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[54] **ARRANGEMENT FOR SEPARATING A SELECTABLE NUMBER OF SHEETS FROM THE MAIN OUTPUT OF A PRINTING PRESS UNDER PREDETERMINED OPERATING CONDITIONS**

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[51] **Int. Cl.** **B41f 13/64**

[58] **Field of Search** 101/136, 232, 236–238, 101/240–241, 174, 183–185; 271/64, 67; 209/74

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[57] **ABSTRACT**

The number of sheets to be separated from the main output upon occurrence of a predetermined operating condition is set into a code switch. When the main output is blocked or when a predetermined number of sheets has been received at the main output, or upon application of an external signal, the contents of the code switch are transferred to a counter. Signals signifying the passage of a sheet past a predetermined location are applied to the counter and the counter counts in reverse until zero is reached. While the counter is counting a relay controlling the direction of transport of the sheets transfers sheets to a second output station. When zero is reached the relay is again energized, causing the sheets to be transported to the main output again.

11 Claims, 2 Drawing Figures

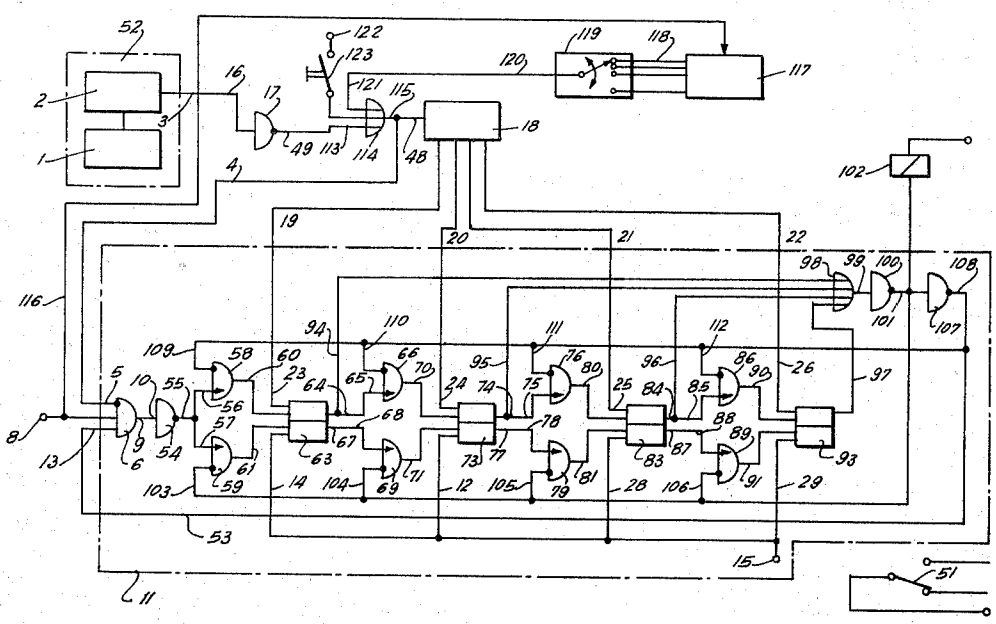
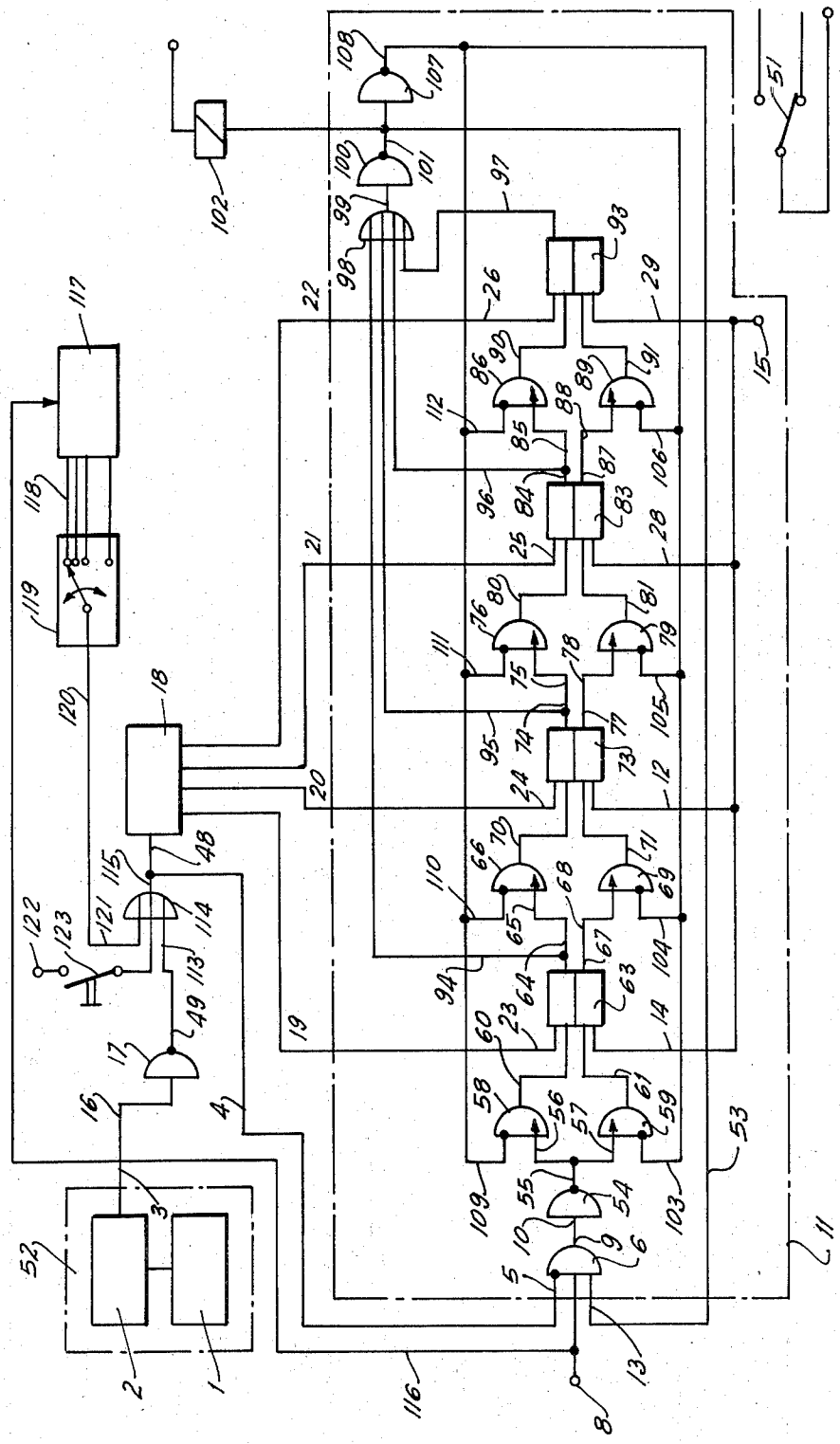


FIG. 1



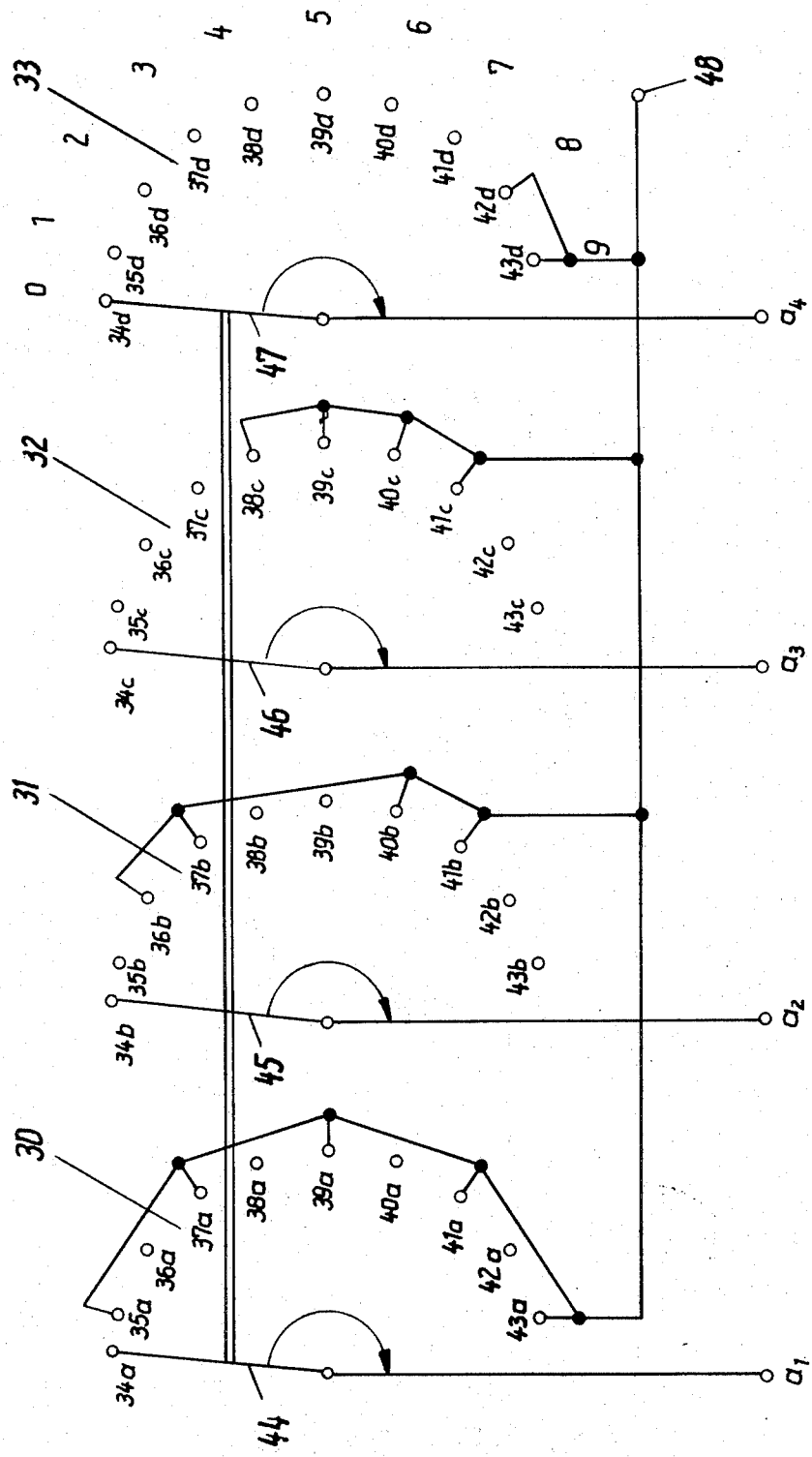

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Fig. 2

ARRANGEMENT FOR SEPARATING A SELECTABLE NUMBER OF SHEETS FROM THE MAIN OUTPUT OF A PRINTING PRESS UNDER PREDETERMINED OPERATING CONDITIONS

BACKGROUND OF THE INVENTION

The present invention relates to a method and arrangement for separating a selectable number of sheets from the main or first output station under predetermined operating conditions. These operating conditions may include the restarting of the press after a stoppage, the receipt of a predetermined number of sheets at the first output station, or an externally applied signal. This is required to assure that only a very high quality printed sheet is furnished at the first output station, while possibly lower quality sheets are routed to a second output station.

Systems are known wherein the chain of grapple claws which carries the sheets has movable gripper blocks for opening the claws arranged underneath the claws. The control of the movable gripper blocks is carried out by a counter operated by the printing press.

In known systems of this type, it is not possible to assure that a predetermined or preselectable number of sheets is routed to the second output station. The routing of the sheets to the second output station takes place only in response to printing errors found or other errors.

SUMMARY OF THE INVENTION

It is an object of the present invention to transport a preselected number of sheets to a second output station rather than the first output station following the start up of the inking device or the damping device, thereby preventing sheets having possible printing inaccuracies or color variations from reaching the first output station.

It is a further object of the present invention to furnish a method and arrangement for separating a preselectable number of sheets from the main output station after a predetermined number of sheets has been received at said station or at arbitrary instants of time in response to an externally applied signal.

The present invention resides in a printing arrangement having sheets passing along a predetermined path past a predetermined location, a first output station for receiving acceptable printed sheets and a second output station for receiving unacceptable printed sheets. It comprises means for furnishing a synchronizing signal upon passage of each of said sheets past said predetermined location. It further comprises first counting means having a reverse counting input, a plurality of setting inputs and an initial counting state. It comprises first logic circuit means for furnishing a first control signal upon occurrence of any of a number of predetermined operating conditions. Code switch means are furnished which are externally settable to a selected one of a plurality of numbers, for presetting said first counting means to said so-selected number in response to said first control signal. Second logic circuit means have inputs connected to said first counting means and furnish an initial count signal when said first counting means is in said initial counting state. Finally, third logic circuit means have a first input connected to receive said first control signal, a second input connected to receive said synchronizing signal, a third input connected to receive said initial count signal and an output connected to the input of said first counting means. The third logic circuit means operates to apply said synchronizing signals to said third counting means to effect a reverse count, in the absence of said first control signal and said initial count signal. Control means are connected to the output of the second logic circuit means, for causing the sheets to be transported to the first output station when the first counting means are in the initial counting state, and to said second output station when the first counting means are not in said initial counting state.

In a preferred embodiment of the present invention the first counting means comprise a forward-reverse counter having a plurality, for example four, bistable stages. Each of the bistable stages is preceded by a first and second gate for controlling the count in a forward or reverse direction. Further, each bistable stage has a direct set input and a direct reset input.

Also in a preferred embodiment of the present invention code switch means comprise a plurality of step switches each having a selector arm mechanically coupled to all the other selector arms for simultaneous operation upon external activation.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows the control circuit of the present invention; and

FIG. 2 shows the code switch means of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of the present invention will now be described with reference to the drawing.

In FIG. 1, reference numerals 1 and 2 refer to components which are a part of the printing press control arrangement and are of interest only in their interconnection with the present invention. Specifically, reference numeral 1 refers to a switch at the first output station which receives the acceptable printed sheet and which furnishes an input to a stage 2 whose output on line 3 indicates whether or not the first output station is locked. The signal on line 3 is applied to the input of an inverter 17 via a line 16. The output 49 of inverter 17 is applied to one input of an OR-gate 114 through a line 113. The output of OR-gate 114 is applied via a line 115 and a line 4 to the input 5 of an AND-gate 6. Input 5 of AND-gate 6 is an inverting input as indicated by the dot. A second input 7 of AND-gate 6 is connected to a terminal 8 at which are applied the synchronizing signals. It should be noted that OR-gate 114 mentioned above is herein referred to as first logic circuit means, while AND-gate 6 constitutes third logic circuit means. The output 9 of AND-gate 6 is applied to the input 10 of an inverter 54. The output 55 of inverter 54 is applies to inputs 56 and 57, respectively, of AND-gates 58 and 59. Outputs 60 and 61 of AND-gates 58 and 59 respectively are connected each to one

side of a bistable stage **63** which is the first stage of the first counting means **11.** The first counting means comprise further bistable stages **73, 83** and **93.** Each of these bistable stages has a reset input, respectively labelled **12, 28** and **29,** all of which are connected in common to a terminal **15** which receives reset signals. The outputs **64** and **67** of bistable stage **63** are in turn connected to the inputs **65** and **68,** respectively, of AND-gates **66** and **69,** respectively. Outputs **70** and **71** of AND-gates **66** and **69,** respectively, are connected each to one-half of bistable stage **73** whose outputs **74** and **77** are connected to the inputs of AND-gates **76** and **79** through lines **75** and **78,** respectively. The output of AND-gates **76** and **79** are connected via lines **80** and **81** to bistable stage **83** whose outputs **85** and **87** are in turn connected to inputs of AND-gates **86** and **89.** The outputs of AND-gates **86** and **89** are connected through lines **90** and **91** to the last bistable stage **93.** The outputs **64, 74, 84** and **97** of bistable stages **63, 73, 83** and **93,** respectively, are each connected to one input of an OR-gate **98** whose output **99** is connected to an inverter **100.** OR-gate **98** and inverter **100** constitute second logic circuit means. The output **101** of inverter **100** is connected to control means, namely a relay **102.** It is further connected to the second input of AND-gates **59, 69, 79** and **89.** A second inverter **107** is also connected to the output of inverter **100.** The output **108** of inverter **107** is connected to a third input of AND-gate **6** through a line **13.** It is further connected to inputs **109, 110, 111,** and **112** of AND-gates **58, 66, 76** and **86** respectively. Relay **102** further comprises contacts **51** which, when the relay is energized serve to control the transport of the sheets to the first output station and, when the relay is deenergized, to the second output station.

A counting input of second counting means, a counter **117,** is also connected to terminal **8** to receive the synchronizing signals. Counter **117** has a plurality of outputs **118** which constitute the inputs of a selector switch **119.** Activation of selector switch **119** causes any one of the outputs **118** to be connected to the selector switch output **120** which in turn is connected to one input of OR-gate **114** through a line **121.** A voltage furnished at a terminal **122** may be connected to a third input of OR-gate **114** through a switch **123** when this switch is closed by external activation. The connection from switch **123** to the input of OR-gate **114** is through a line **27.**

Before describing the operation of the above-described control system, the code switch shown as block **18** in FIG. **1** and shown in detail in FIG. **2** will be described. Reference to FIG. **2** shows that in a preferred embodiment of the code switch, it comprises four selector switches **30, 31, 32** and **33.** Each of the selector switches comprises 10 contacts labelled **34***a*–**43***a*; **34***b*–**43***b*; **34***c*–**43***c* and **34***d*–**43***d*, respectively. Each further comprises a selector arm **44, 45, 46** and **47,** respectively. The selector arms are mechanically intercoupled for simultaneous movement. The selector arms **44–47** are electrically connected to outputs *a***1**–a4, respectively. A common line **48** applies the control signal to whichever contact of the particular step switch it is connected to. The connections are made in such a manner that the decimal values represented by the step switch contacts are converted to a binary representation at terminals a_1–a_4. Specifically, the contacts are connected in accordance with the following table:

TABLE 1

Selector Arms on Contacts	Signal On			
	a_4	a_3	a_2	a_1
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
Binary Place Value	2^3	2^2	2^1	2^0

The operation of the system shown in FIG. **1** will now be described.

It is believed that the understanding of FIG. **1** will be simplified by the use of Table 2 as follows:

TABLE 2

Condition	123	121	1st output station blocked	3	Lines 115 & 48	Code value transferred to ctr. 11	Line 9	Counter 11 counts
1	0	0	yes	0	1	yes	0	no
2	0	0	no	1	0	no	1	yes
3	1	0	yes	0	1	yes	0	no
4	1	0	no	1	1	yes	0	no
5	0	1	yes	0	1	yes	0	no
6	0	1	no	1	1	yes	0	no

It will be noted that OR-gate **114** has three inputs, each of these inputs constituting a possible operating condition under which a selectable number of sheets, namely as selected on code switch **18,** is to be transferred to the second output station for unacceptable sheets rather than to the first output station.

The first operating condition under which the sheets are to be so-separated is that the main output station is blocked and thereafter resumes operation and that following the resumption, a preselected number of sheets is to be first furnished to the second output station. The condition under which the first output station is blocked while no signal is being furnished by switch **123** or on line **121** is shown in the above table under condition 1. Under this condition a 0 signal appears on line **3** which is inverted by inverter **17** so that a 1 signal appears at input **113** of OR-gate **114.** A 1 signal therefore appears on line **4** causing AND-gate **6** to be blocked, since input **5** is an inverting input. Counter **11** thus does not count. Previously to this, a number has been set into the code switch **18.** Because of the signal at the output of OR-gate **114,** a signal appears on line **48** which is transferred to outputs *a***1**–*a***4** in dependence on the number set. Outputs *a***1**–*a***4** furnish signals on lines **19–22** and therefore set the corresponding stages of counter **11.** The number previously entered into the step switch **18** is thus transferred to counter **11.** As soon as the number is entered into counter **11,** a I output appears on line **99** at the output of OR-gate **98.** This I signal is inverted by inverter **100,** causing a O signal to appear at the output **101.** This deenergizes relay **102** causing contact **51** to switch to the state shown in the Figure in which state sheets are transported, when

the transport recommences, to the second output station.

When condition 2 occurs, that is switch 123 is still open, no signal appears on line 120 but the first output station is no longer blocked, then line 3 carries a I signal which is changed to a O signal by inverter 17. The signal at the output of OR-gate 114 is thus a O signal which, since input 5 as previously mentioned is an inverting input, switches AND-gate 6 to the conductive state. Under this condition then counter 11 can count. The signal on line 48, however, is O, therefore causing no further transfer to take place from code switch 18 to counter 11. Since the signal at the output or OR-gate 98 will remain a I signal until the counter reaches O, relay 102 will remain deenergized until the initial signal, namely a O on all stages of counter 11, is again reestablished. Counter 11 of course counts backwards from the number set into it via code switch 18, counting one step in reverse for each synchronizing signal applied at terminal 8. When counter 11 reaches an all O state again, the signal at the output of OR-gate 98 becomes O, is inverted by inverter 100 to be a I, reenergizing relay 102 and causing subsequent sheets to be transported again to the first output station. The I signal at the output of inverter 100 is again inverted by means of inverter 107 and at the output of inverter 107 is applied to the input of AND-gate 6 via a line 53 and 13, thereby blocking AND-gate 6. The counting process is thus stopped when the all zero condition is reached.

In condition 3, the key or switch 123 is closed, no signal is received over line 121 and the first output station is blocked. There is thus a I output at the output of OR-gate 115 which, similarly as discussed above, causes a signal to appear on line 48 which, as reference to FIG. 2 will show, is transmitted to selected contacts of the step switches 30–33. If one of the wipers 44–47 is connected to a contact which is connected to line 48, a corresponding output signal will appear on the corresponding one of outputs *a*1–*a*4. Thus counter 11 will be set to a count corresponding to the number set on code switch 18. Also as previously mentioned, the one output of OR-gate 114 is inverted at input 5 of AND-gate 6, by blocking this AND-gate and preventing the synchronizing signals applied at terminal 8 from being counted by counter 11.

When switch or key 123 is again opened, the I signal at the output of OR-gate 114 remains, as long as a O signal still appears on line 3. Thus the operating condition of the equipment does not change. The count remains set into counter 11 as previously and no counting signals are applied to the input of counter 11.

In condition 4 it will be noted that key 123 is closed while the first output station is not blocked and no signal is applied on line 121. Again, an output signal 1 appears at the output of OR-gate 114, blocking the reverse counting input to counter 11 and causing the transfer of the number previously set into code switch 18 to be transferred to counter 11. If key 123 is now released, the signal at the output of OR-gate 114 changes from a I to a O. This causes the AND-gate 6 to become conductive, allowing the counting process to begin.

Under condition 5, key 123 is opened, a I signal is supplied via line 121 and the first output station is blocked causing a O signal to appear on line 3. It should be noted that a I signal appears on line 121 when counter 117, the second counting means, has reached a predetermined count previously set on selector switch 119. Since the counting input of counter 117 is directly connected to terminal 8, the I signal on line 121 will of course be replaced by a O signal as soon as the next synchronizing signal is applied at terminal 8, thereby advancing counter 117 by one count. In condition 1 the signal I appears on line 121 and the first output station is blocked, causing a I signal to appear on line 113. The I signal thus again appears on line 115, causing the same signal to be applied to line 48 which, as explained above, causes the transfer of the previously set number in code switch 18 to be transferred to counter 11. Also as explained above, AND-gate 6 is blocked under these conditions so that no counting can take place. Even when the signal on line 121 disappears because of the next synchronizing signal arriving at terminal 8, the I signal is still maintained on line 115 as long as the first output station is blocked. Thus no counting can take place under condition 5.

Condition 6 is similar to condition 5 except that the first output station is not blocked. Therefore, a I signal appears on line 3 which, after passing through inverter 17 is a O signal at input 113 of OR-gate 114. A I signal thus appears at the output of OR-gate 115 only as long as key 123 is closed. As soon as key 123 is open, the I signal at the output of OR-gate 114 changes to a O, thereby permitting AND-gate 6 to become conductive and blocking the transfer of the information from code switch 18 to counter 11.

As the above discussion has no doubt made clear, the first control signal, namely the I signal on line 115 always causes the transfer of information from code switch 18 into counter 11 and also blocks signals applied at terminal 8 from counter 11. It does not matter whether the I signal on line 115 is due to the blocking of the first output station, the activation of key 123, or the fact that counter 117 has reached a predetermined count, thereby causing an I signal to appear on line 121. The presence of any one of these three operating conditions thus causes the counter 11 to furnish counting signals which are not equal to the initial count signal and which, thereby, cause relay 102 to be denergized and sheets to be transported to the second rather than the first output station. Relay 102 remains deenergized as long as the count on counter 11 is not equal to the initial count, that is to a zero count throughout. Counter 11 will of course in reverse as soon as a O signal appears on line 115 in the presence of a I signal on line 13, that is while a number other than 0 is in counter 11. When the selected number of sheets, that is the number of sheets corresponding to the number set to code switch 18 has been counted in reverse by counter 11, the output of OR-gate 98 goes to O, causing a I signal to appear at the output of inverter 100. This signal reenergizes relay 102 causing the sheets to be transported to the first output station. Further, the I signal at the output of inverter 100 causes a O signal to appear at the output of inverter 107. The latter signal is applied to input 13 of AND-gate 6 blocking this AND-gate. The I signal on line 101 also, via lines 103, 104, 105 and 106 blocks AND-gates 59, 69, 79 and 89, respectively, thereby assuring that no reverse count takes place, while the O signal on line 108, being applied to inverting inputs of AND-gates 58, 66, 76, and 86 causes these AND-gates to become conductive, thereby enabling the next transfer of information from code switch 18 to counter 11.

While the invention has been illustrated and described as embodied in a system using a particular embodiment of counting and logic circuits, it is not intended to be limited to the details shown, since various modifications and circuit changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. In a printing arrangement having sheets passing along a predetermined path past a predetermined location, means furnishing a synchronizing signal upon passage of each of said sheets past said predetermined location, first counting means for counting said synchronizing signals and furnishing counting signals corresponding to the number of so-counted synchronizing signals, a first output station for receiving acceptable printed sheets and a second output station for receiving unacceptable printed sheets, a method for transporting a selectable number of sheets to said second output station upon occurrence of any one of a plurality of predetermined operating conditions, comprising, in combination, the steps of blocking said synchronizing signals from said first counting means until occurrence of one of said predetermined operating conditions; automatically setting said first counting means to said selected number and transporting said sheets to said second output station upon occurrence of any one of said predetermined operating conditions; thereafter applying said synchronizing signals to said first counting means until said counting signal is a predetermined counting signal signifying a predetermined final count; and transporting said sheets to said first output station in response to said predetermined counting signal.

2. A method as set forth in claim 1, wherein said predetermined counting signal is a signal signifying a zero count.

3. A method as set forth in claim 2, wherein said predetermined operating conditions comprise the starting of said printing arrangement, restarting of said printing arrangement following a malfunction, receipt of an externally applied control signal at an arbitrary time instant, and following the receipt of a preselected number of sheets at said first output station.

4. In printing equipment having sheets passing along a predetermined path past a predetermined location, and having a first output station for receiving acceptable printed sheets and a second output station for receiving unacceptable printed sheets, an arrangement for transporting a selectable number of said sheets to said second output station upon occurrence of any one of a plurality of predetermined operating conditions, comprising, in combination, means for furnishing a synchronizing signal upon passage of each of said sheets past said predetermined location; first counting means having a reverse counting input, a plurality of setting inputs and an initial counting state; first logic circuit means for furnishing a first control signal upon occurrence of any one of said predetermined operating conditions; code switch means externally settable to a selected one of a plurality of numbers, for presetting said first counting means to said so-selected number in response to said first control signal; second logic circuit means connected to said first counting means for furnishing an initial count signal when said first counting means is in said initial counting state; third logic circuit means having a first, second and third input respectively connected to said first logic circuit means, said means for furnishing synchronizing signals and said second logic circuit means, and an output connected to said reverse counting input of said first counting means, for furnishing said synchronizing signals to said reverse counting input only in the absence of said first control signal and said initial count signal; and control means responsive to said initial count signal for controlling the transport of said sheets to said first output station in response to said initial count signal and to said second output station in the absence of said initial count signal.

5. An arrangement as set forth in claim 4, further comprising second counting means having a counting input directly connected to said means for furnishing synchronizing signals and a plurality of counting outputs, each for furnishing a counting signal signifying a corresponding number of received synchronizing signals; selector switch means having a selector output, for connecting a selected one of said counting outputs of said second counting means to said first logic circuit means in such a manner that said first logic circuit means furnishes said control signal upon occurrence of said counting signal at said so-selected counting output.

6. An arrangement as set forth in claim 5, wherein said first logic circuit means comprise an OR-gate having a plurality of inputs and an output, for furnishing said first control signal at said output upon receipt of a signal at at least one of said plurality of inputs.

7. An arrangement as set forth in claim 6, further comprising a source of voltage, and externally activatable switch means for interconnecting said source of voltage to a selected one of said inputs of said OR-gate, whereby said control signal is furnished in response to external activation of said switch means.

8. An arrangement as set forth in claim 6, wherein said printing equipment comprises means furnishing a blocking signal indicative of blocking of said first output station; and means for applying said blocking signal to a corresponding one of said inputs of said OR-gate, whereby said control signal is furnished in response to said blocking signal.

9. An arrangement as set forth in claim 6, wherein said third logic circuit means comprise an AND-gate.

10. An arrangement as set forth in claim 6, wherein said first counting means comprise a plurality of bistable stages each of said bistable stages having a SET input connected to a corresponding output of said code switch means, a reverse counting input and a reset input.

11. An arrangement as set forth in claim 4, wherein said code switch means comprise a plurality of step switch means, each of said step switch means having a selector arm, and means mechanically coupling said selector arms for simultaneous operation in response to external activation.

* * * * *