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(54) **Apparatus for supervising hot plates**

(57) An apparatus for supervising hot plates (1) of a stove (2) with regard to overheating has at least two sensor members (5, 6) directed towards different areas of the stove for indirectly sensing temperatures of different hot plates. A device (10) is configured to compare temperature information so obtained associated with each particular hot plate area with data relating to that area so as to determine whether a condition of overheating exists in any of the hot plate areas and control a breaking member (11) to break the energy supply to the stove upon determination of existence of an overheating condition in any of the hot plate areas.

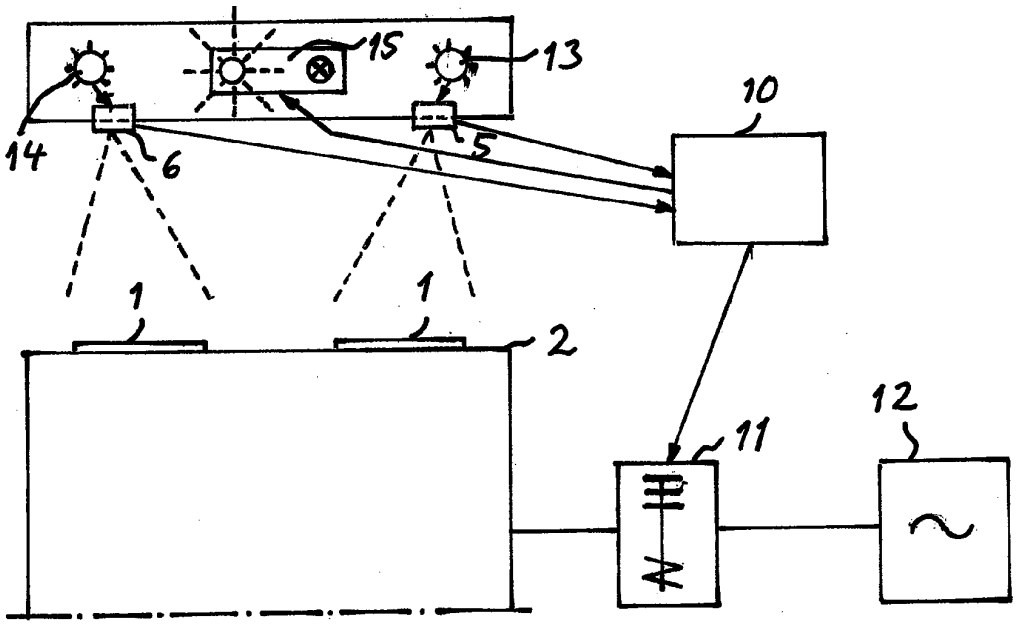

Fig 4

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Description

TECHNICAL FIELD OF THE INVENTION AND BACKGROUND ART

[0001] The present invention relates to an apparatus for supervising hot plates of a stove with regard to overheating, said apparatus comprising a sensor arrangement configured to be arranged in a region above said stove and indirectly sense temperatures of said hot plates, a device configured to receive and evaluate information from said sensor arrangement so as to determined whether a condition of overheating exists, and a member configured to be controlled by said device to break energy supply to the stove upon determination of existence of a said overheating condition.

[0002] Investigations illustrate that a great number of accidents occurs by ignition of overheated objects. Thus, in the order of 30% of all fires in homes are for instance caused by stoves, i.e. by the user having forgotten to turn off the stove. Even in cases where such negligence does not involve fire, other economical damage, namely destroyed hot plates and/or cooking-vessels, occurs due to overheating. It should be pointed out that a fire hazard may well be at hand without the hot plates being excessively heated. In cooking ingredients are often used which may be ignited at relatively low temperatures. It is therefore desirable to be able to detect ignition of such ingredients.

[0003] Accordingly, an apparatus of the type defined in the introduction functioning properly may save large economical values.

[0004] It is pointed out that all types of stoves are concerned, and the hot plates may be formed by areas of a plate which may be individually heated, or real plates as in old fashioned stoves. Known apparatuses of the type defined in the introduction do occasionally break the energy supply to the stove when this is not necessary, and which is more serious, such breaking is not carried out or unnecessarily delayed when a dangerous situation really occurs. For example cooking on four such hot plates at a comparatively low temperature may by such apparatuses not be discriminated with respect to a much more dangerous case in which a small hot plate is excessively hot.

SUMMARY OF THE INVENTION

[0005] The object of the present invention is to provide an apparatus of the type defined in the introduction having an improved functionality with respect to such apparatuses already known, especially reliability, i.e. breaking said energy supply when it is really necessary, but refrain from such breaking when there is no reason therefor.

[0006] This object is according to the invention obtained by providing such an apparatus, in which said sensor arrangement has at least two sensor members configured to be directed towards different areas of said stove for indirectly sensing temperatures of different said hot plates, and said device is configured to compare temperature information so obtained associated with each said particular hot plate area with data relating to that area so as to determine whether a condition of overheating exists in any of said hot plate areas and control said breaking member to break said energy supply to the stove upon determination of existence of an overheating condition in any of said hot plate areas.

[0007] By sensing the temperature of different areas of a stove separately the existence of an overheating in any such area may be reliably determined even if said hot plates of another such area are cold, i.e. not in use. Furthermore, would all hot plates be in normal use resulting in a considerable amount of heat emitted from the hot plate region of the stove, this will not trigger a breaking of the energy supply to the stove, since information from each sensor member will then reveal that no overheating condition exists in the respective area sensed by that sensor member, so that the energy supply to the stove is not unnecessarily broken.

[0008] According to an embodiment of the invention said sensor arrangement has as many sensor members as hot plates to be supervised by said apparatus, such as four. By individually sensing each hot plate with respect to the temperature thereof the reliability of the operation of the apparatus will be high avoiding false determinations made by said device.

[0009] According to another embodiment of the invention said sensor arrangement has at least one sensor having a plurality of sensor members in the form of sensing zones configured to be directed towards different said hot plate areas of a said stove. Such sensors having multiple zones may be built in in one single sensor chip, and one such sensor may then have as many zones as the number of hot plates of a stove to be supervised, or the apparatus may for instance have two sensors each having two sensing zones so as to jointly individually sensing the temperature of four hot plates.

[0010] According to another embodiment of the invention the sensor arrangement has sensor members in the form of a plurality of separate sensors.

[0011] According to another embodiment of the invention said sensor arrangement comprises sensor members configured to be distributed in different locations above a said stove. The sensor members are preferably arranged so as to efficiently sense the respective hot plate area of the stove.

[0012] According to another embodiment of the invention said sensor arrangement comprises sensor members configured to be arranged on a hood or frame of a kitchen fan, which constitutes a preferred location of the sensor members. According to another embodiment said sensor arrangement comprises at least one sensor member configured to be arranged on or in the region of a ceiling of a room and/or connected to said ceiling. Such a sensor member may then, besides sensing the temperature of one or more hot plates, also detect if a person

is present in the region close to the stove, so that the apparatus may use such information for the control of the breaking member. It is then well possible that all sensor members of the arrangement are configured to be arranged in the region of a said ceiling.

[0013] According to another embodiment of the invention at least two of the sensor members of the sensor arrangement have different sensitivity, which for the individual sensor member depends upon the size of the hot plate(-s) in the hot plate area towards which it is to be directed. This means that the different sensor members may distinguish cooking from frying while having a sensor member with a lower sensitivity for a larger hot plate for frying.

[0014] According to another embodiment of the invention the apparatus comprises means configured to allow adjustment of the sensitivity of at least one, such as all, of the sensor members of said sensor arrangement. This means that the sensitivity for said at least one sensor member may be adjusted to the type of hot plate to be sensed thereby and the height above that hot plate on which it is intended to be arranged. Furthermore, such a sensor member may in some cases not be arranged in the most preferred location with respect to the hot plates to be sensed, and such a non-alignment of a sensor member may then be compensated by adjusting the sensitivity thereof accordingly. This means that the apparatus with sensor arrangement may be adapted to different types of stoves combined with different kitchen fans or the like for location of the sensor members.

[0015] According to another embodiment of the invention the apparatus comprises alarm means, and said device is configured to control said alarm means to start to deliver an alarm upon exceeding a first temperature level of the temperature sensed by any of said sensor members being lower than a second temperature level which has to be exceeded for making determination of an existence of an overheating condition possible. Thus, the attention of a person present in the vicinity of the stove may be attracted to the fact that an overheating condition is approaching, so that this person may take relevant measures for avoiding the occurrence of such a condition and that the energy supply to the stove is unnecessarily interrupted.

[0016] According to another embodiment of the invention said first temperature level is 220-280°C, such 250-270°C, and said second temperature level is 300-350°C, such 310-330°C. These are suitable temperature levels for delivering an alarm and for breaking the energy supply to the stove, respectively.

[0017] According to another embodiment of the invention the apparatus comprises alarm means, and said device is configured to control said alarm means to deliver an alarm indicating that a temperature level to be exceeded for existence of an overheating condition has been sensed by any of said sensor members and determine that an overheating condition exists after a predetermined period of time, such as 10 seconds, after said alarm has been delivered. This means that a said person may take actions for avoiding an approaching breaking of the energy supply to the stove, and this alarm means do preferably emit a strong audio signal or audio signal and light signal for attracting the attention of said person.

[0018] According to another embodiment of the invention said device is configured to calculate the temperature gradient for the hot plate area sensed by each said sensor member. This makes it possible to detect whether a person cooking and/or frying is located at the stove, since certain temperature gradients may only occur when a person takes action as taking a frying pan away from a hot plate turned on.

[0019] According to another embodiment of the invention said device is configured to refrain from determination of an existence of an overheating condition of a hot plate area sensed by a sensor member as long as said temperature gradient determined for that hot plate area is negative irrespectively of the temperature sensed by the sensor member for that area. When the temperature of a hot plate area is falling the situation is considered to not be dangerous in spite of a very high level of the temperature and a breaking of the energy supply to the stove is not necessary and not desired. This is considered by this design of the device.

[0020] According to another embodiment of the invention said device is, upon determination by a sensor member that said temperature gradient ceases to be negative and the temperature sensed for that hot plate region is above a temperature level indicating existence of an overheating condition, configured to delay determination of such an existence by a predetermined period of time, such as 10 seconds. Such a delay of a determination of an existence of an overheating condition resulting in a breaking of the energy supply to the stove may be advantageous.

[0021] According to another embodiment of the invention said device is configured to refrain from determination of an existence of an overheating condition of a hot plate area sensed by a sensor member as long as the temperature gradient determined for that hot plate area is above a predetermined level irrespectively of the temperature sensed by the sensor member for that area. When the temperature gradient determined for a hot plate area is above a predetermined level this may only derive from a presence of a person at the stove and actions taken by that person, such as lifting a frying pan or the like. It is then not necessary to break the energy supply to the stove, since a person is there and should have the situation under control. However, it is well possible to provide for a delay of such breaking when the temperature gradient above said predetermined level is calculated, for instance by two minutes, and if the temperature at that moment is still above the temperature level which has to be exceeded for making determination of an existence of an overheating condition it will be decided that an overheating condition exists and the energy supply is broken.

[0022] According to another embodiment of the invention said device is, upon determination by a sensor member that said temperature gradient ceases to be above a predetermined level and the temperature sensed for that hot plate region is above a temperature level indicating existence of an overheating condition, configured to delay determination of such an existence by a predetermined period of time, such as 10 seconds. Such a delay of a determination of an existence of an overheating condition resulting in a breaking of the energy supply to the stove may be advantageous.

[0023] Further advantages as well advantageous features of the invention will appear from the following description of embodiments thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] With reference to the appended drawings, below follows a specific description of embodiments of the invention cited as examples.

[0025] In the drawings:

Fig 1 is a simplified view illustrating a general function of an apparatus for supervising hot plates of a stove with regard to overheating according to a first embodiment of the invention,

Fig 2 is a view similar to Fig 1 of an apparatus according to a second embodiment of the invention,

Fig 3 is a view similar to Fig 1 of an apparatus according to a third embodiment of the invention, and

Fig 4 is a very schematic view used to illustrate the function of an apparatus according to an embodiment of the invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0026] An apparatus according to different embodiments of the invention will now be described while referring to all the figures 1-4 enclosed. These figures show an apparatus for supervising hot plates 1 of a stove 2 with regard to overheating. The apparatus comprises a sensor arrangement 3 configured to be arranged in a region above the stove, such as on the lower side of a hood 4 of a kitchen fan schematically indicated in the figures. The sensor arrangement is configured to indirectly sense temperatures of the hot plates and has in the embodiment shown in Fig 1 two sensors with a sensor member 5, 6 each configured to be directed towards different areas 7, 8 of the stove for indirectly sensing temperatures of the hot plates within these areas. The sensors may sense infrared radiation from said areas. The sensor arrangement has in the embodiment shown in Fig 1 a simplified construction, in which each sensor member senses the radiation emitted from an area covering two hot plates. The sensor members are typically arranged at a distance of approximately 23 cm from the rear edge 9 of the stove 2, although any other distance from the rear edge or at the rear edge are conceivable.

[0027] The embodiment shown in Fig 2 differs from that according to Fig 1 by having a sensor arrangement 203 with four sensors having a sensor member 205, 206, 210 and 211 each configured to be directed towards an area 212-215 of a hot plate each so as to indirectly sense the temperature of that hot plate. This ensures that an existence of an overheating condition of any of the hot plates may be accurately determined without any influence of any other hot plate thereupon.

[0028] Fig 3 shows an apparatus having a sensor arrangement with the same function as the one in Fig 2, but it has only two sensors 305, 306, since each sensor has two sensor members in the form of two sensing zones configured to be directed towards different said hot plate areas 312-315 of the stove 302.

[0029] The apparatuses according to the present invention have also a device 10 schematically indicated in Fig 4 and configured to receive and evaluate information from the sensor members 5, 6 of the sensor arrangement so as to determine whether a condition of overheating exists. The device is for that sake configured to compare temperature information delivered by the sensor members for each hot plate area with data relating to that area so as to determine whether a condition of overheating exists in any of the hot plate areas and control a breaking member 11 to break the energy supply 12 (here indicated by an AC symbol which may just as well stand for any other energy supply than that, such as gas) to the stove 2 upon determination of existence of an overheating condition in any of the hot plate areas.

[0030] The apparatus further comprises means 13, 14 configured to allow adjustment of the sensitivity of the sensor members 5, 6. These means are schematically indicated in Fig 4, but they may advantageously be integrated in the respective sensor member or even in the device 10 by influencing the signals from the sensor members accordingly. These adjustment means allow adaption of the sensitivity of the respective sensor member to the type of hot plate to be sensed thereby, such as the size thereof and if it is intended for cooking or frying. It also allows compensation of a non-alignment of a sensor member with respect to the hot plate area to be sensed thereby for adaption to different types of kitchen fan hoods or other carriers of the sensor members.

[0031] The apparatus also comprises alarm means 15 indicated in Fig 4, which are configured to deliver alarms in the form of audio and light signals. The device 10 is configured to control the alarm means 15 to start to deliver an alarm upon exceeding a first temperature level of the temperature sensed by any of the sensor members, such as 260°C, being lower than a second temperature level, such as 320°C, which has to be exceeded for making determination of an existence of an overheating condition possible for the device. The device may also control

the alarm means to deliver an alarm indicating that said second temperature level has been exceeded for any of the hot plate areas sensed and determine that an overheating condition exists after a predetermined period of time, such as 10 seconds, after this alarm has been delivered. The alarm means may for instance start to alternatively twinkle red and green and deliver a beep sound with 10 seconds intervals when said first temperature level is exceeded and start to twinkle red strongly and fast and beeping loudly when the second temperature level is exceeded.

[0032] The device 10 is also configured to calculate the temperature gradient for the hot plate area sensed by each sensor member. The device will refrain from determination of an existence of an overheating condition of a hot plate area sensed by a sensor member as long as the temperature gradient determined for that hot plate area is negative irrespectively of the temperature sensed by the sensor member for that area. A falling temperature is not dangerous irrespectively of the level of the temperature, so that a breaking of the energy supply to the stove would then only cause unnecessary problems. This is taken care of by this design of said device.

[0033] The device 10 is also configured to refrain from determination of an existence of an overheating condition of a hot plate area sensed by a sensor member as long as the temperature gradient determined for that hot plate area is above a predetermined level irrespectively of the temperature sensed by the sensor member for that area. A very rapid increase of the temperature sensed may only occur if a person is present close to the stove and for instance suddenly takes a frying pan away from a hot plate, so that the temperature then sensed will exceed said second temperature level. However, it is then no need to break the energy supply to the stove, and the device ensures that this is then not done.

[0034] The invention is of course not in any way restricted to the embodiments thereof described above, but many possibilities to modifications thereof would be apparent to a person with ordinary skill in the art without departing from the scope of the invention as defined in the appended claims.

[0035] The stove may be electrical or of any other type and it may have any number of hot plates, such as 6.

Claims

1. An apparatus for supervising hot plates (1) of a stove (2) with regard to overheating, said apparatus comprising a sensor arrangement (3, 203, 303) configured to be arranged in a region above said stove and indirectly sense temperatures of said hot plates, a device (10) configured to receive and evaluate information from said sensor arrangement so as to determined whether a condition of overheating exists, and a member (11) configured to be controlled by said device to break energy supply to the stove upon determination of existence of a said overheating condition, **characterized in that** said sensor arrangement has at least two sensor members (5, 6, 205, 206, 210, 211, 305, 306) configured to be directed towards different areas (7, 8, 212-215, 312-315) of said stove for indirectly sensing temperatures of different said hot plates, and that said device (10) is configured to compare temperature information so obtained associated with each said particular hot plate area with data relating to that area so as to determine whether a condition of overheating exists in any of said hot plate areas and control said breaking member (11) to break said energy supply to the stove upon determination of existence of an overheating condition in any of said hot plate areas.

2. An apparatus according to claim 1, **characterized in that** said sensor arrangement (203, 303) has as many sensor members (205, 206, 210, 211) as hot plates (1) to be supervised by said apparatus, such as 4.

3. An apparatus according to claim 1 or 2, **characterized in that** said sensor arrangement (303) has at least one sensor (305, 306) having a plurality of sensor members in the form of sensing zones configured to be directed towards different said hot plate areas (312-315) of a said stove.

4. An apparatus according to any of the preceding claims, **characterized in that** said sensor arrangement has sensor members (5, 6, 205, 206, 210, 211) in the form of a plurality of separate sensors.

5. An apparatus according to any of the preceding claims, **characterized in that** said sensor arrangement comprises sensor members configured to be distributed in different locations above a said stove.

6. An apparatus according to any of the preceding claims, **characterized in that** said sensor arrangement comprises sensor members configured to be arranged on a hood (4, 204, 304) or frame of a kitchen fan.

7. An apparatus according to any of the preceding claims, **characterized in that** said sensor arrangement comprises at least one sensor member configured to be arranged on or in the region of a ceiling of a room and/or connected to said ceiling.

8. An apparatus according to any of the preceding claims, **characterized in that** at least two of the sensor members of the sensor arrangement have different sensitivity, which for the individual sensor member depends upon the size of the hot plate(-s) in the hot plate area towards which it is to be directed.

9. An apparatus according to any of the preceding claims, **characterized in that** it comprises means (13, 14) configured to allow adjustment of the sensitivity of at least one, such as all, of the sensor members (5, 6) of said sensor arrangement.

10. An apparatus according to any of the preceding claims, **characterized in that** it comprises alarm means (15), and that said device (10) is configured to control said alarm means to start to deliver an alarm upon exceeding of a first temperature level of the temperature sensed by any of said sensor members (5, 6) being lower than a second temperature level which has to be exceeded for making determination of an existence of an overheating condition possible.

11. An apparatus according to claim 10, **characterized in that** said first temperature level is 220-280°C, such as 250-270°C, and said second temperature level is 300-350°C, such as 310-330°C.

12. An apparatus according to any of the preceding claims, **characterized in that** it comprises alarm means (15), and that said device (10) is configured to control said alarm means to deliver an alarm indicating that a temperature level to be exceeded for existence of an overheating condition has been sensed by any of said sensor members (5, 6) and determine that an overheating condition exists after a predetermined period of time, such as 10 seconds, after said alarm has been delivered.

13. An apparatus according to claim 10 or 12, **characterized in that** said alarm means (15) is configured to deliver an alarm in the form of audio signals or audio signals and light signals.

14. An apparatus according to any of the preceding claims, **characterized in that** said device (10) is configured to calculate the temperature gradient for the hot plate area sensed by each said sensor member (5, 6).

15. An apparatus according to claim 14, **characterized in that** said device (10) is configured to refrain from determination of an existence of an overheating condition of a hot plate area sensed by a sensor member (5, 6) as long as said temperature gradient determined for that hot plate area is negative irrespectively of the temperature sensed by the sensor member for that area.

16. An apparatus according to claim 15, **characterized in that** said device (10) is, upon determination by a sensor member (5, 6) that said temperature gradient ceases to be negative and the temperature sensed for that hot plate region is above a temperature level indicating existence of an overheating condition, configured to delay determination of such an existence by a predetermined period of time, such as 10 seconds.

17. An apparatus according to any of claims 14-16, **characterized in that** said device (10) is configured to refrain from determination of an existence of an overheating condition of a hot plate area sensed by a sensor member (5, 6) as long as the temperature gradient determined for that hot plate area is above a predetermined level irrespectively of the temperature sensed by the sensor member for that area.

18. An apparatus according to claim 17, **characterized in that** said device (10) is, upon determination by a sensor member (5, 6) that said temperature gradient ceases to be above a predetermined level and the temperature sensed for that hot plate region is above a temperature level indicating existence of an overheating condition, configured to delay determination of such an existence by a predetermined period of time, such as 10 seconds.

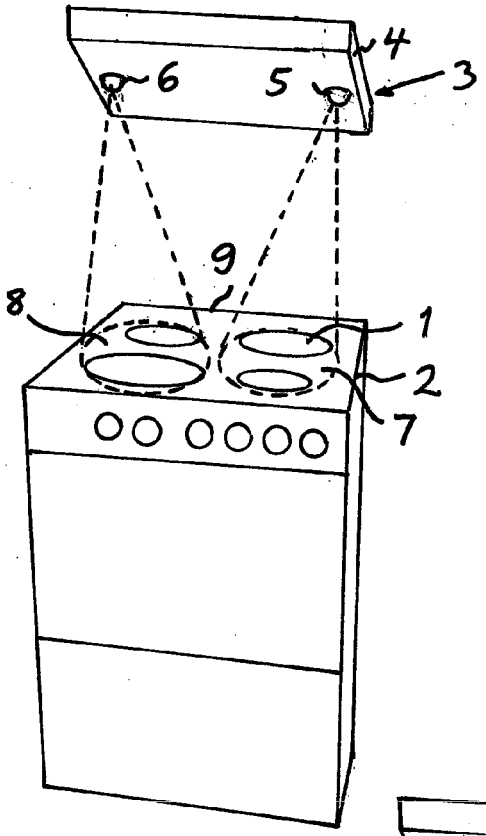

Fig 1

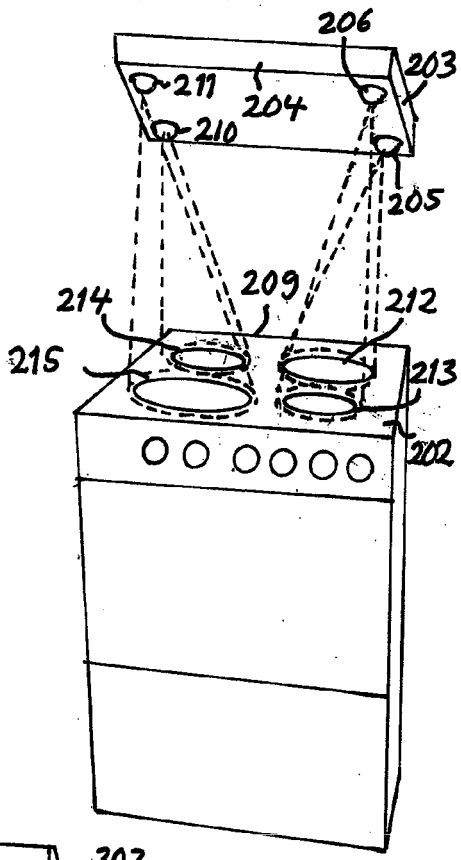

Fig 2

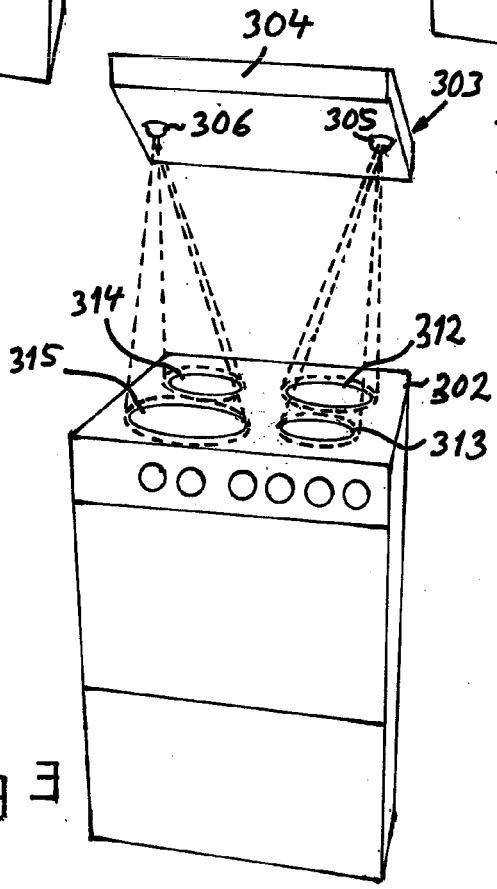

Fig 3

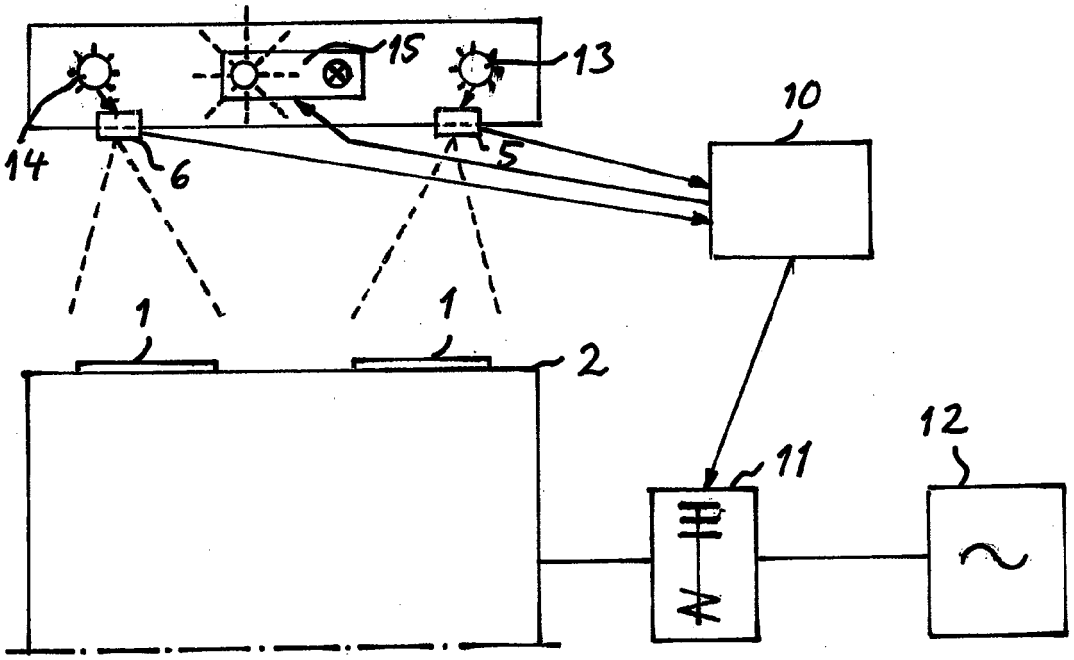

Fig 4