

ELECTRIC INSTALLATION ARRANGEMENT AND METHOD FOR THE OPERATION OF AN ELECTRIC INSTALLATION ARRANGEMENT

The invention relates to an electric installation arrangement for the operation of an electric consumer network and for the demand-oriented control of a safety level in the electric consumer network, comprising at least one first switch for disconnecting at least one first consumer and/or one partial network from the consumer network, at least one first sensor for detecting at least one first physical variable which is induced or can be influenced by a consumer network, and at least one first tripping unit which switches off the first switch within a first tripping time when a first tripping threshold value that can be predetermined is exceeded by a first measured variable proportional to the first variable, and thereby disconnects the consumer and/or partial network from the consumer network, with the electric installation arrangement comprising at least one first control and checking unit for the predeterminable and automatic adjustment of the first tripping threshold value and/or the first tripping time as a function of at least one control parameter.

Protective devices are provided in conventional electric installation arrangements for operating an electric consumer network, with which individual consumers or entire partial networks can be disconnected from the consumer network, e.g. when a safety-relevant parameter such as a fault current for example exceeds a limit value. These limit values depend on the employed switch and are not influenced by the actual conditions. This leads to the consequence that areas which are provided for the presence of humans and/or pets are adjusted to a high safety level, which therefore means low tripping thresholds, leading to unnecessary disconnections from the network and can thus lead to unavailable or non-operational systems although this disconnection from the network could have been avoided due to the absence of the occupants, and therefore there was no threat to life or assets.

US 2006/114630 A1 describes an electric distribution system which determines the presence of humans in the vicinity of live conductors by means of sensors and thus reduces the threshold values for deactivation of a network in such a case.

EP 1 075 068 A describes the disconnection of a partial network when no current flows in the partial network.

It is therefore the object of the invention to provide an electric installation arrangement of the kind mentioned above with which the mentioned disadvantages can be avoided, with which unnecessary disconnections from the network are prevented and a high availability of the network in combination with high protection of the occupants can be achieved.

This is achieved in accordance with the invention in such a way that the first control and checking unit comprises at least one clock, especially a timer, for the predeterminable, automatic and time-controlled adjustment of the first tripping threshold value and/or the first tripping time.

Unnecessary disconnections from the network can thus be prevented and a high availability of the network can be achieved. The safety level in an electric consumer network can thus be increased in a demand-oriented manner. As a result, a high safety level, and therefore low tripping thresholds and short tripping times, can be maintained in the presence of living beings worthy of protection such as especially humans and farm animals, whereas in the absence of such living beings worthy of protection only a low protective level is maintained which is adjusted to the requirements for the protection of buildings and assets, especially fire protection, as a result of which failures of the electric consumer network can be prevented as a result of unnecessary network disconnections for the protection of living beings worthy of protection that are not present. In this way, an especially simple kind of control or check of the electric installation arrangement can be achieved because the tripping threshold values and tripping times are adjusted or adapted automatically as a function of time by the control and checking unit. This can be applied advantageously in areas with regular times of presence and/or absence of the workers or occupants, since no further components are necessary apart from the simple time control.

In this connection it can be provided in a further development of the invention that the first control and checking unit comprises at least one switching logic unit, especially a microprocessor. Complex control and/or checking tasks can thus be assumed by the control and checking unit such as the adjustment of the first tripping threshold and/or the first tripping time as a result of further control parameters than merely the time. Further parameters such as the data of an alarm system can be used for adjusting the first tripping threshold and/or the first tripping time or can be linked logically together with the time as control parameters.

According to a further embodiment of the invention it can be provided that the first control and checking unit comprises at least one output and/or at least one input, especially a bus interface

and/or a radio interface. As a result, the control and checking unit can output data to a display device or can make the adjustment of the first tripping threshold and/or the first tripping time at the at least one first tripping unit, such that a first tripping threshold is output at an output of the control and checking unit to which the first tripping unit is connected.

According to yet another embodiment of the invention it can be provided that it comprises at least one first means for determining the presence of a first living being of a predetermined type, in a predetermined first ambient environment about the first consumer and/or the partial network, which is arranged for transmitting presence data to the first control and checking unit. As a result, the adjustment of the first tripping threshold and/or the first tripping time can be made depending on the presence of a first living being. In this way, such living beings, especially humans and/or farm animals or pets, can be protected by the installation arrangement in a special way without this special protection leading to increased failures of the installation arrangement in the absence of such first living beings.

One variant of the invention can be that the first means for determining the presence of a first living being of a predeterminable kind is arranged as a camera, infrared sensor, motion detector, vibration sensor, light barrier and/or microphone. This provides a simple and highly functional arrangement of the at least one first means for determining the presence of a first living being, which enables the determination of the presence of a first living being in a simple and precise way.

In a further embodiment of the invention it can be provided that the presence data are a control parameter for adjusting the first tripping threshold in a predeterminable and automatic way. In this way it is possible to perform the adjustment of the first tripping threshold and/or the first tripping time based on the presence of a first living being in the area around the consumer or the partial network, and therefore in a demand-oriented manner.

In a further development of the invention it can be provided that the first tripping threshold sent by the first control and checking unit to the tripping unit is lower upon detection of the first living being in the first ambient environment than in the case of a first ambient environment which is free from first living beings. This provides full protection for a first living being from injury by electric current of the electric consumer network by the installation arrangement.

According to a further development of the invention it can be provided that the first tripping time sent by the first control and checking unit to the tripping unit is lower upon detection of the first living being in the first ambient environment than in the case of a first ambient environment which is free from first living beings. This helps to achieve effective protection of the unit, with wrong tripping events and thus dead times of the installation as a result of low tripping thresholds being preventable.

According to a further embodiment of the invention, in which the first sensor is arranged as a current sensor, voltage sensor, residual current sensor, temperature sensor, pollution gas sensor and/or smoke sensor, it can be provided that the first sensor comprises at least one sensor output, especially an analogue output and/or a digital output, and is arranged for transmitting the first measured variable to the first control and checking unit and/or the first tripping unit. This enables a transmission of the first measured variable to the control and checking unit or the evaluation unit. In this way, the sensor can be arranged separately from the switching device, thus offering the possibility in the case of extensive partial networks to detect a comprehensive overall situation of the partial network.

In this connection it can be provided in a further development of the invention that the first tripping unit comprises at least one first comparator circuit for comparing the first measured variable with the first tripping threshold value. This represents an especially simple apparatus for comparing the first measured variable with the first tripping threshold.

Another possible embodiment can be that the first tripping unit comprises at least one analytical unit for analyzing the first measured variable in the time range and/or in the image range, especially comprising a microprocessor, microcontroller and/or a digital signal processor, and with a first tripping threshold value and/or a first tripping time being provided for a first time and/or image range, and a second tripping threshold value and/or a second tripping time being provided for a second time and/or image range. As a result, the first measured variable can be evaluated not only concerning an absolute value such as concerning the apex value or the effective value and be compared with a tripping threshold value, but it can also be regarded as a signal that is changeable in respect of time and frequency and can be regarded accordingly concerning its behavior in the time and/or image range such as the frequency range, with different tripping threshold values being provided for different ranges. The security in the electric installation arrangement can thus be increased even further because different or special evaluation criteria can be applied for different types of faults and residual currents.

It can be provided in a further development of the invention that the first sensor, the first tripping unit and the first switch are arranged integrally in the form of a first circuit breaker, especially a miniature circuit breaker, a residual-current circuit breaker, a differential-current circuit breaker, combination circuit breaker and/or power circuit breaker. This enables an especially simple and compact arrangement of the present invention.

In this context it can be provided for in a further development of the invention that a first switch-on device which can be controlled by the first control and checking unit is operatively connected with the first switch. Its automatic activation is also possible after the deactivation of a consumer.

The invention further relates to a method for operating an electric installation arrangement, especially one in accordance with the invention, with an electric consumer network, comprising at least one first switch for disconnecting at least one first consumer and/or a partial network from the consumer network, at least one first sensor for detecting at least one first physical variable which is induced or can be influenced by the consumer network, and at least one first tripping unit, with the first switch being switched off within a first tripping time by the tripping unit upon exceeding a predeterminable first tripping threshold value by a first measured variable which is proportional to the first variable, and the consumer and/or the partial network is thus disconnected from the consumer network, with the first tripping threshold value and/or the first tripping time being adjusted in a predeterminable and automatic manner by at least one first control and checking unit as a function of at least one control parameter.

It is the object of the invention to provide a method of the kind mentioned above with which unnecessary network disconnections are prevented and high network availability can be achieved with simultaneous high protection of the occupants.

This is achieved in accordance with the invention in that the first tripping threshold value and/or the first tripping time can be adjusted in a temporally predetermined and automatic way.

As a result, unnecessary network disconnections can be prevented and high network availability can be achieved. As a result, the security level in an electric consumer network can be controlled in a demand-oriented manner. In this way, a high safety level and therefore low tripping thresholds and short tripping times can be maintained in the presence of living beings worthy of

protection such as humans or farm animals, whereas in the absence of such living beings only a low protective level is maintained which is adjusted for example to the requirements for protection of buildings and assets, especially fire protection, thus preventing failures of the electric consumer network for reasons of unnecessary network disconnections for the protection of living beings worthy of protection who are not present. As a result, an especially simple type of control and checking of the electric installation arrangement can be achieved, because the tripping threshold values and tripping times are adjusted automatically by the control and checking unit as a function of time. This can be applied especially in areas with regular times of presence and/or absence of the workers or occupants, since no further components are necessary apart from the simple time control.

According to yet another embodiment of the invention it can be provided that the presence of a first living being of a predeterminable type is detected in a predeterminable first ambient environment about the first consumer and/or the partial network. As a result, the tripping threshold values and tripping times can be controlled depending on the actual presence of first living beings.

One variant of the invention can be that the first tripping threshold and/or the first tripping time are adjusted depending on the presence of the first living being in the first ambient environment. As a result, the respective protection which is defined by the respective tripping threshold values and tripping times can be linked to the presence of a first living being. A type of safety zone around the first living being can be formed in this way which will "co-move" with the same, and therefore the respective low threshold values and tripping times will "move" together with a first living being moving through a complex electric installation arrangement and will "envelop" the same in the manner of an invisible protective cloak.

In a further embodiment of the invention it can be provided that upon detection of the first living being in the first ambient environment, a first tripping threshold value and/or a first tripping time is transmitted to the tripping unit which is/are lower than in the case of an ambient environment being free from a first living being. This provides full protection of a first living being from injury by electric current of the electric consumer network through the installation arrangement. This helps achieve effective protection of the installation, with spurious tripping and thus dead times of the installation as a result of too low tripping threshold values being prevented.

Fig. 2 shows a block diagram of a second embodiment of an installation arrangement according to the invention;

Fig. 3 shows a block diagram of a third embodiment of an installation arrangement according to the invention;

Fig. 4 shows a block diagram of a fourth embodiment of an installation arrangement according to the invention;

Fig. 5 shows a block diagram of a fifth embodiment of an installation arrangement according to the invention;

Fig. 6 shows a block diagram of a sixth embodiment of an installation arrangement according to the invention;

Fig. 7 shows a block diagram of a seventh embodiment of an installation arrangement according to the invention;

Figs. 1 to 7 show different embodiments of an electric installation arrangement 1 for operating an electric consumer network 2, comprising at least one first switch 3 for disconnecting at least one first consumer 4 from a consumer network, at least one first sensor 5 for detecting at least one physical variable which is induced or can be influenced by the consumer network 2, and at least one first tripping unit 6 which switches off the first switch 3 within a first tripping time upon exceeding a predeterminable first tripping threshold value by a first measured variable which is proportional to the first variable, and thus disconnects the consumer 4 from the consumer network 2, with the electric installation arrangement 1 having at least one first control and checking unit 7 for the predeterminable and automatic adjustment of the first tripping threshold value and/or the first tripping time as a function of at least one control parameter.

As a result, unnecessary disconnections of consumers 4 or partial networks 30 can be prevented and high network availability can be achieved. In this way, the security level in an electric consumer network 2 can be controlled in a manner as required. As a result, a high safety level, and therefore low tripping thresholds and short tripping times, can be maintained in the presence of living beings worthy of protection such as especially humans and farm animals, whereas in the absence of such living beings worthy of protection only a low protective level is maintained

which is adjusted to the requirements for the protection of buildings and assets, especially fire protection, as a result of which failures of the electric consumer network can be prevented as a result of unnecessary network disconnections for the protection of living beings worthy of protection that are not present.

Installation arrangements 1 in accordance with the invention are provided for the operation of any kind of an electric consumer network 2. They are especially provided for electric end consumer networks 2 or building supply networks which are operated in Europe at a voltage of 230V/400V for example. The short designation network 2 is used hereinafter for the consumer network 2. As a result of installation arrangements 1 in accordance with the invention, consumers 4 can be disconnected from the network 2 or entire partial networks 30, which are therefore partial sections of a network 2. The partial network 30 is designated as the partial section of network 2 which can be deactivated by the first switch 3 and is thus protected by the first switch 3, as illustrated in Figs. 1 through 7. If not designated otherwise, the statements made below in connection with the disconnection of the first consumer 4 from the network 2 can also relate to the disconnection of a partial network 30 from network 2. This can be especially provided for the protection of first living beings as well as installations from the effects of electric current. Especially humans, pets and farm animals are designated as so-called first or protected living beings.

Installation arrangements 1 in accordance with the invention comprise at least a first switch 3 which connects at least a first consumer 4 or a partial network 30 with the network 2, or is provided to disconnect the same from network 2. The first switch 3 may concern any type of switch 3 which is capable of switching the expected currents in the disconnection of a consumer 4 from the network 2, such as also in the case of a short circuit. It can especially be provided, and as will be explained below in closer detail, that the first switch 3 is arranged as a circuit breaker 13. At least one first tripping unit 6 is operatively connected with the first switch 3 and the first switch 3 comprises such a tripping unit 6, as a result of which the first switch 3 can be switched off in an automatically controlled way. The first tripping unit 6 can be arranged as an electromagnetic apparatus which deactivates the first switch 3 in an electrically controlled way. An installation arrangement 1 according to the invention further comprises at least a first sensor 5 for detecting at least one first physical variable which is induced or can be influenced by the network 2 such as a voltage, a current, especially a residual current, and/or a temperature. The first sensor 5 is therefore especially arranged as a current sensor, summation current transformer and/or thermocouple. A pollution gas sensor can also be provided. It is provided that the first

measured variable determined by the sensor 5 is transmitted to the first tripping unit 6. This can be provided both in a wire-conducted or wireless manner such as by means of light or radio, and the first sensor 5 preferably comprises at least one sensor output 12, especially an analogue output and/or a digital output, and is arranged for transmitting the first measured variable to the first control and checking unit 7 and/or the first tripping unit 6. The first tripping unit 6 comprises means in order to compare the measured value with a predeterminable first tripping threshold value and to deactivate the first switch 3 within a first tripping time upon exceeding the first tripping threshold value by the first measured variable and thus disconnecting the consumer 4 from the network 2 or deactivating the partial network 30 per se. It is especially preferably provided for this purpose that the first tripping unit 6 comprises at least a first comparator circuit for comparing the first measured variable with the first tripping threshold value, with the first tripping threshold value being formed by a predeterminable voltage level. It can also be provided however that the first tripping unit 6 comprises at least one analytical unit for analyzing the first measured variable in the time range and/or in the image range, especially comprising a microprocessor, microcontroller and/or digital signal process, and with a first tripping threshold value and/or a first tripping time being provided for a first time and/or image range, and a second tripping threshold value and/or a second tripping time being provided for a second time and/or image range. The time progression of the first measured variable can be considered, which means whether the same rises or drops, or comprises a predeterminable third tripping threshold value over a predeterminable period of time. It can also be provided that the first measured variable is regarded as a frequency-dependent signal and is transformed from a time range to an image range, e.g. in the form of an FFT, a wavelet transformation or a Laplace transformation, through which the first measured variable can be analyzed further and, as considered above, different time and/or image ranges can be provided for different tripping thresholds and tripping times. It is thus known that the effect of electric current on humans is strongly dependent upon the frequency, and therefore for the protection of humans from injury by electric current different frequency ranges of a measured residual current are compared in the form of the first measured variable preferably with different threshold values.

As shown in Figs. 1 to 4, it can be provided that the first sensor 5, the first tripping unit 6 and/or the first switch 3 are arranged as separate elements and are arranged or cooperate in a network. This enables disconnecting the first switch 3 from the first sensor 5, and therefore to record the first measured variable in an area other than where the first switch 3 is arranged. This may be advantageous especially in the case of several sensors 5, which thus offers a more comprehensive picture of the actual physical conditions in the partial network 30 which can be

switched off by the first switch 3. It can also be provided that at least two of the aforementioned elements are arranged in a common housing and jointly use individual modules for example, such that externally only one interface is provided for example and a single bus controller divides the received data among the elements. It can be provided especially preferably that the first sensor 5, the first tripping unit 6 and the first switch 3 are arranged integrally in the form of a circuit breaker 13, especially a miniature circuit breaker, a residual-current circuit breaker, a differential-current circuit breaker, a combination circuit breaker and/or a power circuit breaker, thus realizing an especially simple and compact arrangement of the circuit.

It is provided in accordance with the invention that the electric installation arrangement 1 comprises at least a first control and checking unit 7 for adjusting the first tripping threshold value and/or the first tripping time in a predeterminable and automatic manner as a function of at least one control parameter. The control and checking unit 7 can be used to adjust the at least one first tripping threshold value and the at least one first tripping time to the local and temporary conditions. The control and checking unit 7 can be provided for adjusting the tripping threshold values and tripping times of all tripping units 6 operatively connected with said control and checking unit 7. If not necessary for distinguishing purposes, merely the first tripping threshold value and the first tripping time will be used subsequently and consistently to the claims, with this not representing any limitation to merely one tripping threshold value, one tripping time or one tripping unit 6.

It is preferably provided that the first control and checking unit 7 comprises at least one switching logic, especially a microprocessor, and at least one output 8 and/or at least one input 9, especially a bus interface 27 and/or a radio interface 26, for communication with the further elements of the electric installation arrangement, with the output 8 or input 9 being arranged both as a digital and/or analogue output or input, or any kind of a bus interface 27 can be provided. It can be provided in an especially simple embodiment of the present invention that the at least one output 8 is arranged as an analogue output, at which directly the first tripping threshold value is output in form of an electric voltage, and that the output 8 is directly connected to an input of a comparator circuit associated with the first tripping unit 6. It can also be provided that a digitally encoded first tripping threshold value and/or a digitally encoded first tripping time is sent to the first tripping unit 6 by means of the output 8 and/or the bus interface and/or the radio interface 27, 26, which especially offers the advantage of higher immunity from interference as a result of applicable source and/or channel encoding, and additionally allows the simultaneous

transmission of several tripping threshold values and tripping times, which is especially advantageous in evaluating a first measured variable in the image range.

In the case of electric installation arrangements 1 which are arranged in an especially simple way, as are shown in Figs. 1 to 3 for example, it can preferably be provided that the first control and checking unit 7 controls the first tripping threshold and/or the first tripping time depending on time. This is especially advantageous in electric installation systems 1 which are arranged in areas which are subject to strict temporary access restrictions such as time-controlled safe systems or public buildings such as schools, subway areas or museums. It is therefore provided in such embodiments that the first control and checking unit 7 comprises at least one clock, especially a timer, for adjusting the first tripping threshold in a predeterminable, automatic and time-controlled way.

Fig. 1 shows a basic arrangement of an electric installation arrangement 1 in accordance with the invention, with the first sensor 5 being arranged as a residual-current sensor for example. As in all embodiments shown in Figs. 1 through 7, the first consumer 4 can be not only an individual first consumer 4. Rather, this can concern a predeterminable number of consumers 4.

Furthermore, the at least one partial network 30 is protected by the electric installation arrangement 1 in accordance with the invention. Further consumers 4 can be connected to the partial network 30, especially by means of known plug-in connections. The embodiment according to Fig. 2 additionally comprises a second sensor 15 which is arranged directly on the first consumer 4 and records physical variables which are induced or influenced directly by the consumer network 2. This can be a temperature sensor in the area of the connection terminals of a consumer 4, especially a high-power consumer such as a furnace or a turning lathe, because lack of contact pressure in the area of the terminals leads to an excessive heating of this area with the concomitant likelihood of fires, so that additional monitoring of this area will lead to a further increase in security. Fig. 3 shows an embodiment which in addition to the features of the embodiment according to Fig. 2 provides a status report of the first switching device 3 to the control and checking unit 7 by means of a respective connection, with a first switch-on device 14 which is controllable by the first control and checking unit 7 being operatively connected with the first switch 3, so that the first switching device 3 can also be switched on again after being switched off. A display 16 and an input apparatus 17 is additionally connected with the control and checking unit 7, so that direct control commands can be sent to the control and checking unit 7, with said connection being provided both in a wire-bound as well as wireless manner.

Especially in areas which are frequented by humans and/or animals worth protecting on an irregular time basis it is advantageous when the electric installation system 1 controls the first tripping threshold value and/or the first tripping time depending on the presence of first living beings in a predeterminable first ambient environment about the first consumer 4 or the partial network 30. This allows adjusting the first tripping threshold value and/or the first tripping time in a purposeful manner to humans or other living beings worth protecting who are present, or also in a purposeful manner to local conditions. It can thus be provided for example that the first tripping threshold value of a residual-current circuit breaker is purely adjusted to installations or the protection of buildings when the area to be protected is vacated, which area may comprise a room or a building but also only one consumer for example such as a single machine or a furnace, which in many cases is equal to fire protection. That is why it can be provided in the cases as described above that at a mains voltage of 230 V a first tripping threshold is provided at a residual current of $I_N = 300 \text{ mA}$. Said first tripping threshold value can be set in the presence of first living beings to $I_N = 30 \text{ mA}$ or less for example if the first living beings who are present are children for example. This ensures full protection for first living beings when they are present, whereas installations are not switched off during their absence by unnecessary false tripping, thus causing long dead times with the concomitant costs.

For controlling or adjusting the first tripping threshold value or the first tripping time by the control and checking unit 7, it can therefore preferably be provided that it comprises at least a first means 10 for determining the presence of a first living being of a kind that is predeterminable, in a predeterminable first ambient environment about the first consumer 4. Said first ambient environment, as already explained above, can also extend to a complete partial network 30 which can supply or cover a room or a building, or can also relate only to the direct and close vicinity around a consumer 4. The at least first means 10 is further arranged for transmitting presence data to the first control and checking unit 7, with the presence data being a control parameter for adjusting the first tripping threshold value in a predeterminable and automatic way. The first means 10 therefore comprise at least one output or a bus interface for transmitting presence data to the control and checking unit 7.

The first means 10 for determining the presence of a first living being of a predeterminable type can be arranged as any kind of sensor which responds to the presence of a first living being of a predeterminable kind or indicates a reproducible change. It is preferably provided that the first means 10 is arranged as a camera 11, an infrared sensor, motion detector, vibration sensor, light barrier and/or microphone in order to determine the presence of a first living being of a

predeterminable kind. As a result, at least the presence of a living being of a predeterminable kind can be detected in the first ambient environment, and accordingly the tripping threshold values and the tripping times can be adjusted by the control and checking unit 7 with respect to the highest possible system availability or network availability in conjunction with highest possible protection for the first living beings. The first means 10 and/or the control and checking unit 7 can further be arranged in such a way that it recognizes automotive and/or automatically reacting machines such as robots that may be present in the first ambient environment as such and does not confuse them for first living beings. This can be performed for example by special analysis of the presence data or the data supplied by the first means 10, or by a type of transponder on the robots. Figs. 4 and 5 show simple embodiments of such electric installation arrangements 1, with the embodiment according to Fig. 4 comprising a first means 10 in the form of a camera 11, and in the embodiment according to Fig. 5, as already described above, the first tripping unit 6, the first switch 3 and the first sensor 5 are arranged integrally as a circuit breaker 13. Fig. 6 shows a schematic view of an electric installation unit 1 with four circuit breakers 13, to each of which at least one consumer 4 is connected. As is shown, the entire following partial network 30 is protected by the circuit breaker 13.

By suitable choice of the first means 10 and evaluation of the data supplied by the same, it is also possible to perform a determination of individuals by the first means 10 or the control and checking unit 7. As a result, it is possible not only to detect a first living being by recording the footfall sound, but also whether respective comparative data have been stored. It can thus be detected for example whether a child approaches a dangerous consumer 4 such as a stove 28 and it is responded accordingly by lowering the tripping threshold values for this consumer 4, 28. It can generally be provided that the first tripping threshold value sent by the first control and checking unit 7 to the tripping unit 6 is lower upon detection of the first living being in the first ambient environment than in the case of an ambient environment which is free from first living beings, and/or that the first tripping time sent by the first control and checking unit 7 to the tripping unit 6 is lower upon detection of the first living being in the first ambient environment than in the case of a first ambient environment which is free from first living beings. Therefore, a first living being which moves through a building or an apartment as is shown schematically in Fig. 7 is enclosed by a type of invisible protective cloak which is linked to the presence of the living being in a room or close to a consumer 4. Fig. 7 shows a schematic view of an apartment with a hall 19, a living room 20, a kitchen 21, a children's room 22, a bathroom 23 and a bedroom 24, with each room or each space 19, 20, 21, 22, 23, 24 being protected by a separate circuit breaker 13. No consumer 4 is shown in the individual rooms 19, 20, 21, 22, 23, 24 apart

from kitchen 21, but they can be connected in the known manner to the respective partial network 30 and socket outlets (not shown). The stove 28 protected by means of a separate circuit breaker 13 is shown in kitchen 21. Each room 19, 20, 21, 22, 23, 24 further comprises a first means 10 for determining the presence of a living being of a predeterminable kind in the room 19, 20, 21, 22, 23, 24. In addition, a fire alarm box 18 such as a smoke sensor is arranged in each room 19, 20, 21, 22, 23, 24. All these components are connected by means of bus systems 29 with the control and checking unit 7 which additionally comprises a radio interface 26 and a connection to the internet 25, thus enabling a remote control of the installation arrangement 1 or a remote status query of the same. It can also be provided to include an alarm system in the electric installation arrangement 1 or that the first means 10 for determining the presence of a living being of a predeterminable kind in the rooms 19, 20, 21, 22, 23, 24 also send the presence data to an alarm system.

It is provided in the operation of an electric installation arrangement 1 in accordance with the invention, comprising an electric consumer network 2 with at least a first switch 3 for disconnecting at least one first consumer and/or one partial network 30 from the consumer network 2, at least one first sensor 5 for detecting at least one first physical variable which is induced or can be influenced by the consumer network 2, and at least one first tripping unit 6, with the first switch 2 being switched off within a first tripping time by the tripping unit upon exceeding a predeterminable first tripping threshold value by a first measured variable which is proportional to the first value, and the consumer 4 and/or the partial network 40 is disconnected from the consumer network 2, that the first tripping threshold value and/or the first tripping time are adjusted in a predeterminable and automatic manner as a function of at least one control parameter by at least a first control and checking unit 7.

In addition to the possibility to adjust the first tripping threshold value and/or the first tripping time in a predeterminable and automatic manner, it is especially provided that the electric installation arrangement 1 detects the presence of a first living being of a predeterminable kind in a predeterminable first ambient environment about the first consumer 4 or the partial network 30, therefore in one of the rooms 19, 20, 21, 22, 23, 24 according to Fig. 7, and that the first tripping threshold value and/or the first tripping time are adjusted depending on the presence of the first living being in the first ambient environment. It is especially provided that upon detecting the first living being in the first ambient environment a first tripping threshold value and/or a first tripping time is sent to the tripping unit 6 which is lower than in the case of an ambient environment which is free from the first living beings, such that the tripping threshold values are

lower in the case of a presence of a first living being in the bathroom 23 than when no living being is present in bathroom 23. It can be provided in this respect, if the electric installation arrangement 1 comprises the respective first means 10 in order to detect not only the mere presence of the first living being in an ambient environment but in addition to determine the living being from a predetermined quantity of known living beings, that in the presence of children for example lower tripping threshold values or tripping times are predetermined by the control and checking unit 7 than in the case of grown-ups who should have a higher resistance against the effect of electric current. Such an evaluation could also occur as a result of the mass of a first living being, such that in the case of living beings of lighter weight lower tripping threshold values or tripping times are applied than in the case of living beings of higher weight.

Further embodiments in accordance with the invention comprise merely a part of the described features, with any combination of features being provided, especially also of different described embodiments.

CLAIMS:

1. An electric installation arrangement (1) for the operation of an electric consumer network (2) and for demand-oriented control of a safety level in the electric consumer network, comprising at least one first switch (3) for disconnecting at least one first consumer (4) and/or one partial network (30) from the consumer network (2), at least one first sensor (5) for detecting at least one first physical variable which is induced or can be influenced by a consumer network (2), and at least one first tripping unit (6) which switches off the first switch (3) within a first tripping time when a first tripping threshold value that can be predetermined is exceeded by a first measured variable proportional to the first variable, and thereby disconnects the consumer (4) and/or partial network (30) from the consumer network (2), with the electric installation arrangement (1) comprising at least one first control and checking unit (7) for the predeterminable and automatic adjustment of the first tripping threshold value and/or the first tripping time as a function of a least one control parameter, characterized in that the first control and checking unit (7) comprises at least one clock, especially a timer, for adjusting the first tripping threshold and/or first tripping time in a predeterminable, automatic and time-controlled manner.
2. An electric installation arrangement (1) according to claim 1, characterized in that the first control and checking unit (7) comprises at least one switching logic unit, especially a microprocessor.
3. An electric installation arrangement (1) according to one of the claims 1 or 2, characterized in that the first control and checking unit (7) comprises at least one output (8) and/or at least one input (9), especially a bus interface (27) and/or a radio interface (26).
4. An electric installation arrangement (1) according to one of the claims 1 to 3, characterized in that it comprises at least one first means (10) for determining the presence of a first living being of a predeterminable kind, in a predetermined first ambient environment about the first consumer (4) and/or the partial network (30), which is arranged for transmitting presence data to the first control and checking unit (7).
5. An electric installation arrangement (1) according to claim 4, characterized in that the first means (10) for determining the presence of a first living being of a predeterminable

kind is arranged as a camera (11), infrared sensor, motion detector, vibration sensor, light barrier and/or microphone.

6. An electric installation arrangement (1) according to claim 4 or 5, characterized in that the presence data are a control parameter for adjusting the first tripping threshold value in a predeterminable and automatic way.
7. An electric installation arrangement (1) according to one of the claims 4 to 6, characterized in that the first tripping threshold value sent by the first control and checking unit (7) to the tripping unit (6) is lower upon detection of the first living being in the first ambient environment than in the case of a first ambient environment which is free from first living beings.
8. An electric installation arrangement (1) according to one of the claims 4 to 7, characterized in that the first tripping time sent by the first control and checking unit (7) to the tripping unit (6) is lower upon detection of the first living being in the first ambient environment than in the case of a first ambient environment which is free from first living beings.
9. An electric installation arrangement (1) according to one of the claims 1 to 8, with the first sensor (5) being arranged as a current sensor, voltage sensor, residual current sensor, temperature sensor, pollution gas sensor and/or smoke sensor, characterized in that the first sensor (5) comprises at least one sensor output (12), especially an analogue output and/or a digital output, and is arranged for transmitting the first measured variable to the first control and checking unit (7) and/or the first tripping unit (6).
10. An electric installation arrangement (1) according to one of the claims 1 to 9, characterized in that the first tripping unit (6) comprises at least one first comparator circuit for comparing the first measured variable with the first tripping threshold value.
11. An electric installation arrangement (1) according to one of the claims 1 to 10, characterized in that the first tripping unit (6) comprises at least one analytical unit for analyzing the first measured variable in the time range and/or in the image range, especially comprising a microprocessor, microcontroller and/or a digital signal processor, and with a first tripping threshold value and/or a first tripping time being provided for a

first time and/or image range, and a second tripping threshold value and/or a second tripping time being provided for a second time and/or image range.

12. An electric installation arrangement (1) according to one of the claims 1 to 11, characterized in that the first sensor (5), the first tripping unit (6) and the first switch (3) are arranged integrally in the form of a first circuit breaker (13), especially a miniature circuit breaker, a residual-current circuit breaker, a differential-current circuit breaker, combination circuit breaker and/or power circuit breaker.
13. An electric installation arrangement (1) according to one of the claims 1 to 12, characterized in that a first switch-on device (14) which can be controlled by the first control and checking unit (7) is operatively connected with the first switch (3).
14. A method for operating an electric installation arrangement (1), especially according to one of the claims 1 to 13, comprising an electric consumer network (2), at least one first switch (3) for disconnecting at least one first consumer (4) and/or one partial network (30) from the consumer network (2), at least one first sensor (5) for detecting at least one first physical variable which is induced or can be influenced by the consumer network (2), and at least one first tripping unit (6), with the first switch (3) being switched off within a first tripping time by the tripping unit upon exceeding a predeterminable first tripping threshold value by a first measured variable which is proportional to the first variable, and the consumer (4) and/or the partial network (30) is thus disconnected from the consumer network (2), with the first tripping threshold value and/or the first tripping time being adjusted in a predetermined and automatic way by at least one first control and checking unit (7) as a function of at least one control parameter, characterized in that the first tripping threshold value and/or the first tripping time can be adjusted automatically and in a manner predetermined with respect of time.
15. A method according to claim 14, characterized in that the presence of a first living being of a predeterminable kind is detected in a predeterminable first ambient environment about the first consumer (4) and/or the partial network (30).
16. A method according to claim 15, characterized in that the first tripping threshold value and/or the first tripping time are adjusted depending on the presence of the first living

being in the first ambient environment.

17. A method according to claim 15 or 16, characterized in that upon detection of the first living being in the first ambient environment, a first tripping threshold value and/or a first tripping time is/are transmitted to the tripping unit which is/are lower than in the case of an ambient environment that is free from a first living being.