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Elia et al.

[11] **3,825,246**

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[54] **GATHERING MACHINE AND CONTROL THEREFOR**

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[73] Assignee: **Harris-Intertype Corporation,** Cleveland, Ohio

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[21] Appl. No.: **131,257**

[52] **U.S. Cl.** **270/58,** 270/54, 271/64

[51] **Int. Cl.** **B65h 39/02**

[58] **Field of Search** 270/54, 58, 57, 56; 209/72; 40/79; 271/57

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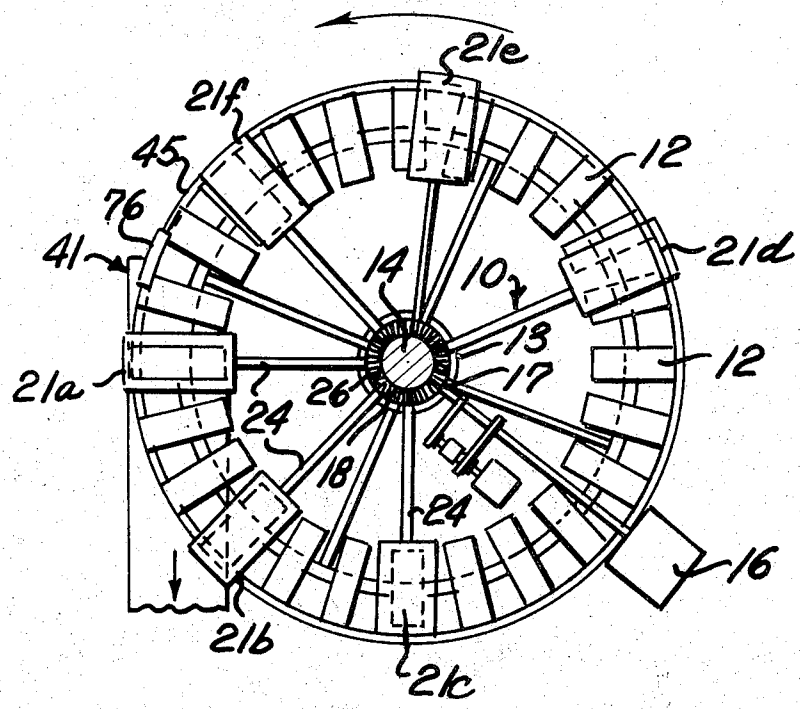
Assistant Examiner—Yance Y. Hum

[57] **ABSTRACT**

Gathering machine in which a gathering station and feed stations are moved relatively to each other to feed items in sequence to the gathering station. If a feed station misses a feed, downstream stations for feeding the sequence are shut off until the group is again positioned to receive the missed item of the sequence. Feeding of the sequence is then reinitiated. When a station feeds double items at a rate greater than a predetermined rate, a control operation is performed.

15 Claims, 6 Drawing Figures



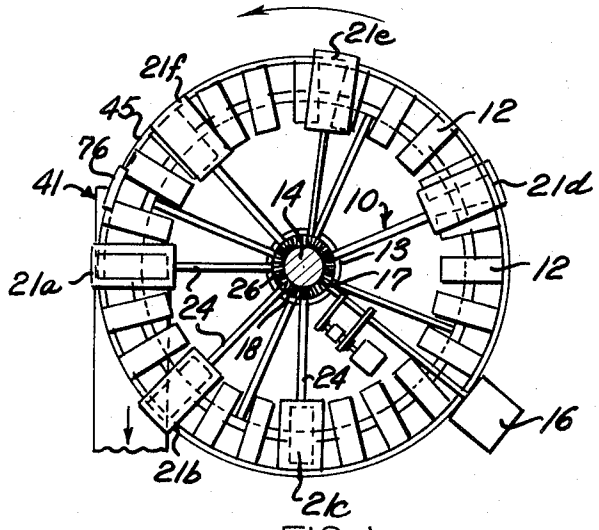


FIG. 1

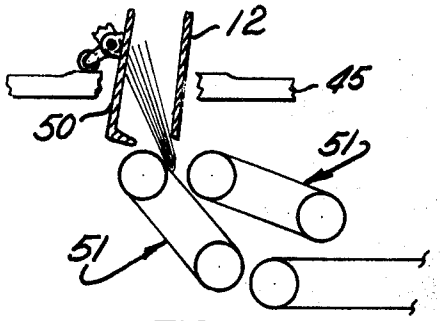


FIG. 3

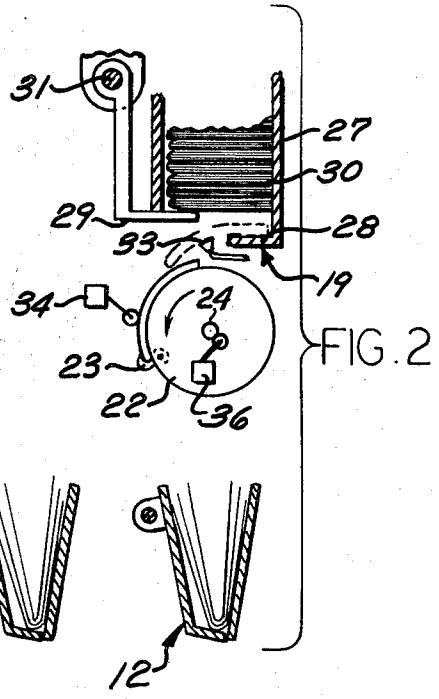


FIG. 2

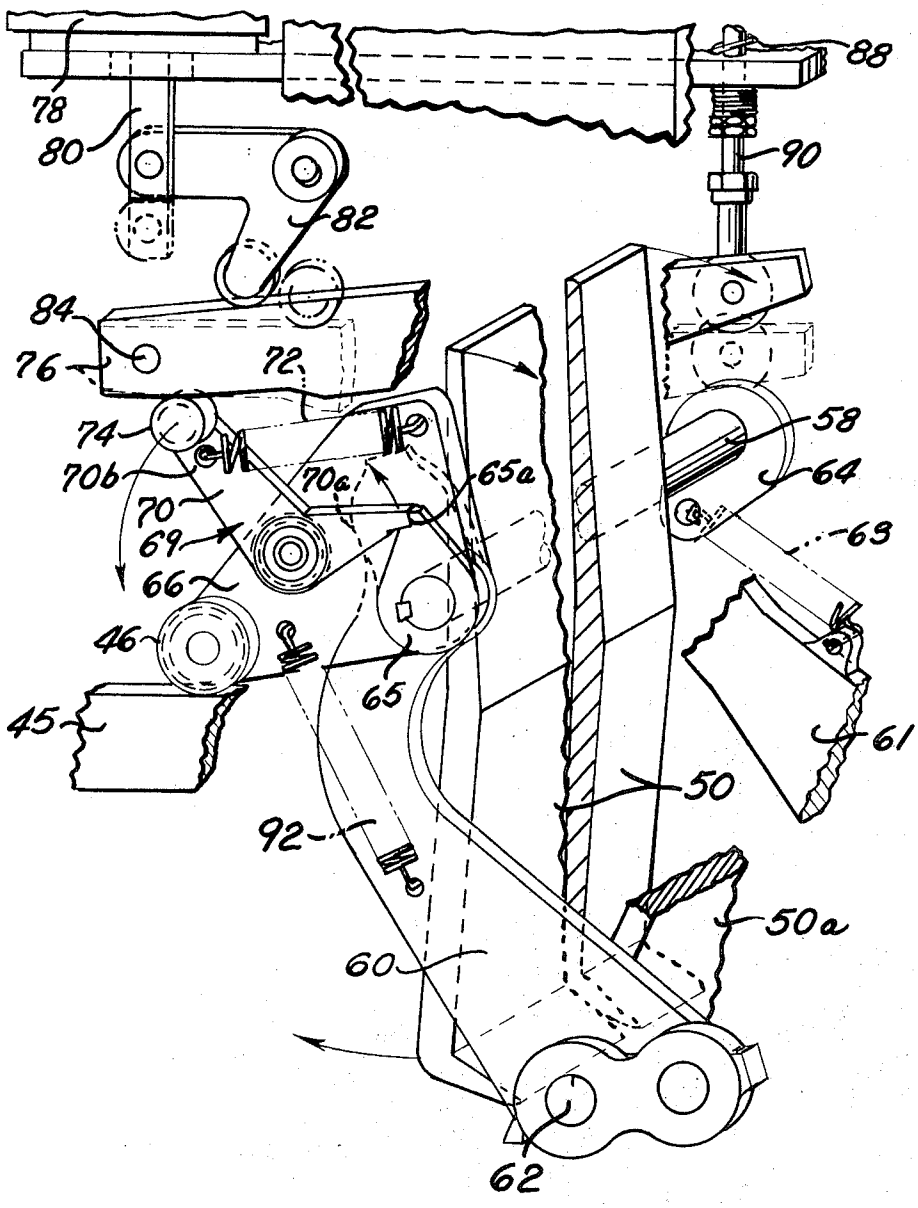

78
80
82
88
90
84
76
72
74
70b
70a
65a
58
64
63
70
69
66
46
65
45
61
50
92
50a
60
62

FIG. 4

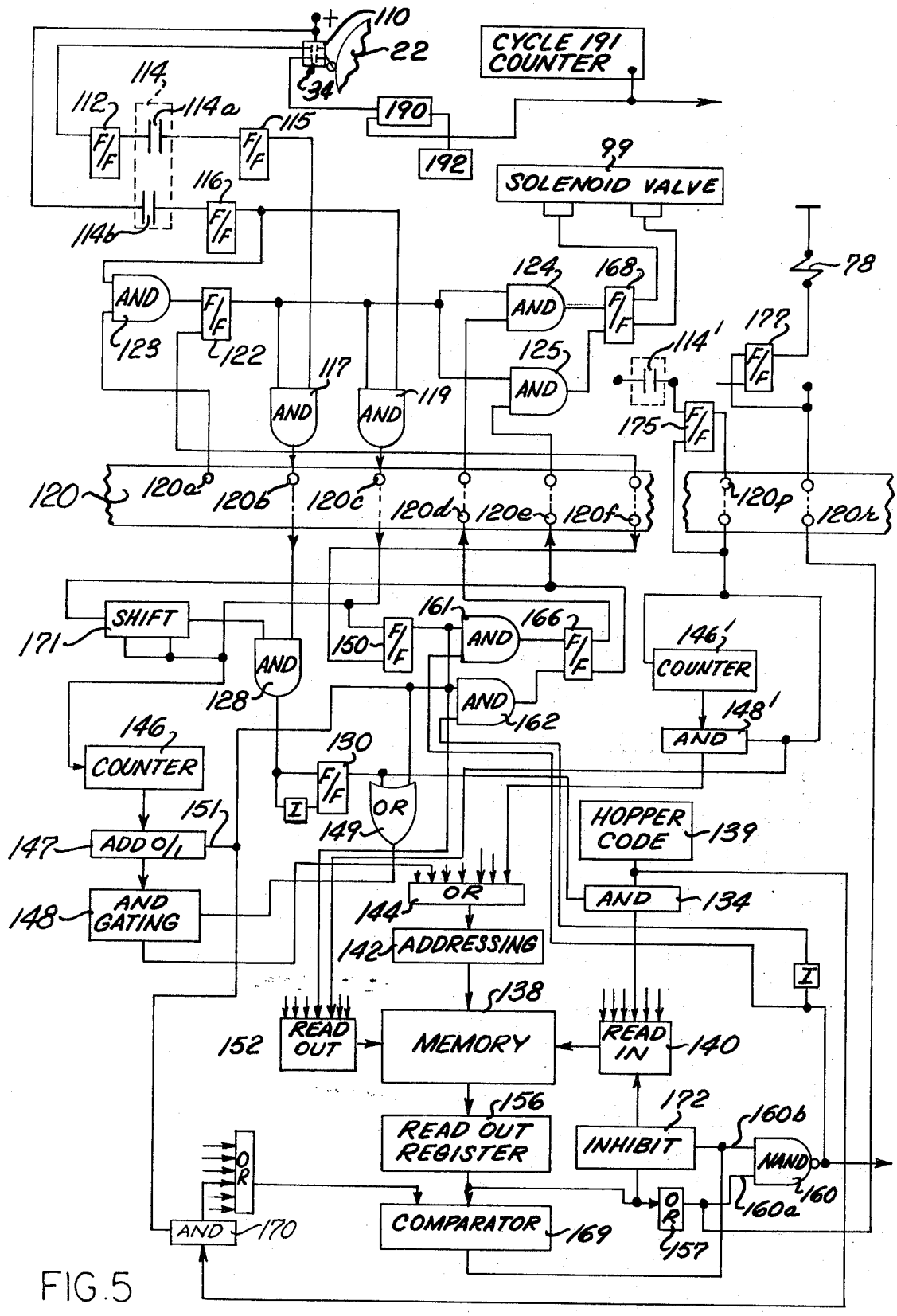
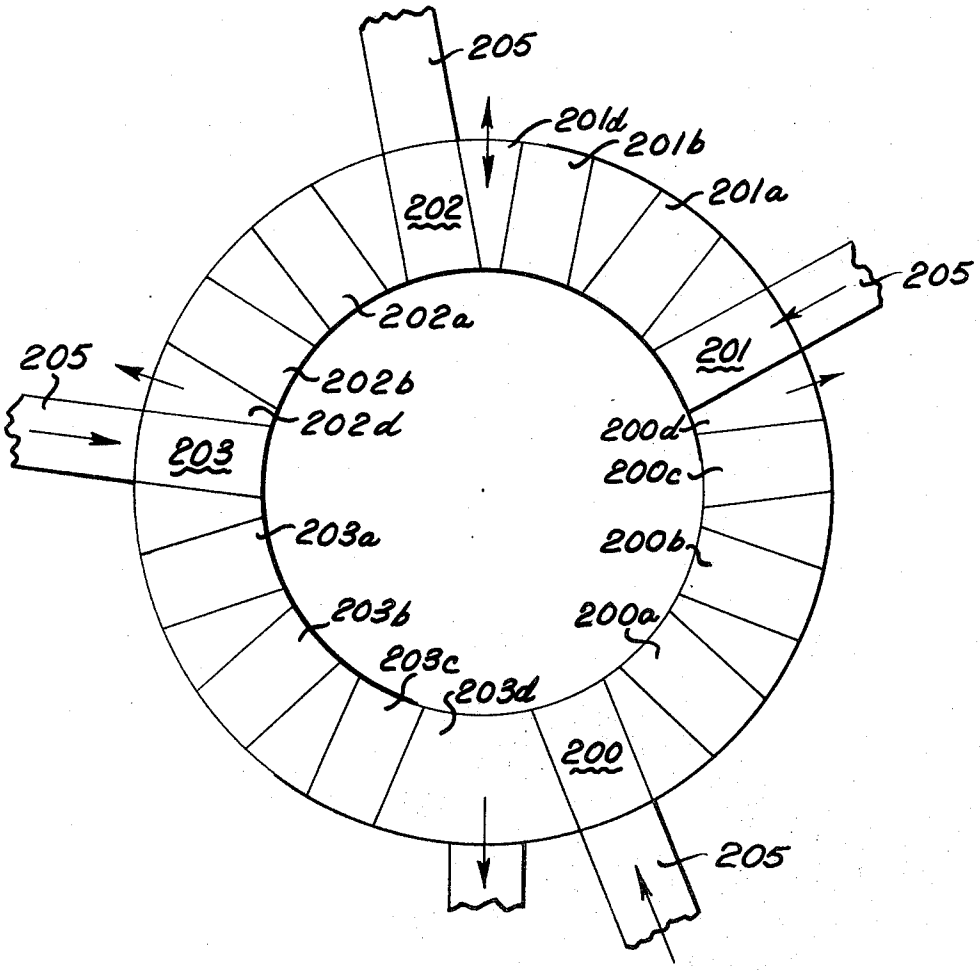

110
22
34
CYCLE 191 COUNTER
190
192
99
SOLENOID VALVE
78
114
112
114a
115
116
114b
F/F
AND
123
122
124
168
125
117
119
114'
177
175
120
120a
120b
120c
120d
120e
120f
120p
120k
SHIFT
171
128
150
161
166
162
146'
COUNTER
148'
146
130
I
OR
149
151
147
ADD 0/1
148
AND GATING
144
142
ADDRESSING
HOPPER CODE
139
134
138
152
READ OUT
MEMORY
READ IN
140
156
READ OUT REGISTER
172
INHIBIT
160b
NAND
160
160a
COMPARATOR
169
157
170

FIG.5


205
201d
201b
201a
202
205
202a
201
205
202b
202d
200d
203
200c
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203b
200a
203c
203d
200
205

FIG. 6

GATHERING MACHINE AND CONTROL THEREFOR

The present invention relates to a machine for gathering or collating a plurality of items into a single group, particularly to such a machine for assembling the items in a predetermined sequence. One type of machine in which the present invention may be embodied is a newspaper stuffing machine adapted to collate the folded sections of a newspaper and the invention is herein described as embodied in such a machine.

In gathering items to form an assembly or group, e.g., in gathering newspaper sections to form a complete newspaper, the items to be assembled are stored in hoppers at feed stations and a collecting or gathering station conventionally moves past the hoppers in sequence and receives an item from each of the hoppers to assemble a group of items. In a newspaper stuffing machine, the sections of the newspaper are conventionally stacked in hoppers at stationary feeding stations from which point they are automatically fed into gathering stations in the form of pockets which move past the hoppers. The pockets are below the hoppers and are mounted upon a rotary turret. The pockets are disposed in an upright position and have a bottom which may be opened to deliver the newspaper when it is completed. One of the problems encountered in newspaper stuffing machines and other machines for gathering and collating items to form a group or assembly is the failure of one of the hoppers to feed as the gathering station moves under the hopper. This results in an assembly or group which is incomplete and this assembly must be rejected from the group of completed articles being delivered from the machine. Conventionally, in a newspaper stuffing machine, the newspaper will be "kicked" so that it assumes a skewed position in the stream of papers being delivered from the machine. Skewed papers are conventionally manually removed and then discarded, manually completed by inserting the missing section, or broken down and returned to the hoppers. Moreover, if a hopper misfeeds, certain conventional machines will stop until the operator locates the pocket, corrects the fault and restarts the machine. This results in lost machine time.

An object of the present invention is to provide a new and improved machine and method for collecting items into a group in which the feeding of the items to the group is terminated when one of the items is not fed at its proper time and in which the group is again moved by hoppers for feeding the items and feeding restored with the item which was missed thereby enabling the group to be completed before the group is discharged from the machine.

Another object of the present invention is to provide a new and improved gathering or collating machine in which a movable station for collecting a group of items fed from feed stations and the feed stations are relatively moved to feed the items to the movable station in a predetermined sequence with the feed stations feeding an item to the gathering station only if the preceding items in the sequence have been fed to the station, the machine being so constructed and arranged so that when a group is incomplete by reason of the failure of a feeding station to deliver an item to the movable station during a first pass by the feeding stations, the missing items in the group may be fed to the group prior to the discharge of the group from the machine.

A still further object of the present invention is to provide a new and improved gathering or collating machine, such as a newspaper stuffing machine, for assembling items into a group in which feeding stations for the items and a gathering station are relatively movable to feed the items to the gathering stations in a predetermined sequence with the machine being capable of delivering a plurality of sequences of said items to said gathering station and in which the feeding of items to a gathering station is terminated when one of the feeding stations fails to feed an item until the gathering station is disposed to again receive the item which was missed, the feeding of the sequence then being resumed.

A still further object of the present invention is to provide a new and improved machine for assembling items into a group in which a plurality of gathering stations are moved through a closed path to receive items from feed stations disposed adjacent the path, the machine having a delivery station where the collected items at a gathering station are to be discharged, the machine being so constructed and arranged so that if a feed station fails to feed an item to a gathering station as it moves thereby, the downstream feed stations are prevented from feeding items to the gathering station to which the misfeed occurred and the items which are in the gathering station are not delivered at the delivery station but are again moved by the feeding means and feeding of the sequence of items to the gathering station re-initiated with the missed item.

It is a still further object of the present invention to provide a new and improved assembling machine, such as a newspaper stuffing machine, for assembling items into a group with the items being fed from feeding stations to a gathering station movable past the feeding stations in sequence and in which the identity of a feeding station which fails to feed an item to the gathering station as it moves thereby is stored in a memory at an address which corresponds to the gathering stations in the sequence and re-initiates the feeding to the gathering station when it again is in a position to receive the missed item.

It is a further object of the present invention to provide a new and improved gathering machine in which a control function is performed if a feeding station is malfunctioning at a rate greater than a predetermined rate.

Further objects and advantages of the present invention will be apparent from the following detailed description thereof made with reference to the accompanying drawings forming a part of the specification for all matter disclosed therein and in which:

FIG. 1 is a simplified schematic top view of a newspaper stuffing machine;

FIG. 2 is a simplified vertical sectional view through a feed station in the machine of FIG. 1;

FIG. 3 is a simplified sectional and diagrammatic view of a delivery station of the machine of FIG. 1;

FIG. 4 is a perspective view of a pocket of the machine of FIG. 1 with parts cut away;

FIG. 5 is a circuit diagram in block form showing a control system for the present invention; and

FIG. 6 is a diagram of another machine which may embody the present invention.

Referring now to the drawings and more particularly to FIGS. **1–4,** a known newspaper stuffing machine of the general type shown in U.S. Pat. No. 2,911,213, whose disclosure is incorporated herein by reference, is illustrated in simplified form. The machine comprises a rotary turret, generally designated by reference numeral **10,** which includes a framework **11** which supports a series of circumferentially arranged V-shaped pockets **12** which constitute a gathering location. Turret **10** includes a central hub **13** which is rotatable about the axis of a central post **14.**

Rotation of the hub **13** about the post **14** moves the pockets **12** in a circular path about the post. The mechanism for rotating the turret about the post includes a main motor **16** which drives a bevel gear **17.** The gear **17** meshes with a ring gear affixed to the turret **10.** In FIG. **1,** it will be assumed that the turret is rotated in a counterclockwise direction.

A plurality of conventional stationary feeding stations **21***a*–**21***f* are supported in a conventional manner above the path of the pockets **12.** These feeding stations are indicated in blocked out line form in FIG. **1** and while five such feeding stations have been illustrated, it will be understood that additional feeding stations or fewer stations may be present. Each of the feeding stations includes a conventional horizontal type hopper **19** (see FIG. **2**) in which newspaper sections are stacked and a conventional mechanism for feeding the bottom one of the newspaper sections stacked in the hopper to deliver it into the open upper end of a pocket **12** passing therebeneath. The newspaper sections in each hopper are commonly referred to as "inserts."

As illustrated in FIG. **2,** the mechanism for feeding inserts at each of the feeding stations may comprise a rotatable drum **22** having gripper means including a finger **23** which when actuated by a suitable mechanism operates to clamp onto the edge of an insert to cause it to move with the drum whereby the drum is able to pull the insert from the hopper. Drum **22** is rotated in synchronism with the movement of the pockets by means of a shaft **24** drivingly connected to the hub portion of the turret as by a gear **26** engaging ring gear **18.**

Each hopper **19** includes a framework **27** for holding a stack of inserts **30.** The bottom one of the stack of inserts is supported on a ledge **28,** which is part of the framework **27** and on a movable shoe **29.** The shoe **29** is fixed to a shaft **31** mounted in the framework **27** of the hopper and the shaft is rotated to swing the shoe outwardly to release the edge of an insert. Conventional mechanism effects rotation of the shaft **31** in synchronism with movement of the turret. When the shoe **29** is swung outwardly, an insert is pulled downwardly by a sucker **33** to move the insert into position to be gripped by the finger **23.**

As the drum rotates, the finger **23** pulls the insert from the hopper. When the leading edge of the insert is in a position such that the insert will drop into a pocket **12** beneath the drum, the finger **23** is opened in a conventional manner to release the insert and effect delivery to the pocket. A calipering type sheet detector **34** is positioned to sense the presence or absence of an insert or the existence of more than one insert on the drum **22** at a predetermined time in the feed cycle. A switch **36** closes the circuit to the detector **34** only during the portion of the cycle when the insert is to be sensed. If an insert is missing, a missed feed is signaled, while if more than one insert is present, a double feed is signaled.

In the illustrated embodiment, if the machine is being used to insert sections into a newspaper, the outside section or jacket of the newspaper into which the other sections are to be inserted is fed at the station **21***a.* As the pocket which receives the jacket moves to station **21***b,* the jacket is opened up by conventional mechanism so that the other inserts will be dropped into the open jacket.

As the pocket moves past the other feed stations and to a delivery position **41,** between stations **21***f* and **21***a,* (see FIGS. **3** and **4**), a cam **45** which extends around the turret normally operates a cam follower associated with each pocket to move the cam follower **46** upwardly to rotate the back wall **50** of the pocket to open the bottom of the pocket to allow the assembled newspaper to drop downwardly to delivery conveyors **51** as shown in FIG. **3.**

In accordance with the present invention, if the sheet detector at a station detects that there has been a misfeed, i.e., a failure to feed, the hoppers downstream of that station where the misfeed occurred are prevented from feeding an insert to the pocket which failed to earlier receive an insert and when the pocket arrives at the position for delivering the paper to the conveyors **51,** the cam **45** is prevented from opening the pocket.

Referring to FIG. **4,** the movable back wall **50** of each pocket is supported between arms **60, 61** on the turret. The arms may be swung about a shaft **62** in a conventional manner to move the wall angularly about the lower front corner of the pocket during the jacket opening operation or to position the sections against one of the pocket walls.

The back wall **50** is supported between arms **60, 61** by a shaft **58** which is rotatable in the arms **60, 61** to swing the lower end of the rear wall away from the front wall **50***a* of the pocket to drop the insert into the delivery conveyors. The shaft **58** is biased to move the lower front end of the back wall **50** against the front wall to close the pocket by a spring **63** connected to an arm **64** on the inner end of the shaft **58.**

The shaft **58** is rotated in a direction to open the pocket by a mechanism comprising an arm **65** fixed to the outer end of the shaft **58.** Immediately inwardly of the arm **65** is a cam follower plate **66** which supports the cam follower **46.** A catch mechanism **69** mounted on the cam follower plate **66** transmits clockwise motion of the cam follower plate **66,** as the latter is viewed in FIG. **4,** to the arm **65** to rotate the shaft **48** and the rear wall of the pocket to discharge an assembled newspaper. Catch mechanism **69** includes a bell crank lever **70** having an arm **70***a* which is received in a notch **65***a* in the upper end of the arm **65** to push the arm **65** in a clockwise direction as the cam follower plate **66** is rotated clockwise. The bell crank lever **70** is biased into engagement with the notch **65***a* by a spring **72** connected between an arm **70***b* of the bell crank lever and the cam follower plate **66.** For selectively preventing delivery of the newspaper when it reaches the delivery station **41,** the arm **70***b* also carries a cam follower **74** which is actuatable by a recycle cam **76** which extends along the path of the pocket **12** at the delivery station above the cam follower **74.** The recycle cam **76** is normally in an inactive position shown in solid lines in FIG. **4** and can be operated to an active position by energiz-

ing a solenoid **78** to lower an armature **80** to operate a bell crank lever **82** to cause the cam **76** to rotate about a pivot shaft **84** and move to its active position shown in dashed lines in FIG. **5.** The end of the recycle cam **76** remote from the shaft **84** is biased upwardly to the inactive cam position by a spring **88** which acts through a rod **90,** the lower end of the rod **90** being tied to the free end of the recycle cam **76.**

When the cam follower **74** is moved downwardly, the arm **70***a* of the catch mechanism **69** is moved out of contact with the notch **65***a* in the lever arm **65** on the shaft **48** so that when the cam follower **46** is actuated upwardly to rotate the cam follower plate **66** in a pocket opening direction, the motion of the cam follower plate is not transmitted to the lever arm **65** and the pocket is not opened so that the sections in the pocket are again moved past the hoppers.

As will be explained in more detail hereinafter, the hoppers of the machine will not feed to the pocket until the pocket reaches the station where the misfeed occurred. That hopper will then be actuated to feed a section and the other hoppers will feed in sequence unless another misfeed occurs.

In the illustrated embodiment, the cam **45** extends co-extensive with the path of the pockets **12** and the cam follower **46** is biased bainst the cam by a spring **92.** Consequently, when the pocket rides off the recycle cam and the cam follower **66** rides off the high portion of the cam **45** for activating the cam plate **66** at the delivery station, cam follower plate **66** will move counterclockwise under the bias of the spring and the spring **72** will return the bell crank lever **70** to its position where the end of arm **70***a* is received in the notch **65***a* in the lever arm **65** to reset the mechanism.

As previously indicated, if one of the hoppers should fail to feed, this failure will be detected by the respective insert detector **34** and the hoppers or stations downstream of the one which failed to feed an insert to a particular pocket will be prevented from feeding inserts to that pocket until the pocket is recycled.

Referring to FIG. **5,** a control system for recycling a partially assembled group of inserts is schematically illustrated and includes a memory **138** which has an addressable storage memory location for storing coded data for each pocket. The memory is addressable by a plurality of address counters **146,** one for each hopper. Each hopper has a unique code in the form of binary data stored in a code register **139** and if a miss occurs, the hopper code is read into the storage location for the pocket which does not receive an insert because of the miss. This code is then utilized to prevent feeding of other inserts to the pocket and to operate the recycle cam at the delivery station. The code is also utilized to cause the station which misfed to initiate the feeding of inserts to the hopper at the station that originally misfed. For example, if a section was not fed at station **21***c*, the pocket would move from station **21***c* and back to station **21***c* without receiving additional inserts and without having the partially completed newspaper delivery at the delivery station. Feeding would again commence with station **21***c*.

The control system includes a scanner **120** which scans inputs from each feed station and provides gating and reset signals and external control signals for controlling the vacuum for the sucker **33** for removing the bottom insert of a hopper. The suckers **33** each has a vacuum applied thereto during the proper portion of the hopper feed cycle through a respective solenoid valve **99** shown in FIG. **5** of the drawings. The solenoid valve **99** has a position enabling vacuum to be supplied to the sucker **33** in the proper time of the cycle and one which shuts off the vacuum supply. The valve is controlled by a flip-flop **168** which when in its set condition positions the valve to supply vacuum when in a reset condition positions the solenoid valve **99** so that no vacuum can be applied to the sucker **33** to render the sucker ineffective to pull an insert from the hopper and thus prevent feeding. In the present application the flip-flops are illustrated as boxes and have set and reset inputs extending from top and bottom, respectively, of the left side of the box and set outputs extending from the top and bottom, respectively, of the right-hand side of the box.

It will be assumed that the station shown in FIG. **5** is station **21***c*, with the understanding that other feed stations are controlled in the same manner.

As a pocket approaches a feed station, the control system must determine whether an insert is to be fed to the pocket at the station and if it is to be fed, whether, in fact, an insert was fed. If an insert is to be fed to a pocket and a malfunction occurs so that an insert is not fed from the hopper, a mis-switch **110** of the caliper detector **34** will be closed and will set a flip-flop **112** at the time in the cycle when the caliper detector is conventionally activated to detect the presence or absence of an insert on the drum **22.**

The control circuitry at each feeding and delivery station also includes a synchronizing switch **114.** The synchronizing switch **114** at each feed station is operated once in each hopper feed cycle to transfer the setting of the flip-flop **112** to a readout flip-flop **115.** The synchronizing (sync) switch **114** for each feed station also has contacts **114***b* which set a sync flip-flop **116** to condition the circuitry to request instructions for an approaching pocket and so that the scanner **120** can transfer information between the memory **138** and the feed station.

In more detail, if a miss has occurred, the misswitch **110** sets the flip-flop **112.** When the sync switch **114** operates, this information is to be transferred to memory and instructions are also to be sought to determine whether or not a vacuum-inhibit operation is to occur. At this point in the hopper cycle, the closing of sync switch contacts **114***a*, **114***b* connects the output of the flip flop **112** to the flip-flop **115** and applies a potential through contacts **114***b* to the set terminal of flip-flop **116.** The flip-flops **115, 116** are self-resetting flip-flops which are set by a negative-going signal and, consequently, are actuated to their set state only when the sync switch contacts **114***a*, **114***b* are opened. The flip-flops **115, 116** and **112** self-reset a predetermined time after the set signal is removed. During the time the flip-flops **115, 116** are set, the information can be transmitted by the scanner to the memory. Also, the circuitry may determine whether or not a vacuum-inhibit is to be signaled at this time.

The flip-flops **115, 116** are connected to scanner terminals **120***b*, **120***c*, respectively, through AND gates **117, 119** which must be conditioned before signals can be applied to the scanner terminals from the flip-flops. These gates are controlled by a control flip-flop **122** which is set when signals appear on a scanner terminal **120***a* and on the set output of flip-flop **116.** These signals are applied to the inputs of an AND gate **123**

whose output sets the flip-flop **122.** The flip-flop **122** also controls AND gates **124, 125** between terminals **120***d*, **120***e* of the scanner and the set and reset inputs of flip-flop **168,** respectively, for controlling the vacuum to the feed station sucker **33.** Consequently, if the flip-flop **116** has not been set to indicate that a sync signal has occurred, gates **124, 126** connecting the set terminals of the flip-flops **115, 116** to the scanner will be disenabled and there will be no inputs to the scanner from these flip-flops. Also, gates **117, 119** between the scanner **120** and the set and reset inputs of a feed flip-flop **168** are disabled.

During the scan, the scanner provides an output on terminal **120***a* to set the control flip-flop **122** if the sync flip flop **116** is set. Then it scans terminal **120***b* and if a signal is applied thereto from the flip-flop **115** indicating a miss, the signal is applied through an AND gate **128** to set a miss flip-flop **130.** The flip-flop **130** is reset when the output of AND gate **128** is lost when the scanner steps to terminal **120***c*. As will be explained hereinafter, the gate **128** is used to prevent the miss signal from setting the flip-flop **130** in the event that the miss signal is a result of earlier no-feed instructions from the memory.

When the flip-flop **130** is set, it conditions an AND gate **134** to enter a code number for the feed station from the code register **139** into the memory **138** via a read-in circuit **140.** The storage location in the memory **138** for information set by the read-in circuit **140** is determined by an addressing circuit **142** which effects a read-in of the information to an address supplied through OR gating **144.** The OR gating **144** has an input from each of the address counters **146.** The address counter **146** for a feed station will be set to the address corresponding to the storage location for the pocket at the hopper at the time a miss signal occurs and the hopper number is now read into the storage location for the pocket at the hopper. The address from the counter is supplied to the OR gating **144** for the addressing circuit **142** through an adder **147** and AND gating **148** activated by the output from an OR gate **149** which is now activated because it has an input connected to the set output of the flip-flop **130.** Accordingly, the code number of the hopper **136** has been stored in the storage location for the pocket to indicate a miss has occurred at the hopper.

When the scanner **120** steps to scan terminal **120***c*, the scanning terminal **120***c* will have a signal therein indiciating that sync flip-flop **116** has been set and this will be transmitted to set an instruction storage flip-flop **150** for effecting a determination of whether or not the vacuum should be inhibited during the next cycle portion for gripping an insert and to step the address counter **146** by one increment. Since the miss which has just been stored, assuming it was a miss, is for the pocket which has now moved from the hopper and the insert which is next to be fed has already been delivered by the vacuum sucker **33,** the circuitry must check the memory to determine whether or not the second following pocket is to receive an insert and not the immediately following pocket.

The setting of the flip-flop **150** to check for a vacuum-inhibit signal steps the counter **146** by a count of 1 and an increment of 1 must, therefore, be added to the address in the counter to address the storage location for the pocket for which a feed or no-feed check is to be made. Accordingly, adding circuit **147** is disposed between the counter and the gating **148** and when a 1 signal appears on an input **151,** the circuit will add a 1 to the address in the counter. This will cause the memory to address the proper location in the memory for the pocket whose vacuum must be inhibited at this time if there is to be a no-feed. The set output of instruction flip-flop **150** provides a logic **1** signal to the adding circuit **147** and to an OR gate **149** whose output gates the address counter **146** to the addressing circuit **142** and also activates a readout circuit **152** for the memory to read for the storage location selected by the address counter **146.** The storage location is read into a readout register **156.** If the insert is to be fed, there will be no number registered in the storage location or in the readout register **156** and a feed of the insert is to be signaled. To this end, the readout register **156** has OR gating **157** connected to the stages of the readout register. If all the registers are in their reset state, the output of the OR gate **157** which is applied to an input **160***a* of a NAND circuit **160,** is a logic 0. Consequently, a logic 1 appears on the output of the NAND gate **160.** The NAND gate **160** has its output connected to one input of AND gates **161, 162** having outputs connected to the set and reset terminals, respectively, of a feed flip-flop **166.** The gates **161, 162** are conditioned to pass a signal to the feed flip-flop **166** by the instruction flip-flop **150.** If there is a logic 1 on the output of NAND gate **160** calling for a feed, the AND gate **161** will be activated to set the flip-flop **166** and to produce a feed signal on its set output. This output is applied to scanner terminal **120***d* and scanned by the scanner **120** and used to set the feed flip-flop **168** at the feed station for effecting operation of solenoid valve **99** to supply vacuum to the sucker **33.** The output of NAND gate **160** is connected to the gate **162** through an inverter I so that the feed flip-flop **166** will be reset if there is a logic 0 on the output of NAND gate **160** indicating that no feed is to take place.

If no feed is to take place, the memory location will have a code number stored therein and the output readout register **156** will have a number registered therein when the location is read. Consequently, there will be a 1 input to input **160***a* of the NAND gate **160** from the OR gate **157.** The other input **160***b* of the NAND gate will have a logic 1 thereon since it is connected to the output of a comparator circuit **169** to which the hopper register **139** of each feed station is connected through an instruction AND gate **170** and through OR gating **171.** The AND gate **170** is activated by the set output of the instruction flip-flop **150** so that the comparator **169** compares the number in the output register with the number in the station code register **139.** If the numbers are different, a 1 appears at the output of the comparator **169** so that a 1 appears at the input **160***b* of the NAND gate **160** to make the output of the NAND gate a logic 0 to reset the feed flip-flop **166** to give a don't feed signal. This is appropriate since the storage location will have a hopper number therein only if there has been a previous miss and a don't feed signal is to be given unless the number in the storage is the same as the station code where the check is now being made. If these are the same, then a feed is to occur since it is this hopper which missed initially. In this case, the comparator output will be a logic 0 and the logic 0 signal on the input **160***b* of the NAND gate **160** will cause a logic 1 output from the gate **160** to provide a feed signal. The scanner **120** will respond to

the feed or don't feed signal when it scans its terminals **120***d*, **120***e* and set the feed flip-flop **168** to the corresponding condition.

If a no-feed signal is given to prevent the hopper from feeding an insert because of a previous miss, the miss signal which results from the intentional no-feed has to be prevented from destroying the information in the memory and entering erroneous information as to where the initial miss occurred. Since the don't feed signal from the memory is not for the insert which will next be calipered, the blanking of the miss signal has to be delayed one cycle. Accordingly, a don't feed signal enters a count of **1** into a three-stage shift register **171.** This register is shifted one stage each time that the terminal **120***c* has an input thereon when it is scanned. The third stage of the shift register has a connection to the AND gate **138** and normally has a logic 1 thereon unless the shift last stage is set to a logic 1. At this time the signal becomes a logic 0 to close the gate **128** to prevent the miss signal from activating the circuitry.

The memory has been illustrated as the type of memory in which the information readout of the memory is read back into the memory through the read-in circuit **140.** This automatic read-in is shown as being accomplished through a circuit **172** which can inhibit the reading in of the number stored in the readout register when a logic 0 is applied to the inhibit circuit. The comparator output supplies logic 1 input to the inhibit circuit **172** to enable it to read the information back into the memory as long as it is not the same as the number hopper code register. If it is, the comparator has a logic 0 output. Consequently, when a number is read out of a pocket address, it is immediately read back into the pocket address unless it is the same as the feed station code addressing the memory. If it is the same as the feed station code being checked, the comparator circuit **169** will have a logic 0 on its output which inhibits the circuit **172** from reading the output register back into the memory location and, in effect, the number is erased from the pocket storage location.

From the foregoing, it can be seen that when a miss is registered at a hopper for a pocket, the code stored in the memory location for that pocket will cause a shut off of all feed stations until the pocket returns to the feed station where the miss occurred. When this happens, the comparator output will call for a feed and prevent the hopper code from being read back into the memory location so that the downstream feed stations will no longer be prevented from feeding.

In addition, a code in the memory location for the pocket will effect operation of the recycle cam at the delivery station **41.** This cam is controlled in a manner similar to the feed stations when a miss feed has occurred. The control circuitry for the recycle cam includes a sync switch **114'** which operates during each part of the machine cycle in which a pocket is approaching the delivery station to request instructions concerning delivery. The actuation of switch **114'** sets a bistable flip-flop **175** to provide a flag or signal requesting a check of the memory **138** to see if the contents of the pocket should be recycled. The flip-flop **175** has a set terminal connected to a terminal **120***p* of the scanner and when this terminal is scanned, a pocket address counter **146'** for the delivery station is incremented and AND gating **148'** is activated so that the counter addresses the memory. Also, the signal from the terminal **120***p* activates to read the storage location for the pocket into the memory readout register **156** and resets the sync flip-flop **175.** Nothing further happens if there is no code read into the readout register and the newspaper is delivered as it moves past the delivery station. If, however, a code does appear in the readout register **156,** a signal will be on a scanner terminal **120***r* connected to the output of OR gate **157.** This signal will cause the setting of a recycle flip-flop **177** for energizing the recycle solenoid **78** to operate the recycle cam to prevent delivery of the contents in the pocket as it moves past the delivery station. The flip-flop **177** may be reset by a switch at the delivery station which is closed when the pocket moves by the delivery station.

For certain types of gatherers, it is advantageous to have information concerning the feeding by a feed station of two inserts to a pocket instead of one insert. These are known as doubles. When assembling newspapers, the feeding of doubles normally need not be corrected unless the rate of double feeds at a particular station is such that there may be an insufficient number of inserts for the required number of newspapers if the rate of double feeds continues.

In accordance with one feature of the illustrated machine, each caliper detector **34** has a set of double contacts which are closed if the detector senses a double sheet. Each time the detector senses a double sheet, it provides an output to step a respective counter **190** by an increment to register an incremental count of 1 therein. The counter **190** is reset after a predetermined number of feed or machine cycles, for example, 1,000, by a counter **191.** The counter **191** is stepped once for each feed cycle of the feeding stations. It will be understood that the counter **191** may be driven from any part of the machine to provide a time period dependent on machine speed within which less than a predetermined number of doubles are to be fed by any station. For example, if the counter at a feed station reaches a maximum count, for example, 20, before it is reset, an output signal from the counter will provide a stop signal to a control circuit **192** for stopping the machine and preferably for lighting an indicator light at the feed station which causes the machine to stop.

From the foregoing it can be seen that in the illustrated machine, a group of inserts being assembled at a movable gathering location is completed before it leaves the machine if a miss occurs at a feed station. When a miss occurs, the code number of the station is stored in a memory location unique to the gathering location and this stored data prevents the delivery of a partially assembled group from the machine as well as preventing the feeding of additional inserts to the location until the location is again in position to receive the inserts in sequence beginning with the missed insert.

While an addressable memory has been used as a storage, it will be understood that circulating or shift registers may also be used.

It will be understood that the present invention may take many forms. For example, FIG. **6** schematically illustrates the layout of a newspaper stuffing machine having ten feed stations with feed stations **200, 201, 202** and **203** having continuous feed conveyors **203** for feeding newspaper jackets to the stations so that more than one newspaper per revolution may be assembled and delivered to a pocket as it moves through the closed path. The newspaper jackets may be opened in a conventional manner at station **200***a*, **201***a*, **202***a* and

203*a* and inserts feed at feed stations 200*b*, 201*b*, 202*b* and 203*b*. The jackets fed at stations 200, 203 may also receive an additional insert at a feed station 200*c* and 203*c*, respectively. The assembled newspapers are then delivered at delivery stations 200*d*, 201*d*, 202*d* and 203*d*. It will be understood the machine may be operated to feed inserts at any or all of the jacket feed stations 201, 202, 203 so that all the deliveries are not used to selectively effect an assembling of one, two or three newspapers instead of one or four. For example, jackets could be fed at only the feed station 200 and the newspaper delivered with nine or less inserts at delivery 203*d* which is the natural machine delivery.

In the machine diagrammed in FIG. 6, a miss at one feed station will normally prevent the feeding of inserts until the pocket returns to that station and the code for the feed station will operate as before to prevent delivery from the machine at any delivery or the feeding of inserts at other feed stations. It will be recognized that if like newspapers were being assembled, for example, at feed stations 200, 200*a*, 200*b* and at feed stations 203, 203*a* and 203*b*, stations 200*a*, 203*a* and stations 200*b*, 203*b* could be respectively given the same code number so that if a miss occurred, for example, at feed station 200*a*, the inserts would be fed to the partially assembled group at feed station 203*a* and the completed newspaper delivered at delivery 203*d*. Similarly, the feed stations 201, 202 and the feed stations 201*a*, 202*a* could respectively be given the same code numbers if the same newspaper were being assembled by the feed stations 201, 201*a* and feed stations 202, 202*a*.

Having described my invention, I claim:

1. In a gathering apparatus for forming groups of sequentially fed items in which each item is fed sequentially to a gathering station for forming one of said groups, said apparatus including delivery means for delivering an assembled group of items from the apparatus and further comprising a plurality of movable gathering stations, feeding means for feeding said items in a predetermined sequence to said gathering stations as said gathering stations move sequentially past a plurality of feed stations including an initial feed station and a terminal feed station for respectively feeding the first and terminal items of an initial sequence of items to form a group at a gathering station, said feeding means being operable to feed a repeat sequence of items to a gathering station after the gathering station moves past said terminal station beginning with any item of the sequence, means for concurrently moving each of said plurality of gathering stations along a closed path and for moving a plurality of said gathering stations in turn past each of said feed stations to sequentially position said gathering stations at said feed stations in sequence to receive an initial sequence of items and for concurrently operating said feed stations to feed items to different gathering stations at respective feed stations and for moving at least incomplete groups past said feed means for a repeat sequence, and control means for said feeding means including first means for monitoring the feed of items from each of said feed stations to a gathering station at the feed station and second means responsive to a feeding malfunction at any of said feed stations for terminating the feeding of items to the misfed gathering station as the misfed gathering station is moved past any remaining stations for completing the remaining items of the sequence and any feed stations of said feed means for feeding previously fed items of the sequence while maintaining feeding to other gathering stations and for actuating said feed means to resume feeding to the misfed gathering station beginning with the item fed by the station which initially misfed.

2. In an apparatus for assembling items as defined in claim 1 and wherein said gathering station and feed stations are relatively movable through a closed path while the gathering station is positioned for conveying items received therein, said delivery means effecting delivery of an assembled group at a delivery station along said path downstream of said terminal station and including delivery control means responsive to said control means for rendering said delivery means ineffective to deliver a partially assembled group from said machine whereby the partially assembled group remains in said closed path.

3. In an apparatus as defined in claim 1 wherein said second means includes memory means for storing electrical signals and means responsive to said first means for setting said memory means to record a misfeed to a gathering station and third means responsive to stored signals recorded in said memory means for controlling said feeding means to prevent feeding to the gathering station while continuing the feed to other gathering stations to which a misfeed has not occurred until the gathering station to which a misfeed was occurred is again relatively positioned with respect to said feeding means to receive the item of the sequence which was misfed.

4. In an apparatus as defined in claim 3 wherein said memory means is settable to indicate the identity of the feeding station which misfed and the gathering station affected by the misfeed.

5. In an apparatus as defined in claim 4 wherein said memory means has memory location for each of said gathering stations and said second means includes means for storing data in said memory means indicating the identity of a feeding station at which a misfeed occurred at the memory location for the gathering station affected by the misfeed.

6. In an apparatus as defined in claim 5 wherein said third means comprises addressing means for signaling the identity of the gathering location approaching a feed station for addressing and reading the data stored in said memory location for the gathering station and actuating means responsive to the data stored in said memory means for controlling the feed of an item to the gathering station by the feed station being approached by the gathering station.

7. In an apparatus for assembling items as defined in claim 3 and wherein said gathering stations and feed stations are relatively moved through a closed path while the gathering stations are maintained in a position for conveying items received therein, said delivering means effecting delivery of an assembled group at a delivery station along said path after a gathering station passes said terminal station and said delivery means including delivery control means responsive to said control means for rendering said delivery means ineffective to deliver a partially assembled group from said machine whereby the partially assembled group remains in said closed path and said delivery control means comprises means responsive to said memory for controlling said delivery means.

8. In a gathering apparatus comprising feeding means including a plurality of feed stations and a plurality of gathering stations to which items for forming a group are to be fed sequentially as the gathering stations and feed stations move relatively to each other with each feed station feeding a particular item of the sequence to the gathering stations, said feed stations including an initial feed station for feeding the initial item of the sequence and a terminal station spaced from the initial feed station in the direction of relative movement of said gathering stations past said feed stations for feeding the terminal item of a sequence, said apparatus being operable to feed said items in a repeat sequence after a gathering station has relatively moved past said terminal station, means for moving each of said gathering stations along a closed path and for concurrently moving a plurality of gathering stations past said feed stations and for feeding and driving said feed stations to feed different locations concurrently, each of said feed stations having associated therewith detecting means for providing an electrical signal indicating a misfeed to a gathering station, memory means comprising a memory store for each gathering station for storing a misfeed code indicating the feed station and gathering station at which the misfeed occurred, and control means comprising first means for setting said memory store for a gathering location in response to said electrical signal indicating a misfeed from a feed station to the gathering station, and second means for reading said store for the gathering location each time a gathering station is being positioned to receive a feed at a feed station to determine whether a misfeed has previously occurred to the gathering station for preventing a feed to a previously misfed gathering station until the previously misfed gathering station is again positioned to receive the misfed item of the sequence and for then reinitiating the feed of the remainder of the sequence to the previously misfed gathering station and for clearing the memory store of the misfeed code.

9. In an apparatus as defined in claim 8 wherein said apparatus includes delivery means for delivering an assembled group of items from said machine after it passes said terminal station and delivery control means responsive to the first said control means for effecting operation of said delivery means to prevent discharge of an incomplete group from said machine.

10. In an apparatus as defined in claim 9 wherein said delivery control means comprises means responsive to data stored in said memory in response to a misfeed to prevent delivery of the items from the gathering location at said delivery means.

11. In an apparatus as defined in claim 10 wherein each feed station has an address counting means for counting the gathering stations to provide an identification of the gathering station approaching the feed station and said second circuit means is responsive to said address counting means for reading the store corresponding to the approaching gathering station.

12. A method of sequentially assembling items into groups which comprises relatively and concurrently moving a plurality of feed stations and a plurality of gathering stations to sequentially position each gathering station at a feed station to receive an item from the feed station and concurrently driving the feed stations to feed items to different gathering stations at different feed stations to initially form the groups, detecting a misfeed at any feeding station, continuing the relative movement of the feeding stations and gathering stations on the detection of a misfeed and storing electrical data indicating the gathering station for which the misfeed occurred and the and the item of the sequence which was misfed, electrically utilizing said data to prevent the feeding of the remaining items of the sequence to the gathering station to which a misfeed occurred as it sequentially moves by the remaining feed stations of the sequence while maintaining the feed to other gathering stations for which a misfeed has not occurred and moving the incomplete group for which a misfeed has occurred again past feed stations for repeating the feeding of the items in sequence, and resuming the sequential feeding of items in response to the stored data when the gathering station for which a misfeed occurred is again positioned at a feed station for feeding the item of the sequence which was misfed.

13. A method as defined in claim 12 wherein a code indicative of the item of the sequence which was misfed is electrically stored in a memory store corresponding to the gathering station for whcih the misfeed occurred and as the gathering station approaches a feed station thereafter, the step of electrically reading the store to determine if the gathering station is approaching a feed station for feeding the misfed item of the sequence and resuming the sequential feeding to the gathering station if the feed station is one for feeding the misfed item of the sequence.

14. A method as defined in claim 13 wherein a code unique to the feed stations is stored in a store corresponding to the gathering station positioned at the feed station when a misfeed occurs and feeding to the gathering station by other stations is prevented and feeding reinitiated by comparing the stored code with a code for the feed station being approached by the gathering location.

15. In an apparatus for gathering a plurality of sequentially fed items into a group, a plurality of gathering stations each of which is movable along a closed path, feeding means comprising feed stations for feeding respective items of said sequence for feeding a first sequence of items to a gathering location and for subsequently feeding an item misfed during the initial sequence, means for moving a plurality of gathering stations past said feeding means and for driving said feeding means to feed said gathering stations, detecting means for monitoring the feed of items from each feed station to said gathering stations and providing a signal indicating a misfeed to a gathering location, means responsive to said monitoring means for storing coded data indicating the item which was misfed for the gathering location to which the item was misfed including memory means in which said coded data is stored, and feed control means responsive to the stored coded data in said memory means for effecting operation of said feeding means to subsequently effect a feeding of the misfed item to the gathering location which was misfed.

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