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GB 1552812
GB 1524109
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(54) Telephone systems

(57) A telephone system with central processor control has telephones which include respective data circuits e.g. microprocessors which scan respective data keys associated with each telephone. The central processor may then scan the telephones at a slower rate without missing brief operations of the keys.

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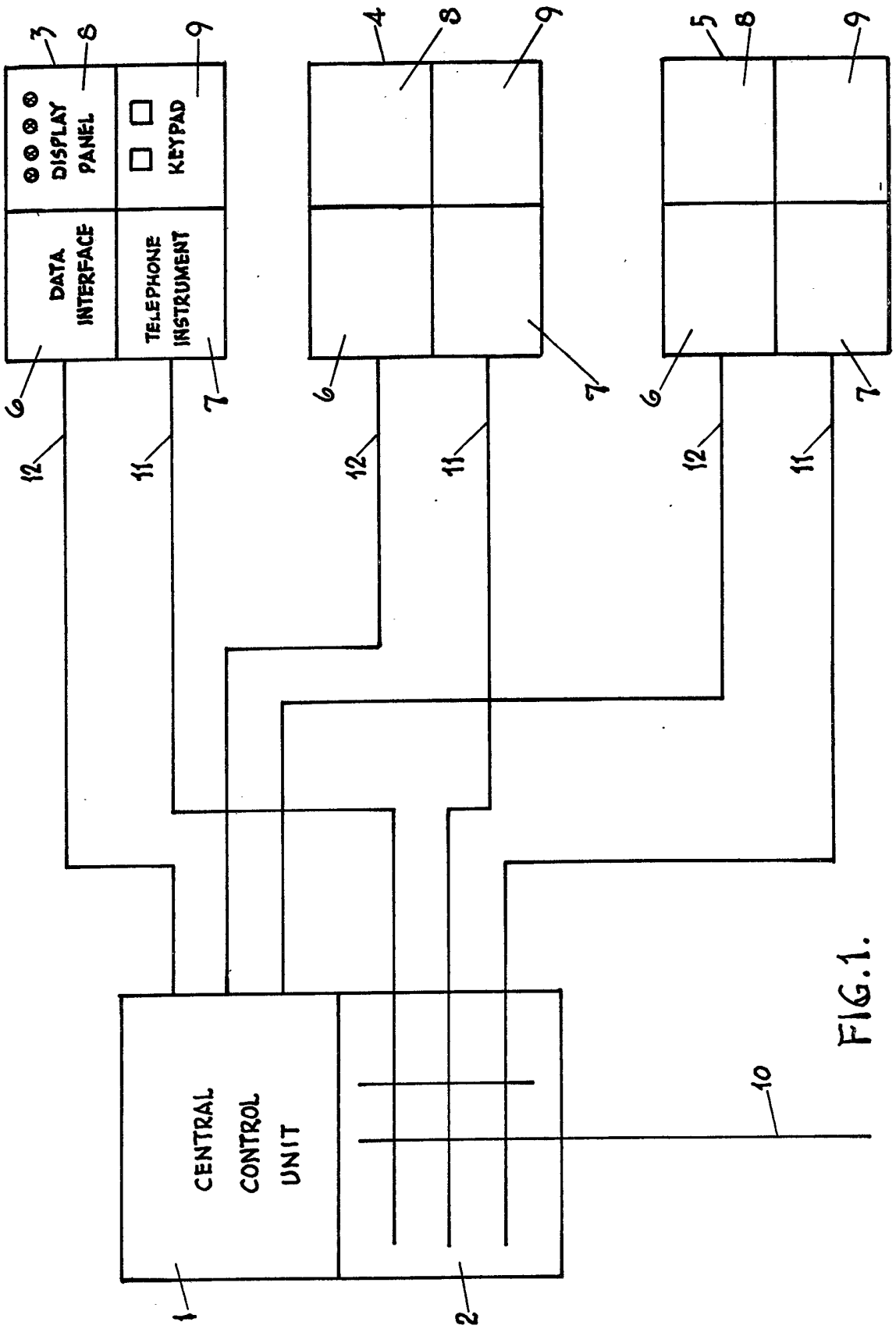
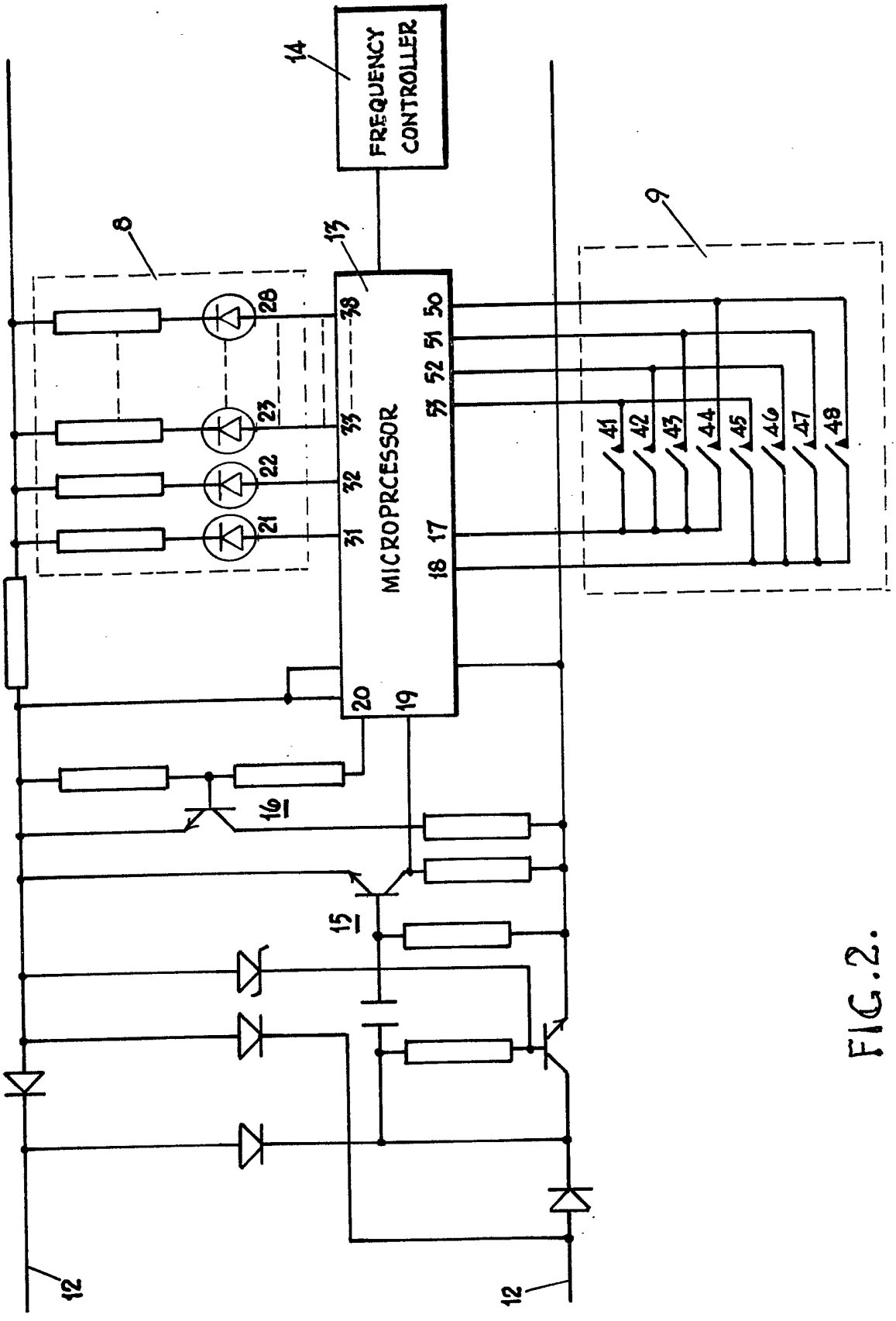

DISPLAY PANEL
KEYPAD
DATA INTERFACE
TELEPHONE INSTRUMENT
CENTRAL CONTROL UNIT
1
2
3
4
5
6
7
8
9
10
11
12

FIG.1.


FREQUENCY CONTROLLER
14
MICROPRCESSOR
13
8
9
28
23
22
21
38
33
32
31
50
51
52
53
18
17
20
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41
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48
16
15
12
12

FIG. 2.

SPECIFICATION

Data handling circuits

The present invention relates to data handling circuits and in particular, but not exclusively to such circuits for use in multi-processor telephone apparatus.

In a telephone system which has provision for selectively setting up a speech connection between two or more of a plurality of telephone stations and between any one of those stations and an exchange line, the several telephone stations may be connected to a control unit which sets up a required speech connection in response to operation of push-buttons of the telephone stations. if now the control unit interrogates the telephone stations sequentially for the purpose of detecting operation of a push-button, care has to be taken to ensure that the control unit does not fail to respond to operation of a push-button which is only depressed for a short period of time. One solution is for the speed of interrogation to be sufficiently high but one object of the present invention is to provide an alternative solution.

According to one aspect of the present invention a data handling circuit comprises means to scan a plurality of variable state means at a substantially periodic rate to detect the status thereof and to store data in respect of the detected status of each of said variable state means, and means subsequently to transmit said stored data over a data path to receiving or control means.

Preferably the stored data is transmitted over the data path in response to signal received from the receiving or control means.

However, the stored data may be transmitted over the data path to the receiving or control means at periodic intervals.

The means to scan the plurality of variable state means may include means to inhibit alteration of the data stored in respect of any one of said plurality of variable state means if a plurality of changes of status of the respective one of said plurality of variable state means occur between successive transmission of the stored data to the receiving or control means.

According to a second aspect of the present invention telephone apparatus comprises a plurality of manually operable switches, means to scan said plurality of switches at a substantially periodic rate to detect the status thereof and to store data in respect of the detectes status of each of said plurality of switches, and means subsequently to transmit said stored data over a data path or receiving or control means.

Preferably said means to scan the plurality of switches includes means to inhibit alteration of the data stored in respect of any one of said switches if a plurality of changes of status of the respective switch occur between successive transmissions of said data.

One example of telephone apparatus according to the second aspect of the present invention including a data handling circuit according to the first aspect of the present invention will now be described with reference to the accompanying drawings of which:

Figure 1 shows the apparatus in block diagram form, and

Figure 2 shows a part of Figure 1 in greater detail.

Referring to Figure 1 the telephone apparatus comprises a central control unit 1, a concentrator 2 and three telephone stations 3, 4 and 5. Each of the telephone stations 3, 4 and 5 comprises a data handling circuit or data interface 6, a telephone instrument 7, a display panel 8 and a keypad 9. Each telephone instrument 7 has access via a respective speech pair 11 to an exchange line 10 via the concentrator 2 under control of the central control unit 1.

Referring also to Figure 2, each data interface comprises an input buffer 15, an output buffer 16 and a microprocessor 13 the speed of operation of which is controlled by a frequency controller 14. Data is transferred between each data interface 6 and the central control unit 1 via a respective data pair 12.

The central control unit 1 scans in sequence the respective data pairs 12 of each of the telephone stations 3, 4, and 5. When the central control unit 1 commences its scan of the data pair 12 of the telephone station 3 for example, the central control unit 1 addresses the respective data interface 6 by applying a sequence of binary coded pulses, hereinafter referred to as a burst of data, to the data pair. This burst of data is used by the microprocessor 13 to determine which, if any, of a set of lamps 21 to 28 are to be illuminated or extinguished and/or to operate on audible alarm (not shown). The data interface 6 responds to the burst of data by returning a respective burst of data to the data pair 12, this return burst of data relating to the status of a set of contacts 41 to 48 which are operated by respective push-button keys of the keypad 9 or by the switch-hook of the telephone instrument 7. The scanning of the data pairs 12 is controlled by the central control unit 1, the data interface 6 being arranged to apply data to the data pair 12 only in response to and following the receipt of a burst of data from the central control unit 1. The transfer of data between the data interface 6 and the central control unit 1 is described in greater detail in our co-pending Patent Application No. (TET 1365).

When the central contor unit 1 has received the burst of data from the data interface 6 of the telephone station 3 it commences its respective scan of the respective data pair 12 of the telephone station 4 in similar manner to that described above.

On completion of the scanning of all of the respective data pairs 12 of the telephone stations 3, 4 and 5, the central control unit 1 carries out any functions requested by the data it has received.

In a larger system (not shown) of a similar kind to that described above there may be a greater

number of telephone stations. The scanning cycle of the central control unit 1 will therefore be longer and in a system including, say, ten such telephone stations the time taken to scan all of the data pairs 12 is of the order of 37.5 milliseconds. Between the scanning of the last of the data pairs and the subsequent scanning of the first of the data pairs there is a period of the order of 25 milliseconds during which the central control unit 1 carries out its control functions. Thus between any one scan of the data pair 12 of the telephone station 3 for example and the next scan thereof, a period of the order of 62.5 milliseconds elapses.

This period of 62.5 milliseconds is longer than the minimum operate and release time of the contacts 41 to 47 of the keys of the keypad 9, which is of the order of 40 milliseconds. Therefore if the data relating to the contacts 41 to 48 is directly communicated to the central control unit 1 a minimum operation of a key of the keypad 9 may be missed.

The microprocessor 13 is arranged to sample the contacts 41 to 48 at intervals much shorter than the minimum operate and release time of those contacts. The microprocessor 13 applies signals in sequence to its outputs 17 and 18. If for example only contacts 44 were closed then a signal applied by the microprocessor 13 to its output 50 would appear at input 17 only. Signals on outputs 51, 52 and 53 would not appear at either of the inputs 17 and 18. On detection of the closure of a set of contacts the microprocessor 13 sets a respective bit in an internal memory (not shown) relating to the set of contacts which have been detected as closed.

The microprocessor 13 continues to scan the contacts 41 to 48 for any further change in condition until a change in the binary state of input 19 indicates receipt of a start signal which precedes transmission of a burst of data from the central control unit 1. After receipt of the burst of data from the central control unit 1 the microprocessor 13 transmits its respective burst of data to the central control unit relating to the status of the contacts 41 to 48 as stored in said internal memory.

If the microprocessor detects a further change in the state of a set of contacts before it has transferred data relating to a first change in the state of that set of contacts, the microprocessor does not amend the respective bit in its internal memory until after the transfer of data to the central control unit 1. Data relating to the further change in status of the set of contacts will be transferred to the central control unit 1 on its subsequent scan of the respective data pair 12.

CLAIMS

1. A data handling circuit comprising means to scan a plurality of variable state means at a substantially periodic rate to detect the status thereof and to store data in respect of the detected status of each of said variable state means, and means subsequently to transmit said stored data over a data path to receiving or control means.

2. A data handling circuit as claimed in Claim 1 in which said stored data is transmitted over the data path in response to signals received from the receiving or control means.

3. A data handling circuit as claimed in Claim 1 in which said stored data is transmitted over the data path to the receiving or control means at periodic intervals.

4. A data handling circuit as claimed in any preceding claim in which the means to scan the plurality of variable state means includes means to inhibit alteration of the data stored in respect of any one of said plurality of variable state means if a plurality of changes of status of the respective one of said plurality of variable state means occur between successive transmissions of said stored data to the receiving or control means.

5. A data handling circuit as claimed in any preceding Claim in which said means to scan the plurality of variable state means is a microprocessor.

6. Telephone apparatus comprising a plurality of manually operable switches, means to scan said plurality of switches at a substantially periodic rate to detect the status thereof and to store data in respect of the detected status of each of said plurality of switches, and means subsequently to transmit said stored data over a data path to receiving or control means.

7. Telephone apparatus as claimed in Claim 6 in which said means to scan the plurality of switches includes means to inhibit alteration of the data stored in respect of any one of said switches if a plurality of changes of status of the respective switch occur between successive transmissions of said data.

8. Telephone apparatus as claimed in Claim 6 or Claim 7 in which the means to scan the plurality of switches is a microprocessor and a first contact of each of a first plurality of the swtiches is connected to one of a plurality of outputs of the microprocessor and a second contact of each of the first plurality of switches is connected to a respective one of a plurality of inputs of the microprocessor.

9. Telephone apparatus as claimed in Claim 8 in which a first contact of each of a second plurality of the switches is connected to a different one of said plurality of outputs of the microprocessor and a second contact of each of the second plurality of switches is connected to a respective one of the plurality of inputs of the microprocessor.

10. A data handling circuit substantially as hereinbefore described with reference to Figure 2 of the accompanying drawings.

11. Telephone apparatus substantially as hereinbefore described with reference to the accompanying drawings.

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