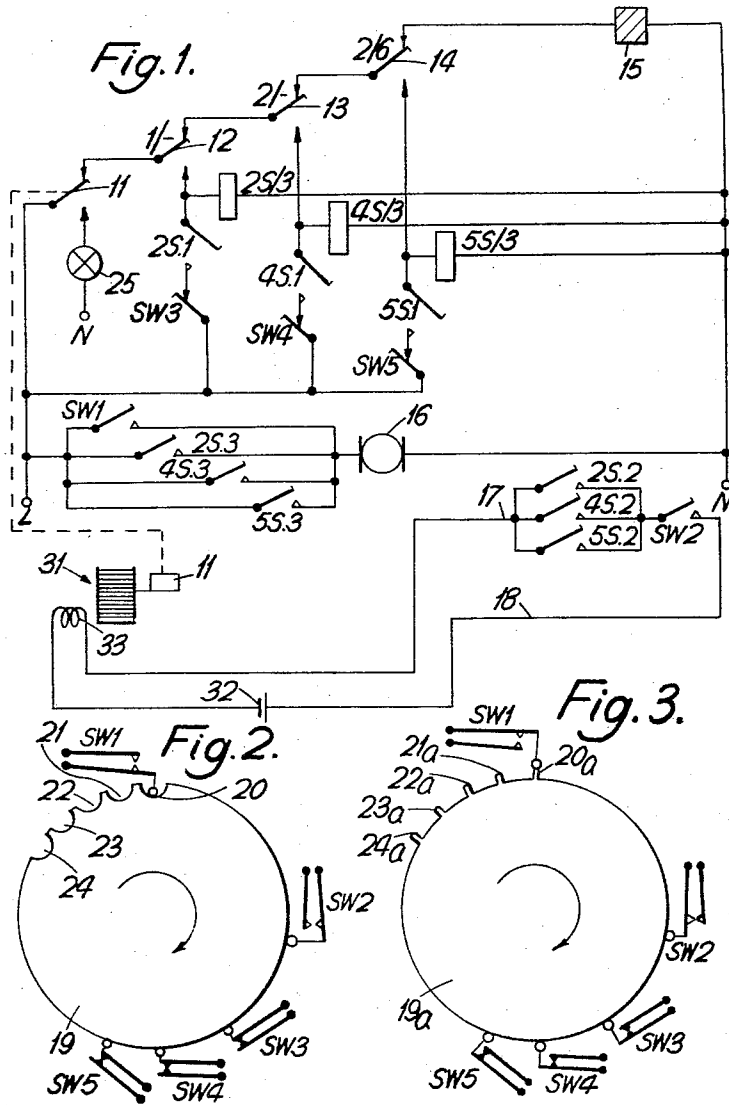


Sept. 26, 1967

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CHANGE-GIVING APPARATUS
Filed Sept. 14, 1965

3,343,641



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3,343,641

CHANGE-GIVING APPARATUS

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Filed Sept. 14, 1965, Ser. No. 487,196

Claims priority, application Great Britain, Sept. 15, 1964,
37,604/64

18 Claims. (Cl. 194—10)

The invention relates to sensing apparatus.

The invention provides sensing apparatus for producing in an output circuit signals for indicating the value of money used to operate the apparatus, which sensing apparatus comprises, a number of first switch means one for each value of money which can operate the apparatus and each operable when money of the appropriate value is received by the apparatus, cyclic means for controlling a cycle of events, starting means for starting the cyclic means in response to the operation of any one of the first switch means, signalling means including signalling switch means operable to produce signals in the output circuit, which signalling switch means is arranged to be operated by the cyclic means and to be started at a predetermined point in the cycle, a plurality of further switch means, the appropriate further switch means being connected to be automatically selected by the operation of one of the further switch means, the further switch means being arranged, if so automatically selected, to be operated by the cyclic means at a later predetermined point in the cycle to disconnect the signalling means from the output when an output signal or output signals, appropriate to the value of money received by the apparatus has or have been transmitted in the output circuit, and stopping means for stopping the cyclic means at the end of a cycle which stopping means is operated by the cyclic means at a point in the cycle after that at which the last of the further switch means is operated and before that at which the signalling switch means is operated.

Preferably the signalling means produces signals in the output circuit in the form of one or more pulses.

Preferably the interval between the operation by the cyclic means of the last of the further switch means and of the stopping means is greater than that between the operation by the cyclic means of the signalling switch means and of the last of the further switch means.

Preferably the intervals between operation by the cyclic means of the signalling switch means and of each of the further switch means are in the same proportion to one another as the values of money required to select the respective one of each of the further switch means.

The sensing apparatus may be connected to receive coins from a coin selector, the coin selector being arranged to prevent any damaged coins being received by the apparatus.

Preferably the cyclic means includes a rotatable member, which may have notches or projections around its periphery.

Preferably the signalling switch means is operable by the passage of each notch or projection when the member rotates.

Preferably the selected one of the further switch means is operable by the passage past it of the first notch or projection to disconnect the signalling means from the output, and preferably the stopping means is operable by the passage past it of the first notch or projection to stop the motor.

Preferably the sensing apparatus includes an electric motor which is rotatably connected to the rotatable member and is controlled by the starting means.

The invention further provides dispensing apparatus comprising sensing apparatus as aforesaid, and at least

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one dispensing means for each type of article to be dispensed, the dispensing means or combination of dispensing means being selectable according to the article or articles which it is required to dispense and the dispensing means being connected either directly to the output of the sensing apparatus to be controlled by the signals in the output circuit thereof, or via an intermediate storage device.

Preferably in the dispensing apparatus, the number of pulses produced by the signalling means in the output circuit corresponds to the number of articles which the dispensing means is required to dispense.

Preferably the dispensing apparatus includes means for indicating when the apparatus no longer contains the appropriate amount of goods, articles or change which it is required to dispense.

The invention also provides sensing apparatus comprising a rotatable disc having around its periphery a predetermined number of notches or projections, a motor connected to the disc to drive the disc, a plurality of relays providing at least one relay for each value of money for which articles are to be dispensed, each relay being adapted to be energised when a coin of the respective value is received by the apparatus, a holding switch on each relay, a first normally open switch associated with and operable by each relay, the first normally open switches of all the relays being connected in parallel with each other and in series with the motor, a second normally open switch associated with and operable by each relay and connected in one of a number of dispensing circuits, a normally closed stopping switch adjacent to disc which is momentarily opened each time a notch or projection passes, the stopping switch being connected in parallel with the first normally open switches of the relays, a normally open signalling switch connected in the dispensing circuits and positioned adjacent the disc, the signalling switch being momentarily closed each time a notch or projection passes, and a number of normally closed further switches, equal in number to the number of relays and associated one with each relay, disposed at intervals around the disc and positioned to be momentarily opened each time a notch or projection passes, each further switch being connected in the holding circuit of its associated relay and arranged so that upon the receipt of a coin of the respective value the corresponding relay is momentarily energised so that its holding switch is closed, the first normally open switch of the energised relay closed to start the motor, the second normally open switch of the energised relay closed to select a dispensing circuit, the repeated closure of the signalling switch by the passage of the notches or projections producing a series of pulses in the selected dispenser circuit, the further switch in the holding circuit of the energised relay being so spaced from the second switch that after the correct number of pulses has been applied to the selected dispenser circuit the respective further switch is momentarily opened by a notch or projection so that the relay is de-energised and released, whereby the dispenser circuit is broken, the motor circuit being maintained by the stopping switch until the first notch or projection reaches the stopping switch and allows it to open, whereupon the motor is stopped.

One embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

FIGURE 1 is a circuit diagram of a sensing apparatus according to the invention and includes a coin dispenser and other associated parts of other apparatus,

FIGURE 2 shows diagrammatically the arrangement of the cyclic means and associated switches employed in the sensing apparatus, and

FIGURE 3 shows diagrammatically the arrangement of an alternative form of cyclic means.

The sensing apparatus of the present embodiment of the invention is suitable for use connected between a coin selector mechanism and a dispenser. The coin selector mechanism maybe of any conventional type having slots through which coins of different sizes and values may be inserted, and may contain the usual devices for checking the coins to establish that they are genuine. The coin dispenser is connected to the output circuit of the sensing apparatus. The sensing apparatus senses the inserted coins after they have been received by the coin selector and allows signals in the form of pulses to be transmitted in its output circuit to indicate the value of money used to operate the apparatus. These signals are used in this embodiment to control the coin dispenser.

A first switch is provided for each value of coin which can operate the apparatus. The first switches 12, 13 and 14, are associated respectively with shilling pieces, two shilling pieces and half crown pieces. The normal position of each first switch is as shown in FIGURE 1 and each switch is operated by the passage of a coin of the particular value. The first switches 12, 13 and 14, and the switch 11 (which is not part of the sensing apparatus) are connected in series with each other and with a coin blocking coil 15 (also not part of the sensing apparatus) between the line and neutral terminals of a single phase electric supply, the terminals being marked L and N.

One end of each of the relay coils 2S/3, 4S/3 and 5S/3 is connected to the neutral terminal N. The other ends of the relays coils 2S/3, 4S/3 and 5S/3 are connected to the normally open terminals of the first switches 12, 13 and 14 respectively. The other ends of the relay coils 2S/3, 4S/3 and 5S/3 are also connected to one terminal of the holding switches 2S.1, 4S.1 and 5S.1 respectively. The other terminals of the holding switches 2S.1, 4S.1 and 5S.1 are connected through the normally closed switches SW3, SW4 and SW5 respectively to the line terminal L.

The sensing apparatus also comprises a cyclic means, constituted by the disc 19 which is driven by an electric motor 16. The electric motor 16 is a small geared motor, the output shaft being conveniently one revolution in about six seconds. The electric motor 16 with its control circuit is connected between the supply terminals L and N. The control circuit comprises the normally open starting switches 2S.3, 4S.3, and 5S.3 and the normally open stopping switch SW1. When any one of these switches is closed, current is supplied to the motor. The normally open starting switches 2S.3, 4S.3 and 5S.3 are connected to be operated respectively by the relay coils 2S/3, 4S/3 and 5S/3 when these relay coils are energised.

The output circuit of the sensing apparatus between the output terminals 17 and 18 comprises the signalling switch SW2 connected in series with the normally open switches 2S.2, 4S.2 and 5S.2 which are connected in parallel. The switches 2S.2, 4S.2 and 5S.2 are connected to be operated respectively by the relay coils 2S/3, 4S/3 and 5S/3, when their relay coils are energised. The energising circuit of an electro-magnetic coin dispensing means 31 is connected in the output circuit of the sensing apparatus by connection to the output terminals 17 and 18, and comprises an electro-magnetic coil 33 and a source of electric power 32, connected in series. The output signals which the sensing apparatus permits to be transmitted in the output circuit indicate the value of money used to operate the apparatus, and control the dispensing means 31.

The cyclic means 19, shown in FIGURE 2 is a disc which is mounted on the output shaft of the motor 16 and which has around part of its periphery five notches 20 to 24 respectively. The stopping switch SW1, the signalling switch SW2 and the further switches SW3, SW4 and SW5 are positioned at predetermined points around the periphery of the disc.

At alternative cyclic means 19a is shown in FIGURE 3. The cyclic means 19a has five projections 20a to 24a instead of five notches. However, its operation in conjunction with the switches SW1 to SW5 is analogous to that of the cyclic means 19. Accordingly only the operation of the cyclic means 19 will be described.

The sensing apparatus of the present embodiment is suitable for sensing shilling, two shilling or half crown pieces inserted into the coin selector. If the output terminals 17 and 18 of the sensing apparatus are connected to a dispensing means for dispensing sixpenny pieces, then the output signals which the sensing apparatus allows to be transmitted in the output circuit may be used to control dispensing means to dispense two, four or five sixpences in exchange respectively for a shilling, two shilling or half crown piece inserted into the coin selector. Assuming that a shilling piece is inserted and is checked and found to be genuine by the coin selector, the coin will be allowed to run down a chute into a coin collecting box.

In its passage the coin momentarily operates the first switch 12, which is conveniently a micro-switch, so that the coil of the relay 2S/3 is momentarily energised. This relay operates, thereby closing its holding switch 2S.1, so that the relay remains energised. Energisation of the relay 2S/3 also causes the switches 2S.3 and 2S.2 to close. Accordingly the operation of the first switch 12, operates the starting circuit to start the motor 16 and the cyclic means 19, automatically selects the further switch SW3, and closes the switch 2S.2 of the output circuit. The stopping switch SW1 is open in the rest position of the cyclic means, but as soon as the cyclic means begins to rotate it is periodically closed as the contact of the switch rides into and out of the notches 20 to 24 in the cyclic means 19. However, as soon as all the notches have passed, the contact of the switch SW1 rides on the periphery of the disc and remains closed. The opening and closing of the stopping switch SW1 has no effect, however, since the switch 2S.3 is closed and maintains the current supply to the motor 16.

Eventually the first of the notches (the notch 20) reaches the signalling switch SW2. The contact of the signalling switch SW2 drops into the notch 20 and the switch is momentarily closed, thereby allowing an output signal in the form of a pulse to be transmitted in the output circuit of the sensing apparatus and coin dispenser. The coin dispenser is actuated by the output signal to dispense a sixpenny piece into a receptacle from which it may be removed by the person who desires the change. The passage of the second notch 21 causes the signalling switch SW2 to allow the transmission of a second pulse, so that a second sixpenny piece is delivered to the person desiring the change. The signals appropriate to the value of money received by the apparatus have now been transmitted to the output, so that the dispensing means has dispensed the correct number of sixpences. The further switch SW3 is so spaced from the signalling switch SW2 around the periphery of the cyclic means 19 so that at this point in the cycle (after the second pulse has been delivered, and before the contact of the signalling switch SW2 can drop into the notch 22 to deliver the third pulse) the contact of the further switch SW3 drops into the first notch 20, so that the switch is momentarily opened. This de-energises the relay 2S/3 allowing its holding switch 2S.1 to open, so that the relay is permanently de-energised. This also causes the switches 2S.3 and 2S.2 to open. The opening of the switch 2S.3 has no effect since the stopping switch SW1 is riding on the periphery of the cyclic means 19, so that the current supply to the motor 16 is maintained. The opening of the switch 2S.2 disconnects the signalling means from the output of the sensing apparatus at this point in the cycle so that when the contact of the signalling switch SW2 drops into the third, fourth or fifth notches, 22, 23 and 24 respectively, no further pulses can be transmitted in the output circuit.

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cuit of the sensing apparatus and no further coins are dispensed. The motor 16 continues to run, its current supply being maintained by the stopping switch SW1, until the cyclic means 19 has made one complete revolution and the first notch 20 reaches the stopping switch when the contact of this switch drops into the notch 20, thus breaking the current supply to the motor and allowing the motor to stop.

If a two shilling piece is inserted into the coin selector the first switch 13 is operated and the relay 4S/3 is energised. This selects the further switch SW4. The cycle is exactly as above described, except that the further switch SW4 is spaced at such a distance from the signalling switch SW2 that the switch SW4 is not opened until the signalling switch has allowed four pulses to be transmitted in the output circuit so that four sixpenny pieces are delivered by the coin dispenser. The insertion of a half crown piece causes the relay 5S/3 to be operated. This selects the further switch SW5 and the cycle is again similar except that the spacing of the further switch SW5 from the signalling switch is such as to allow five pulses to be transmitted in the output circuit so that the dispenser dispenses five coins.

If the dispenser were required to dispense change in the form of threepenny pieces the number of notches in the cyclic means 19 could be increased to ten, the spacing of the switches SW2, SW3, SW4 and SW5 being such as to allow 4, 8 and 10 pulses to be transmitted in the output of the sensing apparatus when coins having the appropriate values are inserted into the coin selector. Alternatively to dispense threepenny pieces instead of sixpences the sensing apparatus described above could be used, but with a dispenser which dispenses two threepenny pieces at each actuation.

If the dispenser were required to dispense four sixpenny pieces and two threepenny pieces as change for a half a crown piece the circuit of the sensing apparatus shown in FIGURE 1 could be so modified that, on insertion of the half a crown piece into the coin selector, both the relays 2S/3 and 4S/3 are operated. The output circuit leading to the output terminal 17 would be split so that the branch containing the switch 2S.2 leads to a first part of the output suitable for connection to a dispenser for threepenny pieces, and the branch containing the switch 4S.2 leads to a second part of the output suitable for connection to a dispenser for six penny pieces. With this arrangement the first two pulses transmitted in the output circuit would be supplied to both the threepenny and sixpenny dispensers, after which the relay 2S/3 would be released, and the remaining two pulses would be supplied to the sixpenny dispenser only. The arrangement of this sensing apparatus would not deal with shilling and two shilling pieces as well, but it could be adapted for that purpose by providing extra relays circuits. With the arrangement of the sensing apparatus for producing output signals suitable for controlling sixpenny and threepenny dispensers to dispense respectively four sixpenny pieces and two threepenny pieces in return for a half crown piece inserted into the coin selector a change over switch could be added to the coin selector, so that, according to the setting of the switch, the sensing apparatus would produce output signals suitable for controlling the dispensers to dispense either four sixpenny pieces and two threepenny pieces or five sixpenny pieces.

The function of the switch 11 and the coin blocking coil 15 remains to be explained. It will, of course, be understood that it is essential to insure that if a person is allowed to insert a coin into the coin selector then the appropriate change must be given without fail. On the other hand it is impossible to provide an inexhaustible supply of coins in the dispensers.

In the normal position of the first switches 12, 13 and 14 and the switch 11, shown in FIGURE 1 current will flow through the coin blocking coil 15. The coin blocking coil 15 is the coil of an electromagnetic actuator

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which is fitted in the coin selector and is arranged so that when it is energised it holds a pin or lever against the force of a spring. When it is de-energised the pin or lever is released and acts to deflect any coin inserted into the selector into a chute from which the person who inserted the coin may recover it. Since the first switches 12, 13 and 14 and the switch 11 are, when in their rest positions, connected in series, the coil 15 is normally energised. It is momentarily de-energised when a coin actuates one of the first switches 12, 13 or 14 by this time the coin has already passed the deflecting mechanism.

The switch 11 (which may conveniently be a micro-switch) is located to be actuated when the reserve coins in the dispenser is reduced to a predetermined number. Actuation of the switch 11 connects the supply terminal L to one side of a lamp 25, the other side of which is permanently connected to the N terminal, so that the lamp lights. This illuminates a "No Change" signal. The actuation of switch 11 also breaks the circuit through the switches 12, 13 and 14 so that the coil 15 is de-energised. Consequently none of the relays 2S/3, 4S/3 or 5S/3 can be energised to start the cyclic means performing a cycle and if a coin is inserted into the coin selector it is deflected to be returned. It should be noted that if the reserve of coins in the dispenser drops during a change giving operation to the predetermined number at which the switch 11 is actuated, its operation is not stopped because the particular relay 2S/3, 4S/3 or 5S/3 selected by the appropriate first switch will have been energised previously and it will remain energised through its holding switch, which provides a circuit between the terminals L and N which does not include the switch 11. The predetermined number of coins in the reserve previously referred to is sufficient to ensure that any change giving operation which has been started may be completed.

I claim:

1. Sensing apparatus comprising a rotatable disc having around its periphery a predetermined number of notches or projections, a motor connected to drive the disc, plurality of relays providing at least one relay for each value of money for which articles are to be dispensed, each relay being adapted to be energised when a coin of the respective value is received by the apparatus, a holding switch on each relay, a first normally open switch associated with an operable by each relay, the first normally open switches of all the relays being connected in parallel with each other and in series with the motor, a second normally open switch associated with and operable by each relay and connected in one of a number of dispensing circuits, a normally closed stopping switch adjacent the disc which is momentarily opened each time a notch or projection passes, the stopping switch being connected in parallel with the first normally opened switch on the relays, a normally open signalling switch connected to the dispensing circuits and positioned adjacent the disc, the signalling switch being momentarily closed each time a notch or projection passes, and a number of normally closed further switches, equal in number to the number of relays and associated one with each relay, disposed at intervals around the disc and positioned to be momentarily opened each time a notch or projection passes, each further switch being connected in the holding circuit of its associated relay and arranged so that upon the receipt by the sensing apparatus of a coin of the respective value the corresponding relay is momentarily energised so that its holding switch is closed, the first normally open switch of the energised relay closed to start the motor, the second normally open switch of the energised relay closed to select a dispensing circuit, the repeated closure of the signalling switch by the passage of the notches or projections producing a series of pulses in the selected dispenser circuit, the further switch in the holding circuit of the energised relay being so spaced from the signalling switch that after the correct number of pulses has been applied

to the selected dispenser circuit the respective further switch is momentarily opened by a notch or projection so that the relay is de-energised and released, whereby the dispenser circuit is broken, the current supplied to the motor being maintained by the stopping switch until the first notch or projection reaches the stopping switch and allows it to open, whereupon the motor is stopped.

2. Sensing apparatus for producing in an output circuit signals for indicating the value of money received by the apparatus to operate it, which sensing apparatus comprises a plurality of first switches one for each value of money which can operate the apparatus and each automatically operable when money of the appropriate value is received by the apparatus, cyclic means adapted to be started in response to the operation of any one of the said first switches, which cyclic means when in operation actuates a signal producing mechanism for producing signals in the output, and control switches each respectively associated with one of said first switches and arranged to be selected by the operation of the associated first switch, the control switches being operable by the said cyclic means at predetermined points in the cycle, and the control switches being arranged when both selected and operated to disconnect the signal producing mechanism from the output circuit, whereby the signals produced in the output circuit provide an indication of the value or money used to operate the apparatus.

3. Sensing apparatus for producing in an output circuit signals for indicating the value of money received by the apparatus to operate it, which sensing apparatus comprises, a plurality of first switch means one for each value of money which can operate the apparatus and each automatically operable when money of the appropriate value is received by the apparatus, cyclic means for controlling a cycle of events, starting means for starting the cyclic means in response to the operation of any one of the first switch means, signalling means including signalling switch means operable to produce signals in the output circuit, which signalling switch means is arranged to be operated by the cyclic means and to be started at a predetermined point in the cycle, a plurality of further switch means, the appropriate further switch means being connected to be automatically selected by the operation of one of the first switch means and each one of the further switch means being arranged, if so automatically selected, to be operated by the cyclic means at a later predetermined point in the cycle to disconnect the signalling means from the output when an output or output signals, appropriate to the value of money received by the apparatus has or have been transmitted in the output circuit, and stopping means for stopping the cyclic means at the end of a cycle which stopping means is operated by the cyclic means at a point in the cycle after that at which the last of the further switch means is operated and before that at which the signalling means is operated.

4. Sensing apparatus as claimed in claim 3, in which the signalling means produces signals in the output circuit in the form of one or more pulses.

5. Sensing apparatus as claimed in claim 3, in which the interval between the operation by the cyclic means of the last of the further switch means and of the stopping means is greater than that between the operation by the cyclic means of the signalling switch means and of the last of the further switch means.

6. Sensing apparatus as claimed in claim 3, in which the intervals between operation by the cyclic means of the signalling switch means and of each of the further switch means are in the same proportion to one another as the values of money required to select the respective one of each of the further switch means.

7. Sensing apparatus as claimed in claim 3, including

a coin selector arranged to prevent any damaged coins being received by the apparatus.

8. Sensing apparatus as claimed in claim 3, in which the cyclic means includes a rotatable member having switch operating regions around its periphery.

9. Sensing apparatus as claimed in claim 8, in which the signalling switch means is operable by the passage of each switch operating region when the member rotates.

10. Sensing apparatus as claimed in claim 9, in which the selected one of the further switch means is operable by the passage past it of the first switch operating region to disconnect the signalling means from the output.

11. Sensing apparatus as claimed in claim 8, in which the stopping means is operable by the passage past it of the first switch operating region to stop the member.

12. Sensing apparatus as claimed in claim 8, characterised in that the rotatable member is driven by an electric motor, which is rotatably connected to the rotatable member and controlled by the starting means.

13. Sensing apparatus as claimed in claim 8, in which the switch operating regions are notches.

14. Sensing apparatus as claimed in claim 8, characterised in that the switch operating regions are projections.

15. Dispensing apparatus comprising at least one dispensing means for each type of article to be dispensed, the dispensing means or combination of dispensing means being selectable according to the article or articles which it is required to dispense, a number of first switches one for each value of money which can operate the apparatus and each operable when money of the appropriate value is received by the apparatus, cyclic means adapted to be started in response to the operation of any one of the said first switches, signal producing mechanism arranged to be operated by the cyclic means when it operates to produce signals, the selected dispensing means when selected being connected to the signal producing mechanism to be operated by the said signals, control switches each respectively associated with one of the said first switches and arranged to be selected by the operation of the associated first switch the control switches being operable by the said cyclic means at predetermined points in the cycle, and the control switches being arranged when both selected and operated to disconnect the signal producing mechanism from the selected dispensing means when the said signals have controlled the dispensing means to dispense in accordance with the value of money supplied to the apparatus.

16. Dispensing apparatus as claimed in claim 15, which includes an intermediate signal storage device connected between the signal producing mechanism and the dispensing means whereby there may be a delay between the signal producing mechanism producing signals and the dispensing means dispensing.

17. Dispensing apparatus as claimed in claim 15, in which the signal producing mechanism produce signals in the form of pulses the number of which corresponds to the number of articles which the dispensing means is required to dispense.

18. Dispensing apparatus as claimed in claim 15, which includes means for indicating when the apparatus no longer contains the appropriate amount of goods, articles or change which it is required to dispense.

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