(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 767 447 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
09.04.1997 Bulletin 1997/15

(51) Int Cl.[6]: **G07F 17/32**

(21) Application number: **96307083.4**

(22) Date of filing: **27.09.1996**

(84) Designated Contracting States:
BE DE ES FR IT

(30) Priority: **03.10.1995 GB 9520109**

(71) Applicant: **CROMPTONS LEISURE MACHINES LIMITED**
Ramsgate, Kent CT12 5HG (GB)

(72) Inventors:
- **Crompton, Gordon**
  Ramsgate, Kent, CT12 5HG (GB)
- **Hunt, Geoffrey**
  Hastings, East Sussex, TN34 4AD (GB)

(74) Representative: **Lewin, John Harvey**
Elkington and Fife,
Prospect House,
8 Pembroke Road
Sevenoaks, Kent TN13 1XR (GB)

(54) Amusement machine

(57) An amusement machine comprises a substantially horizontal playfield which supports a plurality of coins. The coins on the playfield are periodically disturbed, whereby some coins may be pushed over an edge of the playfield. A user of the machine can cause further coins to be added to those on the playfield, to increase the chance of coins being pushed over the edge. A use detector means generates a signal for a predetermined time following use of the machine. A coin chute receives coins pushed over the edge of the playfield. A coin director means receives coins from the coin chute and operates in alternative open and closed modes. A coin fall detector associated with the coin chute gives a signal when a coin is received by the coin chute. Control means for receive signals from the use detector means and from the coin fall detector, and control switching of the coin director means between its alternative modes in response to the signals.

EP 0 767 447 A2

Description

This invention relates to an amusement machine. More particularly, it relates to an amusement machine of the "coin pusher" type, in which a large number of coins on a horizontal playfield are periodically disturbed by a sweeping mechanism, such as a reciprocating stage. The user of the machine can project additional coins onto the playfield, with the hope that some coins will be pushed off an edge of the playfield and pass to a point where they can be retrieved by the user. In this specification, the term "coin" also includes coin-like tokens.

Problems of security continuously arise through dishonest use of such machines. The machines may be subjected to tilting or to sharp blows in an attempt to dishonestly cause additional coins to fall off the edge of the playfield. Furthermore, as such machines have parts which are constantly in motion, vibrations can cause coins to be dislodged from the playfield even when a user is not operating the machine.

GB-A-1 152 755 describes a tilt-detection mechanism which can be used in such machines. Coins falling off the edge of the playfield pass down a chute, which incorporates a movable diverter flap. The flap can adopt one of two positions, a first position which permits coins to pass to a point where they can be recovered by the user of the machine, and a second position which diverts the coins to a cash box within the machine, which is not accessible to the user. The machine incorporates a pendulum bob which hangs within a small opening. Tilting of the machine causes the bob to swing to one side and come into contact with the side of the opening. This completes an electrical circuit which actuates the diverter flap, causing it to move from the first position to the second position.

Another known machine includes a coin-in sensor which causes a signal to be generated for a predetermined time following the insertion of a coin into the machine by a user. Coins falling off the edge of the play field are received by a count hopper which, when running, counts coins received from the playfield. The count hopper is associated with a pay out hopper which will pay out to the user of the machine a fixed number of coins or tokens for each coin counted by the count hopper. A control means receives a signal from the coin-in sensor and causes the count hopper to run only for the length of such signal. Thus, coins dislodged from the playfield accidentally or deliberately, when coins are not being entered by a legitimate user of the machine, will not be counted by the count hopper and thus will not result in a pay out from the pay out hopper.

A combination of the preceding two approaches with only a slight modification is described in GB-A-2 250 368. This incorporates a coin-in sensor and a diverter flap in the coin chute which receives coins falling off the edge of the playfield. The diverter flap is normally in the position which diverts coins falling off the playfield into the internal cash box. When the coin-in sensor indicates that a legitimate user is putting coins into the machine, the diverter flap is moved to the position which permits coins passing down the coin chute to reach a point where they can be recovered by the user. After a predetermined time, the flap then returns to the original position.

The problem addressed by the present invention is to provide an improved security system for such machines. In particular, the prior art security methods are prospective in that they look for a tilt situation rather than an actual fraudulent pay out of coins. We have sought to provide a retrospective system which will detect when coins actually fall from the playfield by fraudulent or accidental means.

The present invention provides an amusement machine comprising a substantially horizontal playfield adapted in use to support a plurality of coins; means for periodically disturbing the coins on the playfield, whereby some coins may be pushed over an edge of the playfield; user actuator means whereby a user of the machine can cause further coins to be added to those on the playfield, to increase the chance of coins being pushed over the edge; use detector means in communication with the actuator means, capable of generating a signal for a predetermined time following use of the actuator means; a coin chute for receiving coins pushed over the edge of the playfield; coin director means capable of receiving coins from the coin chute and adapted to operate in two alternative modes, an open first mode in which coins received are permitted to pass to a point where they may be recovered by a user of the machine or in which coins received are permitted to trigger a prize-giving mechanism, and a closed second mode in which coins received are retained within the machine and without triggering the prize-giving mechanism; a coin fall detector associated with the coin chute and adapted to give a signal when a coin is received by the coin chute; and control means for receiving signals from the user detector means and from the coin fall detector, and for controlling switching of the coin director means between its alternative modes in response to said signals, whereby the open first mode of the coin director means is the default mode, and on receipt of a signal from the coin fall detector, in the absence of a signal from the use detector means, the control means causes the coin director means to switch to the closed second mode.

The invention is applicable to coin pusher machines of the type in which coins entered by a user pass directly or indirectly to the playfield, and coins which are pushed off the playfield during legitimate use of the game can be directly recovered by the user. The invention is also applicable to "closed loop" machines in which coins on the playfield are isolated from the user. The user is able to operate the machine by inserting coins or by other payment means, such as a magnetic card, or even without payment. Coins falling off the playfield are counted

and actuate a mechanism which releases a prize or similar benefit to the user.

The use detector means may be a coin-in sensor of the type known in the art. In the case where the user actuates the machine by some means other than inserting coins, the use detector is any other suitable sensor means which detects when the machine is being legitimately used.

The coin director means may be a diverter flap of the type known in the art. It may also be a combination of a count hopper and a pay out hopper of the type also known in the art. In this case, the open first mode of the coin director means is constituted by running the count hopper whereas the closed second mode is constituted by stopping the count hopper.

In the case where the machine is of the closed loop type, the coin director means may be constituted by hoppers as described above. Alternatively, the coin director means may be constituted by a diverter flap, with a count hopper being positioned to receive coins when the diverter tlap is in the open position.

The coin fall detector is preferably an impact sensor which detects when a coin falls from the edge of the playfield onto an internal surface of the coin chute. It preferably operates by detecting mechanical vibration. However, a micro-switch, infra-red sensor or the like can also be used.

The machine will preferably incorporate other conventional security devices, such as a pendulum bob sensor ("bob tilt"), to detect tilting, and an impact sensor ("slam tilt"), to detect a sharp blow to the machine. Actuation of such security devices sends a signal to the control means, causing the coin director means to switch to the closed second mode.

Reference is now made to the accompanying drawings, in which:

Figure 1 is an operational block diagram;

Figure 2 is a flow chart showing operation of a device according to an embodiment of the invention; and

Figure 3 is a circuit diagram of a preferred device according to an embodiment of the invention.

In one embodiment of the invention, as illustrated in the drawings, the machine is of the type in which coins entered by the user pass directly or indirectly to the playfield, and coins which are pushed off the edge of the playfield during legitimate use of the machine pass down the coin chute to a pay tray, where they can be recovered by the user. The user is encouraged to play the machine in the hope that he will recover more coins from the machine than those which he puts into the machine.

Coins entered by the user are detected by a coin-in sensor. A signal from the coin-in sensor passes to the control which initiates a timer (typically 40 seconds). This time period is restarted every time a coin is put into the machine. This time period constitutes a "game".

The control communicates with a diverter flap in the coin chute. The diverter flap is movable between an open first mode (default mode) in which coins passing down the coin chute are directed to the pay tray, and a closed second mode in which coins passing down the coin chute are diverted to an internal cash box.

The control also communicates with a coin fall detector which is mounted on the coin chute, and which detects a mechanical vibration caused by a coin falling off the playfield and landing on an internal surface of the coin chute. The coin fall detector generates a signal in response to the impact of such coin. The signal is passed to the control, which determines whether or not there is a current "game" (see Figure 2). If the signal is received during a game, then the coin is considered to be legitimately won and the diverter flap remains in the default position, so that the coin passes to the pay tray. If the control receives the signal from the coin fall detector when a "game" is not current, then the coin is considered to be won illegitimately. This causes the control to actuate the diverter flap and move it to the closed second position. The coin is thus diverted into the cash box. The electronic systems of the coin fall detector and the control, and the mechanical operation of the diverter flap, operate within a fraction of a second, sufficiently quickly to divert an illegitimately won coin into the cash box.

As shown in the block diagram, the machine incorporates a pendulum sensor and an impact sensor. The pendulum sensor is of the type described in GB-A-1 152 755. On detection of tilting, a signal is passed to the control which actuates the diverter flap, moving it to the closed second position. The impact sensor comprises a pair of contacts mounted on the inside of a side wall of the machine. If the machine is given a sharp blow, the contacts close and a signal is sent to the control. As a result, the control causes the diverter flap to move to the closed second position.

The control may be connected by directional link to other systems on the same machine, or to similar machines within a single unit. This link can be used to signal to other sections of a unit whether a fraudulent or non-fraudulent win has been detected. The other sections can act upon this information accordingly.

As shown in Figure 3, the circuit consists of two main parts, the microprocessor (MPU) and the impact sensor.

In the impact sensor, a piezo disc is used to detect coins hitting a chute. When a coin hits the chute a voltage is developed across the piezo element. This voltage is passed to a variable attenuator to adjust the sensitivity of the detection. The attenuated signal is passed to the non-inverting input of a comparitor. On the inverting input is a reference voltage of approximately 1/100 of Vdd. When a voltage of 1/100 Vdd is present on the non-inverting input of IC2A the output goes low and discharges CI. This takes the non-inverting input of IC2B below the

threshold on the inverting input and the output goes high for a time roughly equal to 1/R3.C1 seconds. This output is passed to the microprocessor.

In the microprocessor, on power up the diverted output is high turning on the solid state relay and holding the diverter solenoid operated. The busy line is held low for 1 second via T2 open collector output.

In the quiescent state, the diverter output is high turning on the solid state relay and holding the diverter solenoid operated. The power LED is lit. During this state the MPU monitors the coin in, slam tilt, bob tilt and impact sensor inputs. Inputs are acted as detailed in the flow chart (Figure 2).

The busy line is a bi-directional communications link between sections of the same machine. It ensures that, when a diverter solenoid is operated or released (a mechanically noisy event), other sections within the machine are not seeing this noise as a tilt or coin impact event. The MPU can read this line as an input and drive it low as an output via T2 open collector.

There are 5 LED's indicating power on, tilt, busy line active, impact sensor active and game timer active. These are driven from the MPU.

Claims

1. An amusement machine comprising a substantially horizontal playfield adapted in use to support a plurality of coins; means for periodically disturbing the coins on the playfield, whereby some coins may be pushed over an edge of the playfield; user actuator means whereby a user of the machine can cause further coins to be added to those on the playfield, to increase the chance of coins being pushed over the edge; use detector means in communication with the actuator means, capable of generating a signal for a predetermined time following use of the actuator means; a coin chute for receiving coins pushed over the edge of the playfield; coin director means capable of receiving coins from the coin chute and adapted to operate in two alternative modes, an open first mode in which coins received are permitted to pass to a point where they may be recovered by a user of the machine or in which coins received are permitted to trigger a prize-giving mechanism, and a closed second mode in which coins received are retained within the machine and without triggering the prize-giving mechanism; a coin fall detector associated with the coin chute and adapted to give a signal when a coin is received by the coin chute; and control means for receiving signals from the user detector means and from the coin fall detector, and for controlling switching of the coin director means between its alternative modes in response to said signals, whereby the open first mode of the coin director means is the default mode, and on receipt of a signal from the coin fall detector, in the absence of a signal from the use detector means, the control means causes the coin director means to switch to the closed second mode.

2. An amusement machine according to claim 1, in which the use detector means is a coin-in sensor.

3. An amusement machine according to claim 1 or 2, in which the coin director means is a diverter flap.

4. An amusement machine according to any of claims 1 to 3, in which the coin fall detector is an impact sensor which detects when a coin falls from the edge of the playfield onto an internal surface of the coin chute.

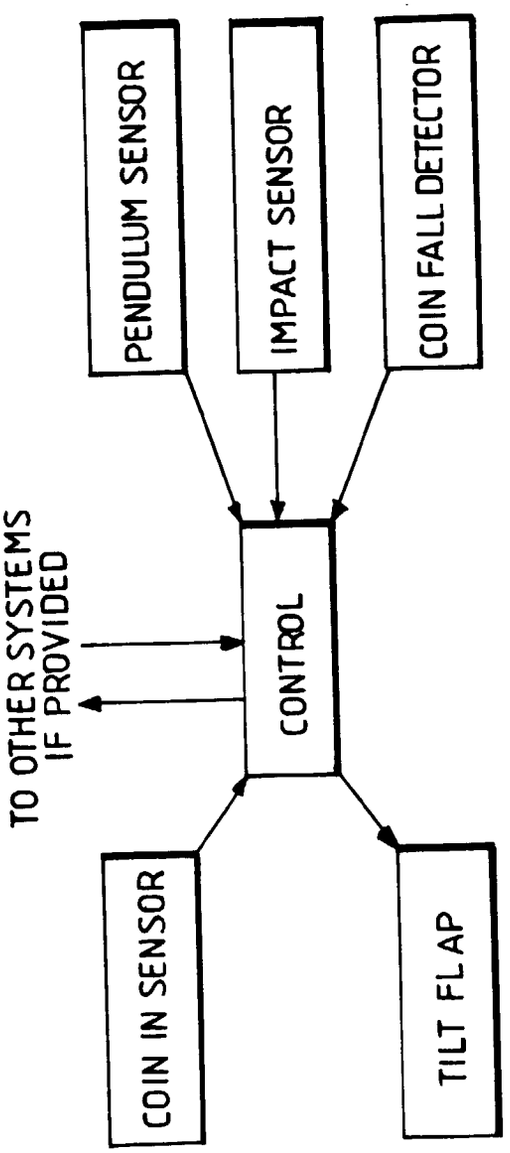
PENDULUM SENSOR
IMPACT SENSOR
COIN FALL DETECTOR
TO OTHER SYSTEMS IF PROVIDED
CONTROL
COIN IN SENSOR
TILT FLAP

FIG.1.

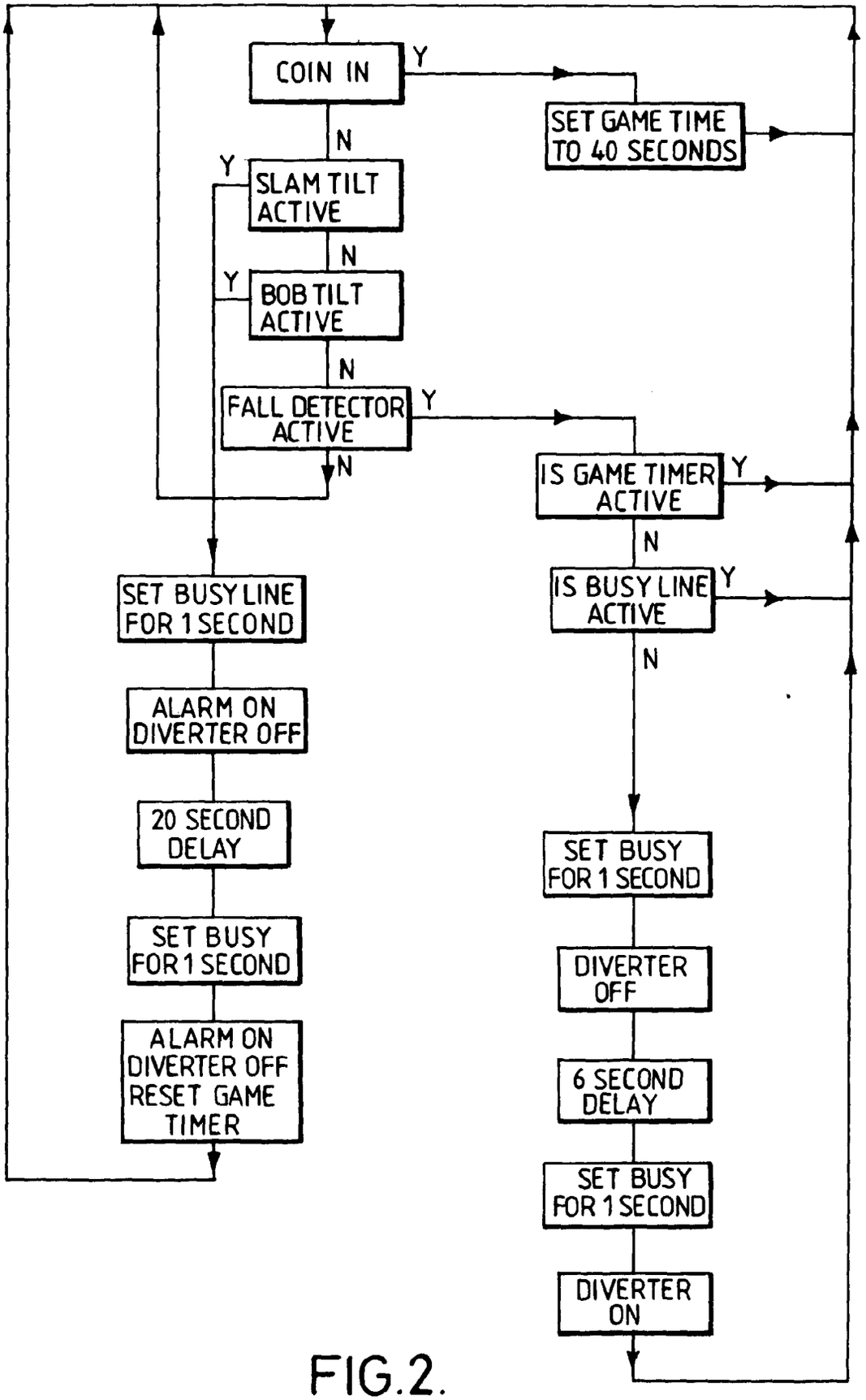
COIN IN
Y
SET GAME TIME TO 40 SECONDS
N
Y
SLAM TILT ACTIVE
N
Y
BOB TILT ACTIVE
N
FALL DETECTOR ACTIVE
Y
N
IS GAME TIMER ACTIVE
Y
N
IS BUSY LINE ACTIVE
Y
N
SET BUSY LINE FOR 1 SECOND
ALARM ON DIVERTER OFF
20 SECOND DELAY
SET BUSY FOR 1 SECOND
ALARM ON DIVERTER OFF RESET GAME TIMER
SET BUSY FOR 1 SECOND
DIVERTER OFF
6 SECOND DELAY
SET BUSY FOR 1 SECOND
DIVERTER ON

FIG.2.

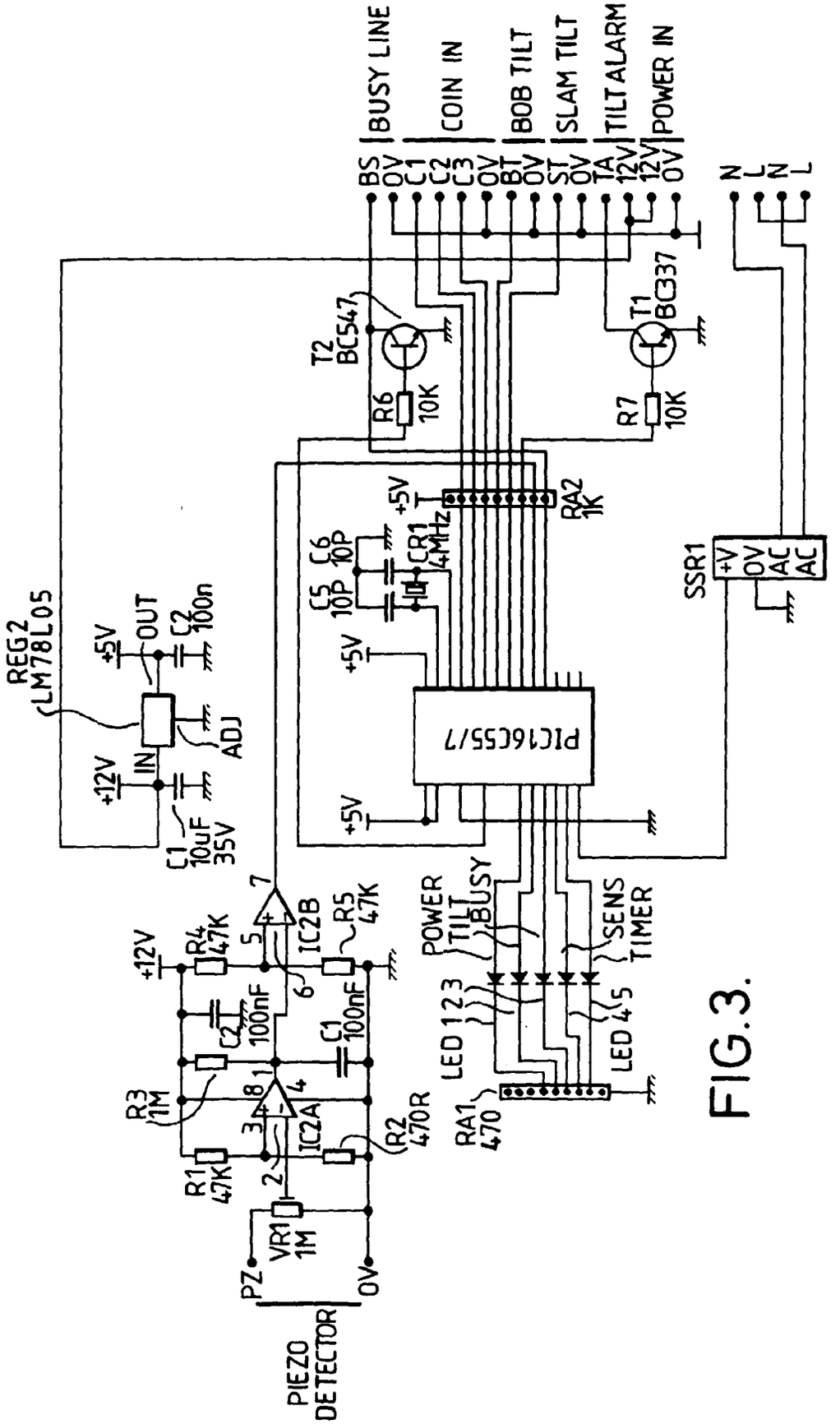
BUSY LINE
COIN IN
BOB TILT
SLAM TILT
TILT ALARM
POWER IN
BS
OV
C1
C2
C3
OV
BT
OV
ST
OV
TA
12V
12V
OV
N
L
N
L
T2
BC547
T1
BC337
R6
10K
R7
10K
RA2
1K
+5V
CR1
4MHz
C5
10P
C6
10P
PIC16C55/7
SSR1
+V
OV
AC
AC
REG2
LM78L05
+5V
OUT
C2
100n
ADJ
+12V
IN
C1
10uF
35V
IC2B
IC2A
R5
47K
R4
47K
R3
1M
R1
47K
R2
470R
C1
100nF
C2
100nF
VR1
1M
PZ
0V
PIEZO
DETECTOR
POWER
TILT
BUSY
SENS
TIMER
LED 1 2 3
LED 4 5
RA1
470

FIG.3.