June 1, 1971 D. H. BUSHEY 3,581,371

PHOTOGRAPHIC FILM PACKET MANUFACTURE

Filed March 3, 1969 2 Sheets-Sheet 1

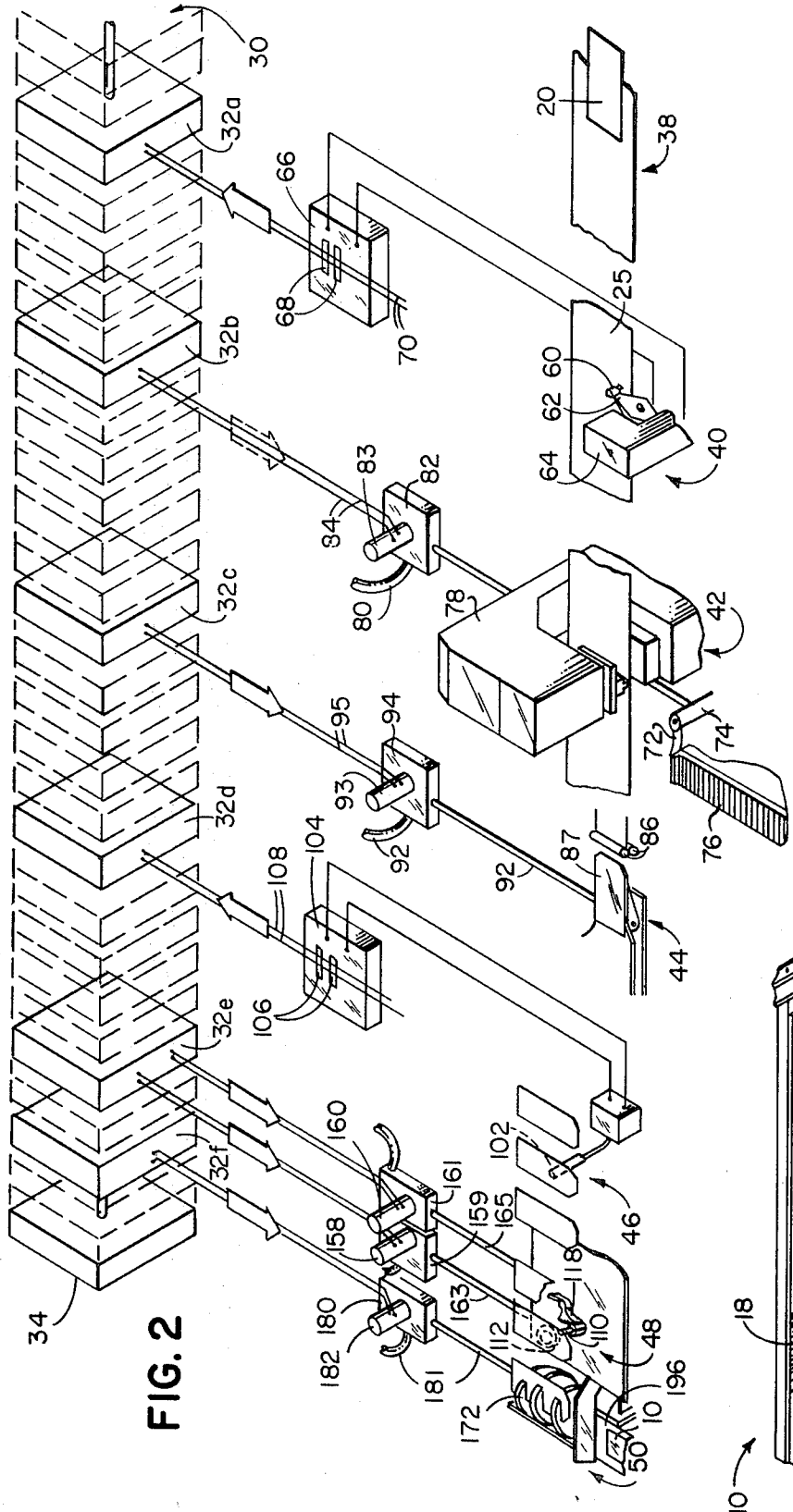


FIG. 2

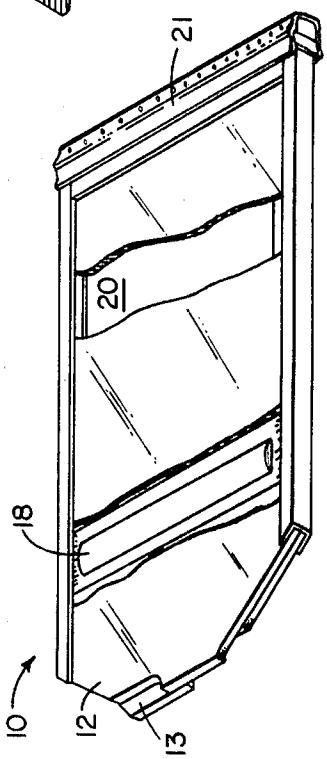


FIG. 1

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PHOTOGRAPHIC FILM PACKET MANUFACTURE

Filed March 3, 1969 2 Sheets-Sheet 2

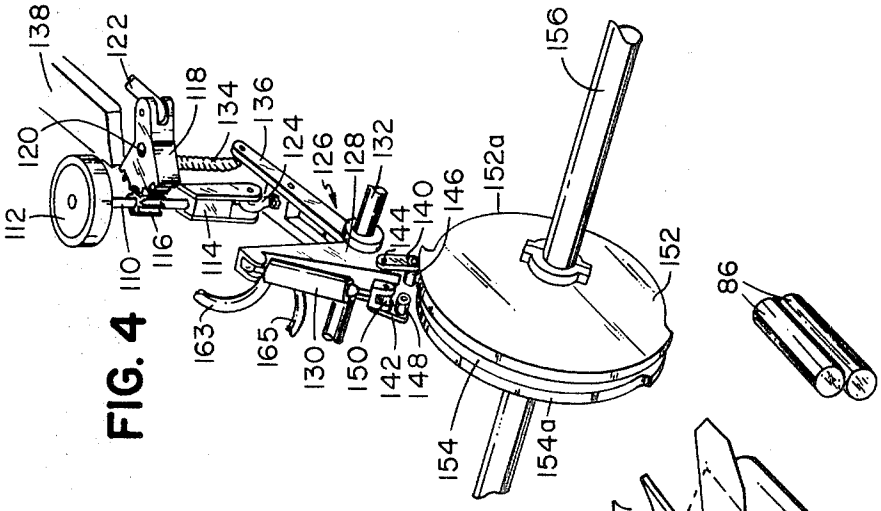


FIG. 4

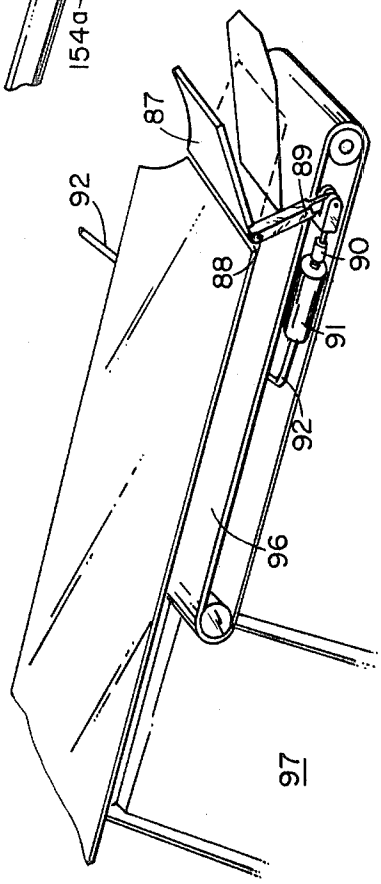


FIG. 3

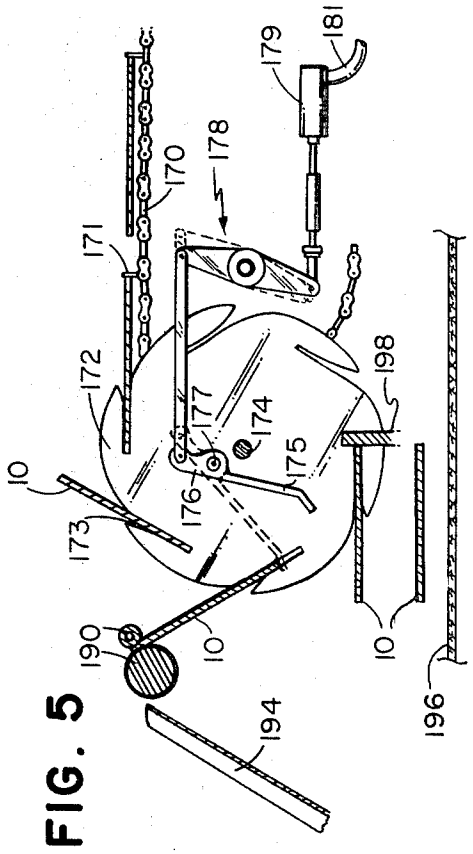


FIG. 5

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PHOTOGRAPHIC FILM PACKET MANUFACTURE

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U.S. Cl. 29—208 15 Claims

ABSTRACT OF THE DISCLOSURE

In photographic film packet manufacturing apparatus having stations operating on web portions, first and second detectors, downstream of first and second stations, providing signals to a memory in response to web portion conditions, an element responding to signals from the first detector to prevent operation of the second station, and an ejector following the second detector and responsive to signals from it to prevent web portions from reaching a terminal station.

This invention relates to the manufacture of photographic film packets.

The primary object of the invention is to minimize the loss of useful packet components on an automatic assembly line that is subject to stringent quality control.

The invention features, in apparatus for the manufacture of photographic film packets which has stations through which pass web portions and at which are respectively carried out in sequence various operations, including first and second stations for respectively depositing first and second packet components on the web portions, and a terminal station for receiving finished packets, a first detector located downstream of the first station and being responsive to the absence of the first component on a web portion to provide a signal, at least one second detector located adjacent the path of the web portions and responsive to a condition at the portions to provide a signal, a memory responsive to the signals, an element responsive to the memory to prevent the depositing of the second component on web portions which caused a signal, and an ejector located between the terminal station and the second station and responsive to the memory to prevent web portions for which the second detector provided a signal from reaching the terminal station. In preferred embodiments the ejector is located downstream of the last station at which components are deposited on the web portions, so that web portions prevented from reaching the terminal station are packets complete except for the existence of the condition, the first detector is located immediately downstream of the first station, the second detector is located downstream of the last station at which components are deposited on the web portions, the first detector is responsive to the absence of a component which cannot be effectively added to the packet after it leaves the apparatus, and the second detector is downstream of the first detector and is responsive to a condition which can be effectively corrected after the packet leaves the apparatus to make the packet commercially useful, the second station includes a fluid operated mechanism having a fluid supply line and the element is a valve in the line; there is included at least one rotatable slotted spider wheel for receiving finished packets in slots in one position and rotating to another position, and a member for transferring the packets from the slots at the other position to the terminal station, in which the ejector includes a movable arm responsive to the memory located at an intermediate position for ejecting packets for which the second detector provided a signal; there is also included a second ejector located between the first and second detector and responsive to the memory to prevent web portions for which the first detector provided a signal from reaching the second detector, the second ejector including a gate movable between a first position allowing the passage of web portions and a second position interrupting the passage of web portions for which the first detector provided a signal; there is also included a station having a member for turning alternate packets 180°, a second element responsive to the memory to prevent alternation with respect to the next previous packet of any packet for which the first or second detector provided a signal, first and second cam wheels having effective operating portions out of phase with each other, first and second rollers mounted for contact with the cam wheels and offset from each other and respectively associated with the wheels so that only one roller may contact its corresponding cam wheel at a time, linkage connected between the member and the rollers so that the packets are turned when one of said rollers is in contact with the effective operating portion of its corresponding cam wheel, the second element causing the roller in contact with its corresponding cam wheel to move away from the wheel and causing the other roller formerly free to contact its corresponding cam wheel.

Other objects, features, and advantages will appear from the following description of a preferred embodiment of the invention, taken together with the attached drawings thereof, in which:

FIG. 1 is a perspective view, partially broken away, of a photographic film packet of the type made by apparatus embodying the invention;

FIG. 2 is a fragmentary, partially schematic isometric view of portions of apparatus embodying the invention;

FIG. 3 is an enlarged fragmentary perspective view of a portion of the apparatus of FIG. 2;

FIG. 4 is a fragmentary perspective view of another portion thereof; and

FIG. 5 is a fragmentary side view of another portion thereof.

Photographic film packet **10** (FIG. 1) includes, in part, outer walls **12** and **13** of opaque paper, metal foil pod **18** for holding film processing chemicals, and a negative **20**. Clip **21** is attached to one end of the packet.

Packet **10** is assembled by apparatus shown in part in FIGS. 2–5. Continuous web **25**, which eventually forms walls **12** and **13**, is moved by a main drive (not shown) intermittently in packet-length increments through a sequence of stations at which it is folded and cut and receives various components of the packets. A memory system **30** is provided, consisting of a magnetic core memory stage **32** corresponding to each station, and a clock **34** synchronized with the web drive for advancing the signals in system **30** one stage for each packet-length advance of web **25**.

At negative detector station **40**, downstream of the station **38** at which the web receives negatives **20**, a feeler **60** is carried at the end of vertically reciprocating arm **62** the other end of which controls the position of the core of a linear variable differential transformer **64** (LVDT). The output of the LVDT is applied to relay **66** which in turn controls the position of switch **68** in the +12 volt line **70** to memory stage **32***a*. Upon each packet-length advance of the web arm **62** lowers to cause feeler **60** to lightly contact negative **20** or, if the negative is missing, web **25**.

At pod applicator station **42** vacuum chuck **72**, carried by pivotal arm **74**, picks up one pod **18** from tray **76** upon each packet-length advance of the web, and positions the pod on the web for lamination thereto by laminator **78**. The vacuum supply to chuck **72** through line **80** includes valve **82** operated by solenoid **83** the coil of which is wired to memory stage **32***b* by wire **84**.

At first packet ejection station **44**, downstream of the station (not shown) at which the web is severed into

individual packet lengths, driven pinch rollers **86** are provided just upstream of gate **87** pivotally mounted on shaft **88** (FIG. 3). Lever **89** is mounted at one end of shaft **88** and is pivoted at its free end to piston **90** of air cylinder **91** connected to a source of air pressure through line **92**. Solenoid **93** operates valve **94** in line **92**, the solenoid including a coil wired to memory stage **32***c* through wires **95**. A conveyor **96** below gate **87** extends to chute **97**.

At pod detector station **46** a proximity head **102**, sensitive to the metal foil of pod **18**, is positioned under the path of the packets. The output of the head **102** is applied to relay **104** which in turn controls the position of switch **106** in the +12 volt line **108** to memory unit **32***d*.

At packet alternator station **48** shaft **110** (FIGS. 1, 4) has at its top a vacuum head **112** connected via the shaft interior to vacuum chamber **114**, and carries gear **116** mating with a segment gear **118** which oscillates around pivot **120** in response to reciprocation of shaft **122** connected to the main drive. Chamber **114** is connected at its bottom by a ball and socket joint **124** to angle bracket **126** which carries on its vertical portion **128** an air cylinder **130**. Bracket **126**, pivotally mounted on shaft **132**, has a bias spring **134** between one end of horizontal portion **136** and adjacent housing **138**, and, at the junction of portions **128** and **136**, links **140** and **142** fixed to pin **144** and offset from each other and respectively carrying rollers **146** and **148**. A central link **150** is attached at one end to pin **144** between links **140** and **142**, and at the other end to the piston of air cylinder **130**. Two parallel cam wheels **152** and **154** are mounted respectively adjacent rollers **146** and **148** on shaft **156**, which is rotatable in synchronization with the main drive. Wheels **152**, **154** have low portions **152***a* and **154***a*, respectively, 180° out of phase. Because links **140** and **142** are offset from each other, only one of rollers **146**, **148** may be in contact with its corresponding cam wheel at a time. Solenoids **158** and **160** (FIG. 1), having coils wired to memory unit **32***e*, control air valves **159**, **161**, respectively, in air pressure lines **163**, **165**, which are connected to opposite ends of air cylinder **130**.

At station **50**, a chain conveyor **170** (FIG. 5) with lugs **171** is located just upstream of three spider wheels **172**, each of which has slots **173** for receiving packets **10** from conveyor **170**, the spider wheels being rotatably mounted on a shaft **174**. Levers **175** are mounted between adjacent wheels **172** each on a bracket **176** pivotable about pivot **177** and connected through linkage **178** to the piston of air cylinder **179**. Air valve **180** (FIG. 1) in air pressure line **181** to air cylinder **179** is responsive to solenoid **182** whose coil is wired to memory unit **32***f*. Pinch rollers **190** are mounted downstream of wheels **172** and lead to reject chute **194**. A conveyor **196** for complete packets lies below the spider wheels. Arms **198** are mounted between adjacent wheels **172** just above conveyor **196**.

In operation, at station **40** the absence of a negative **20** will cause arm **62** to descend more than usual so that the signal from the LVDT will close switch **68** in relay **66**, whereby a signal is transmitted to memory stage **32***a* over line **70**.

At station **42**, pod **18** is deposited on the web unless a signal corresponding to the absence of a negative on that portion of the web appears in memory stage **32***b*, such signal having originated in stage **32***a* and advanced through memory **30** under the control of clock **34**. In that case, the signal in stage **32***b* causes activation of solenoid **83** to open valve **82**, breaking the vacuum at chuck **72** so that a pod is not deposited on the web.

At station **44**, the then completely assembled packets are moved over gate **87** by pinch rollers **86** unless a transmitted signal appears in memory stage **32***c* indicating the absence of a negative in the packet. In that case, solenoid **93** is energized by memory stage **32***c*, activating valve **94** in air pressure line **92** so that air cylinder **91** causes gate **87** to open, allowing the packet to fall to conveyor **96** for

passage to chute **97**. Such rejected packets are not salvageable. However, the memory feedback to station **42** has ensured that packets rejected at station **44** do not include pods, thereby minimizing component loss.

If, as packets move over proximity head **102**, the head senses the absence of a pod, switch **106** in relay **104** is closed and a signal is transmitted to memory unit **32***d*.

At station **48** shaft **110** rises for every other packet in response to motion of bracket **126** determined by the action of cam wheels **152**, **154** on their associated rollers **146**, **148**, lifts the packet with vacuum head **112**, and turns it 180°, unless a rejects signal (originating either in stage **32***a* or **32***d*, the corresponding packet having been ejected in the former case) is present in memory stage **32***e* indicating the absence of a pod. In that case, solenoids **158** and **160** are energized by the memory, reversing the states of air valves **159** and **161** in air pressure lines **163** and **165** so that air cylinder **130** reverses the position of its piston, pivoting link **150** and pin **144** so that the roller following its cam wheel moves away from the wheel and the roller formerly free moves down to contact its cam wheel. Since the cam wheels are 180° out of phase, this will change the sequence of operation of shaft **110** by one packet length so that when the imperfect packet is later removed, the remaining packets will be in alternation.

At station **50** packets are passed to slots **173** in spider wheels **172** by conveyor **170**, the wheels rotate, and packets are pushed out of slots **173** by arm **198** to fall on conveyor **196** which carries them to a suitable receptacle (not shown), all unless a signal is present in memory unit **32***f*. In that case solenoid **182** will activate air valve **180** in air pressure line **181** so that air cylinder **179** will cause levers **175** to move from their rest position (shown solid) to a position (shown dotted) at which they cause the packet to enter rollers **190** which will carry the packet to chute **194**.

Packets recovered from chute **194** are salvageable, since the missing pod can be effectively added manually.

Other embodiments will occur to those skilled in the art and are within the following claims.

What is claimed is:

1. In apparatus for the manufacture of photographic film packets, said apparatus having stations through which pass web portions and at which are respectively carried out in sequence various operations pertaining to said manufacture, said apparatus including first and second stations for respectively depositing first and second packet components on said web portions, and a terminal station for receiving finished packets,

a first detector located downstream of said first station and being responsive to the absence on a web portion of said first component to provide a signal,

at least one second detector located adjacent the path of said web portions and being responsive to a condition at said portions to provide a signal,

a memory responsive to said signals,

an element responsive to said memory to prevent the said depositing of said second component at said second station on web portions in response to which said first detector provided a said signal, and

an ejector located between said terminal station and said second station and responsive to said memory to prevent web portions for which said second detector provided a said signal from reaching said terminal station.

2. The apparatus of claim **1** in which said ejector is located downstream of the last station at which components are deposited on said web portions, so that web portions prevented from reaching said terminal station are packets complete except for the existence of said condition.

3. The apparatus of claim **1** in which said first detector is located immediately downstream of said first station.

4. The apparatus of claim 1 in which said second detector is located downstream of the last station at which components are deposited on said web portions.

5. The apparatus of claim 1 in which said first detector is responsive to the absence of a component which cannot be effectively added to the packet after it leaves said apparatus, and said second detector is downstream of said first detector and is responsive to a condition which can be effectively corrected after the packet leaves said apparatus to make said packet commercially useful.

6. The apparatus of claim 1 including at least one rotatable slotted spider wheel for receiving finished packets in slots in one position and rotating to another position, and a member for transferring said packets from said slots at said other position to said terminal station, in which said ejector includes a movable arm responsive to said memory located at a position intermediate said spider wheel positions for ejecting packets for which said second detector provided a said signal.

7. The apparatus of claim 1 in which said element is directly associated with said second station to prevent normal functioning of apparatus thereat.

8. The apparatus of claim 7 in which said second station includes a fluid operated mechanism having a fluid supply line and said element is a valve in said fluid supply line.

9. The apparatus of claim 1 including a second ejector located downstream of said first detector and upstream of said second detector and responsive to said memory to prevent web portions for which said first detector provided a said signal from reaching said second detector.

10. The apparatus of claim 9 in which said second ejector includes a gate responsive to said memory, said gate movable between a first position allowing the passage of web portions and a second position interrupting the passage of web portions for which said first detector provided a signal.

11. The apparatus of claim 1 including a station at which there is performed a sequence of different operations respectively on successive packets, and a second element directly associated with said station, said second element being responsive to said memory to cause temporary interruption of said sequence upon receipt of a said signal provided by said second detector.

12. The apparatus of claim 11 in which said second element is also responsive to a said signal provided by said first detector to cause temporary interruption of said sequence upon receipt of said signal.

13. The apparatus of claim 11 including a member for turning alternate packets 180° at said last mentioned station and in which said second element is responsive to said memory to prevent alternation with respect to the next previous packet of any packet for which said second detector provided a said signal.

14. The appartaus of claim 13 including

first and second cam wheels having effective operating portions out of phase with each other,

first and second rollers mounted for contact with said cam wheels and offset from each other and respectively associated with said wheels so that only one roller may contact its corresponding cam wheel at a time,

linkage connected between said member and said rollers so that said packets are turned when one of said rollers is in contact with the said effective operating portion of its corresponding cam wheel,

said second element preventing alternation with respect to the next previous packet of any packet for which said second detector provided a said signal by causing the roller in contact with its corresponding cam wheel to move away from said wheel and causing the other of said rollers formerly free to contact its corresponding cam wheel.

15. In apparatus for the manufacture of photographic film packets, said apparatus having stations through which pass web portions and at which are respectively carried out in sequence various operations pertaining to said manufacture, said apparatus including first and second stations for respectively depositing first and second packet components on said web portions, in which said first component, if not deposited at said first station, cannot be effectively added to the packet after it leaves said apparatus and said second component, if not deposited at said second station, causes a condition which can be effectively corrected after the packet leaves said apparatus to make said packet commercially useful, and a terminal station for receiving finished packets,

a first detector located immediately downstream of said first station and being responsive to the absence on a web portion of said first component to provide a signal,

at least one second detector located downstream of said first detector, downstream of the last station at which components are deposited on said web portions, and adjacent the path of said web portions and responsive to said condition at said portions to provide a signal,

a memory responsive to said signals,

an element directly associated with said second station to prevent the said depositing of said second component at said second station on web portions in response to which said first detector provided a said signal,

a station at which there is performed a sequence of different operations respectively on successive packets, and a second element directly associated with said station, said second element being responsive to said memory to cause temporary interruption of said sequence upon receipt of a said signal provided by said second detector,

a first ejector located downstream of said second detector and upstream of said terminal station and responsive to said memory to prevent web portions for which said second detector provided a signal from reaching said terminal station, and

a second ejector located downstream of said first detector and upstream of said second detector and responsive to said memory to prevent web portions for which said first detector provided a said signal from reaching said second detector.

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JAMES M. MEISTER, Primary Examiner