

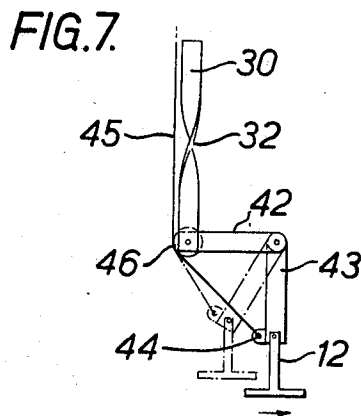
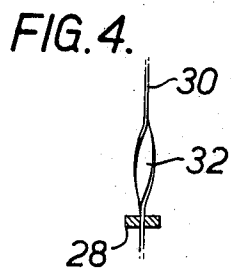
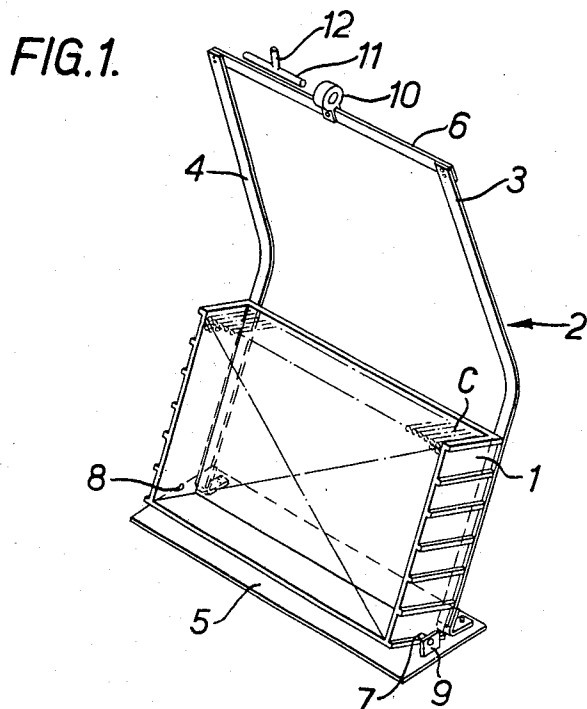
Dec. 30, 1969

D. W. MOLINS
CONVEYING SYSTEM

3,486,604

Filed Feb. 15, 1967

4 Sheets-Sheet 1



Inventor
Diamond Walter Molins

By
Watson, Cole, Greider & Watson
Attorneys

Dec. 30, 1969

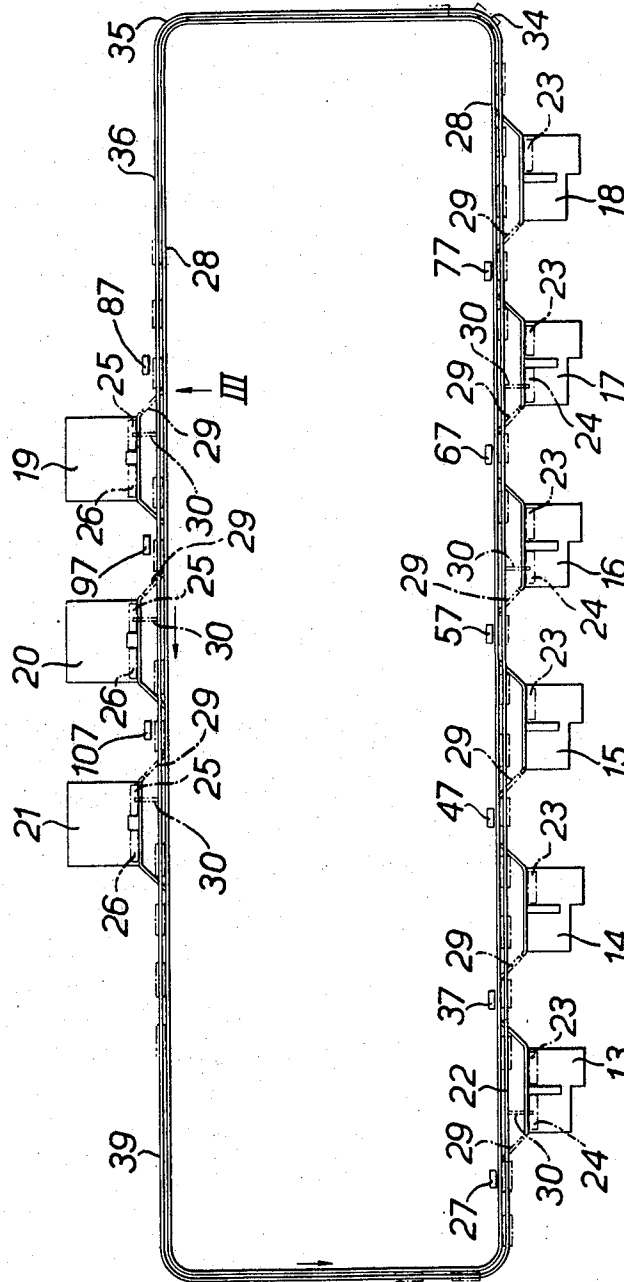
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FIG. 2.



Inventor
Diamond Walter Molins

By
Watson, Colo. Grundle & Watson
Attorneys

Dec. 30, 1969

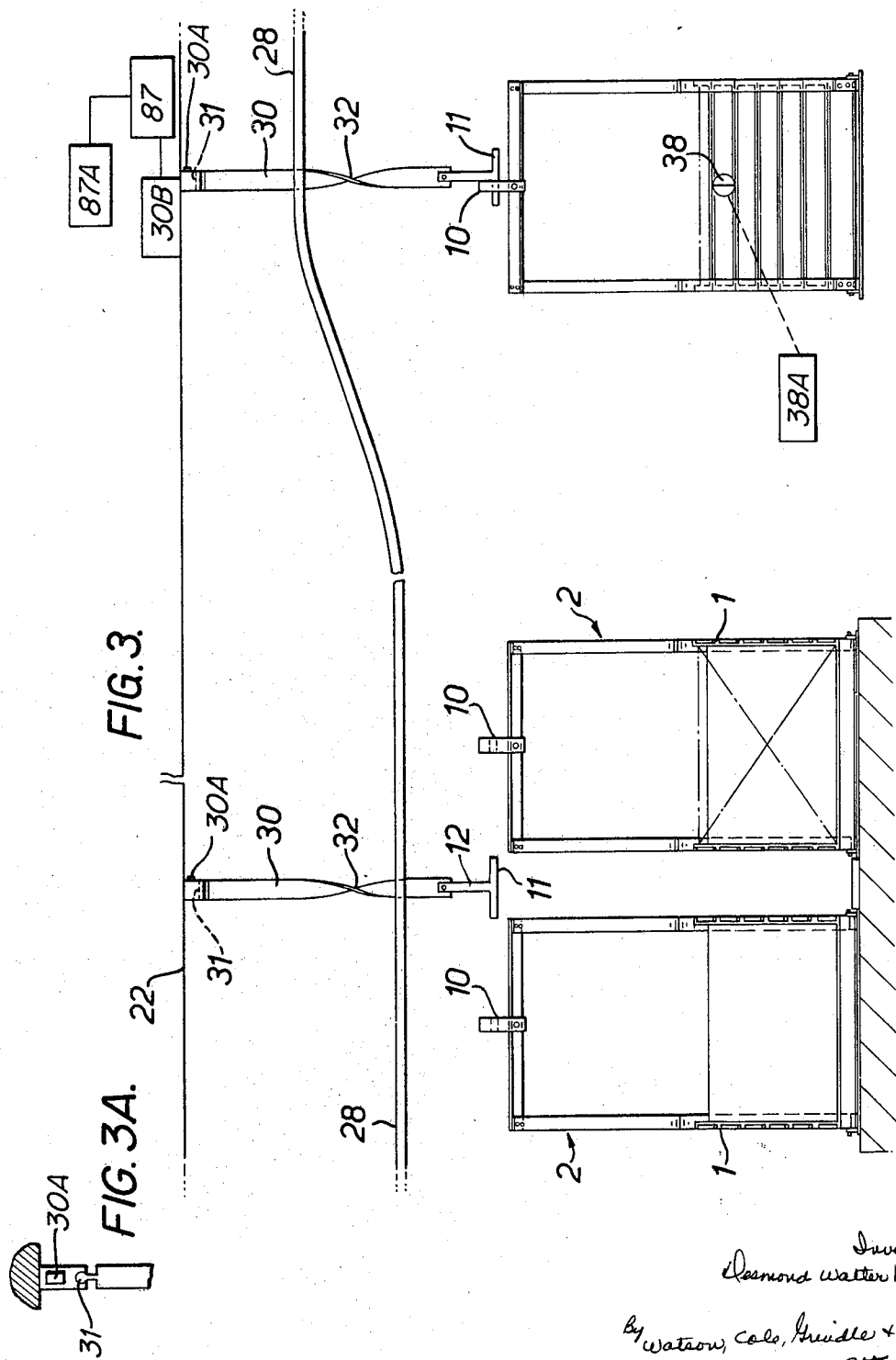
D. W. MOLINS

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4 Sheets-Sheet 3



Inventor
Diamond Walter Molins

By Watson, Cole, Grindle & Watson
Attorneys

Dec. 30, 1969

D. W. MOLINS

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FIG. 5.

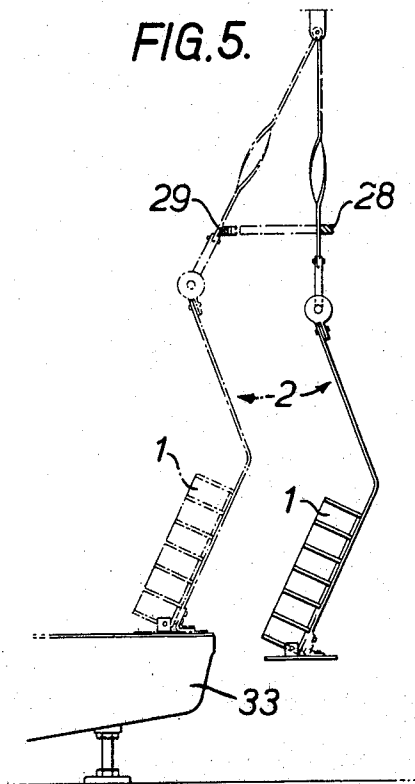
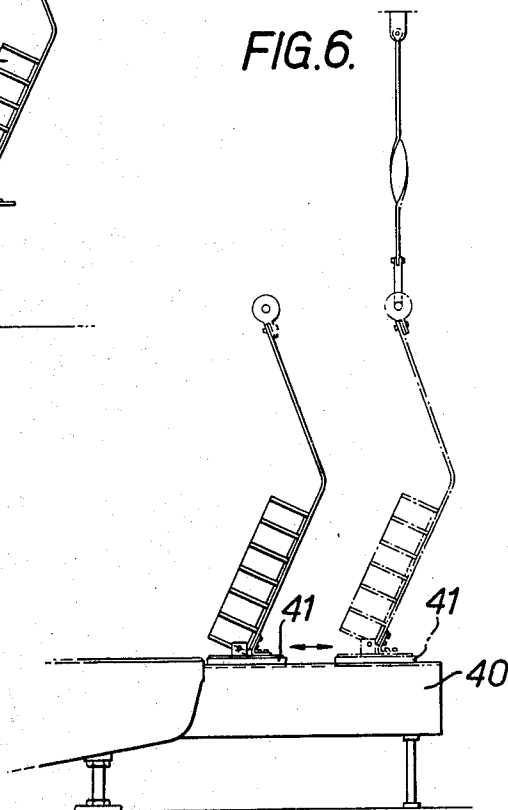


FIG. 6.



Inventor
Desmond Walter Molins

By
Watson, Cole, Grindle & Watson
Attorneys

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3,486,604

CONVEYING SYSTEM

Desmond Walter Molins, London, England, assignor to
Molins Machine Company Limited, London, England,
a corporation of Great Britain

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Int. Cl. B65g 43/00, 17/20

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3 Claims 10

ABSTRACT OF THE DISCLOSURE

An endless overhead conveyor has hangers which automatically pick up and deposit holders carrying full trays of cigarettes from tray filling machines to packing machines and empty trays in the reverse direction. Detector mechanisms, activated responsively to the presence of an empty tray at a packer and a full tray at a tray filler respectively, operate to feed only correctly coded trays between designated tray fillers and packers, and prevent the delivery of full trays to tray fillers or empty trays to packers.

This invention concerns improvements relating to conveying systems and, more particularly, to apparatus for carrying containers such as trays of cigarettes or the like.

During the manufacture and processing of cigarettes using modern high speed cigarette making and packing machines, problems arise due to the sheer volume of traffic passing between these two stages of the process. This traffic consists primarily in moving the cigarettes produced by each cigarette making machine, all of which are usually located in one part of the work space, to their correct destination which may be one of a variety of packing machines again located in another part of the work space. Frequently the traffic problem is solved by the use of overhead conveyors of the chain link type. Such conveyors may be formed into a system while the machines' product, the cigarettes, are stacked into trays or containers which are then lifted by the system and transported to their appointed destination.

Overhead conveying systems, however, suffer from disadvantages. Full trays must be manually loaded onto the conveyor and empty trays similarly removed at the making machines or loading stations whilst at the packing machines the opposite operations must be manually carried out, i.e. off-loading full trays and returning empties. It is consequently an object of the invention to provide simple means by which empty and full trays can be automatically transferred from and loaded onto an overhead conveying system.

According to the present invention there is provided a conveyor system for conveying articles, such as cigarettes, which are filled into containers at a filling position and are emptied from the containers at an unloading position comprising a conveyor carrying members having means to automatically pick up a full container and deposit an empty container as a member travels past the filling position and to automatically deposit a full container and pick up an empty container as the member travels past the unloading position.

The invention further provides a cigarette-making and packing system comprising a cigarette-making machine, a tray-filling machine to fill trays with cigarettes made on the cigarette-making machine, a packing machine to unload and pack cigarettes from the filled trays, using such a conveyor system to convey full trays of cigarettes from the tray-filling machine to the packing machine and empty trays from the packing machine to the tray-filling machine.

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Further according to the invention there is provided a method of feeding articles, such as cigarettes or the like, which are filled into containers at a first position and are emptied from the containers at a second position comprising the steps of automatically depositing empty containers and picking up full containers at the first position, conveying full containers to the second position, automatically depositing full containers and picking up empty containers at the second position, conveying empty containers to the first position, causing full containers to bypass the first position, causing empty containers to bypass the second position, causing empty containers to bypass the first position unless a full container is present at that position, and causing full containers to bypass the second position unless an empty container is present at that position.

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

FIGURE 1 is a perspective view of a cigarette tray carried by a holder,

FIGURE 2 is a diagrammatic plan view of an overhead conveying system,

FIGURE 3 is a side view of part of the system of FIGURE 2,

FIGURE 3A is a detail of the hangar swivel joint,

FIGURE 4 is a detail of part of FIGURE 3,

FIGURE 5 is a further detail of part of the system of FIGURE 2,

FIGURE 6 is an alternative mechanism to that of FIGURE 5,

FIGURE 7 is a modification of the system of FIGURE 2.

Referring first to FIGURE 1, a cigarette container or tray 1 containing cigarettes C is held in a holder shown generally as 2. The holder 2 comprises two side strips 3 and 4 joined at their lower ends by a base plate 5 and at their upper ends by a cross bar 6. The bottom of the tray 1 is held between two pivot pins 7 and 8, being swivelable about the axis of the pins. The pins 7 and 8 project from plates 9, of which only one can be seen, fixed to the base plate 5. Fixed to the centre of the cross bar 6 is an eye 10 into which can be inserted a horizontal portion 11 of a supporting member 12 (see also FIGURE 3). When suspended from the supporting member 12 the tray in the holder is tilted as shown.

In FIGURE 2 six tray loading stations 13, 14, 15, 16, 17 and 18 which in this case are tray filling machines attached to cigarette making machines, feed trays to three off-loading stations 19, 20 and 21, which in this case are packing machines which unload and pack cigarettes from filled trays. The trays are held in the holders 2 (see FIGURES 1 and 3) which are suspended from an overhead continuously movable chain conveyor 22 (shown in FIGURE 3 as a line). Each tray loading station 13, 14, 15, 16, 17 and 18 supplies filled trays in position 23 and has empty trays delivered to position 24 (shown only in the tray loading stations 13, 16 and 17). The packing machines 19, 20 and 21 are provided with full tray off-loading positions 25 while positions 26 accommodate emptied trays ready for being picked up by the conveyor 22. The direction of movement of the conveyor 22 is anticlockwise as seen when looking at FIGURE 2. Before (in the sense of the anticlockwise direction of the conveyor's movement) each packing machine and tray loading station are detector mechanisms 27, 37, 47, 57, 67, 77, 87, 97 and 107. At a lower level than the run of the conveyor 22 is a guide 28 (see also FIGURES 3 and 5) which holds the suspended holders 2 in a steady position. At each loading and off-loading station, i.e. at the tray filling machines (sometimes referred to herein as "tray fillers") 13, 14, 15, 16, 17 and 18 and at the

packing machines 19, 20 and 21 part of the guide 28 can be switched to either one of two positions by the appropriate detector mechanisms 27, 37, 47, 57, 67, 77 87, 97 and 107, i.e. it can continue straight on as shown in full lines in FIGURE 2 or it can branch as shown in chain lines 29. The two positions (shown as 28 and 29) can be clearly see in FIGURE 5 as can the effect the guide (at position 28 or 29) has on the holder 2 and its cigarette tray 1. It is to be noted that the detector mechanisms 27, 37, 47, 57, 67, 77 are only operable in response to the passing of empty trays while the mechanisms 87, 97 and 107 are operable only in response to the passing of full trays. The detector mechanisms are indicated only diagrammatically since they may operate on any of several well known and established principles. For instance, each may comprise a strain gauge 30A and pick-off 30B (shown diagrammatically in FIGURE 3) incorporated in the track of the overhead conveyor 22 so that a signal can be generated whose magnitude depends on the weight of the tray passing below. Each pick-off 30B may include an amplifier to provide a suitable output signal to a course-determining device 87A which directs the hanger 30 along the appropriate path, as will be further explained. In this way the passage of full and empty trays can be clearly distinguished.

FIGURE 3 is a view indicated by arrow III-III in FIGURE 2. From the overhead conveyor 22 (shown in FIGURE 3 as a line) depend hangers 30. At the lower end of each hanger 30 is the supporting member 12 with its horizontal portion 11. The hanger 30 is pivotable about its vertical axis, 31 being a swivel joint. The guide 28 for most of its run, i.e. that part excluding the portion opposite to the tray filling machines and the packing machines, is doubled, as can be seen in FIGURE 4. The effect is that of a single guide having a vertical slot through its centre. The hanger 30 passes through this vertical slot. The hanger 30, whose section is rectangular, is provided with a 180° twist 32.

The operation of the apparatus so far described will now be explained. In the arrangement shown in FIGURE 2, which is but one of many possibilities, there are six tray fillers feeding three packing machines. Even in this single layout, the combinations available are considerable. By way of example only one combination will be considered, that in which the packing machine 19 is to be fed from the three tray fillers 13, 14 and 15, the packing machine 20 from the two tray fillers 16 and 17 and the packing machine 21 from the tray filler 18. The function of the detector mechanisms 27, etc. as well as preventing empty and full tray being fed to packing machines and tray fillers respectively is to ensure that the correct full trays reach the correct packing machine destination and that empty trays are returned either to the tray filler from which they originated or to a tray filler feeding the same packing machine. This is achieved by attaching a coded disc 38 (see FIGURE 3) to the back of each tray 1, i.e. on the opposite face to the one revealed in FIGURE 1. The code consists of black bars pointed vertically on a white surface. For instance, trays used for tray fillers 13, 14 and 15 might have on vertical bar, trays used for tray fillers 16 and 17 two vertical bars, and trays used between the tray filler 18 and the packing machine 21 three vertical bars.

Assuming that the system is in operation, the mechanism functions as follows. The detector mechanisms 27, 37 and 47 are set to operate the part of the guide 28 which can be moved to position 29 appropriate to their respective tray fillers 13, 14 and 15 so that only empty trays bearing discs with one vertical black bar are shunted on to a table 33 (see FIGURE 5) of a tray filler having space for an empty tray. Thus these detector mechanisms are only activated when their own respective tray filler is ready to have an empty tray delivered and, therefore, a full tray removed, while the part of guide 28 which is movable to position 29 can only itself be activated by a

tray bearing the correct coded disc passing an activated detector mechanism. Any convenient form of detector mechanism suitable for distinguishing between the different disc codings may be used. If the tray filler 13 is in a condition to receive an empty tray, i.e. if it has a full tray in the position 23, the detector mechanism 27 is activated. Any empty trays having discs with two or three vertical bars are allowed to pass but the first empty tray with a single barred disc will be accepted since the detector mechanism 27 causes the part of guide 28 to move to position 29 to swing the empty tray 1 into the position shown in chain lines in FIGURE 5. A stop on the table 33 detains the tray 1 and its holder 2 so that the trailing end of the horizontal portion 11 of the support member 12 moves out of the eye 10 leaving empty tray and holder behind. As the support member 12 continues its movement the leading end of the horizontal portion 11 enters the eye 10 of the full tray directly below said member 12 and carries it away. The full tray has a disc with one vertical bar on its back i.e. on the side towards the detector mechanisms 37 and 47 etc. and, therefore, passes on past all the other tray fillers without being deflected.

When this full tray moves around bends 34 and 35 it enters straight portion 36 of the path of the conveyor 22. This portion can be seen in FIGURE 3. The front of the tray is facing towards the top of FIGURE 2 with the eye 10 on the leading part of the horizontal portion 11. In FIGURE 3 the disc 38 with one black vertical bar can be seen. The guide 28 now starts to slope downwards to a lower level and in so doing moves down the hanger 30 and, due to the twist 32, causes the tray and its holder to swivel through 180° on the joint 31. The holder 2 is now carried on the trailing end of the horizontal portion 11 while the disc 38 is directed towards the detector mechanisms 87, 97 and 107. These mechanisms are set to be activated only when their associated packing machines require a full tray and they activate the respective parts of guide 28 which can move to position 29 only when passed by a full tray having a correctly coded disc 38. Assuming the packing machine 19 requires a full tray, then the mechanism 87 activates the appropriate part of guide 28 to move to position 29 when the full tray from the tray filler 13 whose progress has been followed passes by. The full tray is deposited in the position 25 in exactly the same way as the empty tray was deposited on the tray filler 13 at position 24. The empty leading end of the horizontal portion 11 picks up an empty tray whose back carrying the coded disc 38 is directed outwards or towards the top of FIGURE 2. This empty tray will therefore pass by the packing machines 20 and 21 because it does not carry a correctly coded disc and also because it is empty. Along the straight portion 39 of the conveyor 22 the guide 28 rises from its lower position to its higher one and in so doing turns the supporting member through 180°. The empty tray is thus on the trailing end of the horizontal portion 11 while the back of the tray with its coded disc is directed inwards and is thus in the correct position for activating whichever of the three detector mechanisms 27, 37 or 47 is ready.

If an empty tray is carried to the tray fillers when there is no requirement for it then it will recirculate. Suppose a tray having a disc with three vertical bars passes beyond the tray filler 17 when the tray filler 18 for which it is destined has no filled tray to be picked up. Then the detector mechanism 77 will not be activated and the empty tray will pass on. When it reaches the straight portion 36 it will be turned through 180° so that its back with the coded disc faces outwards. Thus being empty, it will pass the detector mechanism 107 without activating the appropriate part of guide 28 which can move to position 29, even if the packing machine 21 is calling for a filled tray. As it passes the straight portion 39 the empty tray is again turned through 180° so as to be ready to activate the movable part of guide 28 appropriate to the tray filler 18 when it passes the detector mechanism 77 if

by then there is a full tray ready to be picked up. In a similar manner a full tray will be recirculated if its correct packing machine destination has no requirement for a full tray.

In FIGURE 6 there is shown an alternative embodiment. Instead of the trays being swung through an arc by the part of guide 28 which can move to position 29 the table 33 of the packing machine or tray filler is extended as shown at 40. On top of the extension 40 a slidable plate 41 is actuated either to be in a position to intercept and receive a correctly coded tray or to be out of position to allow the incorrectly coded trays to pass by. Once a tray is located on the plate 41, the latter is moved inwards so as to deliver the tray to its required position.

FIGURE 7 shows a modification. The hanger 30 has pivoted to its lower end an extension 42 which is again pivoted to a member 43 having the supporting member 12 rigidly fixed to its lower end. A lug 44 is fixed to the member 43. A cable 45 passes around a pulley 46 fixed to the lower end of the hanger 30 and is anchored to the lug 44. The free end of the cable 45 is actuatable by a cam, which is not shown, to raise the supporting member 12 to the position shown in chain lines in FIGURE 7. By this means a tray can be lowered into position as it is being deposited or can be raised as it is being picked up, in both cases thereby reducing the possibility of shaking or juddering of the tray.

What I claim as my invention and desire to secure by Letters Patent is:

1. A conveyor system for conveying cigarettes which are filled into trays at a filling position and emptied from the trays at an unloading position, comprising an endless overhead conveyor, members depending from the conveyor and having means to automatically pick up and deposit trays at said positions and arranged to carry trays between said positions, first detector means associated with said filling position, activated responsively to the presence of a full tray at said filling position, and operative to detect the loaded condition of a tray approaching said filling position, means operative responsively to said first detector means to guide an empty tray to, for deposit at, said filling position when a full tray is present at said filling position, and to guide full trays and, when a full tray is not present at said filling position, empty trays so that they by-pass said filling position, second detector means associated with said unloading position, activated responsively to the presence of an empty tray at said unloading position, and operative to detect the loaded condition of a tray approaching said filling position, and means operative responsively to said second detector means to guide a full tray to, for deposit at, said unloading position when an empty tray is present at said unloading position, and to guide empty trays and, when an empty tray is not present at said unloading position, full trays so that they by-pass said unloading position, whereby an empty tray is deposited at said filling position only when a full tray can be picked up therefrom and a full tray is deposited at said unloading position only when an empty tray can be picked up therefrom.

2. A cigarette tray-filling and cigarette-packing installation comprising at least one tray-filling machine and

at least one packing machine and having means automatically to deposit empty trays and pick up full trays at said filling machine and to deposit full trays and pick up empty trays at said packing machine, said means comprising an endless continuously moving conveyor system having a plurality of carrier members circulating between said machines, a plurality of holders for said trays having connector elements, each said carrier member being engageable with a connector element by forward movement into contact therewith and being releasable from a carrier member by interception of the holder to arrest its forward movement with the carrier member, each of said machines having an unloading station and a loading station, means at each unloading station to intercept a holder carrying a tray to be deposited at that machine, thereby releasing it from its carrier member, and means at each loading station for positioning in the path of the said carrier member a holder carrying a tray to be loaded on to the conveyor system to enable said carrier member to move into contact with the connector element on said holder.

3. A conveyor system for conveying articles which are filled into containers at a filling position and are emptied from the containers at an unloading position comprising a conveyor, holders in which the containers are carried, members carried on the conveyor, an element on each holder with which one of said members can engage to pick up the holder as it reaches the holder and from which the member can disengage as it deposits the holder, said element and said member including engaging parts comprising a bar on one and means defining an opening in the other so that as the member travels past the holder the bar enters and engages in the opening to pick up the holder and as the holder is deposited the bar leaves the opening, and means to rotate the holder through 180° relatively to the conveyor after the holder has been picked up so that relative movement between the bar and the opening takes place in opposite directions as the holder is picked up and as it is deposited while the member is traveling in the direction of movement of the conveyor on both occasions, whereby as a member travels past the filling position a holder containing at least one empty container is automatically deposited and a holder containing at least one full container is automatically picked up and as the member travels past the unloading position a holder containing at least one full container is automatically deposited and the holder containing at least one empty container is automatically picked up.

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HUGO O. SCHULZ, Primary Examiner

U.S. Cl. X.R.

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