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SELECTOR DEVICE FOR USE IN TELECOMMUNICATION SYSTEMS,
PARTICULARLY TELEPHONE SYSTEMS

The invention relates to an apparatus for
5 effecting a selection in a communications facility and
in particular telephone equipment in which selection
or dialling information defining a desired connection
is transmitted by operating two release members, one
of which is in operative connection with a telephone
10 directory divided up into groups according to the
initial letters of the subscribers and movable in
extract form, whilst the other is in operative connection
with a coding and selection information transmitting
device.

15 Such an apparatus is already known from
German Patent 18 03 396, but has the disadvantage
that each key-like release member can only fulfil one
function. As a result it is necessary to provide a
numerically comprehensive keyboard because for each
20 letter, each of the figures 0 to 9 and the control
functions it is necessary to provide in each case a
function key as the release member. The release
members must consequently have a relatively large
size, so that the casing of the known apparatus must
25 be made relatively large. The large number of
release members arranged in a confined space involves
very costly manual production to obviate the risks
of faults and errors resulting from the large number
of electrical lines.

30 The problem of the invention is to so improve
this known apparatus that only a few function keys are
required, so that manufacture and operation is simplified.

According to the invention there is provided a
telephone register with a device for carrying out
35 dialling in a telecommunications and in particular

telephone system, comprising a stack of register cards in a casing having markings, and being provided with marginal cut-outs or openings in an index-like manner, forming a subscriber register for storing subscriber's number and a device for releasing the subscriber register, controllable by means of a selection mechanism, the latter comprising a plurality of selection keys combined in a keyboard arranged on the front of the casing, whereof each selection key has a marking corresponding to that of the register cards and a marking for feeding in code numbers and is connected with control levers for selecting the register card, the selection information designating a desired connection being transmitted by operating the selection keys, which on the one hand bring about the release of the subscriber register and on the other are connected to a coding device and a store; characterized in that each selection key (23, 24a, 24b, 24c, 25) of the keyboard (6) is additionally provided with a marking for feeding the subscriber numbers into the store (41) and with a key pin (26) running at right angles to the casing base (4), and in whose movement path and below whose free end is arranged a matrix-like contact plate (18) having contacts, on which is provided an upper layer of parallel, strip-like longitudinal contacts (21) spaced from the dialling keys (23) and whereof each longitudinal contact (21) can be pressed by means of a key pin (26) onto one of a plurality of strip-like transverse contacts (22) arranged below the layer of longitudinal contacts (21) and at right angles thereto in an arrangement corresponding to the arrangement of the selection keys (23; and in that the contact plate (18) and the further keys (24a, 24b, 24c, 25) arranged on keyboard (6) and having a control function are connected to the coding device (40) connected to a monochip microprocessor (50).

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Further embodiments and features of the invention are described in the subclaims.

The invention is described hereinafter relative to non-limitative embodiments and the attached

5 drawings, wherein show:

Fig. 1 - a simplified sectional side view of the selection-making apparatus.

Figs. 2 to 4 - the construction of possible matrix circuits for the contacts.

10 Fig. 5 - a key lettering space for a key with a quadruple function.

Fig. 6 - an apparatus keyboard in plan view.

Fig. 7 - a circuit diagram of the electronic part of the apparatus of Fig. 1.

15 Fig. 8 - the block circuit diagram of the coding and selection information transmitting device.

Fig. 9 the block circuit diagram of a printer.

Fig. 10 the block circuit diagram of the alphanumeric display device.

In the embodiment of Fig. 1 the selection-making apparatus 1 comprises a casing 2 formed from a casing top 3 and a casing bottom 4. Casing 2 contains a device for releasing the chosen index cards 9 which is constructed as a drawer 8 with a stack of index cards. Drawer 8 is positioned in such a way that, if necessary, it can be extended out of the casing 2.

An area 7 is provided on casing top 3 on which can be placed a telephone. In the rear portion of casing 2 a cavity 5 is provided which serves to receive a loudspeaker and a coding and selection information transmitting device. In the end portion of casing 2 opposite to cavity 5 a keyboard 6 is formed on casing top 3. This keyboard 6 has selection keys 23 connected by means of a lever arm 14 with a control lever 11, on whose free end portion is formed a key selecting hook 12. Each control lever 11 can be pivoted about a pivot pin 13. A key lifting spring 15 which bears against keys 23 and casing top 3 serves to raise the said keys. On depressing a key 23 the other keys 23 are kept in their positions, because the control lever 11 acts as a counterweight. The key pins 26 engage on a contact plate 18 connected to a contact plate stop lever 16 on depressing the particular keys 23. The contact plate stop lever 16 also pivots about the pivot pin 13 and is in operative connection with the drawer notch 10 when drawer 8 is pushed in. A contact plate spring 17, whose free end portion bears against casing top 3 is formed on stop lever 16.

Contact plate 18 has contacts arranged in matrix-like manner. They are constructed as

longitudinal contacts 21 and transverse contacts 22. The strip-like longitudinal contacts 21 are arranged as an upper layer in recesses 19 of contact plate 18, being parallel to one another with the spacing of keys 23. Below the longitudinal contacts 21 are positioned the transverse contacts, 22, which are also constructed in strip-like manner and are arranged at right angles to the longitudinal contacts 21. Each transverse contact 22 is mounted in a recess 20 of contact plate 18. Longitudinal contacts 21 and transverse contacts 22 are preferably constructed as silver-coated leaf springs. However, other contacts can be used instead of these strip-like contacts. Possible matrix circuits 30, 31, 32 used on contact plate 18 are shown in Figs. 2, 3 and 4. Matrix circuit 30 has four longitudinal contacts 21 and four transverse contacts 22, so that 16 pulse signals can be supplied. Matrix circuit has 3 longitudinal contacts 21 and four transverse contacts 22, so that twelve pulse signals can be supplied. Matrix circuit 32 is constructed as an installed circuit with four longitudinal contacts 21 and four transverse contacts 22.

Keyboard 6 shown in Fig. 6 has a call display 27, twelve keys 23 and in each case one key 24a, 24b, 24c, 25. The call display 27 is constructed as an eight segment LED or LCD display. The keys 23 quadruple function keys with the possibility of feeding in alphanumeric values. Keys 23 can fulfil the functions of letter pulse signals, selection of index cards 9, extension of index drawer 8 and figure pulse signal. Fig. 5 shows a possible key lettering space 33 of a key 23. Lettering space 33 is subdivided into a letter area 28 and a number area 29. Keys 24a, 24b, 24c are constructed as single

function keys and key 25 as a double function key. Keys 24a, 24b, 24c are not connected to key selecting hooks 12. Key 25 acts in the same way as keys 23. All the index cards 9 are held and only a not shown drawer with e.g. a note pad is extended. The contacts of keys 24a, 24b, 24c, 25 correspond to those of keys 23. Keyboard 6 can be extended if further functions are to be observed.

The electronic part 35 of apparatus 1 is shown in the circuit diagram of Fig. 7 and essentially comprises the coding and selection information transmitting device 40, which is in turn connected to microprocessor 50 and the call display 27 in the form of an LED or LCD display 60. At the output of the coding and selection transmitting device 40 are provided the selection or dialling relays 43 of relay control 48 which initiate the direct dialling or selection and in turn by means of earthed contacts release the selection pulses in the telephone network, so that the desired subscriber can be obtained. The electronic coding and selection information transmitting device 40 is connected to a sound amplifier 70, which can be switched on and off and a loudspeaker 71 to permit the monitoring of the telephone conversation taking place by means of the loudspeaker. For this purpose the sound amplifier 70 is connected via an adaptor coil 72 to the speaking circuit. The desired volume can be set by means of a volume control (not shown in the drawing) located in the input circuit. The power supply of the device is provided by means of the mains unit 80 integrated into a power plug, including a buffer or storage battery 81 connected thereto, so that the installation still functions completely satisfactorily in the

case of a prolonged power failure. The electronic part 35 of apparatus 1 functions in the following way. After feeding in the code numbers of the desired subscriber by means of keyboard 6 the coding and selection information transmitting device 40 by means of code converter 42 seeks the subscriber's number stored in internal store 41. This number can comprise subscribers' prefixes, local prefixes and possibly foreign country prefixes. Thus, with each code number range in store 41 of transmitting device 40 is associated a prefix range divided up into three. The subscriber's number comprise in a maximum of three code ranges addressed under the code number and which is called up is read out of store 41 and supplied to the coding and selection information transmitting device 40, which converts the digital information stored into the pulse shape and sequence suitable for trunk operator dialling. If transmitting device 40 receives a busy or engaged signal on the telephone line, said signal is supplied to the internal signal analyser 44 which, via microprocessor 50 brings about an automatic post-selection of the subscriber after a preprogrammed time until, after one of the following dialling processes, the desired free-line signal sounds. In this case the signal analyser 44 frees the monitoring circuit comprising adaptor coil 72, sound amplifier 70 and loudspeaker 71 by switching in the operating voltage. Simultaneously and after the dialled subscriber has removed the receiver and the last free-line signal has ended, the time switch 45 gives a starting order to the microprocessor 50. This serves to start the count of the tariff units in microprocessor 50. When the conversation is at an end and the subscriber

has hung up time switch 45 gives a stop order to microprocessor 50, which ends the counting of the tariff units. Thus, microprocessor 50 is in a position to calculate the accrued fees on the basis of a stored programme. As the microprocessor 50 receives the subscriber's number divided up into parts such as the subscriber's prefix, local prefix, etc., it can make different tariff calculations as a function of whether it is a local, trunk or foreign call.

According to a further development of the electronic part 35 a small printer 90 is connected to the apparatus with an adaptor plug and cable (Fig. 9). Printer 90 is controlled by microprocessor 50 and retains the name and address of the dialled subscriber, the subscriber's number, the duration of the conversation and the accrued tariff units. For this purpose at the end of the conversation the desired units are read out of the internal store 41 of the microprocessor 50 and transferred via the external data bus of the microprocessor 50 to printer 90 constructed in per se known manner. The latter can, for example, be constructed as a matrix printer which prints its information in the form of a matrix head controlled by means of a point matrix on a paper strip which can be torn off.

Microprocessor 50 controls the multiplace call display 27 which is able to represent the desired subscriber's number, divided up into the subscriber's prefix, local prefix and possibly the foreign country prefix. For this purpose the call display 27 is constructed as an eight segment LCD or LED display 60 controlled by the data bus of microprocessor 50 via code converter 61. It is

assumed that the binary code of microprocessor 50 is converted into a hexadecimal number for digital representation. The eight segment figures can be represented by self-luminous LED displays. In the case of battery operation LCD displays can be used in order to reduce the battery loading. If a printer 90 is not used for printing out the accrued call charges, the accrued amount can be represented in the call display 27 by means of the internal programme control of microprocessor 50. Besides the LED or LCD display 60 it is also possible to directly electronically represent the name and address of the subscriber, as well as clear text information such as e.g. "subscriber busy or engaged", or "subscriber unobtainable", "fault on the line", "line disconnected", etc.

For this purpose a multiplace alphanumeric point raster display device 100 is used. This display device 100 is controlled by microprocessor 50 in such a way that from the address register contained in the internal store of microprocessor 50 the subscriber's address stored therein is read out after feeding in the associated code number and is transferred to display 100 by means of the external data bus of microprocessor 50. If special information such as e.g. "subscriber engaged" etc., is displayed, they are displayed in preferred manner by means of a priority prefix in the addressing.

Fig. 8 is a block circuit diagram of the coding and selection information transmitting device 40, which is connected via code converter 42 with keyboard 6. All coded inputs of keyboard 6 are read into store 41 via code converter 42. The input signal is converted into an addressed digital code and the associated data in the store, e.g.

subscriber's prefix, etc. are called up and read out followed by transferring to microprocessor 50. Code converter 42 is also connected to relay control 48 comprising the dialling or selection relays 43 in order to convert the determined dialling number into the direct selection function. Relay control 48 has a pulse circuit control, so that the individual prefixes given in digital word form can be converted into a pulse sequence corresponding to a telephone dial. The selection relays 43 of relay control 48 open and close the dialling contacts 46 in the telephone circuit.

At the end of dialling the number the signal analyser 44 is switched on together with the sound amplifier 70. It simultaneously supplies sound amplifier 70 with the operating voltage and receives from it the free-line signal or the engaged signal. In the case of the engaged signal microprocessor 50, which is connected to signal analyser 44, organizes one or more post-selections until contact with the subscriber is made or fails to answer when the subscriber's line is free. In the latter case the display device 100 is controlled by means of microprocessor 50. The display gives the information "subscriber fails to pick up receiver". Time switch 45 is connected to signal analyser 44 and when the connection is made it ensures by means of a starting order that microprocessor 50 starts to calculate the tariff units based on the prefixes foreign, local, subscriber. When the conversation is ended a stop order is transmitted to the microprocessor and counting of the tariff units ends. The microprocessor 50 now determines the charge and represents it by means of printer 90 and/or display device 100 or some other suitable display. By operating a key it is also possible to represent the charges from a

given date to the present time from the store of microprocessor 50.

Fig. 9 shows in block circuit diagram form the internal construction of printer 90. It comprises a multiplexer 91 connected to the external data bus of microprocessor 50.

Multiplexer 91 receives the information to be transmitted and by code conversion brings about the control of signal generator 93, which prepares the corresponding signal in printing head 95. Control logic 92 ensures that via printing head control 95 printing head 94 receives the correct position in the line. At the end of each line the control logic 92 also operates the feed motor 96 for the paper feed in the following print line.

Fig. 10 shows the construction of the electronic alphanumeric display device 100. The information to be displayed is passed via microprocessor 50 to signal generator 101, which converts the digital information into a raster signal and overplugs the latter on to the raster generator 102. The latter prepares the signal raster on display 103 and brings the signal into the correct position thereon. Display 103 comprises a point matrix providing e.g. a maximum of 8 x 4 points for each signal.

The selection-making apparatus which is connected by a not shown cable to the telephone functions in the following manner. Normally drawer 8 with the index cards 9 is inserted in direction D into casing 2. The drawer notch 10 is engaged behind the contact plate stop lever 16, so that a bottom spring not shown in the drawing cannot force drawer 8 in direction C out of casing 2.

By pressing a key 23 in direction A the associated key pin 26 presses on to one of the longitudinal contacts 21 connected to a lower transverse contact 22. This pulse is transmitted to the electronic coding and selection information transmitting device. If key 23 is pressed further in direction A, contact plate 18 is pivoted on pivot pin 13 counter to the tension of contact plate spring 17 and contact plate stop lever 16 moves in direction A, which releases the drawer notch 10. Simultaneously the key selecting hook 12 moves in direction F and holds back certain index cards 9. The bottom spring forces drawer 8 in the direction C and takes up the free index cards 9 with drawer tension projection 34. The selected index card 9 is then visible in the extended drawer 8 with details of the subscriber and the code number. By pressing key 23 with the code number a second code information is fed into the coding and selection information transmitting device, so that on pressing the dialling symbol automatic through dialling of the stored call numbers can take place.

The following operating modes are possible with apparatus 1. It is put into operation by plugging in the plug of mains unit 80 and then a point of the LED/LCD display lights up on the call display device 27. If a call number is to be dialled without extending drawer 8 a key 23 with the lettering corresponding to the initial letter of the desired person being called is lightly pressed and then the point on the call display 27 rhythmically lights up. The key with the numbering corresponding to the desired code number of the person being called is

then lightly pressed and the automatic subscriber dialling starts and the digits of the call number appear in the dialling order on the display 27.

If dialling is to take place with drawer 8 extended key 23 with the initial letter of the desired person being called must be strongly pressed, after which drawer 8 is extended and the point of the LED/LCD display lights up on the call display device 27. The unknown code number must be read off from the index card 9 and then by operating a key 23 with inscriptions corresponding to the code number lightly or strongly pressed. This is followed by automatic subscriber dialling and the digits of the call number appear on the call display device 27 in the dialling order. Drawer 8 can be inserted at a random time, because this has no influence on the telephone conversation or on the dialling of the person being called. If the dialling process is interrupted key 24b must be depressed. Key 24b must also be depressed if a key 23 is operated in error and the point rhythmically lights up on display device 27.

If drawer 8 is extended without telephone dialling following the first strong depression of key 23 which extends drawer 8 and also makes the point rhythmically light up on the call display device 27, key 24b must also be depressed, so that the first input pulse is cleared.

A free memory location is programmed in that initially a key 23 is strongly pressed in accordance with the lettering representing the initial letter of the subscriber to be stored, so that drawer 8 is extended and the point display lights up rhythmically on display device 27. Key 24a is then depressed and the smallest free code number appears on call display 27 and can then be recorded on the

appropriate index card 9. Then by depressing keys 23 the code numbers and the digits of the subscriber's call number are fed in and light up on the display device 27 for checking purposes in the feed-in sequence. After feeding in the digits key 24c is depressed to bring programming to an end.

If the store is fully occupied for a key 23 according to the lettering on depressing key 24a a full symbol, such as e.g. a minus sign appears on the call display device 27 indicating that all stores for this index card 9 are occupied and that no programming can take place.

For clearing a particular memory location and reprogramming a key 23 with the lettering corresponding to the initial letter of the subscriber to be cleared or reprogrammed is strongly pressed, so that drawer 8 is extended and the point display rhythmically lights up on the call display device 27. Key 25 is then depressed and then a free code number or the engaged signal appears on display device 27. If a store is still free the desired code number is pressed by operating a key 23 and subsequently the new call number is fed in. The process is ended by depressing key 24c. If an interval is fed in in a call number key 25 must be operated.

By the combination of letters, digits and symbols on a few keys it is possible to store in well-arranged manner e.g. 120 lines in the case of a three-four matrix, only a single code number being necessary because the first code is the initial letter of the subscriber to be dialled. It is possible to store 120, 160, 240 and more lines by the index cards 9

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with the recorded code numbers, it being possible to easily, rapidly and reliably find the said lines. Despite this large information capacity apparatus 1 can be manufactured in a small size and easily operated.



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CLAIMS

1. Telephone register with a device for carrying out dialling in a telecommunications and in particular telephone system, comprising a stack of register cards in a casing having markings, and being provided with
5 marginal cut-outs or openings in an index-like manner, forming a subscriber register for storing subscriber's number and a device for releasing the subscriber register, controllable by means of a selection mechanism, the latter comprising a plurality of selection keys
10 combined in a keyboard arranged on the front of the casing, whereof each selection key has a marking corresponding to that of the register cards and a marking for feeding in code numbers and is connected with control levers for selecting the register card,
15 the selection information designating a desired connection being transmitted by operating the selection keys, which on the one hand bring about the release of the subscriber register and on the other are connected to a coding device and a store; characterized in that
20 each selection key (23, 24a, 24b, 24c, 25) of the keyboard (6) is additionally provided with a marking for feeding the subscriber numbers into the store (41) and with a key pin (26) running at right angles to the casing base (4), and in whose movement path
25 and below whose free end is arranged a matrix-like contact plate (18) having contacts, on which is provided an upper layer of parallel, strip-like longitudinal contacts (21) spaced from the dialling keys (23) and whereof each longitudinal contact (21) can be pressed
30 by means of a key pin (26) onto one of a plurality of strip-like transverse contacts (22) arranged below the layer of longitudinal contacts (21) and at right angles thereto in an arrangement corresponding to the arrangement of the selection keys (23); and in that the



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contact plate (18) and the further keys (24a, 24b, 24c, 25) arranged on keyboard (6) and having a control function are connected to the coding device (40) connected to a monochip microprocessor (50).

- 5 2. Telephone register according to claim 1, characterized in the contact plate (18) comprises a plate-like blank and is connected to a locking lever (16) for the register card release device (8) and that the plate-like blank carries a printed circuit
10 board with the longitudinal contacts (21) and the transverse contacts (22).
3. Telephone register according to claims 1 and 2, characterized in that the selection keys (23) connected to the control levers (11) are constructed
15 as quadruple function keys.
4. Telephone register according to claims 1 to 3, characterized in that the longitudinal contacts (21) and the transverse contacts (22) are constructed as silver-coated leaf springs.
- 20 5. Telephone register according to claims 1 to 4, characterized in that the selection keys (23, 24a, 24b, 24c) of keyboard (6) are connected across the longitudinal and transverse contacts (21, 22) with a relay control (48) of the coding device (40), which is
25 connected to the microprocessor (50) across a control circuit (47) with a display (27) and the dialling contacts (46).
6. Telephone register according to claims 1 to 5, characterized in that the contact plate (18)
30 comprises a base plate with shaped on locking levers (16), on which is constructed a printed circuit board with longitudinal contacts (21) and transverse contacts (22).
7. Telephone register according to claims 1 to
35 6, characterized in that the coding device (40) is connected to a long-term store.



8. Telephone register according to claim 7, characterized in that the long-term store is constructed as a buffer battery or accumulator (81).

5 9. Telephone register according to claims 1 to 7, characterized in that the coding device (40) has connection means for private branch exchanges.

10 10. Telephone register according to claims 1 to 7, characterized in that the keys (24a, 24b, 24c) used for control purposes are constructed as single function keys, without key selection hooks (12), and key (25) as a double function key.

15 11. Telephone register according to claims 1 to 10, characterized in that a loudspeaker in the form of an amplifier and in operative connection with the coding device (40) is arranged in casing (2).

12. Telephone register according to claims 1 to 11, characterized in that the coding device (40) is connected to a power pack (80).

20 13. Telephone register according to claims 1 to 12, characterized in that the coding device (40) is connected to an earth key.

14. Telephone register according to claims 1 to 13, characterized in that the coding device (40) is connected to a multiposition LED or LCD display.

25 15. Telephone register according to claims 1 to 14, characterized in that the coding device (40) is connected to an electronic alphanumeric display (100), which can be controlled by microprocessor (50).

30 16. Telephone register according to claims 1 to 15, characterized in that the microprocessor (50) is connected to a display (100) and a printer (90).

17. Telephone register according to claims 1 to 16, characterized in that the coding device (40) is connected to a sound amplifier (70).
