

SPECIFICATION

Selection circuit for a vending machine

- 5 This invention relates to a selection circuit for a vending machine control apparatus. In a typical vending machine the selected product is dispensed by activating an actuator, such as a motor or relay, when various vend criteria
- 10 such as product availability, customer payment, and correct change availability have been satisfied. The control system is used to identify which product has been selected, to ascertain whether the vend criteria have been satisfied, and to accordingly cause the activation of the corresponding actuator to dispense the desired product. Our copending British Patent Application No. 40990/78 (Serial No. 2005892), from which the present application is divided, discloses a control apparatus for a vending machine of this kind.

Prior art vending systems and the vending machine disclosed in the aforesaid application 40990/78 have provided various apparatus for detecting which product has been selected and generating the appropriate identifying signals for use by other elements of the control system. The present invention provides new and advantageous control apparatus for performing this function.

- According to the invention there is provided a selection circuit for a vending apparatus having a plurality of actuators each of which is operable for the dispensing of a customer's selected product, and a plurality of selection switches for selective activation of the actuator by a customer in selecting desired products, the selection circuit comprising a plurality of comparator circuits, each comparator circuit including a first and second input and an output, with each comparator circuit responsive at its first input to a switch indicating activation of a selection switch and causing the comparator circuit to generate a product selection signal by altering its output from a first level of output to a second level of output, with the outputs of each comparator circuit being interconnected with the second input of each of the remaining comparator circuit for inhibiting the remaining comparator circuits from generating any further selection signals in response to subsequent receipt of any switch signal for as long as the said selection signal is generated by the comparator circuit.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:-

Figure 1, which discloses an embodiment of out aforesaid patent application No. 40990/78, shows a vending machine including a control apparatus 12 generally in block diagram, with an alternating current power

supply, selection switches, and electric motor; and

Figure 2 is a schematic diagram of an embodiment of the present invention, showing a latching selection circuit 122 having a plurality of comparators, which can be used as the selection circuit 22 of the control apparatus of Fig. 1.

Fig. 1 illustrates a vending machine 2 having an alternating current power supply 4 in the form of a step-down line transformer, a plurality of selection switches 6 (a-n), a plurality of actuators 8 (a-n) here in the form of alternating current electric motors, a matrix box 10 and control apparatus 12 for controlling the actuators to dispense the selected product.

The control apparatus 12 has a price indicating means 14 here in the form of a pricing circuit, for producing a signal indicative of the price of the customer selected product; a calculating section 16, here in the form of a totalizer 18 and a vend processing circuit 20, for comparing the amount of customer credit with the price of the selected product; a selection circuit 22 for generating a selection signal indicating which product category was selected; actuator controls 24 (a-n) for activating the actuator 8 (a-n) corresponding to the selected product to dispense the product; and a vending monitor circuit 50 for indicating when the vending operation is taking place.

In operation, a selection switch, such as switch 6a of Fig. 1, generates a switch signal in response to selection by a customer of a desired product. While a conventional push-button switch is illustrated in the embodiment of Fig. 1, other types of switches and other switching apparatus could be used. The switch signal is carried into a optional matrix box 10 of conventional design wherein the switches 6 (a-n) and actuators 8 (a-n) for products of a common category can be connected to a common output, the outputs carried along lines 28 (a-n). For example, in the illustrated embodiment the actuators 8a and 8a' for products selling for the same price are interconnected within the matrix to a common output, with those actuators associated with a first price being connected to line 28a. Actuator 8n, associated with a second price, is connected to a line 28n. Wiring the switches 6 (a-n) in series precludes a customer from deceiving the machine into vending too many products of the same category, since the pressing of one button severs the remainder of the buttons from the series circuit.

The product category switch signals along lines 28 (a-n) are carried to the actuator control circuits 24 (a-n) and to the selection circuit 22. The selection circuit 22 receives the switch signal at inputs 21 (a-n) and in response generates a selection signal at outputs 23 (a-n) along lines 30 (a-n) indicative

of the category of the selected product. This selection signal is received by the pricing circuit 14 which in response produces a signal indicative of the price of the selected product along line 32 to the totalizer 18. The selection circuit 22 also generates a selection made signal along line 34 to the vend processing circuit 20, indicating that a selection has been made without indication of the nature of the selection.

In the calculating section 16, the vend processing circuit 20 receives the selection made signal from the selection circuit 22 and in response transmits a signal via line 36 to the totalizer 18. In response, the totalizer 18 operates conventionally to calculate the customer credit as, for example, by recording the money paid into the machine or by other means of receiving a credit indication. The credit indicating means is indicated schematically at 15 in the drawings. The totalizer further compares the amount of customer credit with the price of the selected product received from the pricing circuit 14, and if sufficient, transmits a signal via line 36 to the vend processing circuit 20. In response, the vend processing circuit 20 transmits a vend signal along line 38 to the actuator circuits 24 (a-n).

In the Fig. 1 embodiment, the actuator circuits 24 (a-n) each comprise an electronic power switch 40 (a-n) and an NAND gate 42 (a-n). The combination of the vend signal on line 38 from the calculating section 16 and the selection signal on one of the lines 30 (a-n) from the selection circuit 22 switches the corresponding NAND gate 42 (a-n) and activates the corresponding power switch 40 (a-n). For example, a selection signal on line 30a from output 23a of the selection circuit 22 and a vend signal on line 38 would switch NAND gate 42a, causing the activation of the power switch 40a, activating one of the corresponding actuators 8 (a-n) as explained below.

In the illustrated system, the actuators 8 (a-n) are not electrically isolated from the control system 12, and all these elements are powered by the alternating current power supply illustrated as a step down line transformer 4. First output terminal 48 of the transformer output is connected to a common terminal 5, such as to a ground. Similarly, the electronic power switches 40 (a-n) are connected on one side to the common terminal 5 by lines 49 (a-n). Second output terminal 44 of the transformer output is connected by switches 6 (a-n) and, as explained below, by switches 46 (a-n) to the actuators 8 (a-n). When a power switch, such as 40a, is activated by the switching of its NAND gate, 42a in this example, the corresponding actuator 8a is thereby connected to the common terminal through lines 28a and 49a and the interconnections in the matrix box 10. Assuming that actuator 8a'

corresponds through the matrix Lox to power switch 40a, the activation of power switch 40a in the above example would activate actuator 8a' by completing the electrical connection through the matrix box 10, the actuator 8a', and switch 6a' to output terminal 44 of the power supply. Once the actuator is activated, the corresponding switch 46 (a-n) is mechanically activated by a cam or other conventional means to maintain the electrical connection between the actuator and terminal 44 even after the selected switch among switches 6 (a-n) is released by the customer and returns to its normal position. For example, once actuator 8a' is activated as a result of the customer pressing switch 6a', switch 46a' is activated by the actuator and the actuator 8a' continues to be powered even though the customer thereafter releases switch 6a'.

During the period when the actuator is operating, the vending monitor circuit 50 conventionally by means of relay 51 produces a vending-in-progress signal along line 52 to the vend processing circuit 20 in the calculating section 16. In response, the vend processing circuit 20 instructs the totalizer 18 along line 54 to collect the price of the product being vended and to return any appropriate change. The continuation of the vending-in-progress and selection made signals causes the vend processing circuit 20 to continue to generate the vend signal on line 38 until the product has been completely vended. When the vending is completed, the vending-in-progress signal is terminated, the vend signal along line 38 is terminated, and the activated power switch 40 (a-n) is deactivated. Also, while the power switch 40 (a-n) was deactivated, the corresponding line of lines 28 (a-n) had been connected to ground, maintaining a ground input into the corresponding terminal 21 (a-n) of the selection circuit 22, thereby maintaining the selection and selection made outputs from the selection circuit 22. When the activated power switch is deactivated at the end of vending, the signal is removed from the corresponding line of lines 28 (a-n), thereby causing the selection circuit 22 to terminate the selection and selection made outputs and preparing the control apparatus 12 to process a new selection.

Several possible circuits can perform the selection circuit 22 function of receiving the switch signals and in response generating a selection signal indicating which product category was selected and a selection made signal indicating that a selection has been made. A preferred selection circuit, forming an embodiment of the present invention, is illustrated in Fig. 2.

In Fig. 2, the selection circuit 122 has selection circuit inputs 121 (a-n), selection signal outputs 123 (a-n) corresponding to inputs 21 (a-n), selection signal outputs 23

(a-n) and selection made output line 134 corresponding to output line 34. The circuit 122 comprises a plurality of comparator circuits 124 (a-n), each comparator circuit having a first, positive input 126, a second, negative input 128 and an output 130.

Before a selection is made by the customer, inputs 121 (a-n) are all open circuited. In this condition the bias current at the negative inputs 128 (a-n) of the comparators resulting from the 1.5 megohm resistors to ground dominates and the comparators 124 (a-n) each produce a low signal at their outputs 130 (a-n), in this embodiment a - 12 volts D.C. output.

When a switch 6 (a-n) is activated by a customer in selecting a product, the resultant product category switch signal at the corresponding selection circuit input 121 (a-n) grounds that input and causes the corresponding comparator to generate a selection signal by altering its output from a first level of output to a second level of output. In the embodiment illustrated, the output at corresponding terminal 130 (a-n) goes from the initial low of - 12 volts D.C. to a high ground, which is the same as the ground of the vending section 3. Specifically, when a switch signal at input 121a, for example, drives that input to ground, the two 470 kilohm resistors and the 1 μ fd capacitor form a filter which blocks alternating current from reaching the comparator 124a. Since the 940 kilohm resistance to ground on the positive input 126a of the comparator is less than the 1.5 megohm resistance to ground on its other input 128a, the bias current on the positive input 126a of that comparator dominates and the signal at the output 130a switches to a high signal of ground potential. This output over line 123a constitutes a selection signal for the remainder of the control apparatus 12 and also adds additional bias via the 1 megohm resistors to both the positive input 126a and the negative input 128a of the comparator 124a. This output over line 134 constitutes a selection made signal.

This change in the output of the first comparator to receive a switch signal inhibits the other comparator circuits from generating any further selection signals since the outputs 130 (a-n) of the comparator circuits are interconnected with their second inputs 128 (a-n). Specifically, in the above example the high signal at output 130a is transmitted to all second inputs 128 (b-n) of the other comparators via line 132, resulting in additional bias at those inputs. The first input 126 (b-n) of the other comparators are blocked from receiving the additional bias by blocking diodes 136 (a-n). Overall, the additional bias on the negative inputs 128 (b-n) of the remaining comparators provided via line 132 blocks them from operation in the event that a subsequent switch signal is received on any of their

corresponding inputs 121 (b-n) because the bias provided by connecting a 1 megohm and a 1.5 megohm resistor to ground will dominate over the 940 kilohm bias which would be provided if an additional switch 6 (b-n) were activated after an initial selection had been made.

The described selection circuit, therefore contains a plurality of comparator circuits in forming a latching system. The system generates a selection signal indicative of which product category is to be dispensed in response to the first switch signal received, and is thereafter latched against generating any subsequent signal until the machine is prepared for another selection.

CLAIMS

1. A selection circuit for a vending apparatus having a plurality of actuators each of which is operable for the dispensing of a customer's selected product and a plurality of selection switches for selective activation of the actuator by a customer in selecting desired products, the selection circuit comprising a plurality of comparator circuits, each comparator circuit including a first and second input and an output, with each comparator circuit responsive at its first input to a switch signal indicating activation of a selection switch and causing the comparator circuit to generate a product selection signal by altering its output from a first level of output to a second level of output, with the outputs of each comparator circuit being interconnected with the second input of each of the remaining comparator circuits for inhibiting the remaining comparator circuits from generating any further selection signals in response to subsequent receipt of any switch signal for as long as the said selection signal is generated by the comparator circuit.

2. A selection circuit according to claim 1, wherein each comparator circuit is provided with a circuit network interconnecting the output of the comparator circuit with its first and second inputs so as to supply additional bias to the two inputs when the output of the comparator circuit is altered to said second level of output.

3. A selection circuit for a vending apparatus, substantially as hereinbefore described with reference to Fig. 2 of the accompanying drawings.



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