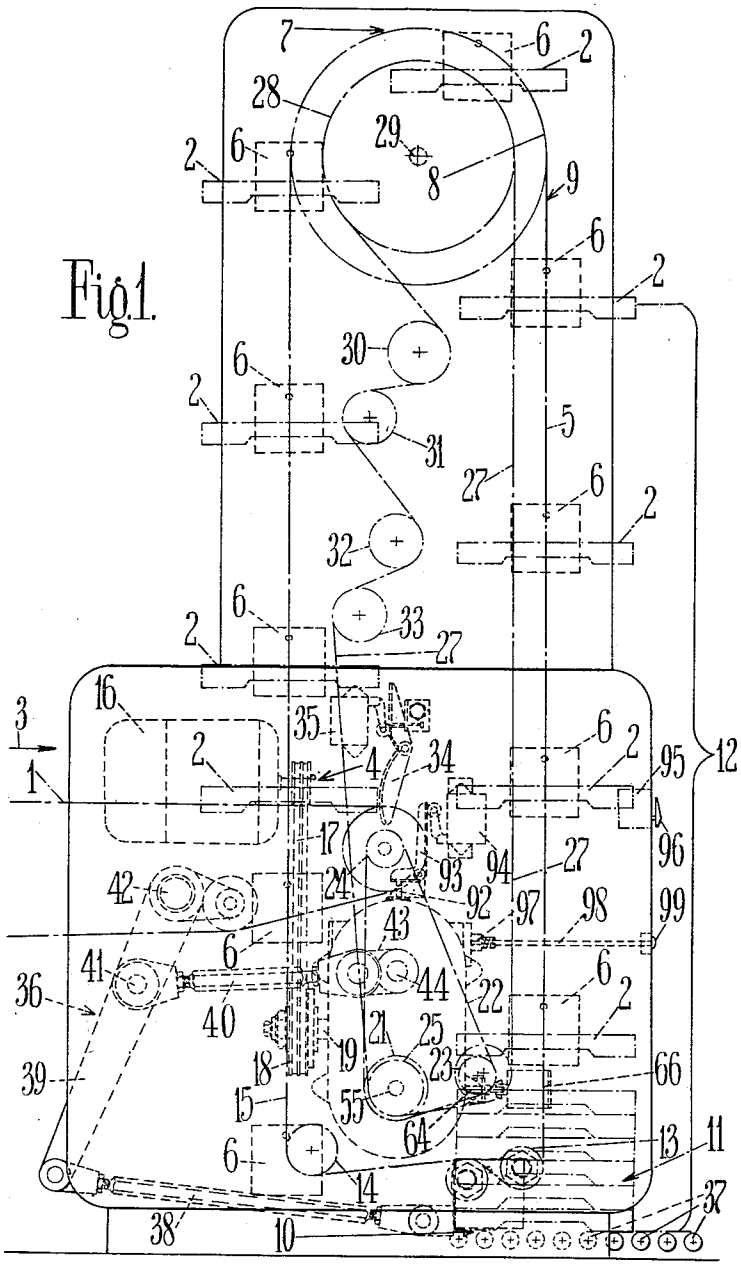
Feb. 25, 1964 G. STEELS 3,122,240

STACKING APPARATUS FOR CONFECTIONERY CASTING TRAYS

Filed Sept. 26, 1960 5 Sheets-Sheet 1

Fig. 1.



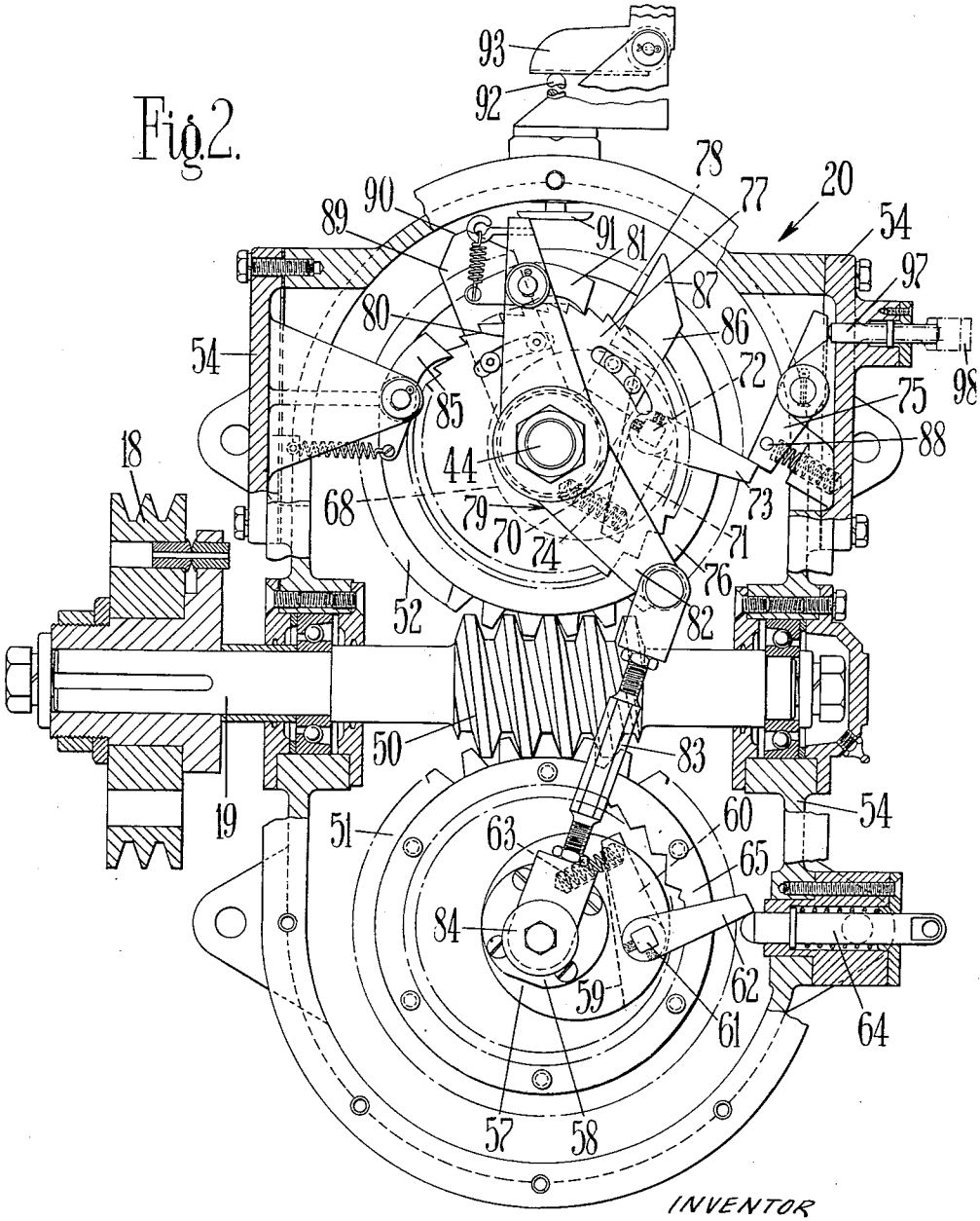
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STACKING APPARATUS FOR CONFECTIONERY CASTING TRAYS

Filed Sept. 26, 1960 5 Sheets-Sheet 2

Fig. 2.



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STACKING APPARATUS FOR CONFECTIONERY CASTING TRAYS

Filed Sept. 26, 1960 5 Sheets-Sheet 3

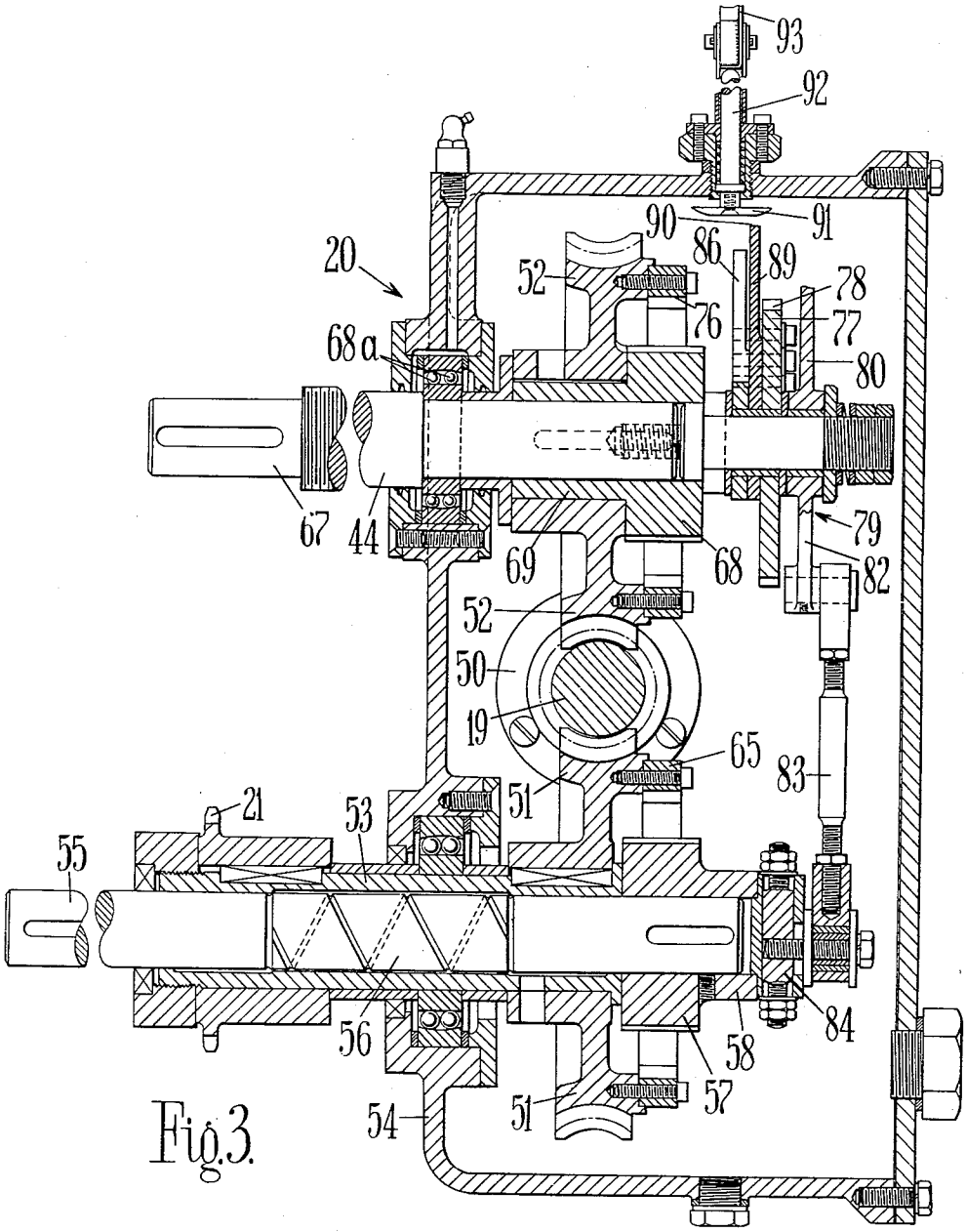


Fig. 3.

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STACKING APPARATUS FOR CONFECTIONERY CASTING TRAYS

Filed Sept. 26, 1960 5 Sheets-Sheet 4

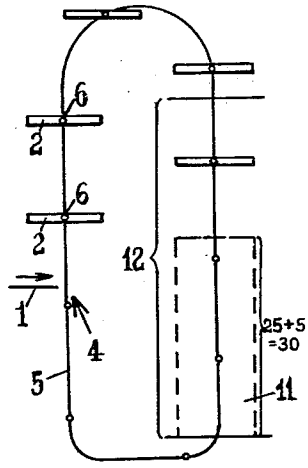


Fig. 4a.

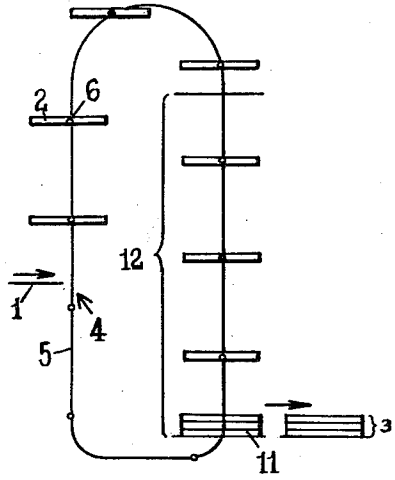


Fig. 4b.

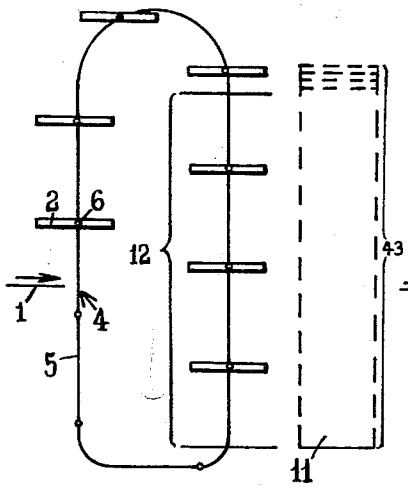


Fig. 4c.

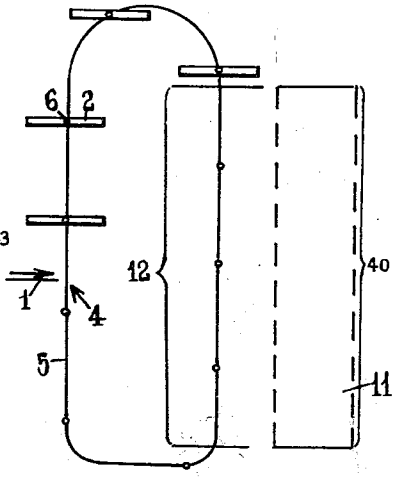


Fig. 4d.

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STACKING APPARATUS FOR CONFECTIONERY CASTING TRAYS

Filed Sept. 26, 1960 5 Sheets-Sheet 5

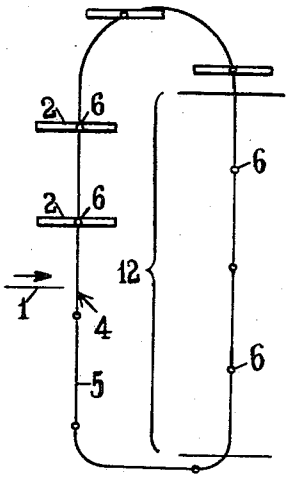


Fig. 6a.

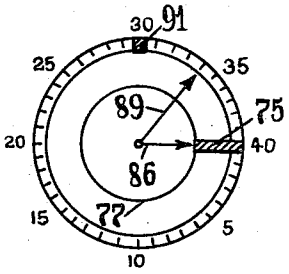


Fig. 6b.

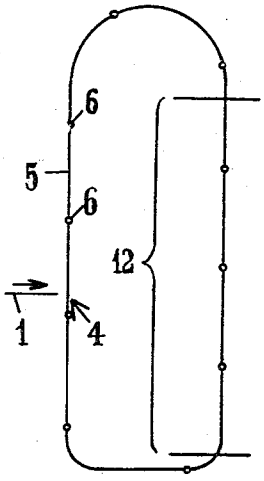


Fig. 5a.

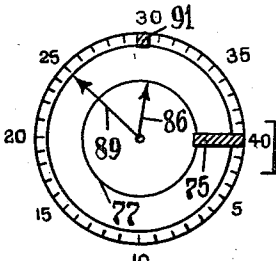


Fig. 5b.

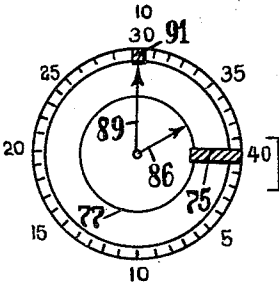


Fig. 5c.

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3,122,240

Patented Feb. 25, 1964

3,122,240

STACKING APPARATUS FOR CONFECTIONERY CASTING TRAYS

Gordon Steels, Peterborough, England, assignor to Baker Perkins Holdings Limited, Peterborough, England

Filed Sept. 26, 1960, Ser. No. 58,488
Claims priority, application Great Britain Nov. 11, 1959
6 Claims. (Cl. 214—6)

This invention relates to apparatus for stacking trays, for example those used in confectionery casting and employing, for instance, powdered starch as the moulding medium, after the sweet-forming material has been cast in the moulds in the trays, so as to form tray stacks for further treatment in a drier. Such tray stacking apparatus consists of horizontal conveyor means which carries the trays one after another from the depositor to an elevator conveyor bearing spaced carriers which engage and lift each tray vertically, the elevator conveyor carrying the trays around and over a semi-circular path providing a top turning point and down to a stacking station where the trays are assembled in stacks of predetermined height. The elevator conveyor is driven in stepwise increments such that each step is equal to the pitch between one tray carrier and the next and means are associated with the elevator conveyor to count up the trays as they are received so that when each stack is completed (i.e. the predetermined number of trays is reached), the stack is automatically ejected from the stacking apparatus by pusher means acting on the lowermost tray of the stack, the stack having been built on a roller conveyor surface; when the next tray in the elevator conveyor circuit reaches the roller conveyor surface the next stack starts to build up and the process is repeated.

At the end of the day's work or on other occasions when the plant is shut down, only a partial stack may have been built and this is ejected from the apparatus by operating a manual ejection control. On starting up again, however, the stacking apparatus will start to build up the remaining part of the stack which was not completed during the previous run and as soon as the number of trays to make up the remaining stack have been fed to the elevator means, the automatic ejection operation will take place and eject such trays as have been stacked. The number of trays actually stacked and ejected, however, is less than the total number required to complete the balance of the stack remaining from the previous run, since a number of the trays fed to the elevator will be still suspended in transit on the elevator and will, in consequence, not be ejected. These trays in transit will form the beginning of the next stack but will not be counted by the machine, which will count the number of trays to make a full stack as and when they are fed to the elevator means, thus the next stack will contain too many trays by the number left in transit at the previous ejection.

The formation of an oversize stack in this manner may cause the stack to foul the drier structure or, more particularly, the top of the over-size stack may foul the next tray in transit on the elevator before the stack is ejected.

It is an object of the present invention to provide an elevator drive and counting mechanism which can be operated on starting up so as to prevent the above-described mis-functioning by initially re-phasing the tray

counting mechanism with the correct build-up of the first full stack.

According to the present invention, in apparatus for stacking trays of the type indicated, there are provided, means for effecting and controlling the building-up of stacks of trays of predetermined height comprising a constantly driving motor means, means for coupling the drive from said motor means to the elevator conveyor to effect a stepwise drive increment thereof equal to one tray carrier pitch whenever a tray is in position to be picked up by the elevator conveyor, counting means responsive to each of said elevator conveyor drive increments to count and total the number of trays fed to the elevator conveyor and means associated with said counting means for actuating ejector means to eject a stack of trays from the stacking apparatus when the counting means has counted and totalled a number of trays equal to the predetermined number of trays to form a complete stack.

The invention also consists in means for effecting and controlling the building up of a stack of trays in a starch tray stacking apparatus of the type indicated comprising means for driving the elevator conveyor in tray pitch steps, means for counting the number of trays fed to the elevator conveyor, means actuated by said counting means for operating the ejector means after the predetermined number of trays constituting a complete stack have been fed to the elevator means, phasing means, put into operation when restarting the apparatus after a shut-down, for running the elevator conveyor empty until counting means is in a position of x tray counts before actuation thereby of the ejector means, where x equals the total number of trays which can be in transit between the point of transfer from the feed conveyor to the elevator conveyor and the level of the top of a complete stack of trays, and means for restoring normal operation of the apparatus, the arrangement being such that the operation of the phasing means, prior to normal running, has ensured that the ejector means operate in phase with the proper build-up of tray stacks of the correct predetermined height only.

In the accompanying drawings:

FIGURE 1 is a side elevation of a tray stacking apparatus, of the type indicated, having operation control means according to the present invention,

FIGURE 2 is a sectional side elevation of a principal part of the operation control means, according to the present invention,

FIGURE 3 is a sectional elevation taken at right angles to the view shown in FIGURE 2,

FIGURES 4*a* to *d* are successive diagrams showing the operation of a tray stacking apparatus without the operation control means according to the present invention,

FIGURES 5*a* to *c* are diagrams showing the initial stages of the operation of tray stacking apparatus with operation control means according to the present invention, and

FIGURES 6*a* to *b* are diagrams showing the final stage of the operations shown in FIGURES 5*a* to *c*.

Before describing in detail the mechanism, according to the present invention, by which the stacking apparatus can be re-phased after a shut down, the problem for which the present invention provides a solution will be discussed with reference to the accompanying diagrammatic drawings, FIGURES 1, 4*a–d*, 5*a–c* and 6*a* and *b*,

so that the operation of the phasing mechanism may be more easily understood.

Describing the general arrangement of a stacking machine of the type mentioned previously, see FIGURE 1, a continuously moving feed conveyor 1 carries trays 2 from a depositor (not shown) in the direction of the arrow 3 to a transfer station 4 whereat the trays are picked up in turn by an intermittently driven elevator conveyor 5.

The elevator conveyor 5 consists, for example, of two spaced chains (not shown) between which the trays 2 pass on entering the transfer station 4 and the chains of the levator conveyor 5 carry opposed pairs of tray carriers, known per se, and indicated at 6, the tray carriers 6 being spaced around the elevator conveyor 5 at equal pitches. The elevator conveyor 5 lifts the trays 2 as they are picked up by the carriers 6 and passes them around a top turning point 7, comprising spaced large diameter sprocket wheels 8. The trays 2 are then carried on a downward path 9 towards a platform 10 constituting a stacking zone at which the stack of trays is built up; a partially built stack 11 of six trays is shown on the platform 10. The trays 2 are deposited one by one on the stack 11 as the elevator conveyor 5 carries the trays past the top of the growing stack, the tray carriers 6 being of the known type which automatically release the trays as the trays are arrested on top of the stack. After passing the stacking zone, indicated by the bracket 12, being the full height of a completed stack, the elevator conveyor 5 and the tray carriers 6 thereon pass around turning point sprockets 13 and 14 back to the vertical path 15 leading to and past the transfer station 4.

The drive for the feed conveyor 1 and the elevator conveyor 5 is derived from an electric motor 16 through a belt drive 17 to a pulley 18 on the input shaft 19 of gear box 20 (illustrated in detail in FIGURES 2 and 3 and described hereinafter) which has a continuously driven output sprocket wheel 21 which drives the feed conveyor 1 through the chain drive 22 and sprocket wheels 23 and 24, and an intermittently driven sprocket wheel 25 which drives the elevator conveyor 5 intermittently in steps or increments each equal to the pitch between successive tray carriers 6 through a chain drive 27 and a sprocket wheel 28 connected to the shaft 29 of the elevator conveyor sprocket wheels 8, the chain drive 27 including a number of tensioning and adjustment sprocket wheels 30, 31, 32 and 33.

As each tray 2 enters the transfer station 4, it actuates a sensing means comprising a trip lever 34 and a microswitch 35 which in turn, initiates in a manner described hereafter a one step drive of the sprocket wheel 25 from the gear box 20 so that the elevator conveyor 5 moves one carrier pitch to pick up the waiting tray 2 and carry it upwards out of the transfer station 4; at the same time any tray carrier 6 carrying a tray past the top of the stack 11 deposits the tray on top of the stack and passes on empty.

As will be described hereafter, the gear box 20 also counts the trays 2 as each tray enters the transfer station 4 and actuates the trip lever 34 and when a total number of trays have been counted which makes up a stack 11 of the desired total height 12, say, 40 trays, the gear box 20 operates an ejector mechanism, indicated at 36, which pushes the completed stack 11 over the platform 10, which has a system of rollers 37 on which the lowermost tray rests, and out of the stacking zone 12 for onward conveying to the drier (not shown).

The ejector mechanism 36 consists of a pusher rod 38 which engages the tray stack at its lowermost tray, a pivoted arm 39 to which the pusher rod 38 is connected and a connecting rod 40 coupled to the pivoted arm 39 at a point 41 spaced from its pivot 42 and to a crank 43 carried on an output drive shaft 44 of the gear box 20, the drive of which is described hereafter. One rotation

of the shaft 44 and crank 43 causes the ejector mechanism 36 to experience a complete forward and backward reciprocation in the course of which the end of the pusher rod 38 pushes the stack of trays out of the stacking zone 12.

Thus the next tray 2 on the elevator conveyor 5 which had not reached the top of the stack at the moment of stack ejection will form the beginning of a fresh stack.

The operation of a stacking apparatus, as described above, will now be described in respect of shutting down the apparatus, e.g. at the end of a day, and restarting the apparatus, reference being made to FIGURES 4*a* to *d* representing what would happen in a conventional or unmodified apparatus, and the resultant disadvantages.

FIGURE 4*a* represents a situation which might commonly occur at shut down, 25 trays having been built up into a partial stack 11 at the time the depositor and other ancillary devices are brought to a halt. Five trays are in transit on the elevator conveyor 5 above the stack and these are incorporated by manually moving or inching the elevator conveyor 5 so that the final stack consists of 25+5 trays, equals 30 trays, i.e. ten trays short of a full stack, which for purposes of illustration will be assumed to be 40 trays. The partial stack of 30 trays is then manually ejected and passed on to the drier.

On restarting there will be no trays on the stack and no trays on the elevator conveyor 5 and as soon as trays are fed to the transfer station 4 the elevator conveyor 5 starts up its stepwise movement and each tray is counted as described above, the counting mechanism having already counted 30 trays at the time of the previous shut down. Thus, when 10 trays have been fed into the elevator conveyor 5 the ejection mechanism will operate automatically and eject the stacked trays. However, at that time only 3 trays will have been stacked as shown in FIGURE 4*b*, the remaining 7 trays fed into the elevator conveyor 5 still being in transit. The 3 tray stack is therefore ejected and a new stack commences to be built, but since three trays were in transit in the stacking zone 12 at the time of the ejection of the previous stack and since the counting mechanism will restart to count a new total of 40 trays fed to the elevator conveyor before the next ejection takes places, the new stack will build up to 3 plus 40 trays equal 43 trays before being ejected, see FIGURE 4*c*. Such an oversize stack may cause dislocation or hindrance to the operation of the plant e.g. due to the next tray on the elevator conveyor fouling the top of the stack before or during ejection and/or due to the stack having to be manually diminished or, failing that, fouling the drier.

After this over-size stack has been built and dealt with, the operation of the machine will be normal, since at the time of the last ejection no unstacked trays were in the stacking zone 12, see FIGURE 4*d*, and the next 40 trays fed to the elevator conveyor 5 will be counted and ejection will take place correctly. The four trays in transit, see FIGURE 4*d*, at the time of ejection do not affect the counting and stack building as although they will form the first four trays of the new stack, the last four trays of the forty counted into the elevator conveyor will themselves be in transit when the new stack is completed and ejected.

In order to overcome this disadvantage, mechanism is included in the gearbox 20 and in the controls of the apparatus for phasing or re-phasing the tray counting mechanism with the correct build-up of the first full stack after restarting the apparatus from shut-down.

In the gearbox 20, see FIGURES 2 and 3, the input shaft 19 carrying the pulley 18 driven by the motor 16 as already described is provided with a worm 50 in constant mesh with an externally gear toothed ring member 51 and a second externally gear toothed ring member 52, so that both ring members 51 and 52 are constantly rotating while the apparatus is in operation.

The ring member 51 is carried on a tubular shaft 53 which passes through the casing 54 of the gearbox 20 and

provides the drive and mounting for the above mentioned sprocket wheel 21 which drives the feed conveyor 1 through the chain drive 22. The sprocket wheel 21, and therefore the feed conveyor 1, are in this way constantly driven.

The intermittent drive to the elevator conveyor 5 is also derived from the constant rotation of the ring member 51 and to this end the sprocket wheel 25 which drives the elevator conveyor 5 through the chain drive 27 is carried on the end 55 of a shaft 56 which passes through the interior of the tubular shaft 53 and is rotated independently thereof. The shaft 56 carries at its inner end a bracket member 57 having a central boss 58 which is co-axial with the shaft 56 and a transverse open channel 59 therethrough. In the channel 59 a pivotal pawl 60 is located on a pivot shaft 61 which passes through the bracket member 57 and carries externally of the bracket member 57 a control arm 62. A compression spring 63 urges the pawl 60 in a direction radially outward of the shaft 56, but movement of the pawl 60 is restrained by contact of the control arm 62 with a displaceable stop post 64 carried on casing 54 of the gearbox.

The ring member 51 has secured concentrically thereto an internally toothed elevator ratchet annulus 65 which rotates constantly with the ring member 51, so that on momentary retraction of the stop post 64 out of contact with the control arm 62, the pawl 60 is urged by the spring 63 into engagement with the elevator ratchet annulus 65 so that the rotation of the elevator ratchet annulus 65 is coupled to the shaft 56. Thus, the shaft 56 completes one rotation, thereby driving the elevator conveyor 5 one step equal to the pitch between one tray carrier 6 and the next, and then stops due to the stop post 64 re-engaging the control arm 62 to cause the pawl 60 to pivot out of engagement with the elevator ratchet annulus 65.

The retraction of the stop post 64 is effected in timed relationship with the arrival of a tray on the feed conveyor 1 at the transfer station 4 and to this end the above mentioned trip lever 34 and micro-switch 35 when actuated by a tray energises a solenoid 66 (see FIGURE 1) which is coupled to the stop post 64 and retracts it momentarily to free the pawl control arm 62 as described above.

In order to count the trays as they are transferred from the feed conveyor 1 to the elevator conveyor 5, the gearbox 20 also includes the counting mechanism to which allusion has previously been made and with this counting mechanism is also associated the actuation of the ejector mechanism 36 previously mentioned.

The ejector mechanism drive shaft 44 which carries on its end 67 the aforementioned crank 43 passes through a bearing 68*a* in the casing 54 of the gearbox 20 and has secured thereto a bracket member 68, similar to the bracket member 57 on the shaft 56. The bracket member 68 has a circular boss 69 on which the previously mentioned second externally gear toothed ring member 52 is journalled so as to rotate, by the continuous drive from the worm 50, independently of the bracket member 58 and shaft 44.

The bracket member 68 is formed, similarly to the bracket member 57, with a transverse channel 70 in which a pivotal pawl 71 is located on a pivot shaft 72 which passes through the bracket member 68 and carries externally of the bracket member 68 a control arm 73. A compression spring 74 urges the pawl 71 in a direction radially outward of the shaft 44, but movement of the pawl 71 is restrained by contact of the control arm 73 with a displaceable stop lever 75 pivotally carried on the casing 54 of the gear box.

The ring member 52 has secured concentrically thereto an internally toothed ejector ratchet annulus 76 which rotates constantly with the ring member 52, so that, on momentary retraction of the stop lever 75 out of contact with the control arm 73 (in the circumstances described hereafter), the pawl 71 is urged by the spring 74 into engagement with the ejector ratchet annulus 76 so that the rotation of the ejector ratchet annulus 76 is coupled to the shaft 44. Thus, the shaft 44 completes one rotation, thereby driving the ejector mechanism 36 by the crank 43 through one forward and backward reciprocatory ejection movement, and then stops due to the stop lever 75 re-engaging the control arm 73 to cause the pawl 71 to pivot out of engagement with the ejector ratchet annulus 76.

Since an ejection operation is required each time a stack of trays reaches its predetermined height, e.g. 40 trays high, it is necessary to count the number of trays passed to the elevator conveyor 5 from the feed conveyor 1 at the transfer station 4, which number under normal working will also represent the number of trays stacked, and then when the predetermined stack total of trays have been transferred to cause the ejector mechanism 36 to be operated as described above by retraction of the stop lever 75 at the appropriate moment.

To effect this counting the shaft 44 carries freely thereon a circular counting member 77 having a circumferentially extending series of equally spaced ratchet teeth 78 the total number of which equals the predetermined number of trays in a complete stack, i.e. for a forty tray stack, the counting member 77 has forty teeth. Also freely mounted on the shaft 44 adjacent the circular counting member 77 is a two-armed lever 79, one arm 80 of which carries a spring-loaded pawl 81 in permanent contact with the counter member 77 and the other arm 82 of which is coupled by a link 83 to an eccentric 84 on the boss 58 of the bracket 57 on the elevator drive shaft 56. Thus on each occasion that the elevator drive shaft 56 is driven around one rotation the two-armed lever 79 is caused to oscillate one forward and backward movement on the shaft 44, by the operation of the eccentric 84 and link 83, and in so doing the pawl 81 moves the counting member 77 incrementally round by one tooth 78 thereby counting one tray transfer. Counter-rotation of the counting member 77 is prevented by a spring loaded pawl 85 mounted on the casing 54 of the gear box. Secured to the counting member 77 is trip lever 86 which moves round with the counting member 77 as the latter experiences its tooth-by-tooth, incremental rotation and counts the number of trays transferred (and hence, normally, the number of trays stacked). When the 39th tray has been counted, the tip 87 of the trip lever 86 is very close to, or just in contact with, a post 88 projecting from the side of the stop lever 75, so that as soon as the 40th tray has been counted, i.e. the counting member 77 has made its 40th tooth movement the trip lever 86 is moved past the post 88 on the stop lever 75 and in so doing retracts the stop lever 75 so that the control arm 73 is freed to allow the pawl 71 to engage in the ejector ratchet annulus 76 and so cause the shaft 44 to be driven round one revolution to effect a full movement of the ejector mechanism 36 to eject the stack of trays from the stacking apparatus. By the time the bracket 68, pawl 71 and control arm 73 have completed one revolution the stop lever 75 again engages the control arm 73 which disengages the pawl 71 from the ejector ratchet annulus 76 so that drive of the ejector drive shaft 44 ceases.

The above counting mechanism is satisfactory during normal running of the stacking apparatus, but in order to effect the proper phasing of the counting mechanism with the correct build-up of the first full stack of trays after a shut down as already discussed, there is also secured to the counting member 77 a radially extending phasing striker arm 89, the tip 90 of which moves with the rotation of the counting member 77 in an orbit which intersects the head 91 of an axially displaceable control rod 92, so that the control rod 92 is moved upwardly (as viewed in FIGURE 2) when the tip 90 of the striker arm 89 comes into engagement with the head 91 of the control rod 92. Displacement of the control rod 92

causes a bell crank lever 93 (see FIGURES 1, 2 and 3) to pivot and opens a normally closed micro-switch 94 (see FIGURE 1 only) which however is only used (i.e. is only in the control circuit) during a phasing operation as will be described hereafter. The angular position of the phasing striker arm 89 relative to the trip lever 86 is such that when the striker arm 89 actuates the micro-switch 94, the tip 87 of the trip lever 86 is exactly x number of the teeth 78 of the counting member 77 before the point at which the tip 87 of the trip lever 86 will operate the stop lever 75 to cause an ejection operation, where x is the number of trays (or tray carriers 6) which can be in transit between the transfer station 4 and the top of a full stack (i.e. in the present example $x=4$).

In order to set the apparatus to carry out a phasing operation, a manual control switch 95 is provided with a control knob 96 which can set the switch 95 either for "Running" (i.e. normal running as described above, in which the micro-switch 35 is operative and the micro-switch 94 inoperative) or for "Phasing" in which the micro-switch 35 of the sensing means is disabled and the micro-switch 94 is operative. When the switch 95 is turned to "Phasing," three conditions are established: (1) the main drive to the "master" or "mogul" machine (molding and casing machine of known type) and the depositor is discontinued so that no trays are delivered to the feed conveyor 1; (2) switch 35 is isolated, as already mentioned so that the solenoid 66 controlling, through the stop post 64, the drive engagement between the rotating elevator ratchet annulus 51 and the elevator drive shaft 56, is no longer operated by trays engaging the trip lever 34 at the transfer station 4; and (3) the solenoid 66 is put into circuit with the normally closed micro-switch 94 so that the stop post 64 is kept retracted and, therefore, the elevator conveyor 5 runs continuously until the micro-switch 94 is opened, as described, by the phasing striker arm 89 displacing the control rod 92 and bell-crank lever 93.

For the purpose of operating the ejector mechanism 36 manually when required, e.g. at shut-down, to eject a part-formed stack of trays, a plunger 97 is mounted in the casing 54 in contact with the stop lever 75 so as to pivot the latter and release the pawl 71. To facilitate using this manual trip, an operating rod 98 is connected to the plunger 97 and extends to the outside of the machine to be operated by a push button 99 or the like.

The operation and effect of the phasing control mechanism described above will be more easily understood with reference to FIGURES 5*a* to *c* and FIGURES 6*a* to *b*, together with FIGURES 1, 2 and 3.

Assuming at the time of shut-down of the plant, the same conditions apply as shown in FIGURE 4*a* and described previously, viz. a partial stack of 25 trays has been completed and the remaining five trays in transit are manually inched down on the elevator conveyor 5 on to the stack so that the partial stack then consists of 30 trays, which stack is manually ejected from the machine by operation of the push button 99 (FIGURE 1) to release the stop lever 75, then on restarting the stacking apparatus will be empty of trays as shown in FIGURE 5*a*. In the counting mechanism, however, the counting member 77 will only have experienced 30 tooth movements (i.e. have only counted 30 trays), see diagram of FIGURE 5*b*, where the arrow 86 representing the trip lever 86 (FIGURES 2 and 3) has just passed the 30th tooth.

To restart, the switch 95 is turned to "Phasing," when only the motor 16 will be running (i.e. the depositor and other previous plant will not yet start) and the tray operated switch 35 will be inoperative and the phasing striker operated switch 94 operative to energise the solenoid 66 to retract the stop post 64 (FIGURE 2) so that the empty stacking conveyor 5 starts running continuously and the counting member 77 rotates tooth-by-tooth. When, however, the phasing striker arm 89 strikes the head 91 of the control rod 92, the switch 94 is opened so that the solenoid 66 is de-energised and the stop post 64 causes the pawl 69 to disengage from the elevator ratchet annulus 65 and the elevator conveyor 5 stops. This is shown in FIGURE 5*c* where the arrow 89 represents the phasing striker arm 89 and the hatched square 91 represents the head 91 of the control rod 92. It will be seen that the trip lever 86 is then 4 teeth away from the stop lever 75 represented by the hatched bar 75. The machine is now phased and the switch 95 is turned to "running" so that when four trays have been fed on to the elevator conveyor 5 at the transfer station 4, see FIGURE 6*a*, the counting member has moved round four teeth so that the trip lever 86 engages the stop lever 75 (see FIGURE 6*b*) and displaces it so that the pawl 71 engages the ejection ratchet annulus 76 and an ejection movement of the ejector mechanism 36 takes place although there are no trays stacked.

As the feed of trays to the elevator conveyor 5 continues, the counting member 77 will proceed to count forty trays before the ejector mechanism 36 operates again, so that a full stack of forty trays will next be ejected, i.e. correct running has been established.

I claim:

1. Tray stacking apparatus adapted to receive trays from a delivery means and arrange them in a stack having a predetermined number of such trays therein; said apparatus comprising means for receiving successive trays from said delivery means and conducting them to a stacking zone; sensing means actuated by each tray delivered to said receiving means; counting means normally connected to said sensing means and operable in response to operation of said sensing means to count each tray delivered to said receiving means; ejecting means at said stacking zone; means interconnecting said counting means and said ejecting means for operating the latter to eject a stack of trays in response to operation of said counting means a predetermined number of times; phasing means independent of said sensing means for operating said counting means; and means for disabling said sensing means and operating said phasing means to condition said counting means in phase with said ejecting means.

2. The apparatus set forth in claim 1 wherein said receiving means comprises a conveyor adapted to support a plurality of such trays in transit to said stacking zone, and means for driving said conveyor.

3. The apparatus set forth in claim 2 including clutch means connecting said driving means and said counting means for moving the latter in increments in response to driving of said conveyor.

4. The apparatus set forth in claim 3 wherein said counting means is rotatable and wherein the number of increments of movement of said counting means in one full revolution thereof corresponds to the number of trays to be arranged in a stack.

5. The apparatus set forth in claim 4 including means for inactivating said phasing means when said counting means has been rotated to a position short of its ejecting means operating position by the number of increments corresponding to the number of trays that may be supported by said conveyor.

6. Tray stacking apparatus adapted to receive trays from a delivery means and arrange them in a stack having a predetermined number of trays therein, said apparatus comprising a conveyor adapted to receive successive trays from said delivery means and transport them to a stacking zone, said conveyor being capable of supporting in transit a number of trays simultaneously; sensing means normally actuated by each tray delivered to said conveyor; counting means; means mounting said counting means for incremental movements; means normally connecting said sensing means to said counting means for moving the latter an increment in response to actuation of said sensing means; ejecting means at said stacking zone; means interconnecting said counting means and said

ejecting means for operating the latter to eject a stack of trays from said stacking zone in response to movement of said counting means through a predetermined number of increments; phasing means independent of said sensing means adapted for connection to said counting means to move the latter incrementally; means for disabling said sensing means and operating said phasing means; and means operated by said phasing means upon movement of said counting means through said predetermined number of increments, less the number of increments corresponding to the number of trays capable of being in transit by said conveyor, for disabling said phasing means.

References Cited in the file of this patent

UNITED STATES PATENTS

1,767,592	King	June 24, 1930
2,266,170	Currie	Dec. 16, 1941
2,635,768	Currie	Apr. 21, 1953
2,924,342	St. Jean	Feb. 9, 1960