway extending in a first direction for receiving pluralities of cigarettes;
- a pair of hoppers for dispensing cigarettes, said hoppers positioned on opposite sides of the passageway;
- a pair of channels spaced from one another, each having movable walls extending generally in the direction of said passageway, defining an inlet and an outlet end for each of said channels;
- a reciprocating frame for mounting said channels;
- means for moving said frame to align one of the channels with said hopper while aligning the other of said channels with said passageway;
- first pushing means associated with each hopper for pushing cigarettes from beneath said hopper into the inlet of the channel aligned therewith;
- second pushing means aligned with said passageway for pushing cigarettes out through the outlet of that channel aligned with the passageway and along the passageway; and
- means for moving at least one of the walls associated with each channel to compress slightly cigarettes in the channels before the cigarettes are pushed out of the outlets of the channels, said moving means thereafter spreading the walls of the channels to fa-

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cilitate pushing cigarettes into the channels when the channels are aligned with the hopper, wherein said moving means includes:

means pivoting the walls to the reciprocating frame at locations adjacent to the outlets of the channels: 5
and

means for shifting the walls to rotate about said pivots to thereby spread the walls at the outlets of the channels to receive the cigarettes and move the walls toward one another to compress the cigarettes. 10

2. The apparatus of claim 1, further including stationary guide walls positioned between said hoppers and said channels when said channels are aligned with said hoppers, said stationary guide walls having walls which converge from the guide walls to the channels to move the cigarettes together as the cigarettes are pushed into the channels. 15

3. The apparatus of claim 2, wherein the shifting means includes: 20

means for positioning the walls of the channels to extend in substantially linear alignment with the stationary guide walls when the channels are aligned with the hoppers and for positioning the walls of the channels parallel with one another when the channels are aligned with the passageway. 25

4. An apparatus for advancing cigarettes comprising: a passageway extending in a first direction for receiving pluralities of cigarettes; 30

a pair of hoppers for dispensing cigarettes, said hoppers positioned on opposite sides of the passageway;

a pair of channels spaced from one another, each having movable walls extending generally in the direction of said passageway, defining an inlet and an outlet end for each of said channels, and wherein the walls of the channels are arranged in a row with each channel having an outside wall and an inside wall; 35

a reciprocating frame for mounting said channels;

means for moving said frame to align one of the channels with said hopper while aligning the other of said channels with said passageway;

first pushing means associated with each hopper for pushing cigarettes from beneath said hopper into the inlet of the channel aligned therewith; 45

second pushing means aligned with said passageway for pushing cigarettes out through the outlet of that channel aligned with the passageway and along the passageway; and 50

means for moving at least one of the walls associated with each channel to compress slightly cigarettes in the channels before the cigarettes are pushed out of the outlets of the channels, said moving means thereafter spreading the walls of the channels to facilitate pushing cigarettes into the channels when the channels are aligned with the hopper wherein said moving means includes: 55

a substantially L-shaped link secured by a pin in one arm thereof to each outside wall and pivoted to said reciprocating frame; 60

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a first push arm extending over said row of walls and registering with said pin securing said L-shaped links to said walls;

link means connecting said inside walls to one another and to the other arms of said L-shaped links by a pin-in-slot connection;

second push arm means connected to said link means and extending substantially parallel with said first push arm; and

means for reciprocating said first push arm with a greater amplitude than said second push arm to cause the inlet ends of said walls to spread relative to the outlet ends of said walls when said channels are aligned with said hoppers and to bring said outlet ends of said walls together when said channels are aligned with said passageway.

5. An apparatus for advancing cigarettes comprising: a passageway extending in a first direction for receiving pluralities of cigarettes;

a pair of hoppers for dispensing cigarettes, said hoppers positioned on opposite sides of the passageway;

a pair of channels spaced from one another, each having movable walls extending generally in the direction of said passageway, defining an inlet and an outlet end for each of said channels and wherein the walls of the channels are arranged in a row with each channel having an outside wall and an inside wall; a reciprocating frame for mounting said channels; 30

means for moving said frame to align one of the channels with said hopper while aligning the other of said channels with said passageway;

first pushing means associated with each hopper for pushing cigarettes from beneath said hopper into the inlet of the channel aligned therewith;

second pushing means aligned with said passageway for pushing cigarettes out through the outlet of that channel aligned with the passageway and along the passageway; and 40

means for moving at least one of the walls associated with each channel to compress slightly cigarettes in the channels before the cigarettes are pushed out of the outlets of the channels, said moving means thereafter spreading the walls of the channels to facilitate pushing cigarettes into the channels when the channels are aligned with the hopper, wherein said moving means includes:

a first push arm linked pivotally by pin means to the outside walls adjacent to the inlets of said channels; a second push arm extending parallel to said first push arm and having a pair of bell cranks mounted thereon, said bell cranks being connected to said walls at the inlet of said channels by said pin means; and 50

means for reciprocating said first push arm with greater amplitude than said second push arm to cause the inlet ends of said walls to spread relative to the outlet ends of said walls when said channels are aligned with said hoppers and to bring said outlet ends of said walls together when said channels are aligned with said passageway.

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