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[54] SELECTIVE INSERTION MACHINE HAVING VERIFICATION AND OVERWEIGHT DIVERSION

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[52] **U.S. Cl.** **270/58**

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

[58] **Field of Search** 270/58, 54, 56

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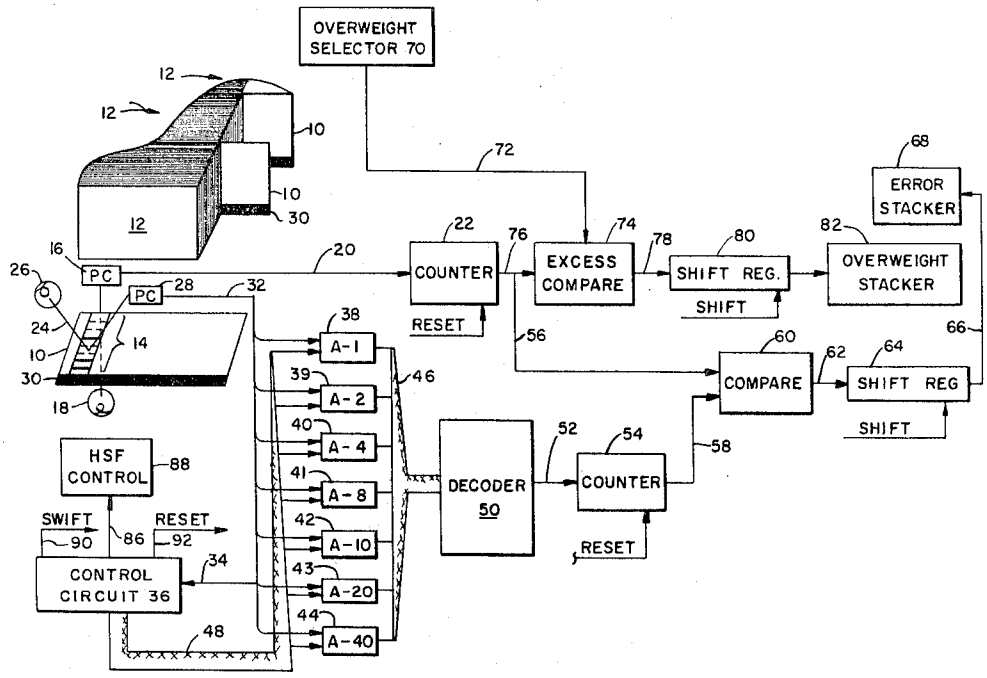
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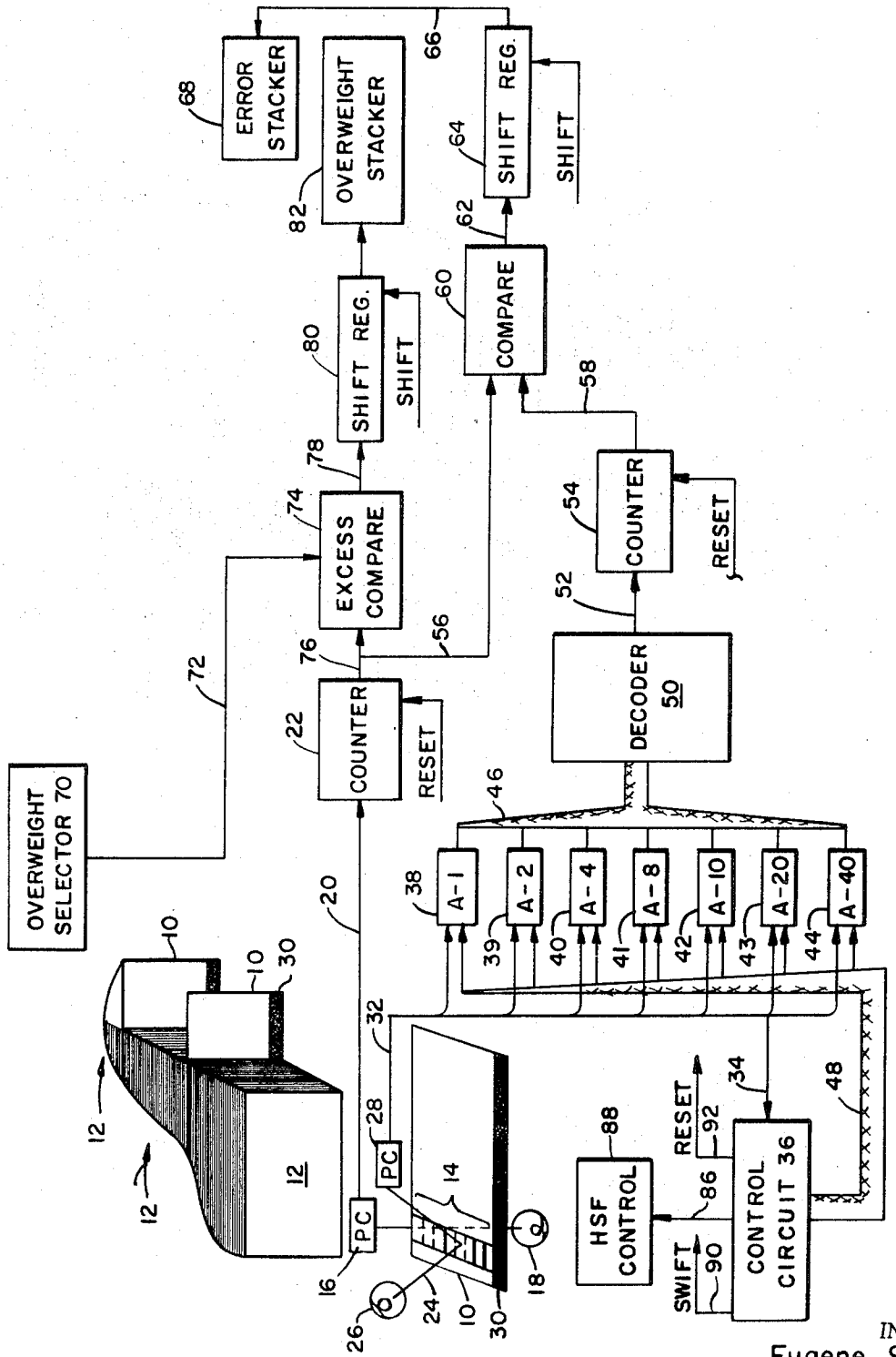
[57] **ABSTRACT**

A high speed feeder delivers a main document and a plurality of related subordinate documents onto an insertion track which carries the documents past a plurality of insertion and diversion stations. Each main document includes a coded representation of the number of related subordinate documents that are to follow thereafter. The coded representation is sensed as the main document is fed from the high speed feeder and signals are generated and delivered to a counter for representing a count corresponding to the number represented by the code. A photocell senses each subsequent subordinate document as it passes thereover and delivers a pulse corresponding to each such subordinate document to a second counter. The outputs of the two counters are compared and an error signal is generated if the two counts are not in agreement.

In accordance with another aspect of the invention, an overweight selector produces signals representing a predetermined number of subordinate documents. These signals are delivered to a means for comparing the numeric value they represent with the count in the second counter and providing an "overweight" output signal to an overweight-stacker when the actual count exceeds the predetermined number. In this manner, when a packet of documents contains an excessive number of subordinate documents, the packet is removed from the insert track by the overweight-stacker.

17 Claims, 1 Drawing Figure





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SELECTIVE INSERTION MACHINE HAVING VERIFICATION AND OVERWEIGHT DIVERSION

This is a continuation-in-part of commonly assigned United States application, Ser. No. 657,721, now U.S. Pat. No. 3,484,100 filed on July 14, 1967 and entitled "Selective Insertion Machine Having Variable Capacity Insertion Stations and Matching". In this respect, in accordance with a notice in Volume 859 of the Official Gazette dated Feb. 11, 1969, the subject matter of that application is incorporated herein by reference.

BACKGROUND OF THE INVENTION

The referenced application relates to a selective insertion machine wherein main documents and subordinate documents are delivered from a high speed feeder onto an insertion track which moves the thusly formed group of documents past a plurality of other feeding, insertion, and diversion stations, and past a postage meter. It is an object of this invention to provide a structure for determining whether all of the intended subordinate documents are in fact fed onto the insert track with the associated main document.

Most insertion machines which include a postage meter use a fixed rate of postage. That is, it is assumed that all of the envelopes passing through the machine will fall within the same postage-rate weight categories so that each will take the same amount of postage. In the newer, more complex insertion machines where documents are selectively inserted from any one of a number of insertion stations, it is more likely that certain groups of documents will weigh more than the weight corresponding to the postage for which the meter is set. Hence, it is another object of this invention to provide a means for detecting overweight document packets and removing them from the insert track prior to the time that they pass through the postage meter.

In accordance with principles of the invention, each main document has a coded representation thereon corresponding to the number of subordinate documents that are expected to accompany it out of the feeder. This coded representation is sensed and signals are generated representing the number of subordinate documents that are expected to follow. A sensor generates a signal in response to passage of each subordinate document from the feeder. These signals are delivered to a counter; and a compare circuit compares the output of the counter with the signals derived from the main document's coded indicia. The compare circuit is operative to provide an error-signal output if the two counts do not compare.

In accordance with another aspect of the invention, an overweight selector generates signals representing a given number of subordinate documents which, if exceeded, would probably result in an overweight packet when the documents arrive at the postage meter. An excess-compare circuit compares the counter output signals representing the actual number of subordinate documents that are fed from the feeder during a given machine cycle with the signals representing the number of documents that would create an overweight condition. The excess-compare circuit is operative to provide an output signal to a shift register if the actual count is in excess of a predetermined number of documents necessary to cause an overweight condition. The output signal from the excess-compare circuit is then used to control a device for removing the overweight document packet from the insert track.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, features, and advantages of this invention will be apparent from the following more particular description of a preferred embodiment thereof as illustrated in the accompanying drawing which is a schematic diagram of structure embodying the invention. In this respect, the drawing is not intended to be to scale, but rather is presented so as to illustrate the principles of the invention in clear form.

DETAILED DESCRIPTION

During each machine cycle of an insertion machine, a high speed feeder delivers a group of documents onto an insert track of the insertion machine. Each group of documents is comprised of a main document **10** followed by a set of subordinate documents **12** which may vary in number from none to an indefinitely large sum. Each main document includes a code field **14** adapted to have a plurality of dark marks placed thereon at predetermined locations. These marks are placed thereon in the form of a binary coded decimal code (BCD) to represent the number of subordinate documents **12** that should follow the associated main document **10** from the high speed feeder.

Each document that is delivered by the highspeed feeder passes over a photocell **16** so as to interrupt the passage of light from a lamp **18** to the photocell **16**. During each such interruption the photocell generates a pulse on line **20** which delivers the resulting pulses to a counter **22**. After the main document passes under the photocell **16**, it is struck by a beam of light **24** from a lamp **26** so that the light is reflected to a photocell **28**. In this respect, in a conventional manner, a means not shown in provided for reflecting light to the photocell **28** when there are no documents from which the light beam **24** can be reflected.

Each main document **10** has its leading edge marked with a control indicium in the form of a nonreflective bar **30** so that the light beam **24** is not reflected to the photocell **28** when the bar passes thereunder. This results in a change in the photocell's output on line **32** which is delivered on branch **34** to a control circuit **36** to initiate a series of timing pulses to be described more fully shortly.

As the main document **10** continues its passage under the photocell sensor **28**, the light beam **24** is interrupted by each of the BCD code marks that have been previously placed in the field **14**. These marks, therefore, cause the photocell **28** to further change its output and provide signal pulses on line **32** to a group of AND gates **38–44**. The outputs from the AND gates are delivered to a cable **46**, but such outputs are only provided when the signals from the photocell **28** on line **32** arrive at the AND gates simultaneously with a gating signal on an appropriate line of cable **48** from the timing control circuit **36**.

By way of example, if the main document **10** is to be followed insertion **23** subordinate documents, the BCD code indicia in the field **14** would be such that only the AND gates **38**, **39**, and **43** would receive simultaneous pulses from both the timing control circuit **36** and the photocell **28**.

The outputs from the AND gates **38—44** on the lines of cable **46** are delivered to a decoder **50** which generates a series of pulses on line **52** to a counter **54** which provides a binary representation of the number of subordinate documents that are expected to follow the associated main document **10**.

Signals representing the counts in the counters **22** and **54** are delivered on lines **56** and **58**, respectively, to a compare circuit **60** which generates an error signal on line **62** if the two counts do not agree. This signal is then delivered to a shift register **64** whose output on line **66** controls an error stacker **68** which is operative to remove the particular group of documents from the insert track after it has passed the various insert stations along the track and arrives adjacent a suitable stacker type of diversion station such as described in the referenced application.

As is also described in the referenced application, the various groups of documents traverse the length of the insertion track past the various feeding, insertion, and diversion stations. The document packets are then passed through a postage meter which is customarily of the type which places a fixed amount of postage on each envelope into which the document packets have been stuffed. It is apparent, however, that where a sufficiently large number of subordinate documents are placed on the insert track along with a given associated main document, the resulting document packet will

weight more than the maximum weight for which the postage meter is adjusted. Hence, in accordance with another aspect of the invention, an overweight selector **70** is selectively settable to deliver output signals on line **72** to an excess-compare circuit **74** which also receives signals on line **76** from the counter **22**. The excess-compare circuit **74** is operative to compare the two count signals delivered to it on lines **72** and **76** and generate an output signal on line **78** whenever the signals on line **76** represent a count in excess of the number represented by the signals on line **72**.

Again by way of example, if it has been determined that no more than **20** subordinate documents should be placed with any given main document without exceeding the weight corresponding to that for which the postage meter is set, the overweight selector **70** is set to provide a group of binary output signals representing a count of "20". Hence, in the situation described above where **23** subordinate documents follow the main document **10**, the counter **22** provides a binary signal representing the count "23" and the excess-compare circuit **74** produces an overweight signal on line **78**. This overweight signal is delivered to a shift register **80** which makes timely delivery of the overweight signal to an overweight stacker **82** located at one of the diversion stations described in the reference application. In this manner, overweight document packets are removed from the insert track prior to the time they would otherwise be passed through the postage meter and receive insufficient postage.

It will be appreciated by those skilled in the art that although the invention has been described in specific terms, various other modifications are equally within the scope of the invention. For example, in the preferred embodiment, the timing control circuit **36** is operative upon receipt of the pulse on line **34** (derived from the dark leading edge marking **30** on the next main document **10**) to produce a signal on line **86**. This signal is delivered to a high speed feeder control **88** for terminating operation of the high speed feeder until the beginning of the next machine cycle. Similarly, the control circuit is operative to generate timely shift and reset pulses on lines **90** and **92** for delivery, where necessary to the various circuit components such as the shift registers **64** and **80** and the counters **22** and **54**. It will also be apparent to men skilled in the art that certain of the various signals can be delayed somewhat in order to provide good timing; and depending upon the time that a reset signal is delivered to the counter **22**, it may be desirable to provide a counter of the type which is reduced by one in order to account for its input pulse caused by passage of the preceding main document under the photocell **16**.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention. For example, although the code indicia on the main card **10** have been illustrated in terms of marks placed at selected locations thereon, punched holes or magnetic indicia might be equally satisfactory.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In an insertion machine of the type in which an insertion track moves groups of documents past a different one of a plurality of insertion stations during each machine cycle; and wherein said groups are comprised of a main document and an associated plurality of subordinate documents, said main document having indicia thereon representing the number of said associated plurality of subordinate documents that are expected to be deposited on said insertion track therewith, a diversion apparatus comprising:

feeding means for feeding said main document and said subordinate documents onto said insertion track;

sensing means for sensing said indicia on said main document and generating number signals representing the expected number of said associated plurality of subordinate documents;

counting means for counting the subordinate documents fed by said feeding means and generating count signals representing the number of subordinate documents fed;

comparing means for comparing said count signals and said number signals and generating an error signal when the number represented by said number signals differs from the number represented by said count signals; and,

diversion means for receiving said error signal from said comparing means and diverting from said insertion track the main document and said subordinate documents causing said error signal.

2. The apparatus according to claim **1** including a control means operative in response to the feeding of each group of documents for generating timing signals, said timing signals being applied to said sensing means for controlling the sensing of said indicia on said main document and the generating of said number signals representing the expected number of said associated plurality of documents.

3. The apparatus according to claim **2** wherein said main document includes a control indicium and wherein said control means is operative in response to receipt of signals derived from said control indicium to begin generation of said timing signals.

4. The apparatus according to claim **3** including means for delivering timing control signals from said control means to said feeding means, said feeding means thereby being operative in response to signals derived from said indicium of said main document.

5. The apparatus according to claim **2** including gating means operative in response to receipt of timing signals from said control means for gating said number signals to said comparing means.

6. The apparatus according to claim **1**:

wherein said diversion means comprises an error stacker located along said insertion track; and,

including means for delivering said error signal to said error stacker when the associated group of documents is adjacent said error stacker, said error stacker being operative in response to said error signal to remove said associated group of documents from said insertion track.

7. In an insertion machine of the type of which an insertion track moves groups of documents past a different one of a plurality of insertion stations during each machine cycle; and wherein said groups are comprised of a main document and an associated plurality of subordinate documents, a diversion apparatus comprising:

overweight selector means for generating a weight signal representing a given number of subordinate documents;

feeding means for feeding said main document and said subordinate document onto said insertion track;

counting means for counting the subordinate documents fed by said feeding means and generating a count signal representing the number of subordinate documents fed;

overweight comparing means for comparing said weight and said count signals and generating an overweight signal when the number represented by said count signal is greater than the number represented by said weight signal;

overweight delivering means for delivering said weight and said count signals to said comparing means so that said overweight comparing means can compare said weight and count signals; and,

overweight diversion means for receiving said overweight signal from said overweight comparing means and diverting from said insertion track the main document and said subordinate documents causing said overweight signal.

8. The apparatus according to claim **7** including a control means operative in response to the feeding of each group of documents for generating timing signals, said timing signals controlling the output from said overweight comparing means so that said overweight diversion means diverts the main document and said subordinate documents causing said overweight signal.

9. The apparatus according to claim 8 wherein said main document includes a control indicium and wherein said control means is operative in response to receipt of signals derived from said control indicium to begin generation of said timing signals.

10. The apparatus according to claim 9 including means for delivering timing control signals from said control means to said feeding means, said feeding means thereby being operative in response to signals derived from said indicium of said main document.

11. The apparatus according to claim 7:

wherein said overweight diversion means comprises an overweight stacker located along said insertion track; and

including means for delivering said overweight signal to said overweight stacker when the associated group of documents is adjacent said overweight stacker, said overweight stacker being operative in response to said overweight signal to remove said associated group of documents from said insertion track.

12. The apparatus according to claim 7 wherein said document has indicia thereon representing the number of said associated plurality of subordinate documents that are expected to be deposited on said insertion track therewith and including:

sensing means for sensing said indicia on said main document and generating number signals representing the expected number of said associated plurality of subordinate documents;

count comparing means for comparing said count signals and said number signals and generating an error signal when the number represented by said number signals differs from the number represented by said count signals;

count delivering means for delivering said count and number signals to said count comparing means so that said count comparing means can compare to said count and number signals; and,

count diversion means for receiving said error signal from said count comparing means and diverting from said insertion track the main document and said subordinate documents causing said error signal.

13. The apparatus according to claim 12:

wherein said overweight diversion means comprises an overweight stacker;

wherein said count diversion means comprises an error stacker;

including means for delivering said error signals to said error stacker when the associated group of documents is adjacent to said error stacker; and,

including means for delivering said overweight signal to said overweight stacker when the associated group of documents is adjacent to said overweight stacker, said error and overweight stackers being operative in response to receipt of said error and overweight signals respectfully to remove the associated groups of documents from said insertion track.

14. The apparatus according to claim 12 including a control means operative in response to the feeding of each group of documents for generating timing signals, said timing signals being connected to said sensing means for controlling the sensing of said indicia on said main documents and to the output of said overweight comparing means for controlling the passage of said overweight signal from said overweight diversion means.

15. The apparatus according to claim 14 wherein said main document includes a control indicium and wherein said control means is operative in response to receipt of signals derived from said control indicium to begin generation of said timing signals.

16. The apparatus according to claim 15 including means for delivering timing control signals from said control means to said feeding means, said feeding means thereby being operative in response to signals derived from said indicium of said main document.

17. The apparatus according to claim 14 including gating means operative in response to receipt of timing signals from said control means for gating said number signals to said count comparing means.

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