

[54] **AUTOMATIC TRAY-LOADING DEVICE
FOR CIGARETTE PACKAGING
MACHINES**

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[56] **References Cited**

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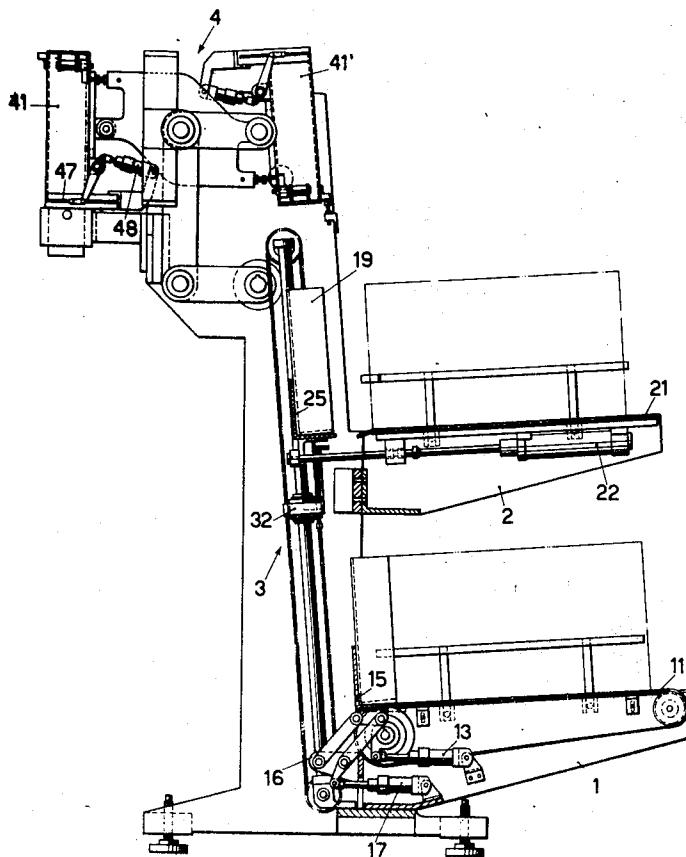
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[57] **ABSTRACT**

A device for automatically feeding cigarette-trays into the hopper of a cigarette packaging machine within a remarkably reduced time, having the magazine of full trays located just above the floor level and under the magazine of empty trays so as to have a direct linkage between the tray-loading device and the tray-filling machine. This tray-loading device includes on a transfer mechanism at least one pair of tiltable tray containers which operate simultaneously in order to transfer full trays over the hopper of the packaging machine and empty trays from the hopper to a lifting mechanism. The same lifting mechanism, in addition to conveying the empty trays to the proper magazine, also conveys the full trays from the magazine to the transfer mechanism. A number of pneumatic cylinders are also provided for imparting movement to the various parts of the device, these pneumatic cylinders being actuated by sensing means such as limit switches and photocells.

8 Claims, 6 Drawing Figures



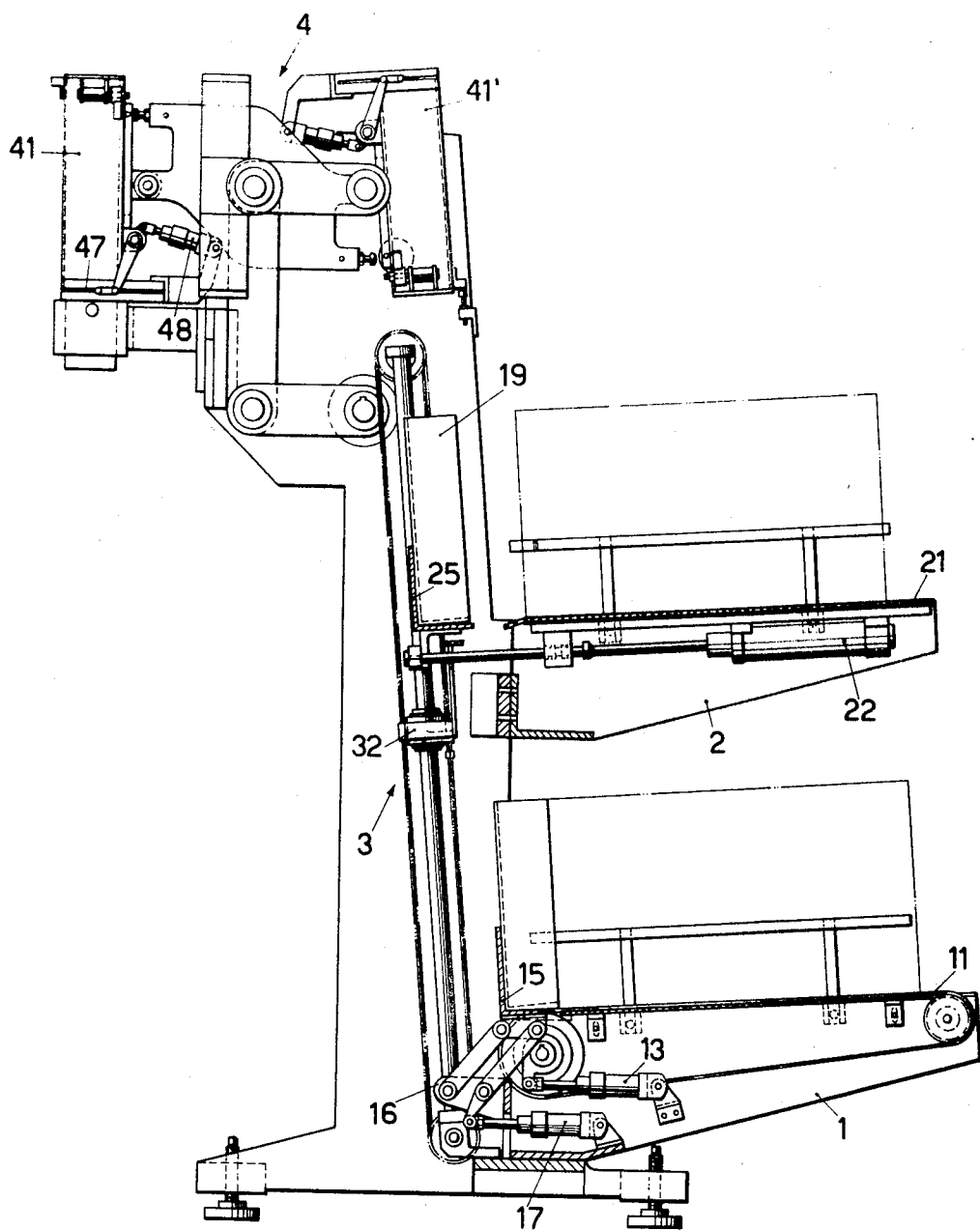


Fig. 1

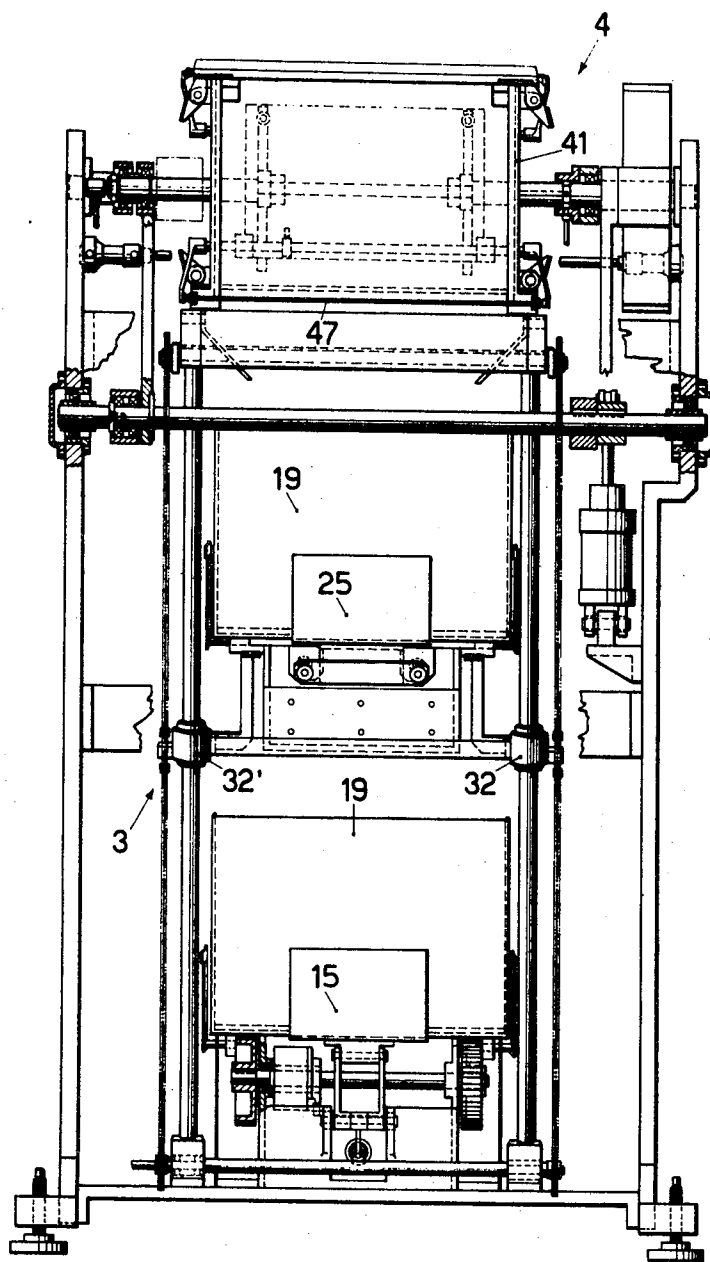


Fig. 2

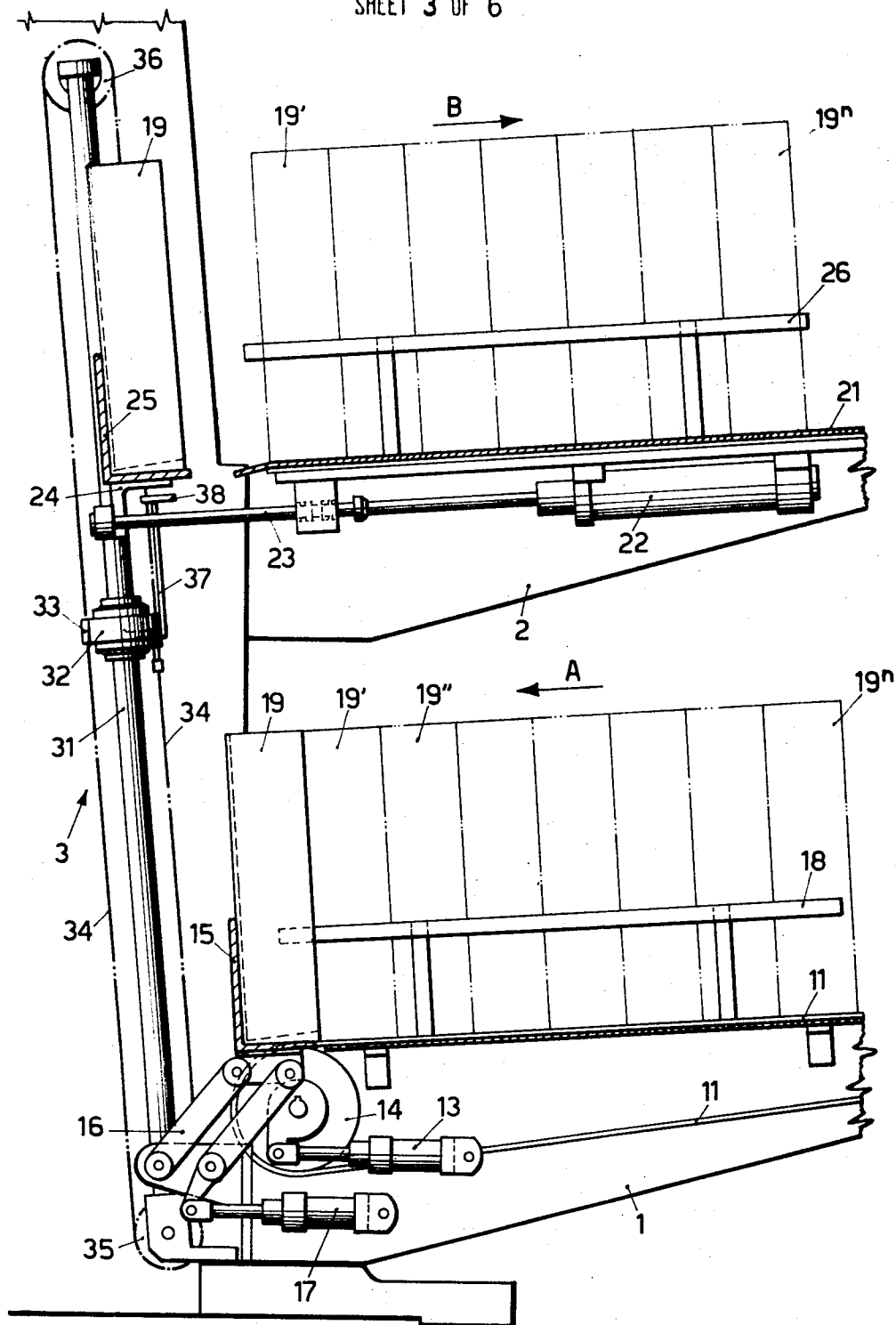


Fig. 3

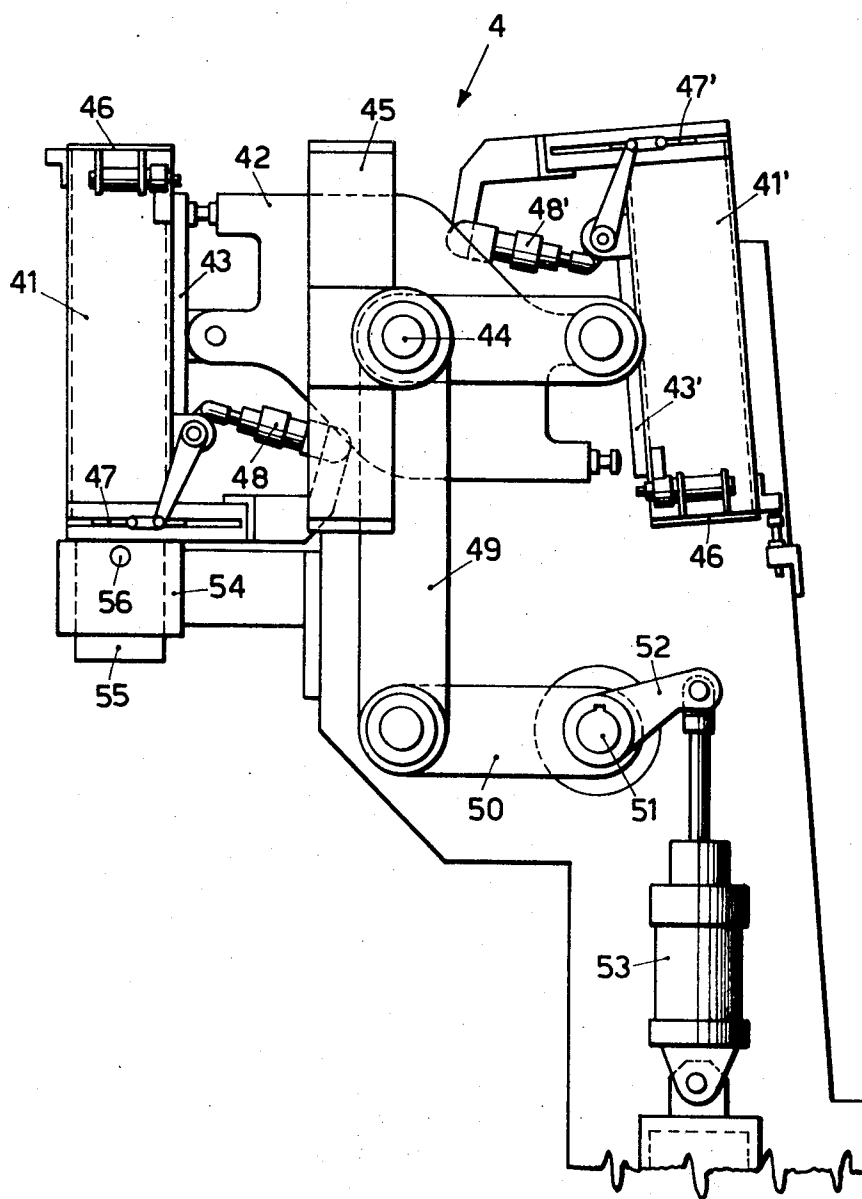


Fig. 5

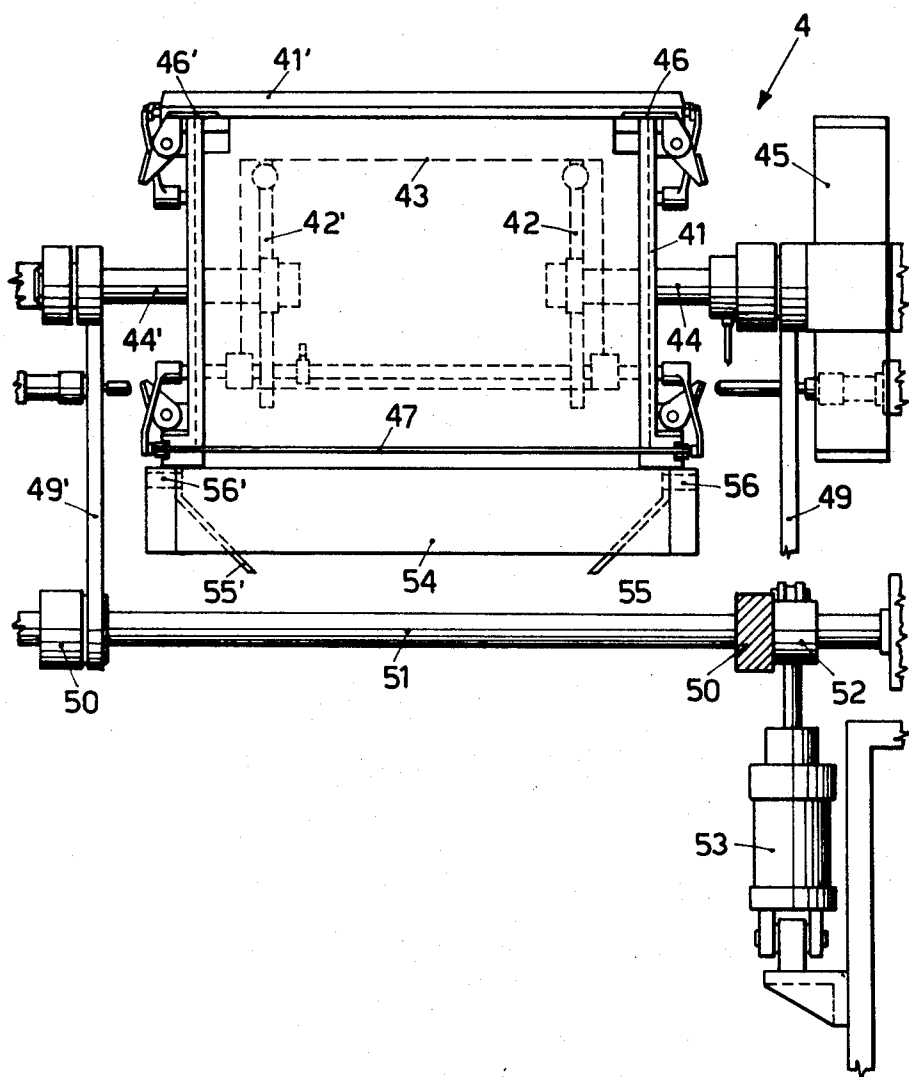


Fig. 6

AUTOMATIC TRAY-LOADING DEVICE FOR CIGARETTE PACKAGING MACHINES

BACKGROUND OF THE INVENTION

The invention relates to a device for the automatic feeding of trays in synchronism with a cigarette packaging machine.

Automatic device for feeding trays in cigarette packaging machines are already known in the art. The term "trays" usually refers to the containers of cigarettes with which the machine is fed and which are essentially prismatic, with two open ends. The capacity of each tray usually varies between 3,000 and 4,000 cigarettes. At present, tray-feeding has many drawbacks, one of which is the relatively long time required to replace an empty tray with a full one on the hopper of the packaging machine.

This drawback is due principally to the time required for the transfer device to take the empty tray to the special magazine for empty trays, collect a full tray from the magazine containing the full trays and transfer it on to the hopper of the packaging machine.

It is evident from the above, that the position of the magazines themselves can influence the transfer time. The term "magazine" refers to the supports in which the empty trays coming from the hopper of the packaging machine and also the full trays coming from the cigarette tray-filling machine are contained. In the majority of devices at present known, the magazine of full trays is situated on the same plane as that of the empty ones but on the opposite side. This naturally involves a loss of energy and/or time for manual loading and unloading of full and empty trays to and from the relative magazine.

It is also known that in the majority of automatic cigarette tray-filling machines, the delivery of full trays takes place from the lower part of the machine at just above floor level.

SUMMARY OF THE INVENTION

The present invention of an automatic tray-loading device enables all the known drawbacks of tray feeding devices to be overcome.

The tray-loading device according to the present invention offers, for example, the advantages of having the magazine of full trays situated just above floor level, this magazine of full trays being located under the magazine of empty trays. This advantage permits a direct link-up of the tray-loading device to the tray-filling machine.

Another advantage of the tray-loading device according to the present invention consists in that it has at least one pair of tray containers which operate simultaneously, thus causing a considerable reduction in the time required to replace an empty tray, situated on the hopper of the packaging machine, with a full one.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other advantages of the new tray-loading device according to the present invention will be evident to those skilled in the art from the following detailed specification, with reference to the annexed drawings, wherein:

FIG. 1 shows a side elevation of a tray-loading device according to the present invention;

FIG. 2 shows a front elevation of the same tray-loading device as illustrated in FIG. 1;

FIG. 3 shows a side elevation of the magazines and the lifting mechanism of the tray-loading device illustrated in FIGS. 1 and 2;

FIG. 4 shows a front elevation of the magazines and the lifting mechanism of the tray-loading device illustrated in FIGS. 1 and 2;

FIG. 5 shows a side elevation of the transfer mechanism of the tray-loading device illustrated in FIGS. 1 and 2;

FIG. 6 shows a front elevation of the transfer mechanism of the tray-loading device illustrated in FIGS. 1 and 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A fundamental characteristic of the tray-loading device according to this invention is represented by the fact that the magazine of full trays is situated in the lower part. This arrangement provides the advantage of enabling the tray-loading device to be directly connected to cigarettes tray-filling machines which usually deliver filled trays from the lower side. This represents an advantage, regardless of whether tray transfer from the tray-filling device is performed manually or automatically. In the case of manual transfer, it is evident that this arrangement dispenses from an expensive and tiring exercise of lifting full trays to a higher level when loading the tray-loading device magazine. This arrangement of the full tray magazine also permits an automatic connection with the cigarette tray-filling machine.

Another fundamental characteristic of this tray-loading device according to the present invention lies in the fact that it incorporates at least one pair of containers for the trays, which operate simultaneously in order to transfer full trays over the hopper of the packaging machine and transfer empty trays from the hopper to a lifting mechanism which then conveys them to the appropriate magazine.

The method of using tray-containers in pairs allows, in practice, to reduce the time required for the operation of replacing empty trays with full ones.

Referring to FIGS. 1 and 2, it will be seen that the tray-loading device according to the present invention substantially consists of a magazine for full trays 1, located below a magazine for empty trays 2, and a lifting mechanism 3 that conveys the trays to and from a transfer mechanism 4 which transfers the trays to and from the hopper of the packaging machine. For all applications which need the location of the tray-loading device at one side of the packaging machine, it is obvious that the transfer mechanism can be fitted with horizontal guides, so as to allow a horizontal translation and subsequent rotation of the containers, in pairs or separately, from the magazines of the tray-loading device towards the hopper of the packaging machine and vice versa.

Referring to FIGS. 3 and 4, the magazine 1 for full trays essentially consists of a metal frame at the base of which run two belt conveyors 11 and 12 actuated by a pneumatic cylinder 13 by way of a pulley 14. At its front end, magazine 1 also incorporates a support cradle 15 connected to a parallelogram linkage 16 actuated by a pneumatic cylinder 17.

A pair of guides 18, the position of which can be adjusted, are fitted on the upper part of magazine 1. The guides 18 hold a plurality of trays 19, 19', 19'', . . . 19ⁿ.

The belt conveyors driven by cylinder 13, advance step by step in the direction indicated by arrow "A," each step being equal in length to the maximum depth of one tray. With this arrangement, one tray at a time is located onto cradle 15 and thereby transferred towards the lifting mechanism 3.

During this transfer, the cradle 15, driven by the cylinder 17 via the parallelogram link system 16, is lifted towards the position 15', represented with a dotted line in the figure.

The magazine 2 for empty trays essentially consists of a frame supporting a pair of fixed runners on which the empty trays slide, the direction of movement being indicated by arrow "B." A pneumatic cylinder 22 connected to supporting plate 24 by means of a pair of rods 23, transmits a forward and reverse motion to cradle 25 which, in the forward movement, travels towards the lifting device 3 where it collects the empty tray 19, and in the reverse movement transfers the tray onto the runner 21 of the magazine 2. This transfer is facilitated by the fact that the front portions of the runners form an inclined surface, over which the bottom side of the tray slides, the tray being thus lifted when joining the other trays already present. The movement of trays 19, 19' . . . 19ⁿ sliding along the runners 21 is controlled laterally by a pair of adjustable guides 26.

The lifting mechanism 3 essentially consists of a pair of upright round guides 31 and 31' along which two sliding blocks 32 and 32' travel. These blocks 32 and 32' are fixed to a pair of chains 34 and 34' respectively. These chains, which can be substituted by any other known means, rotate also around sprockets 36 and 36' respectively.

The sliding blocks 32 and 32' are fitted with arms 37 and 37' respectively, at the upper end of which are the supporting pads 38 and 38' respectively. The support pads 38 and 38' come in contact with the bottom side of trays 19 in both cases when travelling downwards with an empty tray.

Referring finally to FIGS. 5 and 6, the transfer mechanism 4 essentially consists of one or more pairs of containers 41 and 41' adapted to receive the trays. These containers are fixed to coupling plates 43 and 43' respectively, which in turn are hinged to connecting plates 42 and 42'. These connecting plates 42 and 42' are pivoted on shafts 44 and 44', respectively, these shafts being actuated by a rotary pneumatic cylinder 45. Containers 41 and 41' are substantially prismatic and are opened at the top and bottom ends. The position of the openings in the containers is not critical but depends on the position of the tray-loading device with respect to the packaging machine. For example, for those applications that need the location of the tray-loading device on one side of the packaging machine, the openings of the containers could be set laterally, so as to facilitate the introduction and removal of cigarette trays along a horizontal plane, during the transfer movement to and from the magazine.

Referring again to FIGS. 5 and 6, it will be seen that at one open end of each container, there is a pair of small flaps 46 and 46' respectively. The other open end of the containers 41 and 41' is closed by sliding lids 47

and 47' respectively, which are actuated by pneumatic cylinders 48 and 48' respectively, by means of two pairs of levers. It will be seen that the whole transfer mechanism is supported by the two shafts 44 and 44', these shafts being connected in an articulated manner to arms 49 and 49' which rest on levers 50 and 50' keyed on rotating shaft 51. Referring to FIG. 5, it will be seen that another lever 52 connected to a pneumatic cylinder 53, is keyed onto shaft 51. Due to the action of pneumatic cylinder 53, the lever 52 transmits a rotary motion to shaft 51 which causes an angular displacement of lever 50, with consequent lifting of arm 49, of shafts 44 and 44' and, therefore, of the whole mechanism supported by the shafts.

The tray-loading device according to the present invention is also equipped with a pre-hopper 54 which contains a pair of shutters 55 and 55'. This pre-hopper has also two holes 56 and 56' into which the receiving and transmitting elements, respectively, of a photocell are inserted. The function of this photocell is to transmit the impulse required to start the operating cycle of the whole unit. The operating cycle will be described in more detail hereunder.

As soon as the last row of cigarettes has dropped from the tray into the pre-hopper 54, the beam of light emitted by the photocell transmitter is picked up by the receiver which in turn transmits an impulse to the control device of the cylinder 53. As mentioned above, the aforesaid cylinder causes the transfer mechanism 4 to lift to its upper position where a detecting device is located. This device, as those described in the following paragraphs, could be, for example, a micro-switch, a limit switch, a pneumatic device, a fluidic component or any other equivalent means.

The detecting device (not shown) causes actuation of the rotary cylinder 45 which rotates the shafts 44 and 44' through 180°. By this rotation, the container 41, containing a full tray, is transferred to the position occupied in FIG. 1 by the container 41', which contains an empty tray. Simultaneously, the container 41' is transferred to the position occupied by container 41 in FIG. 1. At the end of the rotation, another detecting device causes the transfer mechanism to descend in such a way the full tray container, overturned during the rotation, is located over the opening of pre-hopper 54. At this moment another detecting device operates cylinder 48 which, by moving the sliding lid 47, opens the container, allowing cigarettes to drop into the hopper of the cigarette packaging machine, and thus interrupt the beam between the component of the photocell located within holes 56 and 56'. Simultaneously at the end of the descent motion of the transfer mechanism, the empty tray container actuates another detecting device which causes the rotation of the two flaps 46 and 46', operated by means of two side cylinders; as a consequence the bottom aperture of the container is opened and the empty tray contained in it is released.

The bottom portion of the empty tray released will come to rest on supporting pads 38 and 38', fixed to the sliding blocks 32 and 32', which are now in the upper-end position of their stroke. At this moment the descent motion of sliding blocks 32 and 32' of the lifting mechanism 3 is started by means of a synchronizing device.

Referring to FIG. 1, when blocks 32 and 32' are in the position shown, the empty tray 19 is picked up by cradle 25 which, at this moment, is at the forward end of its path.

The contact of tray 19 with cradle 25 causes a detecting device to operate cylinder 22 which will move back cradle 25 towards the magazine 2 and thus transfer the empty tray over the runners 21. The sliding blocks 32 and 32' continue their descent until they reach the lower end position of their downward travel, where they start the cycle of cylinder 17 which, when moving cradle 15 by means of the parallelogram linkage 16, places the full tray resting on the cradle along the path of sliding blocks 32 and 32' (position 15' in FIG. 3). At this point, the sliding blocks start their upward travel and, on their way, pick up the full tray from cradle 15 and transfer it into the container 41' which has previously released an empty tray. At an intermediate point located between the extreme ends of the travel of the sliding blocks 32 and 32', there is a sensing device which, when coming in contact with the sliding blocks during their upward travel, causes the return motion of the system carrying cradle 15. The cradle 15, at the end of its stroke, actuates cylinder 13 which in turn causes belt conveyors 11 and thus all the full trays supported by them, to move forward. By this motion, which takes place in the direction shown by arrow "A," a new full tray is placed on cradle 15.

At the end of the upward stroke of sliding blocks 32 and 32', the full tray resting on support pads 38 and 38' is introduced in the container 41' which has previously released an empty tray. The flaps 46 and 46' are then closed and the full tray remains in the container 41. At this stage the operating cycle is completed and the subsequent cycle will be started as soon as the last row of cigarettes flows out of the tray being emptied into the pre-hopper 54.

Even though the invention has been described in detail with reference to one of its possible embodiments, only by way of a non-limiting example, additions and/or modifications made would still remain within the scope of the invention.

What I claim is:

1. Tray-loader device for automatic feeding of cigarette-trays to packaging machines, comprising: a magazine for full trays with a superimposed magazine for empty trays; a lifting mechanism to convey the full trays from the magazine to a transfer mechanism and convey the empty trays from the transfer mechanism to a magazine for empty trays; a transfer mechanism comprising one or more pairs of tilting containers adapted to transfer full trays from said lifting mechanism to a packaging machine hopper to the aforesaid lifting mechanism, said magazine for full trays including a metal frame, at the base of which runs at least one belt conveyor driven by a first pneumatic cylinder, and at the front end of which is attached in an articulated manner a cradle driven by a second pneumatic cylinder, this cradle being adapted to receive at least one full tray and to transfer it along the path of said lifting mechanism.

2. Tray-loader device according to claim 1, wherein the movement of the belt conveyor is performed step by step, one step equal to the maximum depth of one tray.

3. Tray-loader device for automatic feeding of cigarette-trays to packaging machines, comprising: a magazine for full trays with a superimposed magazine for empty trays; a lifting mechanism to convey the full trays from the magazine to a transfer mechanism and convey the empty trays from the transfer mechanism to a magazine for empty trays; a transfer mechanism comprising one or more pairs of tilting containers adapted to transfer full trays from said lifting mechanism to a packaging machine hopper to the aforesaid lifting mechanism, said magazine for empty trays comprising a metal frame supporting at least one fixed runner for the unloading of empty trays and at the front end of which is attached in an articulated manner a cradle for picking up of an empty tray for said lifting mechanism and transferring it onto the fixed runner, the necessary "to" and "fro" movement being supplied to said cradle by a pneumatic cylinder via a pair of rods connected to a support plate fixed to said cradle.

4. Tray-loader device for automatic feeding of cigarette-trays to packaging machines, comprising: a magazine for full trays, with a superimposed magazine for empty trays; a lifting mechanism to convey the full trays from the magazine to a transfer mechanism and convey the empty trays from the transfer mechanism to a magazine for empty trays; a transfer mechanism comprising one or more pairs of tilting containers adapted to transfer full trays from said lifting mechanism to a packaging machine hopper to the aforesaid lifting mechanism, said lifting mechanism comprising a pair of uprights guides vertically positioned between said magazines and said transfer mechanism, along which two blocks connected by a bar can slide, each block being fitted with an arm bearing a support pad at the top, these pads being able to support a tray and transfer it to and from the magazines, driven by chains attached to the sliding blocks.

5. Tray-loader device for automatic feeding of cigarette-trays to packaging machines, comprising: a magazine for full trays, with a superimposed magazine for empty trays; a lifting mechanism to convey the full trays from the magazine to a transfer mechanism and convey the empty trays from the transfer mechanism to a magazine for empty trays; a transfer mechanism comprising one or more pairs of tilting containers adapted to transfer full trays from said lifting mechanism to a packaging machine hopper to the aforesaid lifting mechanism, said transfer mechanism including at least one pair of basically prismatic containers, open at least at two sides, each one adapted to receive a tray and both being attached, diametrically opposite, to a pair of shafts, these shafts being lifted by a lifting means and made to rotate by a rotary pneumatic cylinder, each rotation movement taking place through an angle of 180°, together with the simultaneous tilting of the said pair of containers.

6. Tray-loader device according to claim 5, wherein one of said two open sides of each container is partially closed by means of a pair of retaining flaps, these flaps being able to hold the bottom of the tray inside the container, the other open side of the container being closed by a plate which is made to slide in a slot by the action of a pneumatic piston.

7. Tray-loader device according to claim 5, wherein said lifting means of said pair of shafts comprises a pair

7

of arms, connected to the shafts in an articulated manner and resting on a pair of levers keyed to a rotating shaft on which is also keyed another lever connected to a pneumatic cylinder actuated by the impulse signal of a photo-electric cell or similar detecting device.

8. Tray-loader device according to claim 7, wherein

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said photocell elements controlling the pneumatic cylinder which actuates said lifting means are fixed on opposite sides of a pre-hopper located under the transfer mechanism at the point where the tray full of cigarettes is emptied.

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