

CALL COIN-BOX TELEPHONE INSTRUMENT

The present invention relates to telephone call coin-box instruments and is more particularly concerned with the provision of such instruments having in-built coin and call management arrangements.

Of recent times there has been introduced coin telephone instruments incorporating electronic control, for example micro-processor control, allowing important improved facilities. Coin and fee checking, for example, can take place in the telephone instrument without the need for complex signalling to and from the exchange. This means not only that the minimum fee can consist of several coins, giving maximum tariff flexibility but also that the coin telephone instrument can present itself in exactly the same way as a direct exchange line instrument does allowing "phone box" use on International calls.

In such instruments coin validation depends not simply on measuring the thickness and rolling diameter of coins but also on electronically monitored measurement of weight, size, thickness and metal content.

Micro-processor-controlled coin telephone instruments are arranged to take a range of coins depending upon economic considerations. Some can hold coins inserted in store, cashing them as a call progresses and refunding unused coins in such a way that the largest possible value of unused coins is returned to the customer. Alternatively, the user has the option of using the credit on a follow-on call. In some instruments a credit display is provided to

provide the caller with information of current call cost and credit remaining.

It is an aim of the present invention to provide a micro-processor controlled telephone call coin-box instrument which includes a number of anti-fraudulent measures.

According to the invention there is provided a payphone telephone subscribers instrument incorporating a micro-processor adapted to control the functions of coin and fee checking and call administration functions performed by the instrument, in which means are provided for detecting the disconnection of an earth condition from the instrument and the instrument is arranged to prevent all chargeable calls after detection of an earth condition disconnection.

The invention will be better understood by reference to the accompanying schematic diagram. The schematic diagram shows a) Validation Process Element Devices S1, S2, VC1 and VC2, b) Coin Routing Management Devices S3, S4, S5, EM1, EM2 and EM3, c) Circuit Element Blocks LEDD, PR1, CV, PR2, CAD, PR3, C/RSD and PR4, d) Central Processing Unit CPU and e) Main features of the Analogue and Interface A/I.

COIN VALIDATION

25 Coin Entry

Coin entry is made through a single coin slot for all coin denominations of the four coin set.

Conditions applicable to Coin Validation

Coins will only be subjected to the validation process on calls originated from the payphone when it is locked into the 'Coin' mode.

- 5 Coins not subjected to the process will be immediately refunded.

Validation Process

- 10 Coins subjected to the validation process by the coin validator CV pass along a coin runway and their location relative to the validation arrangements are detected by opto-electronic sensors S1, S2, S3, S4 and S5. The sensors designated S1 and S2 are operational only during an originating call from the payphone locked to the 'Coin' mode and are effective in priming the validation process
- 15 using the validator CV.

Validated coins may only pass into the coin storage escrow through coin diversion arrangements responsive to the operation of an electromagnet controlled flap operated by EML.

- 20 Non-operation of the electromagnet will result in the coins being directed to a refund channel and this is the case in the event of any coin insertion in any condition other than call origination with the payphone locked to the 'Coin' mode.

- 25 Under the validation process two inter-related tests are made on each coin by the micro-processor using the validator coil sets VC1 and VC2. The first test provides a measurement indicative of the general bulk and alloy

characteristics of the coin whilst the second test provides a relatively precision measurement indicative of the value of the coin conditional upon the results of the first test.

5 The concept of the validation tests provides for apparatus temperature variations over the specified range.

Coins failing the validation process are immediately refunded by the non-operation of the electromagnet EM1 as previously described.

10 It is noteworthy that most conceivable circuit or component malfunctions will result in the immediate refund of any coins inserted.

Validated coins diverted into the coin storage escrow by the operation of electromagnet EM1 are retained against
15 the subsequent determination process of encashment or refund under the control of electromagnets EM2 or EM3.

COIN MANAGEMENT

In general all uncashed coins are refunded when the handset is restored to its rest whilst coin encashment is
20 under the control of the micro-processor CPU program which uses the information produced by the coin validator CV.

25 An opto-electronic sensor S5 is utilised to check that coins are effectively entering the cash box and also to provide detection arrangements indicative of cash box full conditions. Unsatisfactory conditions will result in the immobilisation of chargeable 'Coin' mode calls.

A further sensor S4 of the same nature is used to

detect the presence of a coin in the first position in the escrow. This feature enables the escrow to be emptied of refund coins at the maximum possible rate and is used to immobilise the apparatus in the 'Coin' mode from further chargeable calls, if for example there was a malfunction in the refund process. A further sensor S3 is provided to prevent coin manipulation by means of string or the like within the payphone.

An optional coin management configuration allows all coins to be stored, a nil value being assigned to invalid coins. When invalid coins reach the head of the escrow they are immediately refunded. This arrangement simplifies the organisation of the payphone and allows additional coin storage.

15 ANALOGUE AND INTERFACE ARRANGEMENTS A/I

This arrangement provides the interface between the telephone related equipment and the micro-processor CPU allowing the micro-processor to be controlled or to control the operation of the telephone related equipment. The circuit elements involved are (i) a recall switch RS allowing the payphone subscriber to perform recall operation (ii) the line terminal block LTB connecting the payphone equipment to the subscribers exchange line, (iii) an audible tone generator TCD for incoming call signalling, (iv) a regulated rechargeable battery B, (v) an earth connection detection arrangement ED, (vi) the telephone handset equipment HS, (vii) a handset switch HSSW and (viii) a subscribers pulse metering

pulse receiver.

ANTIFRAUDULENT MEASURE OPTIONS

Simulation of MF4 Signals

5 Without preventive measures it may be possible to simulate MF4 signals by means of, for example, a tape recorder.

10 Arrangements are provided in the payphone handset under micro-processor CPU control to immobilise the microphone until at least three digits have been entered via the keypad KB so that the discipline of operation of the apparatus is maintained.

Security of the Earth Connection

15 The operation of the apparatus in the 'Coin' mode is reliant upon the earth connection as the instrument is line powered.

Accidental or deliberate disconnection say at the terminal block LTB results in no cash collection on chargeable calls.

20 Arrangements are incorporated to provide a check of the earth connection in an earth detection arrangement ED which results in chargeable calls being immobilised in the event that the earth is disconnected.

Simulation of Loop/Disconnect Dialling

25 The provision of a recall key RS giving line disconnection features comparable to the duration of digits may give rise to the possibility of dialling simulation with this key. Software arrangements are provided to prevent this possibility.

In coin operated devices the routing of coins relies upon gravitational features, and this is acceptable in most situations where the apparatus is fixed and its packaging inhibits tilting and the possibility of inversion.

The payphone may be arranged such that it is portable and consequently the above possibility must be anticipated in connection with the functional operation of the payphone.

Consider the following hypothetical condition:-

A user lifts the handset inserts 2p which is validated and is stored in the escrow. The payphone is then physically inverted causing the coin to lie in the escrow in a position which will prevent the coin passing to the refund channel when the handset switch is in the on-hook position.

The electrical logic of the payphone is now normalised and the handset switch may again be operated and the payphone restored to its normal position leaving the 2p in store with no knowledge of this occurrence.

A 50p piece and a further coin may now be inserted which will be validated and stored in the escrow as the second and third coins although the logic considers them to be in the first two positions. If now a call is established the 2p coin will be cashed and the payphone logic will give 50p credit, if the call is then abandoned before the timed credit of 50p is exhausted, the 50p and the unspecified coin will be returned to the caller.

To prevent such occurrences the payphone includes

the following features:-

A mechanical gate to retain the first coin in the escrow in its position irrespective of the orientation of the payphone.

A sensor S4 as previously described to detect a coin in the first position in the escrow prior to the call process arrangements.

Detection of any coin in this position at this time will prevent the origination of chargeable 'Coin' mode calls.



201

Claims

1. A call coin-box telephone instrument incorporating a micro-processor adapted to control the functions of coin and fee checking and call administration functions performed by the instrument in which means are provided for detecting the disconnection of an earth condition from the instrument and the instrument is arranged to prevent all chargeable calls after detection of an earth condition disconnection.
2. A call coin-box telephone instrument - according to claim 1 in which the instrument includes an escrow for the storage of coins for the payment of an outgoing telephone call and the escrow handles coins on a gravity feed basis and includes a sensor arranged to indicate when a coin is in a first position in the escrow and the instrument is arranged to reject all outgoing calls if any outgoing call is originated with a coin located in said first position.
3. A call coin-box telephone instrument substantially as described with reference to the accompanying drawing.

The text of the specification has been reproduced by photocopying the applicants original typescript. It may contain a few amendments which are difficult to read. The original typescript containing these amendments may be inspected on the premises of the Patent Office