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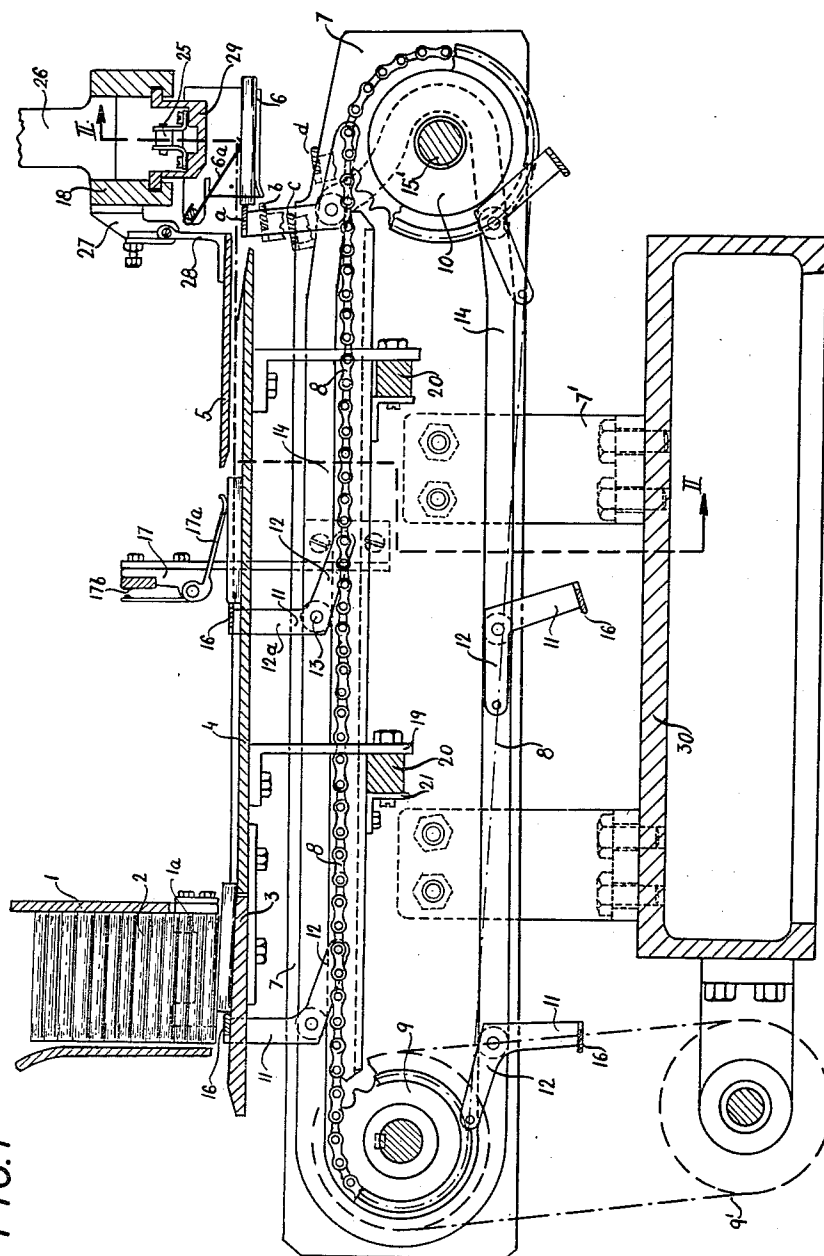
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CIGARETTE GROUPING APPARATUS

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3 Sheets-Sheet 1

FIG. 1



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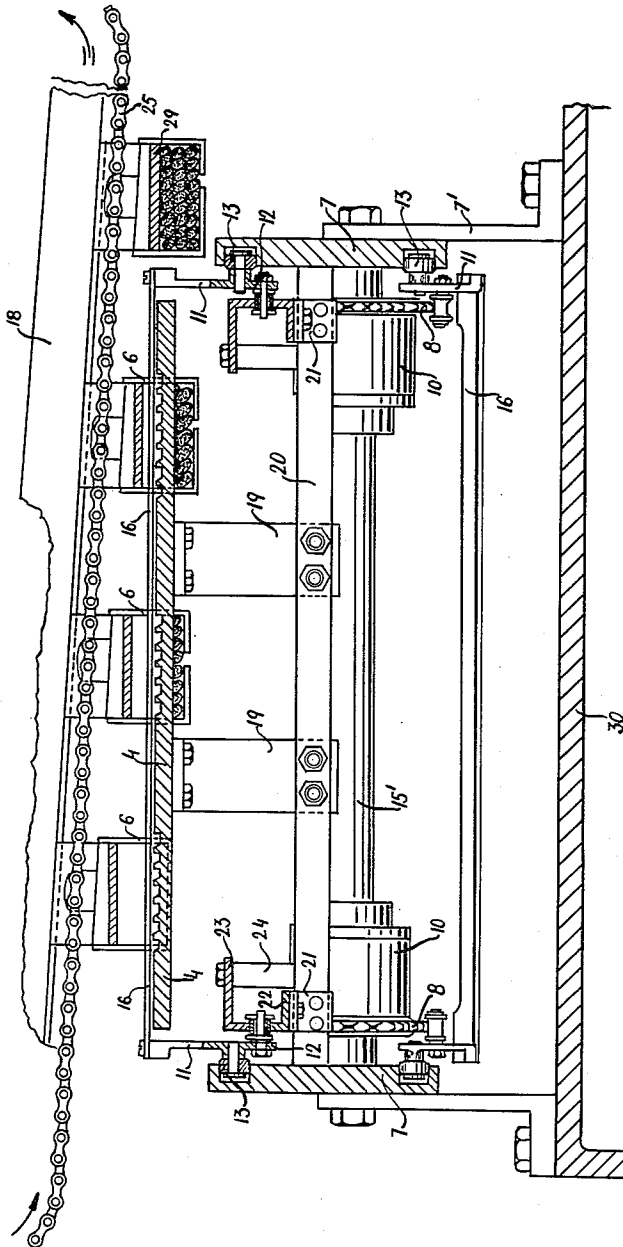
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FIG. 2



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CIGARETTE GROUPING APPARATUS

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FIG. 3

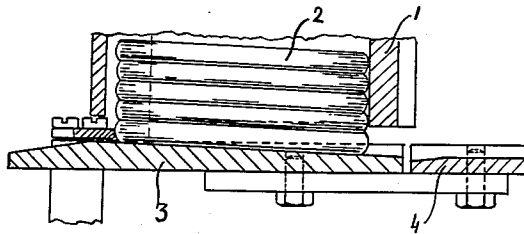
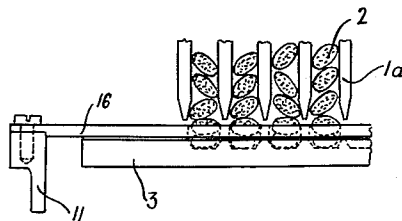


FIG. 4



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CIGARETTE GROUPING APPARATUS

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This invention relates to the manufacture of cigarettes, and more particularly to the grouping of cigarettes prior to packaging.

It is conventional to collect the cigarettes successively discharged from the cigarette making machine in containers or bins, and to discharge groups or layers of cigarettes from the containers, to align them, and then to enter them into individual receptacles such as boxes, packs, or transfer pans for transfer to such boxes or packs while in the aligned condition.

The known devices for grouping cigarettes prior to packaging are relatively complex, they operate at output rates which are low when compared with the rates achieved on other units of modern cigarette manufacturing machinery, and their reliability is not always as great as would be desirable.

The primary object of this invention is the provision of improved cigarette grouping apparatus.

More specifically, the invention aims at higher output rates and improved reliability of the grouping apparatus.

Another object of the invention is the avoidance of damage to cigarettes by the grouping apparatus regardless of the shape and size of the cigarettes.

A further object is the simplification of the apparatus so that it may group cigarettes in any of the customary patterns without basic changes in the apparatus.

Yet another object is the provision of cigarette grouping apparatus for use prior to packaging, or as part of the packaging operation, which simultaneously removes a number of cigarettes sufficient for the complement of cigarettes in a package from a storage container or bin, and stacks the cigarettes in several superimposed groups for packaging.

With these and other objects in view, the invention in one of its aspects consists mainly in apparatus including a support having a top face. A receiving portion and a delivery portion of the top face are horizontally spaced. A container or bin is arranged at a storage station adjacent the aforementioned receiving station, and at least one receptacle, such as a conveyor pan is arranged adjacent the delivery end. The container is provided with partitions for aligning a bottom layer of cigarettes. A pusher bar is arranged so as to be engageable with this bottom layer. Movement of the pusher bar is actuated by a drive chain mounted on the support for movement in a direction from the storage station toward the loading station. A lever having three portions, namely two arms and a pivot, has one of these portions secured to the chain, and another on secured to the pusher bar. The third lever portion is guided by a cam track on the support in such a manner that the pusher bar and the engaged bottom layer of cigarettes are guided from the container toward the receptacle until the cigarettes of the bottom layer are received in the receptacle, whereupon the pusher bar is moved transversely away from the path of the cigarettes, when the chain moves from the storage station to the loading station.

Other features and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a side-elevational sectional view of a pre-

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ferred embodiment of the cigarette grouping apparatus of the invention;

FIG. 2 shows the apparatus of FIG. 1 in fragmentary front elevational section on the line II—II, certain portions of the structure having been omitted so as better to show others;

FIG. 3 shows a detail of the apparatus of FIG. 1 in side-elevational section parallel to the plane of FIG. 1; and

FIG. 4 shows the detail of FIG. 3 in front elevation.

Referring now to the drawing in detail, there is shown a cigarette bin 1 with an upwardly flaring open top and an open bottom. The bottom portion of the bin 1 is divided by partitions 1a into as many aligned vertically elongated slots as there are cigarettes 2 in each layer that it is intended to take from the bin at any one time.

A grooved plate 3 is arranged beneath the bin 1. Its grooves are aligned with the slots of the bin 1 and increase in depth from the left toward the right, as viewed in FIGS. 1 and 3, that is, in the direction of cigarette discharge from the bin 1. The plate 3 is fastened to the receiving end of a top deck 4 which is attached to the main support frame 30 of the apparatus by means of brackets 19, transverse bars 20, side plates 7, and brackets 7'. Grooves in the deck 4 are aligned with those in the plate 3.

A guide plate 5 is upwardly spaced from the delivery end of the deck 4 remote from the bin 1 to guide cigarettes from the grooves of the deck 4 across a gap into the traveling pans 6 of a conveyor 26. The conveyor 26 includes two guide rails 18 fixedly fastened to the main frame 30 in a manner not further illustrated. Each pan 6 is carried by a hanger 29 which travels past the discharge end of the deck 4 on the guide rails 18 in a path which is perpendicular to the grooves in the deck 4, and slightly inclined to the horizontal plane of the deck. Movement of the pans 6 is actuated by an endless roller chain 25 trained over drive sprockets and guide sprockets in a conventional manner (not shown). The drive sprockets of the chain 25 are connected to the continuously rotating main drive shaft of the apparatus (not illustrated) by a Geneva-cross movement (not illustrated) so that the pans 6 move intermittently in steps equal to the uniform spacing of the pans 6 on the chain 25 in the direction of the arrows in FIG. 2. The guide plate 5 is adjustably mounted on one of the rails 18 by means of a fixed bracket member 27, and an adjustable bracket member 28 hinged to the member 27.

Movement of cigarettes along the deck 4 is actuated by a pair of parallel endless roller chains 8 trained over a pair of drive sprockets 9 and a pair of idler sprockets 10. The pairs of sprockets are mounted on respective shafts 15, 15' which are journaled to the side plates 7. The shaft 15 is connected to the aforementioned main drive shaft of the apparatus by a transmission arrangement 9' which includes a Whitworth motion (not illustrated) for moving the chain 8 alternately at higher and lower speed in synchronization with the movements of the chain 25 so that the periods of slower movement of the chains 8 coincide with the periods during which the pans 6 stand still.

Six levers 11 are attached to each chain 8 by a hinged connection between their respective arms 12 and the chain. The levers 11 are spaced from each other along the chains 8 a distance corresponding to the length of one cycle of slow and rapid movement of the chains. The other arms 12a of corresponding levers 11 on the two chains 8 are connected by a flat pusher bar 16 which is elongated perpendicularly to the direction of chain movement. The levers 11 are pivoted on respective rollers 13 which travel in corresponding grooves 14 in the side plates 7.

The grooves 14 form endless cam tracks which have

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respective longitudinal upper and lower sections connected by arcuate sections about the shafts 15, 15'. A major portion of the upper longitudinal cam track section is straight, horizontal, and on a level between that of the upper strand of the corresponding chain 8 and that of the deck 4. The upper strand of the chain 8 is guided between an upper guide member 23 and a lower guide member 22 respectively mounted on the transverse bars 20 by means of straps 24 and brackets 21.

A minor portion of the upper longitudinal section of each groove 14 slopes slightly downward beneath the discharge end of the deck 4, and the groove turns abruptly downward beneath the gap between the end of the deck 4 and the path of the pans 6. It then extends in a circular arc about the axis of the shaft 15'. The radius of curvature of this arc is substantially smaller than the radius of the idler sprocket 10.

The arcuate section of the groove 14 about the shaft 15 extends in a circular arc coaxial with the shaft 15 and having a radius greater than that of the drive sprocket 9. The upper longitudinal section of the groove 14 is tangential to the last-mentioned arcuate section, and so is the lower longitudinal groove section. The latter is somewhat inclined with respect to a horizontal plane so as to merge smoothly with the arcuate groove section about the shaft 15'.

A counter 17 is mounted above the deck 4. It includes a spring loaded sensing arm 17a which opens a switch 17b whenever a cigarette passes on the deck 4 under the sensing arm 17a.

The afore-described device operates as follows:

During the period of rapid movement of the chains 8, a pair of levers 11 connected by a pusher bar 16 swings about the shaft 15 from the lower to the upper horizontal section of its path. A narrow entrance gap between the bin 1 and the plate 3 permits the flat bar 16 to make contact with the lowermost cigarette in each slot of the bin 1 when the bar passes through the gap as the slower movement of the chains 8 begins.

The shallowness of the grooves in the plate 3 near the entrance gap exposes only one cigarette in each slot to the bar 16 whose thickness is less than the minimum transverse dimension of the cigarettes being grouped, as is best seen in FIG. 4. The bottom layer of cigarettes is pushed through a discharge gap between the bin 1 and the plate 3 at an initially slow speed. The discharge gap is merely wide enough to clear the bar 16, and to permit a single cigarette partly received within each corresponding groove to pass to the deck 4.

As shown in FIG. 2, the apparatus illustrated has twenty grooves in its deck 4. The grooves are arranged in laterally spaced groups of seven, six, and seven grooves. When the twenty cigarettes of the removed layer pass outside the bin 1, the chains 8 are accelerated and quickly transfer the cigarettes to the counter 17. While only a single counter arrangement has been illustrated, there may actually be as many sensing arms 17a and switches 17b as there are grooves in the deck 4 to initiate stopping of the machine or other suitable control action when one of the grooves should not be filled.

During movement of the first layer of twenty cigarettes from the bin 1 to the counter 17, the cigarettes 2 in the bin 1 descend by gravity so that a next layer is available for discharge while the first layer is being moved past the sensing arm or arms 17a during the next period of slow chain movement. Since the grouping apparatus of the invention operates continuously, further description of its operation will be limited to the first-removed layer of cigarettes. That layer is rapidly moved from the counter 17 toward the delivery end of the deck 4, and then slowly beyond that end into three pans 6 standing ready respectively to receive the three groups of 7, 6, and 7 cigarettes 2. It is held in the pan by a spring 6a.

Because of the inclined path of the pans 6 on the guide rails 18, one group of seven cigarettes is discharged di-

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rectly on the surface of a pan 6. The second group of six cigarettes is placed in another pan 6 on top of a previously deposited group of seven. The third group of seven cigarettes is placed in a pan 6 on top of two previously deposited layers, and completes the complement of cigarettes in the last mentioned pan. The pan is transferred during subsequent cycles of machine operation to a non-illustrated packing station for transfer to a package. The cigarettes in the pan are in the relative position which they are intended to occupy in the ultimate package.

Prior to receiving the next layer of cigarettes, the conveyor 26 moves over a distance equal to the spacing of the pans 6, while the pusher bar 16 which delivered the previous layer is slightly withdrawn and moves downward from the position *a* (FIG. 1) through the gap between the discharge end of the deck 4 and the pans 6 as indicated by sequential phantom views *b* and *c*, and into a circular path about the axis of the shaft 15' as indicated by phantom view *d*. This change in the direction of the movement of the bar 16 is brought about by the pivoting of the corresponding levers 11 about their rollers 13 as the rollers enter the descending portion of the cam track 14. The bars 16 are withdrawn to a position near the chains 8 while traveling about the shaft 15', and are gradually returned to their operative positions spaced farther from the chains 8 as they return to push another layer of cigarettes from the bin 1.

While specific spatial and numerical relationships have been chosen in the drawing and the specification for the purpose of the disclosure, such relationships may be varied without departing from the spirit and scope of this invention. The manner in which the bin 1 is mounted on the machine frame 30 has not been shown since it may be entirely conventional and will be obvious to those skilled in the art. The bin is preferably interchangeable with other bins having differently arranged partitions for co-operation with corresponding different grooved plates, top decks, and conveyor pans which may be installed to replace the corresponding illustrated elements when it is intended to group cigarettes in a manner different from the 7-6-7 pattern inherent in the operation of the illustrated apparatus. The changes necessary for altering the device for grouping twenty cigarettes in two groups of ten each, or in a single flat layer of twenty are too obvious to require description. Such changes may require different synchronization of the movements of the chains 8 and 25, but will not affect the basic features of the invention.

The choice of six levers 11 on each chain 8 is preferred where the cigarettes are moved between three work stations, namely a storage station, an inspection station, and a loading station respectively represented by the bin 1, the counter 17, and the conveyor 26, but more levers and push bars may be arranged on each chain 8 at appropriate spacings to accommodate additional work stations or for any other reason.

It is a basic feature of the cigarette grouping apparatus of the invention that the cigarettes are handled without bruising or injuring them. The cyclic variation in the rate of pusher bar movement is an important factor in the absence of injury to the cigarettes handled, but equally important is the particular path of the pusher bars which moves the bars out of contact with the cigarettes as soon as the latter are delivered to the pans or receptacles on the conveyor 26.

The machine operates at very high overall output. This high efficiency is at least partly due to the fact that the machine operates in uniform cycles, and simultaneously deposits a number of cigarettes sufficient for one package in each cycle, yet superposes groups of different numbers of cigarettes in a receptacle for later packaging. The machine handles cigarettes of oval and circular cross section with equal ease.

The reliability of the apparatus is outstanding. The sloping grooves in the plate 3 make it virtually impossible for the pusher bar 16 to engage more than one cigarette

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in each slot of the bin 1. Although the removal of more than a single cigarette can be prevented by suitably dimensioning the discharge gap of the bin 1, a cigarette engaged by the pusher bar if not permitted discharge through the gap would be crushed and would clog the apparatus. Such crushing and clogging is safely prevented by the sloping grooves.

While the invention has been described with particular reference to specific embodiments, it is to be understood that it is not limited thereto, but is to be construed broadly and restricted solely by the scope of the appended claims.

What is claimed is:

1. An apparatus for grouping cigarettes prior to packaging and the like, comprising, in combination:

(a) a support having a top face, said top face having a receiving portion and a delivery portion spaced from said receiving portion in a horizontally extending direction;

(b) a container at a storage station adjacent said delivery portion for holding the cigarettes to be grouped;

(c) partition means for aligning a bottom layer of said cigarettes in said container;

(d) receptacle means at a loading station adjacent said delivery portion, said top face defining a path extending in said direction from said container to said receptacle means;

(e) pusher bar means engageable with said bottom layer in said container;

(f) drive chain means movable on said support in said direction;

(g) lever means having a pivot portion, a first arm portion, and a second arm portion, two of said portions of said lever means being secured to said pusher bar means and to said chain means respectively; and

(h) cam track means on said support and engaging the third one of said lever means portions for guiding said pusher bar means and the engaged bottom layer of said cigarettes from said container toward said receptacle means until said cigarettes are received in

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said receptacle means, and for thereafter moving said pusher bar means transversely of said path when said drive chain means moves on said support in said direction.

2. An apparatus as set forth in claim 1, wherein said third lever means portion is said pivot portion.

3. An apparatus as set forth in claim 1, wherein said drive chain means includes two rollers and a chain member trained over said rollers, a strand of said chain member extending between said rollers in said direction, and means for actuating movement of said chain member at a speed cyclically varying between a higher and a lower speed, said speed being lower when said pusher bar means engages said bottom layer in said container.

4. An apparatus as set forth in claim 1, further comprising conveyor means movable in a direction transverse of said direction, said receptacle means including a plurality of receptacles mounted on said conveyor means for sequential movement through said loading station.

5. An apparatus as set forth in claim 4, wherein said bottom layer includes a plurality of groups of cigarettes, and said plurality of receptacles are mounted on said conveyor means for simultaneously receiving respective ones of said groups.

6. An apparatus as set forth in claim 5, wherein said top face defines a plane, and said transverse direction is obliquely inclined relative to said plane.

7. An apparatus as set forth in claim 1, wherein said top face includes a plate member in said container subjacent said bottom layer, said plate member being formed with a plurality of grooves for respectively receiving the cigarettes of said layer in aligned condition, said grooves increasing in depth in said direction.

8. An apparatus as set forth in claim 1, further comprising counter means mounted on said support intermediate said storage station and said loading station for sensing cigarettes of a bottom layer moving between said stations.

References Cited in the file of this patent

UNITED STATES PATENTS

2,872,020 Hansel Feb. 3, 1959