

SYSTEM FOR COMMUNICATING BETWEEN TWO UNITS

The present invention concerns a system for communicating between a first unit such as a computer, in particular a PC, or a watch and a second unit such as another computer or another watch.

US Patent No. 5,652,602 discloses the case of a system for
5 communicating between a first unit constituting a computer and a second unit constituting a watch. In this case, the transmission of the computer data to the watch is achieved via a variation in the length of a line segment appearing on the screen of the PC monitor, the length determining the bit value which has to be transmitted.

10 This system has a significant drawback which lies in the fact that the data is coded and optically carried or conveyed so that it can only be transmitted if certain very particular conditions are satisfied. For example, the ambient lighting must be sufficiently low that the optical variations in the monitor image are not made imperceptible to the watch. Further, the
15 photosensor of the watch must be placed close to the screen so that the data can receive correctly. It should also be noted that this data is unidirectional in the computer-watch direction, which considerably limits the possibilities of use of the system.

Infrared ray transmission systems are also known, particularly for the
20 remote control of all sorts of domestic apparatus such as televisions, hi-fi systems etc.. In this case, the directivity of the data carrier radiation is limited, because the two units (the remote control unit and the apparatus) must have a visual contact which constitutes a serious handicap. Moreover, the link can only be made from the remote control unit to the apparatus in
25 question, the system therefore also being unidirectional.

An object of the invention is to provide a system for communicating between a first unit, for example a watch, and a second unit such as a computer, in particular a PC, which lacks the drawbacks of the communication systems of the prior art.

30 Another object of the invention is to provide such a system which is efficient and easy to make.

The invention thus concerns a communication system according to claim 1.

As a result of these features, a two-directional communication system
35 is obtained, involving no directivity during the transmission of data between the two units. Moreover, since the carrier frequency with which the two units



work is derived from time bases having almost identical drifts in both units, communication can be made whatever the ambient conditions and in particular the temperature in which the two units have to operate.

Complementary features of the invention are specified in the sub-claims.

5 Other features and advantages of the invention will appear during the following description, given solely by way of example and made with reference to the annexed drawings, in which:

- Figure 1 shows a block diagram of an example of a system for communicating between a portable apparatus and a computer, according to
10 the invention; and

- Figure 2 is a simplified diagram of a control unit used in the communication system shown in Figure 1.

In the embodiment example of the invention shown in Figure 1, the communication system according to the invention includes a first unit U1 able
15 to be carried by a person. In particular, this unit can be formed by a wristwatch or any other portable electronic device fitted out in accordance with the precepts of the invention. However, this unit is not limited to a portable apparatus.

The communication system also includes a second unit U2, formed in
20 this example by any computer, preferably an ordinary PC. However, this second apparatus can also be formed by a watch thus allowing communication between two watches.

In the example shown in which unit U1 is a watch, it includes first the usual components which are a time base 1 driven by a quartz used as
25 frequency standard, a control microprocessor 2, a motor 3 controlled via control microprocessor 2 and a display device with hands 4 driven by the motor and intended for indicating the time. Watch U1 also includes at least one alphanumerical display 5. This display may include several display fields to allow the display of various time related data (day, date, month etc.), data
30 concerning the watch functions, and also preferably personal data such as those related to a diary (calendar, meetings, birthdays, telephone numbers, address book etc.). It is these latter data in particular which can form the subject of an exchange between the two units U1 and U2.

The functions of watch U1 can be activated in the usual way using one
35 or more control buttons, of a sequential type for example, symbolised by unit 6. Such a button can be used in particular to activate and/or deactivate the

reading or editing mode of data relating to the watch or to the diary and the communication mode of watch U1.

Watch U1 is also fitted with a device 7 for entering alphanumerical data, advantageously formed by capacitive touch keys disposed on the crystal. This device will be called the « keyboard » hereinafter for the sake of simplification. Such devices are known to horological specialists, see for example European Patent Application No. 0 838 737 in the name of the present Applicant.

An acoustic alarm device 8 can complete unit U1. This device can be set off by various events such as: a meeting, birthday or morning alarm call etc..

It is to be noted that unit U1 of the communication system according to the invention can include all or only some of the elements which have just been described. For example, if unit U1 is a watch, the hand display and the motor associated therewith and/or the acoustic alarm device could, for example, be omitted. If unit U1 is another portable apparatus, for example a pocket calculator, a reference unit, such as a multilingual dictionary, or an electronic diary etc., it could omit certain time-keeping components. However, it is desirable for it to be thermocompensated.

This being so, unit U1 also includes an internal communication bus 9 assuring the data exchange between microprocessor 2, alphanumerical display 5, control unit 10 and a data memory 11 which is preferably of the non-volatile type, for example an EEPROM. Such a memory has the advantage of being less sensitive to shock and keeping data in the event of power failure (change of battery) compared to a volatile memory. However, the use of a volatile memory is obviously also possible.

Unit U1 is also provided with a radio transceiver circuit 12 capable of carrying data on at least one high frequency carrier wave modulated by said data and sending the modulated carrier wave to an antenna 13 incorporated in unit U1. Of course, according to known techniques, the transceiver is also capable of demodulating a message received to extract the useful data therefrom.

According to an important feature of the invention, transceiver 12 is designed to be able to generate a plurality of high frequency carrier waves, the selection of the carrier wave sent to antenna 13 being assured by control unit 10. These high frequency carrier waves are all driven by time base 1 whose stability, in the example described, also assures the accuracy of the

time provided by the watch. There results a high level of frequency stability for each of the carrier waves generated in watch U1.

Memory 11 is preferably organised in pages comprising data blocks which are carried by the high frequency link. They may for example have a
5 size of 64 bytes. This memory can be written or read first via microprocessor 2, the data entered into the memory then originating from keyboard 7 and the read data being transmitted to display 5 also via microprocessor 2. But memory 11 can also be used by control unit 10 which can write data therefrom originating from transceiver 12 into said memory
10 and which can read data therefrom to send it to said transceiver 12.

As shown in Figure 2, control unit 10 includes a frequency selection unit 14 intended for controlling the frequency of the carrier wave on which transceiver 12 operates.

It is clear that the possibility of communicating on one of a plurality of
15 carrier waves, in a same power range, enables a plurality of communication systems according to the invention to be able to assure data exchanges for each system, without disturbing the data exchange of the other systems present within this same power range. For this purpose, each communication system is locked on one carrier wave selected from the carrier waves which
20 are still available in the space in which the systems are present, the carrier wave being available to the other systems again as soon as the system which occupied it has completed its communication.

By way of example only, carrier waves having the following frequencies may be selected: 433,245 MHz, 433,845 MHz, a different frequency and a
25 different number of frequencies naturally being able to be envisaged.

Control unit 10 also has the function of forming an interface between memory 11 and transceiver 12. In the embodiment described and shown, it includes a first register 15 for communicating with memory 11 and a second register 16 for communicating with transceiver 12, the two registers
30 exchanging their contents by the action of a sequencer 17. This sequencer 17 is also connected to a page counter 18 which indicates the pages of data in memory 11.

Thus, when transceiver 12 is transmitting to unit U2, control unit 10 reads the data corresponding to a memory page in memory 11 then
35 transmits them via registers 15 and 16 to transceiver 12 under the control of sequencer 17. Page counter 18 is incremented by one unit, then the following page is read in the memory, and so on until the last occupied page

in memory 11 is read. Conversely, when transceiver 12 is in receiving mode, it transmits the data which reach it in blocks of the size of a memory page, to control unit 10 which is responsible for transmitting them to memory 11 via the two registers 15 and 16, also under the control of sequencer 17, so that
5 the data can be written in the memory, the content of counter 18 naturally being updated after each block.

It is to be noted that, advantageously, the transmission of data between units U1 and U2 is achieved in accordance with a protocol which defines in the flow of transmitted data a succession of data blocks, of 64
10 bytes each for example, corresponding in this example to the size of one page of memory 11, each block being able to further include a synchronisation and recognition preamble, and an identification block including in particular a code identifying unit U1 or U2 which is transmitting the data and unit U1 or U2 which has to receive it.

15 Unit U2 of the communication system according to the invention includes a transceiver unit 19, electrically identical to unit 12 of unit U1, capable of generating at least one carrier wave driven by a time base or quartz frequency standard 20, preferably a thermocompensated time base. Transceiver unit 19 is provided with an antenna 21.

20 Advantageously, the communication system according to the invention can operate in accordance with a master/slave protocol. In such case, at the opening of communication between the two units, one defines which one will be the master and which one the slave. However, in the case of a system including a computer and a watch, the computer can be defined beforehand
25 as the master and the watch as the slave. Thus, one can provide a control unit 10 in the watch which is simpler and which thus allows the power consumption of the watch to be reduced. Master computer U2 will control the synchronisation of communication and will send to control unit 10 of slave watch U1 a block of data including a command indicating whether unit 10 has
30 to read or write data in memory 11 thereof. Control unit 10 has thus only to control the direction of transfer of data between transceiver 12 and the memory. Advantageously, control unit 10 is arranged so that when the user of the watch activates the communication mode by acting on selection
35 button 6, selection unit 14 scans sequentially all the carrier wave frequencies. If control unit 10 recognises its own identification code in a message carried by one of these carrier waves, it automatically locks transceiver 12 onto this carrier wave. If after a determined interval no message has been recognised,

the communication mode of the watch is automatically deactivated, in order to save energy.

Of course, those skilled in the art know that it is possible to operate each of units U1 and U2 as master and slave if so required simply by
5 adapting the programming of the protocol and/or the electric components such as the control units.

According to an important feature of the invention, time bases 1 and 20 have frequencies drifts which are at least approximately equal. In this way, the working frequencies of transceivers 12 and 19 will always have carrier
10 wave frequency values as close as possible to each other, which enables unit U1 always to find a unit U2, whatever the environment, in particular as regards the temperature.

For this purpose, the time bases can be identical so that the carrier frequencies generated from each time base will have a zero relative drift,
15 since there will be a mutual cancelling out of their drifts. However, it is also possible to have different time bases, but which have different thermo compensations adapted to the drifts so that a zero relative drift is again obtained between the two carrier frequencies.

If unit U2 is a PC, units 19 and 20 and antenna 21 are preferably
20 formed by a component able to be plugged in to one of the computer ports, as if it were an ordinary peripheral unit of the computer such as a printer or a data carrier read device (diskette or CD ROM for example). Preferably, this component conforms to the computer standard used (for example USB, Universal Standard Bus, Plug&Play or RS232). In these circumstances, this
25 component can be implemented in PC U2 in the same way as any other plug-in component using a driver programme 22 and an application programme 23 allowing the computer to control the generation of data flow according to the transmission protocol selected both for the transmission and reception of data.

30 According to another important feature of the invention, transceiver unit 19 of unit U2 is preferably arranged to be able first to detect the carrier waves already occupied by other communication systems situated within its power range, then to become locked onto a free carrier wave amongst those liable to be used by all the other systems situated in the same power range.

35 It will thus be noted that by using a communication system according to the invention, data can be exchanged between the two units U1 and U2

with a high level of reliability even if several similar systems are used at the same time in the same environment.

It is thus possible to transmit data either between a watch and a computer or between two watches, or between two computers. Thus, in a practical case, it is possible to transmit for example the diary of the present week or the names and addresses of people stored in a first unit to the second unit.

It has been noted that a communication system according to the invention is particularly well suited to the exchange of data between a watch worn on the wrist and a PC, the acquisition, modification and edition of data being able to be achieved using the watch while the wearer is away from his PC. Thus, for example, the user can note meetings or store other important data, then once he returns to his workplace, store this data in his PC. Conversely, data acquired in the computer, in the diary or even coming from another application, for example an Internet navigator, can be « transported » to the watch and consulted at any time while the user is away from his work station.

Of course, the invention is not limited to the embodiment described hereinbefore which was given solely by way of example. Thus, it is to be noted that several modifications and/or improvements can be made to the communication system according to the invention without departing from the scope thereof.

CLAIMS

1. System for communicating between a first unit (U1) and a second unit (U2), each of the units including one radio wave transceiver (12, 19) working with one common high frequency carrier wave and intended to carry the data to be sent to the other unit, and a time base (1, 20) from which said carrier wave is derived, said time bases (1, 20) have at least approximately equal frequency drifts, characterised in that
said radio wave transceiver (12, 19) of each of the units is designed to be able to generate a plurality of high frequency carrier waves, and in that,
each of the units includes selection means (14), among said plurality of high frequency carrier waves, of a common operating carrier wave, for emitting and receiving said data.
2. Communication system according to claim 1, characterised in that at least said second unit (U2) is arranged in a manner that its selection means select the frequency of a common operating carrier wave, and in that at least the first unit (U1) is arranged in a manner that its selection means scan the frequencies of said plurality of carrier waves in order to detect the common operating carrier wave selected by said second unit.
3. Communication system according to claim 2, characterised in that at least said second unit (U2) is also arranged to be able to detect the carrier waves occupied among said plurality of carrier waves, and in that said common operating carrier wave is free carrier wave.
4. Communication system according to claim 1, characterised in that said second unit (U2) is defined as master unit and is arranged in a manner that its selection means select the frequency of a common operating carrier wave, and in that said first unit (U1) is defined as slave unit and is arranged in a manner that its selection means scan the frequencies of said plurality of carrier waves in order to detect the common operating carrier wave selected by said master unit.
5. Communication system according to claim 4, characterised in that said master unit (U2) is also arranged to be able to detect the carrier waves occupied among said plurality of carrier waves, and in that said common operating carrier wave is free carrier wave.
6. Communication system according to any of claims 2 to 5, characterised in that at least said first unit (U1) further includes means (6) for activating selection means (14), this scan of selection means being deactivated if after a determined interval no message has been recognised.
7. Communication system according to any of claims 1 to 6, characterised in that said first unit (U1) is a watch whose time base is used both to provide the time-keeping frequency standard and for the derivation of the high frequency carrier wave or waves.

8. Communication system according to any of claims 1 to 7, characterised in that said second unit (U2) is a PC

9. Communication system according to any of claims 1 to 8, characterised in that said time bases (1, 19) are thermocompensated.

10. Communication system according to any of claims 1 to 9, characterised in that said data to be exchanged between the two units (U1, U2) is coded on said carrier wave by blocks of data, and in that said unit (U1) includes means (2, 10, 11) for recording or reading said data as a function of the type and size of said blocks.

11. Communication system according to claim 10, characterised in that said recording means include a memory organised by pages (11) in which said data blocks are recorded at the rate of one block per page.

12. Communication system according to claim 11, characterised in that said page memory (11) is a non-volatile type memory.

13. Communication system according to claim 8, characterised in that said PC (U2) includes an application programme (23) dedicated to processing said data for the purpose of the transmission or reception thereof by said transceiver and for the purpose of the exploitation thereof after reception or transmission by said transceiver and in that said application programme is in communication with said transceiver (19) via a driver programme (22).

14. Communication system according to claim 13, characterised in that said transceiver (19) and said time base (20) of said second unit (U2) are mounted in a component able to be plugged into a peripheral port of said second unit.