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BE DE ES FR IT(30) Priority: **22.09.1995 GB 9519436**(71) Applicant: **CROMPTONS LEISURE MACHINES LIMITED****Ramsgate, Kent CT12 5HG (GB)**

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(57) Means are provided for sensing a physical shock to an amusement machine of the type in which a user attempts to obtain a payment of coins from the machine. The means for sensing a physical shock comprises a piezoelectric sensor (1) and a signal provision means (2). The piezoelectric sensor (1) is mounted to the machine. The signal provision means (2) receives signals for the piezoelectric sensor (2) and outputs signals to a control section of the amusement machine when a physical shock is detected.

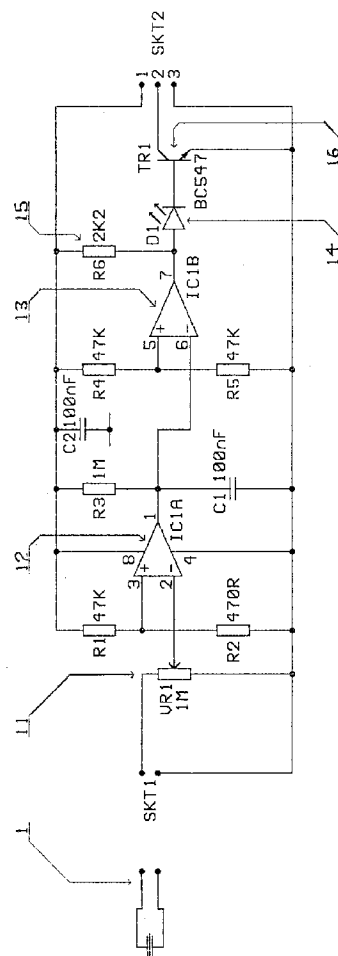


FIGURE 1

EP 0 764 926 A2

Description

This invention relates to a physical shock detector for detecting a physical shock to a machine. In particular, the invention relates to a physical shock detector for use with an amusement machine of the type in which a user attempts to obtain a payout of coins from the machine.

A preferred feature of such machines is a mechanism to ensure that a user will not obtain an unwarranted payout of coins by hitting or otherwise physically disturbing the machine. This is a particularly significant problem in coin pusher amusement machines: the present invention is particularly relevant to such machines, though it should be noted that it is not restricted to use in or with such machines.

Coin pusher amusement machines are illustrated in, for example, GB-A-2124913 and GB-A-2272383. Such machines generally include a horizontal playfield, on which many coins are distributed. In the context of this specification, the term "coins" should be understood to include any similar disks or tokens or the like. The pattern of coins on the playfield is periodically disturbed by a coinpusher, which may be in the form of a movable stage which periodically sweeps across part of the playfield surface. Coins are pushed towards the edge of a playfield and some may be pushed over the edge into a "win chute". From this win chute, these coins pass into a receptacle to be recovered by the user of the machine. The user is able to introduce additional coins into the machine. These additional coins may pass onto the playfield surface directly or via another surface of the coin pusher. The object of the user of the machine is to insert such additional coins with the hope that as a result a larger number of coins will be pushed over the edge into the win chute. A problem for the owner of the machine is to prevent an unearned dispensation of coins down the win chute to the receptacle. Such an unearned dispensation may be caused by the user hitting the machine to knock coins off the playfield into the win chute.

One means of preventing unearned dispensation of items from coin-operated machines, in particular coinpusher machines, is disclosed in GB-A-2250368. A gate is positioned in the win chute. This gate in its normal position will divert coins which fall down the win chute into an internal cash box inaccessible to the user. When a user inserts additional coins, the gate means is moved to a second position which permits coins falling down the win chute to be recovered by the user.

A mechanism of this type can be used in conjunction with a sensor for detecting a physical shock to the machine. If the machine is given a physical shock, a signal is produced by the sensor. This signal is passed to a central control section which acts to move the gate means to divert any coins into the internal cash box, regardless of whether or not coins are fed into the machine. Accordingly, if the user of the machine hits or rocks the machine in an attempt to cause coins to drop into the win chute, any coins that do drop as a result of

this action will be deposited in the internal cash box and not made available to the user.

A known form of detector for this purpose comprises a pair of phosphor bronze contact strips. These are mounted close to each other in parallel and fastened together at one end, but electrically isolated from each other. A bob weight is attached to one of the contact strips. A wire leads away from each contact, the whole assembly being mounted on a small rectangle of wood. This wooden rectangle is then rigidly mounted to the inside of the cash box door, with the contacts oriented vertically such that the free ends are at the bottom. A physical shock to the machine, for example, a thump with the palm of the hand, would then be sufficient to close the contacts for a moment. This provides a signal detectable by the control section, which is configured to take appropriate action. The chosen procedure on detection of a physical shock could comprise operation of a gate in the win chute to prevent dispensation of coins to the user as described above, and may also or alternatively comprise an alarm.

Contacts of this type require individual adjustment and are especially sensitive to the handling that they receive. Carelessly handled contacts may require readjustment and as a result may not function in a satisfactory and reproducible manner.

The present invention provides a solution to this problem of the prior art by provision of a reliable sensor which provides reproducible results. This sensor is also of low cost and of simple construction.

According to the present invention, there is provided a means for sensing a physical shock to an amusement machine of the type in which a user attempts to obtain a pay out of coins from the machine, said means for sensing a physical shock comprising:

a piezoelectric sensor for mounting to the machine for detection of a physical shock thereto; and signal provision means, having an input for receiving signals from the piezoelectric sensor and an output for providing signals to a control section of the machine when a physical shock is detected.

The invention also provides an amusement machine comprising means for sensing a physical shock as described above, and further comprising a control section and means controlled by the control section for diversion of coins to an internal cash box when a physical shock is detected.

An embodiment of the invention is described below, by way of example, with reference to the accompanying drawing, in which:

Fig. 1 shows a circuit diagram of a physical shock sensing means according to the invention.

Figure 1 shows a means for sensing a physical shock to an amusement machine of the type in which a user attempts to obtain a pay out of coins from the machine, this means for sensing a physical shock compris-

ing a piezoelectric sensor (1) for mounting to the amusement machine for detection of a physical shock thereto. It also comprises a signal provision means (2) which has an input at SKT1 for receiving signals from the piezoelectric sensor and an output at SKT2 for providing signals to a control section of the amusement machine when a physical shock is detected.

The piezoelectric sensor (1) is mounted to the amusement machine. A particularly appropriate location for the sensor is on the inside of the door of the cash box of the machine. It is desirable for the piezoelectric sensor to be mounted securely but such that it is not cushioned from any physical shock experienced by the machine. An appropriate way to mount the piezoelectric sensor is to bond it to the inside of the cash box door with double-sided tape. A suitable form of tape is "Scotch VHB" tape, which has a high bonding strength but does not provide any significant degree of cushioning to shock. The piezoelectric sensor (1) is advantageously a conventional sensor of the ceramic disc type, although alternative forms of piezoelectric sensor could be employed.

It is desirable to mount the signal provision means circuitry close to the piezoelectric sensor. This circuitry is advantageously formed on a printed circuit board which is then mounted on pillars nearby.

The circuit for the signal provision means (2) is shown in Figure 1. The piezoelectric sensor (1) is connected to a SKT1. If the machine is subjected to a physical shock, the piezoelectric sensor will be stressed by the shock and will emit a voltage signal as a result. This provision of voltage with time results in a pulse. This voltage is dropped across a potentiometer (11). The sensitivity of the circuit is adjusted by adjustment of this potentiometer, this adjustment determining the size of the signal received as an input by a first operational amplifier (12) for a given sensor signal size. The signal amplified by this first amplifier (12) is shaped by resistors R3 and C1 and then fed to a second operational amplifier (13). The amplified signal then passes through a light emitting diode (14) to a switching transistor (16). Between the output of the second operational amplifier (13) and the input of the light emitting diode (14) there is a pull up resistor (15). The function of the light emitting diode (14) is to provide a visual indication of when there has been a sufficient signal to provide an output to the control means of the amusement machine. This is of assistance in adjustment of the potentiometer (11) to obtain a desired degree of sensitivity. Alternatively, if the circuit response has already been evaluated or determined, the potentiometer (11) can be replaced by an appropriate pair of resistors and the light emitting diode (14) can be removed from the circuit. The source of the transistor (16) is connected to pin 2 of SKT2, which is connectable to the control section of the amusement machine. Pins (1) and (3) are for connection to the positive supply and earth respectively. Pin (2) is connected such that if the gate signal at transistor (16) is sufficient

to make the source drain channel conducting, pin 2 will be effectively grounded. Pin 2 is therefore adapted to provide a logic signal indicative of a physical shock of above a predetermined magnitude threshold being suffered by the machine.

When a signal is received by the amusement machine through pin 2 of SKT2, appropriate known means can be employed to prevent dispensation of coins to the user or to alert the machine operator. An alarm can be sounded, or, alternatively, a gate in the win chute can be operated such that coins are diverted automatically into the internal cash box.

15 Claims

1. Means for sensing a physical shock to an amusement machine of the type in which a user attempts to obtain a payout of coins from the machine, said means for sensing a physical shock comprising:

a piezoelectric sensor (1) for mounting to the machine for detection of a physical shock thereto; and
signal provision means (2), having an input for receiving signals from the piezoelectric sensor (1) and an output for providing signals to a control section of the machine when a physical shock is detected.

2. Means for sensing a physical shock as claimed in Claim 1, wherein said piezoelectric sensor (2) is a ceramic disc piezoelectric sensor.
3. Means for sensing a physical shock as claimed in Claim 1 or Claim 2, wherein said signal provision means (2) comprises one or more amplifiers (12, 13) and a switching transistor (16), wherein there is provided at an output of the switching transistor a logic signal indicative of a physical shock of above a predetermined magnitude threshold.
4. Means for sensing a physical shock as claimed in Claim 3, wherein the signal provision means (2) further comprises a light emitting diode (14) between said amplifier or amplifiers (12, 13) and said switching transistor (16) to provide a visual indication of presence of a signal sufficient to provide a logic signal indicative of a physical shock to the control section of the machine.
5. An amusement machine comprising means for sensing a physical shock as claimed in any preceding claim, said amusement machine further comprising a control section and means controlled by the control section for diversion of coins to an internal cashbox when a physical shock is detected.

6. An amusement machine as claimed in Claim 5,
wherein said piezoelectric sensor is mounted to the
machine with adhesive tape.
7. An amusement machine as claimed in Claim 6, 5
wherein said piezoelectric sensor is mounted to the
inside of the cashbox door.
8. An amusement machine as claimed in any of
Claims 5 to 7, wherein the signal provision means 10
is provided on a printed circuit board mounted on
pillars in the proximity of the piezoelectric sensor.

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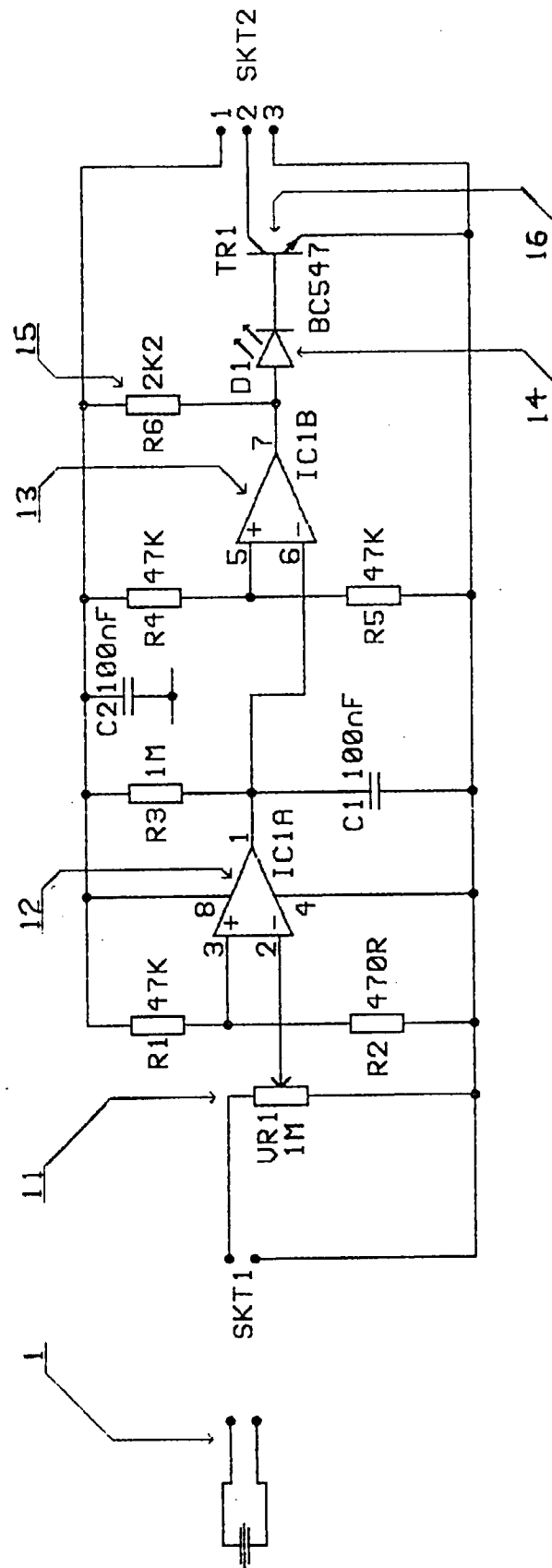


FIGURE 1