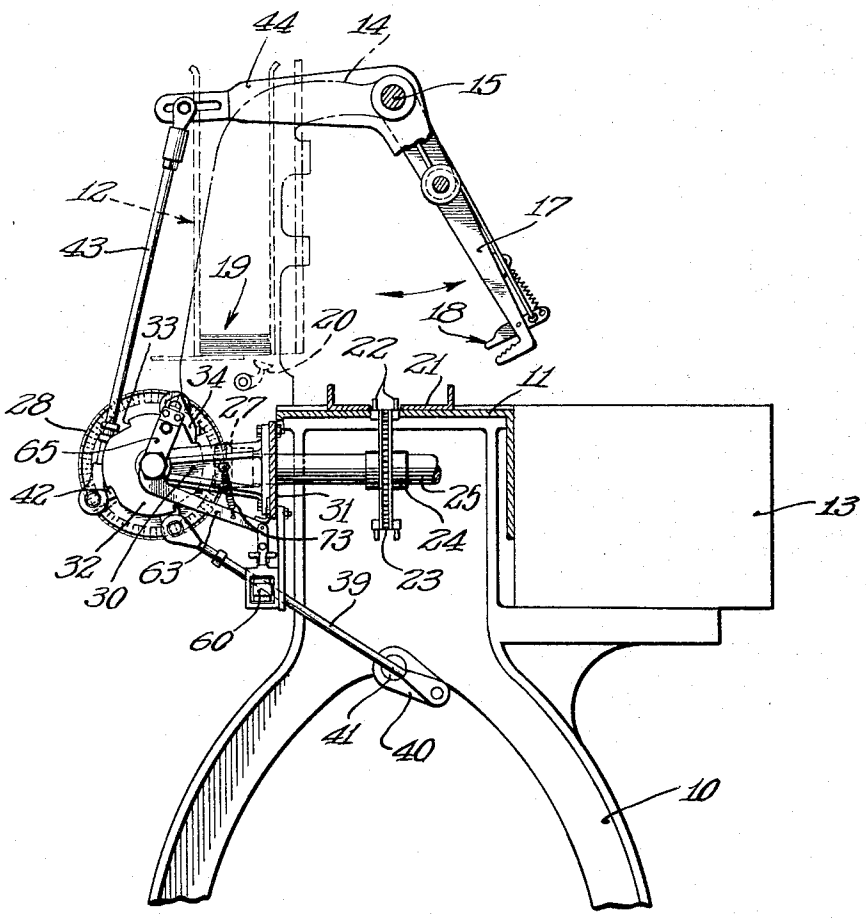
Sept. 6, 1966 E. SATHER ET AL 3,271,022

INSERTER WITH DOCUMENT RESPONSIVE TRACK CONTROL MEANS

Filed July 11, 1963 3 Sheets-Sheet 1

Fig. 1



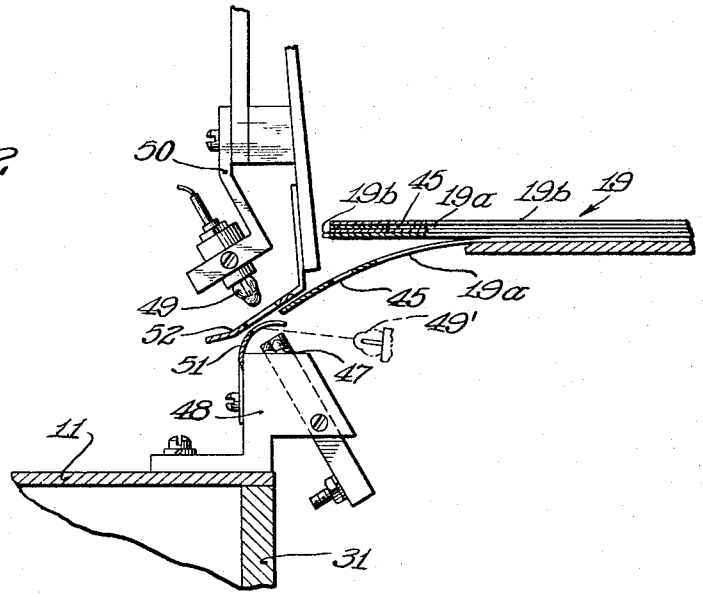
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INSERTER WITH DOCUMENT RESPONSIVE TRACK CONTROL MEANS

Filed July 11, 1963 3 Sheets-Sheet 2

Fig. 2



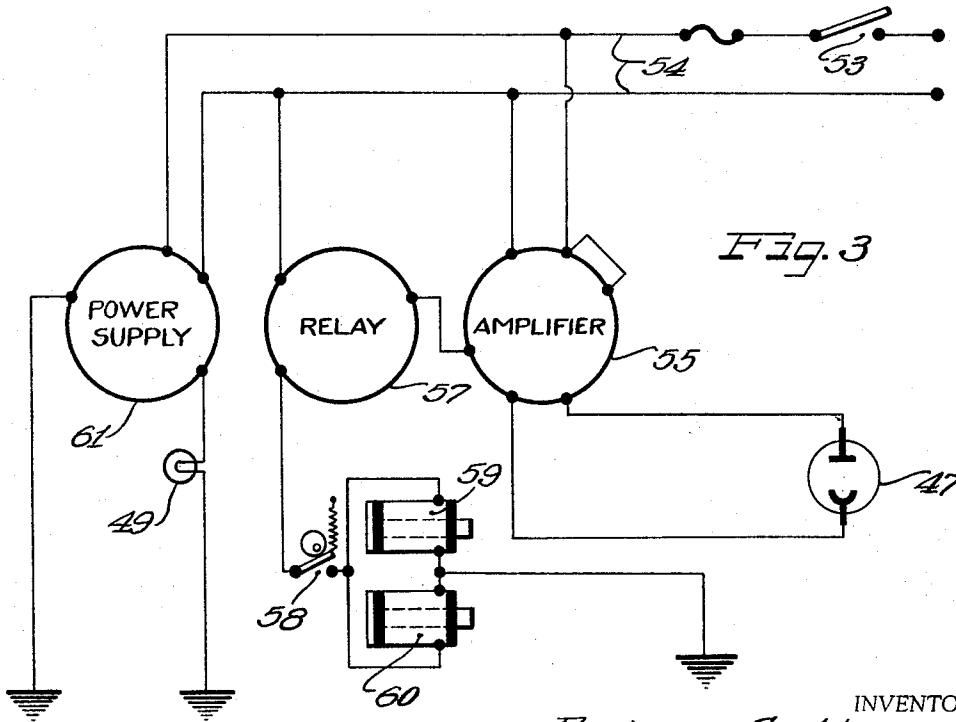


Fig. 3

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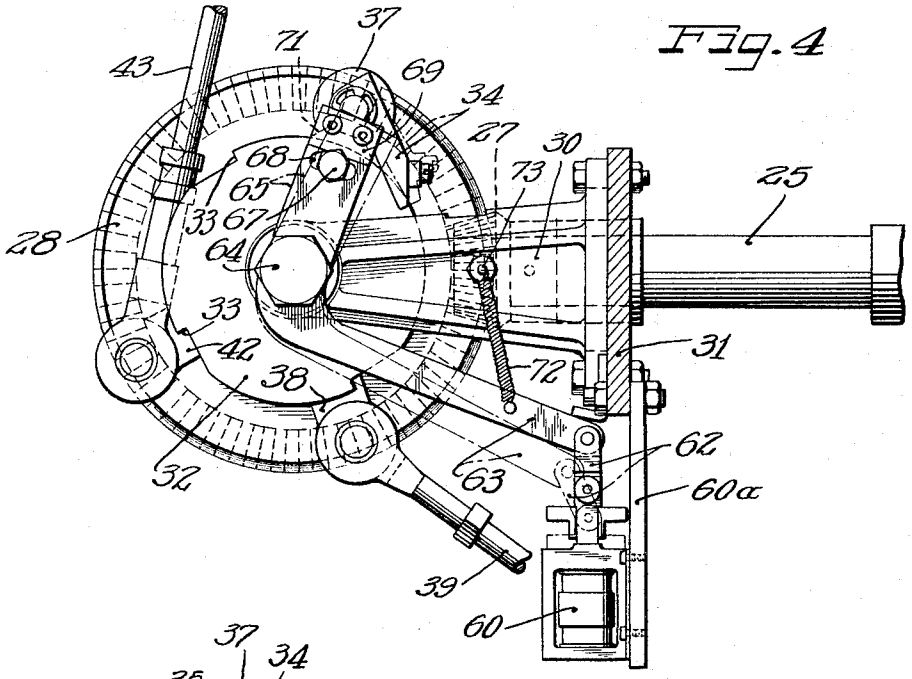
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INSERTER WITH DOCUMENT RESPONSIVE TRACK CONTROL MEANS

Filed July 11, 1963 3 Sheets-Sheet 3

Fig. 4



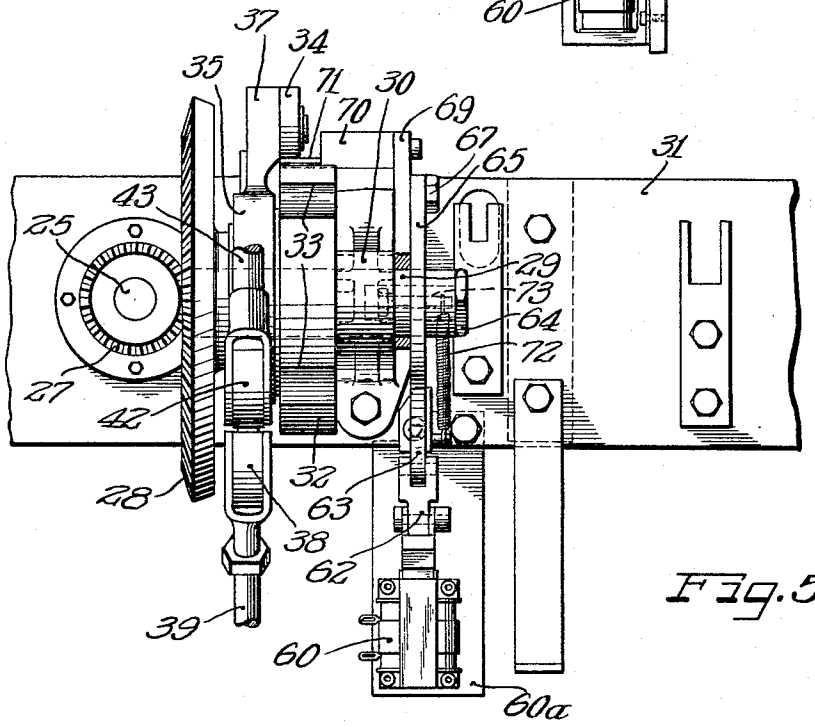


Fig. 5

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3,271,022

INSERTER WITH DOCUMENT RESPONSIVE TRACK CONTROL MEANS

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Filed July 11, 1963, Ser. No. 294,367
14 Claims. (Cl. 270—58)

This invention relates to improvements in inserters of the general type disclosed in detail in A. H. Williams Patent 2,325,455 dated July 27, 1943 (which is hereby made a part of this specification by reference) being especially concerned with new and improved means for controlling the insert transportation mechanism or insert track, and more particularly the intermittent advances of the insert conveyor, of the machine to enable respective groups of companion inserts to remain together when separated from a stack of insert groups and deposited in the track.

Machines essentially as comprehensively disclosed in the aforesaid patent are the well known Phillipsburg inserters. These inserters effect the removal and/or collation of document type pieces of mail and like material from one or more stacks, insertion of the same into envelopes, and sealing, stamping and stacking the envelopes ready for mailing. This is accomplished in a high speed, continuous, automatic fashion by withdrawing stacked inserts from one or more insert stations located alongside insert transportation mechanism, generally referred to as an insert track, comprising a conveyor which is intermittently advanced in timed relation to oscillating gripper arm means, having jaw structure, which successively remove the inserts from the stack in the magazine structure at each insert station and deposit the withdrawn inserts onto the conveyor of the insert track. The inserts eventually arrive at an inserting station where they are stuffed into the envelopes.

In normal conventional operation, single inserts are withdrawn from each insert station magazine successively so that either a single insert in a one station machine or a collection of individual inserts from multi-stations will be deposited on the insert track, as is true for mass mailings, and the like, but the need has arisen for controlling operation of the machine to adapt it for collating indeterminate numbers of companion documents or insert pieces in each insert group. For example, in selective customer, purchaser, patron, and like mailings where the addressees are to receive groups of already collated but separate companion documents or pieces, the machine must discriminate and be selective to withdraw from the stack of grouped pieces to deposit on the insert track all of the pieces in grouped relation which belong together. By way of practical example, where the addressees are to receive dividend, interest, refund or like checks with optional purchase of something of value represented by a document or a plurality of documents, such as one or more bonds of a predetermined value, the respective checks with the companion document or documents such as bonds where requested or ordered are stacked together by groups. Certain of the checks may be alone, others may have one companion piece associated therewith and others may have a plurality of companion pieces therewith, and the machine must be selective as to the varying quantities of grouped inserts as successively reached in the stack.

Accordingly, it is an important object of the present invention to provide new and improved means in an inserter for controlling the insert track responsive to the documents handled by the machine.

Another object of the invention is to provide a novel insert track operation controlling device.

A further object of the invention is to provide new and improved means for controlling the dwell intervals of the insert track in accordance with variable numbers of inserts to be grouped together but individually successively withdrawn from an insert station magazine stack.

Still another object of the invention is to provide new and improved means for controlling the operation of the ratchet indexing pawl for indexing the insert track.

Other objects, features and advantages of the present invention will be readily apparent from the following detailed description of a preferred embodiment thereof taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a more or less schematic fragmentary vertical sectional detail view through an inserter, embodying features of the invention;

FIGURE 2 is a more or less schematic vertcial sectional elevational detail view of a photoelectric eye detector device adapted to be employed in the control system of the machine;

FIGURE 3 is a schematic diagram of the electrical control circuitry involved in the control system;

FIGURE 4 is an enlarged fragmentary detail side elevational view of the insert track conveyor indexing pawl and ratchet mechanism and the control mechanism therefor; and

FIGURE 5 is a rear elevational view of the mechanism.

In the generally schematic illustration in FIGURE 1 only those features of the inserter are depicted which are pertinent to an understanding of the present invention which is concerned with an accessory or addition to the machine represented by the disclosure in Patent 2,325,455 included by reference herein. Therefore, elements of the machine assembly not immediately related to the present invention have been omitted from the present drawings. In this machine a supporting frame **10** carries a working table **11** at suitable elevation and of a preferred length to accommodate as many insert stations at the rear side thereof as preferred, one such insert station **12** being depicted. An operating mechanism housing **13** is carried by the front of the machine frame.

Supported by upright standards **14** attached to the rear portion of the machine frame is a rock shaft **15** carrying as many gripper arms **17** as there are insert stations **12** and each provided with a gripper jaw assembly **18** operable in the cyclical oscillating swinging movements of the gripper arms over the table **11** from a starting position over the front of the table to an insert gripping position at the rear of the table to grip the front margin of an insert **19** in the associated insert magazine or hopper at the station **12**, as deflected downwardly at the bottom of the magazine by a suction cup device **20**, and pull the insert from the bottom of the stack toward the front of the table **11**. Operation of the gripper jaws **18** of the gripper arms is synchronized to release the withdrawn insert in each instance as the arm reaches a proper position adjacent to the front of an insert track **21** located longitudinally on the table **11**. As the insert is deposited in the track **21**, in each instance, it comes to rest in the path of conveyor lugs or pins **22** on a conveyor chain **23** trained over appropriate sprocket gears including a drive sprocket **24** carried by a rotary shaft **25** having a rear end portion carrying corotatively a beveled pinion **27** which meshes with a beveled driving gear **28** (FIGS. 1, 4 and 5) mounted corotatively on a shaft **29** parallel to the back of the table **11** and supported by a bearing bracket **30** which is secured fixedly to a rear vertical apron plate **31** depending below the table **11** on the frame **10**.

Means are provided for indexing travel of the conveyor **23** with insert withdrawing and depositing cycles of the gripper arms **17**, comprising a ratchet disk or wheel

32 mounted corotatively on the shaft 29 and provided with a series of equidistantly spaced peripheral ratchet teeth or shoulders 33, herein comprising four, adapted to be successively engaged by an oscillating pawl 34 for incrementally advancing the indexing ratchet wheel 32 and through the bevel gear train or transmission, the shaft 25 and thereby the driving sprocket 24 and the conveyor chain 23 by one inserter station increment with normally an intermediate dwell synchronized with one cycle of operation of the gripper arms 17. Means for synchronously driving the pawl 34 comprise a three armed lever 35 freely oscillatably mounted on the shaft 29 between the bevel gear 28 and the ratchet disk wheel 32 and having one arm 37 on which the indexing pawl 34 is mounted. A second arm 38 of the oscillating lever is connected by a connecting rod 39 to a crank 40 fixed on a main drive shaft 41 mounted on the machine frame 10 below the conveyor 23. As the shaft 41 drives the crank 40 continuously, the armed lever 35 is cyclically oscillated for not only actuating the indexing pawl 34, but also for synchronously oscillating the gripper arm carrying rock shaft 15 through a third lever arm 42 having connected thereto a generally upwardly extending link rod 43 adjustably connected on its upper end to the rear end portion of a rock lever 44 fixedly attached as by keying or the like to the rock shaft 15. Thereby, in each cycle of the crank 40, the gripper arms 17 are oscillated through one full cycle and the indexing pawl 34 is driven through one full indexing cycle.

According to the present invention, means are provided at one of the insert stations 12 for controlling the conveyor indexing means, and more particularly the pawl 34 to coordinate the length of dwell of the conveyor 23 with any indefinite number, from one up, of companion inserts to be withdrawn individually in successive cycles of the associated gripper arm 17 and deposited in grouped, stacked together or collated relation in the insert track 21 so as to be conveyed as a group by the conveyor 23. To this end, at least one of the inserts in each group has a sensing identification, and sensing means are mounted in the path of movement of the inserts from the stack in the magazine of the insert station 12 which means are sensitive to the indentification to control the operations of the means for controlling the indexing mechanism and more particularly the indexing pawl 34. Such sensing identification or sensible means, in one practical arrangement, comprises a hole 45 (FIG. 2) in an insert 19*a* serving as a control or master piece for an insert group, which may include itself alone, but is adapted to include an indefinite number of companion inserts 19*b* which are free from the indentification 45.

As the master insert 19*a* is withdrawn from the magazine, sensing means "read" the identification 45 and provide a signal ordering an indexing advance of the conveyor 23 to clear the track 21 for receiving the master insert 19*a* and its companion insert or inserts 19*b*, if any. However, since the companion inserts 19*b* do not have any sensible means, their passing the sensing means affords no signaling response therein and, accordingly, the conveyor dwell is prolonged through completion of the withdrawing and depositing cycle of the gripper arm in respect to the companion piece or insert 19*b*, and any succeeding companion inserts 19*b* until another master insert 19*a* through its identification 45 causes the system to respond and effect indexing by advance of the conveyor 23 to carry the preceding group onward to a succeeding insert station where another insert of a type to be included with each of the groups is collated therewith.

In a suitable sensing device, a photoelectric cell arrangement is employed including a diode 47 mounted as on a bracket 48 on one side of the path of movement of the inserts 19 from the magazine to the insert track, while a lamp 49 is mounted on the opposite side of the path of movement as on a bracket 50. Through this arrangement the diode receives the light source beam whenever the identification hole 45 registers with the electric eye. Apertured guides 51 and 52 associated with respectively the diode and the light source lamp assist in guiding the successive inserts through the sensing zone.

In FIGURE 3 is shown a diagrammatic circuit in which the electric eye assembly is operatively connected and including a master switch 53 and main power leads 54 connected to any suitable source of electrical power such as 110 volt alternating line current. An amplifier 55 is connected to the power source leads 54 and has the diode 47 connected thereto for amplifying the diode signal when energized and transmitting such signal to a relay 57 which is connected through a cycling switch 58 to a vacuum or suction control solenoid 59 and an indexing control solenoid 60. The lamp 49 receives current from a low voltage power supply 61.

In the normal cycling operation of the machine the solenoids 59 and 60 remain deenergized and there is an indexed advance of the conveyor 23 cycled with each oscillating cycle of the gripper arms 17. If a sensing identification hole 45 registers with the electric eye during a regular cycle, the signal put in through the amplifier 55 calls upon the relay 57 to maintain the solenoids 59 and 60 deenergized and inactive. However, when the electric eye is blanked out in the cycle by passage of an unperforated insert 19*b* through the sensing zone, the lack of signal through the amplifier 55 permits the relay 57 to send an energizing current to the solenoids 59 and 60 whereupon the vacuum solenoid 59 disconnects suction from the suction cups 20 of all of the insert stations 12 beyond the insert station containing the stack of groups of inserts 19 and at the same time the energized solenoid 60 disables the conveyor indexing mechanism to prolong the dwell of the conveyor until the companion insert joins the master insert of the group.

Support for the index controlling solenoid 60 is provided by a mounting plate or bracket 60*a* secured to depend below the skirt plate 31 so that by means of a connecting link 62, the upper end of the solenoid armature can conveniently be connected to an adjacent end of a bell crank 63 which is freely oscillatably mounted on an axis concentric with the shaft 29 by means such as a removable bolt 64 secured into the end of the shaft opposite the bevel gear 28. A generally upstanding arm 65 of the bell crank lever is adjustably secured as by means of a screw 67 extending through a transversely elongated adjustment slot 68 to a disabling lever arm 69 which is concentrically freely oscillatably journalled on the adjacent end portion of the shaft 29. On its head end, the disabling arm 69 has a cam block 70 provided with a disabling cam 71 disposed in the normal cycling relationship of the mechanism in an inactive position relative to the indexing pawl 34 but is arranged for movement into disabling relation to the pawl when the solenoid 60 is energized. Thus, in the normal, inactive, deenergized condition of the solenoid 60, biasing means, in the form of a coiled tension spring 72 connected at one end to the lower long arm of the bell crank 63 and at its opposite end to a stud 73 projecting from the bracket 30, holds the bell crank in a counterclockwise position as shown in full line in FIGURE 4, wherein the disabling cam 71 is disposed in such relation to the underside of the indexing pawl 34 that in the return stroke of the pawl reciprocation it remains in contact with the perimeter of the ratchet wheel 32 so that the pawl can engage freely with the next succeeding one of the racthet shoulders 33.

Upon energization of the solenoid 60, the bell crank 63 is rocked clockwise as viewed in FIGURE 4, in opposition to the bias of the spring 72 and the disabling cam 71 is shifted into active position, as shown by the dot dash outline of the arm 65 wherein the cam 71 is in the path of return movement of the pawl 34 and biases or holds it away from the ratchet wheel perimeter so that in the succeeding advancing stroke of the pawl it idles past and clears the next succeeding one of the pawl shoulders 33 and does not cause indexing of the insert conveyor in that

stroke or cycle of the machine. At the end of the cycle, opening of the normally open cycling switch **58** deenergizes the solenoids **59** and **60**. If, in the succeeding cycle the differentiating or sensing device is passed by another one of the non-coded inserts **19***b*, there is again energization of the solenoids **59** and **60** during closing of the cycling switch **58** and dwell of the track conveyor is prolonged to receive such document in collated relation with the preceding document or documents of its group. If the indexing control system receives a conveyor advancing signal from the sensing device by reason of a coded one of the inserts **19***a* passing through the sensing zone, the disabling or index pawl cutout device remains dormant or non-operating and the indexing pawl functions to effect indexed advance of the insert track conveyor.

Although the punched card coding **45** of the inserts **19***a* is an effective distinguishing or differentiating arrangement and is highly useful due to the extensive use of punched card checks and the like, another and alternative type of coding which will function the same comprises differentiating color coding the documents either by over all color differentiation or by color spot differentiation. For that type of sensing, the light source is mounted as shown at **49'** in FIGURE 2 to direct a beam of light onto and to reflect from that face of the document which opposes the diode or electric eye **47**, which will read the color for which it is adjusted and thus differentiate between the colors and generate a signal for indexing only when a document having the readable color passes through the sensing zone. For this type of reading the diode and light source may be selectively either above or below the document.

Where the document groups comprise at least one document which is undistinguished by code characteristics producing a response in the sensing device to go to each addressee and optionally one or more companion inserts which do have sensible coding means thereon such as punched holes or color differentiation, the indexing control signal system is readily adjustable to function to signal the system to index and advance the conveyor whenever a document passes through the sensing zone without any distinguishing, sensible characteristic, but to hold the conveyor in a prolonged dwell, that is skip the indexing operation of the cycle, when a coded document passes through the sensing zone. The net result is, of course, the same as where the master insert is coded instead of the master insert being uncoded. Operation is fully automatic in the continuous cycling operation of the machine.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

We claim as our invention:

1. In an inserter including means for supporting a stack of groups of inserts comprising in each group at least a master insert and optionally an indefinite number of companion inserts with sensibly differentiating identification means on either the master insert or the companion inserts and means for withdrawing the inserts one-by-one from the stack and depositing them in an insert track including an insert conveyor with means for indexing intermittent advancing movements of the conveyor in timed relation to the withdrawing and delivering means, the improvement comprising:

means for controlling operations of said indexing means including sensing means responsive to said identification means for enabling functioning of the indexing means to advance the conveyor when a master insert is withdrawn from the stack and for disabling the indexing means to hold the conveyor in a dwell when a companion insert is withdrawn from the stack to be collated with the master insert in the track.

2. An inserter as defined in claim **1**, wherein the indexing means include a pawl and ratchet mechanism, and said means for controlling operations of the indexing means comprise a pawl-engageable disabling device.

3. An inserter as defined in claim **2**, wherein the means for controlling operations of the indexing means include a solenoid controlled by said sensing means for operating said disabling device.

4. In an inserter including means for supporting a stack of groups of inserts comprising in each group at least a master insert and optionally an indefinite number of companion inserts with sensibly differentiating identification means on either the master insert or the companion inserts and means for withdrawing the inserts one-by-one from the stack and depositing them in an insert track including an insert conveyor with means for indexing intermittent advancing movements of the conveyor in timed relation to the withdrawing and delivering means, the improvement comprising:

a selectively operable disabling device operatively associated with said indexing means,

and sensing means distinguishing said identification means and controlling operations of said disabling device.

5. In an inserter including means for supporting a stack of groups of inserts comprising in each group at least a master insert and optionally an indefinite number of companion inserts with sensibly differentiating identification means on either the master insert or the companion inserts and means for withdrawing the inserts one-by-one from the stack and depositing them in an insert track including an insert conveyor with means for indexing intermittent advancing movements of the conveyor in timed relation to the withdrawing and delivering means, the improvement comprising:

a selectively operable disabling device operatively associated with said indexing means,

a solenoid for operating said disabling device, and sensing means responsive to said identification means for controlling said solenoid.

6. An inserter including means for supporting a stack of groups of inserts comprising in each group at least a master insert and optionally an indefinite number of companion inserts with sensibly differentiating means on either the master insert or the companion inserts,

means for withdrawing the inserts one-by-one from the stack,

an insert track for receiving the inserts from said withdrawing means and including a conveyor,

conveyor indexing means including a ratchet wheel and an indexing pawl,

means for reciprocably actuating said pawl in coordination with said withdrawing means for incrementally advancing the conveyor in timed relation to the withdrawing means,

and pawl disabling means responsive to said differentiating means and operable to control said pawl to advance the indexing ratchet wheel for advancing the conveyor whenever a master insert is withdrawn from the stack and to disable the pawl whenever a companion insert is withdrawn from the stack.

7. An inserter construction comprising indexing means for coordinating operations of an insert track conveyor with means for removing inserts from a stack and depositing them on the conveyor,

said indexing means including a rotatably mounted indexing ratchet wheel having circumferentially spaced ratchet shoulders,

a reciprocably mounted indexing pawl,

means for reciprocably actuating said pawl in timed relation to the insert removing and depositing means,

and a pawl disabling device selectively operable to hold the pawl against indexing said indexing ratchet wheel in any selected cycle of the insert removing and depositing means to permit multiple insert deposits on the conveyor between indexing of the conveyor.

8. An inserter construction as defined in claim 7, wherein said disabling device comprises a member which selectively holds the pawl against making engagement with a ratchet shoulder of the indexing ratchet wheel while the pawl continues its normal reciprocating cycles.

9. In an inserter including means providing an insert track with an indexably movable conveyor,
means for supporting a stack of groups of inserts at one side of the track,
a rock shaft mounted above said track and having a gripper arm depending therefrom and oscillated in the rocking of the rock shaft,
said gripper arm having an insert gripping jaw,
a conveyor actuating shaft,
gear means for driving said shaft including a driving gear,
an indexing ratchet wheel mounted corotative with said driving gear,
oscillating means including a connection for oscillatably driving said rock shaft and also including an indexing pawl,
means for continuously cyclically driving said oscillating means for cyclically rocking said rock shaft to move said gripping jaw into insert engaging relation to said insert supporting means to withdraw successive inserts and deposit the same in said track while at the same time effecting indexing oscillations of the pawl to actuate said ratchet wheel and thereby indexably advance the conveyor in timed relation to said gripper arm,
and means for selectively disabling said pawl while it continues its oscillating cycles to effect prolonged dwells for deposit in the track of a plurality of inserts individually removed from the stack by the gripper arm.

10. In an inserter including means providing an insert track with an indexably movable conveyor,
means for supporting a stack of groups of inserts at one side of the track,
a rock shaft mounted above said track and having a gripper arm depending therefrom and oscillated in the rocking of the rock shaft,
said gripper arm having an insert gripping jaw,
a conveyor actuating shaft,
gear means for driving said shaft including a driving gear,
an indexing ratchet wheel mounted corrotative with said driving gear,
oscillating means including a connection for oscillatably driving said rock shaft and also including an indexing pawl,
means for continuously cyclically driving said oscillating means for cyclically rocking said rock shaft to move said gripping jaw into insert engaging relation to said insert supporting means to withdraw successive inserts and deposit the same in said track while at the same time effecting indexing oscillations of the pawl to actuate said ratchet wheel and thereby indexably advance the conveyor in timed relation to said gripper arm, and means for selectively disabling said pawl while it continues its oscillating cycles to effect prolonged dwells for deposit in the track of a plurality of inserts individually removed from the stack by the gripper arm, said disabling means including:
a bell crank mounted oscillatably on the oscillating axis of said pawl and including a disabling cam engageable in disabling relation with the pawl responsive to oscillation of the bell crank relative to the pawl,
means for normally holding the bell crank in an inactive position,
and means selectively operable to rock the bell crank into pawl disabling relation of said cam to the pawl.

11. In an inserter including means providing an insert track with an indexably movable conveyor,
means for supporting a stack of groups of inserts at one side of the track,
a rock shaft mounted above said track and having a gripper arm depending therefrom and oscillated in the rocking of the rock shaft,
said gripper arm having an insert gripping jaw,
a conveyor actuating shaft,
gear means for driving said shaft including a driving gear,
an indexing ratchet wheel mounted corotative with said driving gear,
oscillating means including a connection for oscillatably driving said rock shaft and also including an indexing pawl,
means for continuously cyclically driving said oscillating means for cyclically rocking said rock shaft to move said gripping jaw into insert engaging relation to said insert supporting means to withdraw successive inserts and deposit the same in said track while at the same time effecting indexing oscillations of the pawl to actuate said ratchet wheel and thereby indexably advance the conveyor in timed relation to said gripper arm,
and means for selectively disabling said pawl while it continues its oscillating cycles to effect prolonged dwells for deposit in the track of a plurality of inserts individually removed from the stack by the gripper arm, said disabling means including:
a bell crank mounted oscillatably on the oscillating axis of said pawl and including a disabling cam engageable in disabling relation with the pawl responsive to oscillation of the bell crank relative to the pawl,
means for normally holding the bell crank in an inactive position,
a solenoid connected to said bell crank,
and electrically operable means for selectively energizing the solenoid to rock the bell crank in opposition to said normal holding means for the bell crank to move the disabling cam into disabling relation to the pawl.

12. An inserter including means for supporting a stack of groups of inserts comprising in each group at least a master insert and optionally an indefinite number of companion inserts and wherein at least one of said master and companion inserts carries differentiating means,
means for withdrawing the inserts one-by-one from the stack,
an insert track including a conveyor for receiving the inserts from said withdrawing means,
conveyor indexing means coordinated in operation with said withdrawing means,
and means for controlling operations of said indexing means responsive to said differentiating means including:
a mechanical disabling device operatively associated with the indexing means,
electrical means for controlling said disabling device and including a sensor responsive to said differentiating means,
an amplifier receiving signals from the sensor,
a relay signalled by the amplifier,
and a solenoid controlled by the relay and connected operatively to said disabling device,
whereby said conveyor is controlled in operation with said withdrawing means to keep the groups of inserts together on the conveyor although withdrawn individually from the stack.

13. An inserter as defined in claim 12, wherein the electrical means includes in addition a normally open cycling switch which is cyclically closed in the cycle of operations of the withdrawing means and which is located between the relay and the solenoid to close a circuit to

the solenoid timed with signalling of the relay but which switch is open in each cycle to deenergize the solenoid and clear the disabling means so that the solenoid will be energized to activate the disabling means only in response to signal received from the sensor through the amplifier and the relay.

14. An inserter as defined in claim **12**, including in addition to said first mentioned means, at least one means for supporting a stack of inserts and having means for withdrawing inserts for collating with the groups of inserts successively, and means for controlling said last mentioned withdrawing means including a control solenoid connected in parallel with said first mentioned solenoid and

controlled by the same sensor to amplifier to relay signal, to withdraw inserts in response to signals from the sensor.

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