A cooking utensil having a heat indicator comprising an angularly shaped tube closed at both ends and partially filled with a liquid evaporating at normal cooking temperature, one end of said tube being located adjacent to the cooking space of the cooking utensil and the other end being located in such a manner that vapor generated at said first end of the tube is condensed at said other end.

6 Claims, 10 Drawing Figures
COOKING UTENSIL WITH GAUGE

BACKGROUND OF THE INVENTION

When food products are cooked, heat is transferred from the surrounding medium to the food products by radiation and/or conduction and to a more limited degree also by convection. The cooking is not completed until the heat has penetrated the food products and the interior thereof has obtained the desired temperature which normally is within the range of between 65° and 85° C. Thus, the cooking is based on a heat transmission from the surroundings to the interior of the food products. The completing period of said cooking process depends on various factors of which the most important are: The type, size and/or the weight of the food products, the heat sources available and the cooking temperature used.

When cooking fish, poultry, vegetables and meat dishes it is difficult to determine at which time the heat supplied has penetrated the food products under treatment and has heated the interior thereof to a sufficiently high temperature to obtain a desired degree of cooking. If too much heat is supplied due to an excessive heating period or due to the use of too high a cooking temperature in a normal cooking period, the result is that the food products depending on whether they are fried or boiled, are over-fried or over-boiled, respectively.

In both cases the result is that valuable vitamins and other nutrients are lost. Furthermore, the tenderness and the taste of the food products are deteriorated. If the heating period is kept too short at a normal temperature or the food products are heated to a too low temperature within a normal cooking period, the interior of the food products will not obtain the necessary temperature, and consequently the interior of the food products remains uncooked.

Normally, the cooking temperature and time are selected based on the housewife's experience and with due regard to i.e. the type, size and shape of the food products, the utensil used and the heating means available. A fork or a similar device is normally inserted in the food products in order to control the progress of heating at certain intervals. The resistance met during this insertion is considered to be an indication of the tenderness obtained. This method is subjective and inexact and furthermore it directly interferes with the cooking process which consequently is changed. Furthermore, this measurement may have a destructive effect on the food product because meat juice may flow out through the holes formed during the insertion of a fork.

A more exact picture of the temperature conditions within meat products during cooking can be obtained by using a meat thermometer which is designed in such a manner that the sensor of the thermometer can be inserted in the meat product and so that the temperature measured can be read on a scale forming an integral part of the meat thermometer. However, meat thermometers have not obtained widespread acceptance. This is primarily due to the fact that it constitutes a separate device which necessarily should be inserted in such a manner that the sensor is located close to the center of the meat piece because if it is not located in this manner the thermometer gives a false picture of the actual temperature conditions. Furthermore, such a meat thermometer may be difficult to read when cooking in a pot or in an oven for example due to a water or fat layer on the scale of the thermometer or due to the vapors generated. When using such a thermometer it is also impossible to turn over the piece of meat under treatment during the cooking process. Finally, such a thermometer cannot be used when boiling meat, fish or vegetables.

SUMMARY OF THE INVENTION

According to the present invention there is provided a cooking utensil eliminating the above mentioned drawbacks. This cooking utensil is characterized in that it comprises an indicator responsive to the total amount of heat supplied to the cooking utensil and a scale having calibrations corresponding to different amounts of heat supplied.

In a preferred embodiment of the cooking utensil according to the invention said indicator comprises a thermometer having a sensor located in a material which thermally insulates said sensor with respect to the cooking space of the cooking utensil.

By using such an indicator the cooking process can be supervised and controlled during the heating. This is due to the fact that by using such an indicator the process registered closely corresponds to or is a model of the process which is taking place within the food products during the cooking. Thus, the insulation surrounding the sensor of the thermometer is comparable to the food products being cooked because the heat slowly penetrates the insulation in a manner corresponding to the penetration of heat into said food products. Thus, the response of the thermometer depends on the cooking temperature and the heat transmission through the heat insulating material. The latter depends on the heating time. By reading the scale of the thermometer it can be established whether sufficient heat has been supplied to food products of a given type and size to ensure that they are cooked satisfactorily.

Examples of suitable insulation materials are solid polymers which, if desired, may be combined with expanded resins. The indicator of the above mentioned type is preferably moulded or inserted in the lid of the cooking utensil or in its handle. In the former case the lid may be prepared from plastic or glass which preferably is transparent. In that case it is possible to prepare the lid and incorporate by moulding or otherwise the indicator into said lid in one operation.

In order to avoid a destruction of the sensor of the indicator in cases of over-cooking, it is designed in such a manner that the maximum temperature obtainable within the interior of the cooking utensil can be registered by means of the indicator even if said indicator had not been insulated.

Another embodiment of the invention is particularly suitable for cooking food products over long periods of time. This embodiment is designed on the basis of the discovery that the vapors formed by the evaporation of a liquid contained in a compartment located adjacent to the cooking space of the cooking utensil can be transferred to a condensation compartment and that the amount of evaporated and condensed liquid can be used as a measure for the heat treatment of the food product contained in the cooking space of the cooking utensil.

Thus, this embodiment of the cooking utensil of the invention comprises an indicator having an angularly shaped tube closed at both ends and partially filled with
a liquid evaporating at the cooking temperatures normally used, one end of said tube being located adjacent to the cooking space of the cooking utensil, and the other end being located in such a manner relative to the cooking space that it has a temperature below the boiling point of the above mentioned liquid. Consequently, the vapors formed at the other end of the tube are condensed when they flow to the end of the tube remote from the cooking space.

Before using this embodiment of the cooking utensil according to the invention the liquid is caused to flow e.g. by turning the indicator, to the end of the tube adjacent to the cooking space of the utensil. The latter end of the tube preferably has the shape of a bulb which is capable of holding the total amount of liquid contained in said tube. During the cooking the liquid evaporates and the vapors flow to the opposite end of the tube at which they are condensed. The amount of condensed vapors is indicative of the product of the heating time and the heating temperature used. By providing the end of the tube at which the condensation takes place with a scale suitably calibrated, it can be determined whether a sufficient amount of heat has been supplied to the food product contained in the cooking utensil to cook it satisfactorily.

The calibration of the scale is made based on experiments with different types of food products and with different amounts of such food products.

In order to obtain a satisfactory response in the cases where a short cooking time is required, the liquid in the tube is preferably a liquid boiling slightly above room temperature. By selecting a proper pressure — sub- or super-atmospheric — within the tube, the boiling temperature of the liquid can be suitably adjusted and many different liquids can be used. Furthermore, it is preferably to use a liquid having a low surface tension so as to allow the droplets formed at the condensation end of the tube to coalesce. The amount of liquid contained in the tube can be reduced to a minimum if the heat of evaporation of the liquid used is high.

Methanol has been found to be a very suitable liquid.

When it is desired to register the heat treatment over long periods of time relative large amounts of liquid are required. However, the tube should be constructed in such a manner that both the end at which the evaporation takes place and the end at which the condensation takes place, each can hold the total amount of liquid. The inner diameter of that portion of the tube which connects the two ends should be sufficiently large to allow the liquid to be transferred from the end at which the condensation takes place to the opposite end of the tube.

The reading of the amount of liquid contained at the end of the tube at which the condensation takes place can be facilitated by using a colored liquid which is also colored when it has been evaporated and subsequently condensed.

A float provided at the end of the tube at which the condensation takes place may also facilitate the reading of the amount of liquid transferred to the end at which the condensation takes place.

Contrary to an empty glass tube, a glass tube filled with liquid acts as a magnifying glass. This is very advantageous if a scale or a colored line is located behind the glass tube. In that case the line looks broader where covered by the liquid than when viewed through the glass tube alone. This line may be drawn on the reverse side of the glass tube or on its background.

The use of an internally matted tube in combination with a colored background also facilitates the reading of the scale of the indicator. The dry matted portion reflects white light whereas the portion of the tube filled with liquid transmits the colored light from the background.

A colored liquid of which a given amount is introduced in the end of the tube at which the condensation takes place also facilitates the reading because the coloring substance may diffuse into the condensed liquid and color said liquid.

As mentioned above the indicator may be located in a handle on the cooking utensil or in its lid. However, it can also be constructed as an independent unit attached to either the cooking utensil per se or its lid.

**DESCRIPTION OF THE DRAWINGS**

FIG. 1 shows a vertical section through a preferred embodiment of the cooking utensil according to the invention.

FIG. 2 shows a top view of the cooking utensil according to FIG. 1.

FIG. 3 shows a vertical section through another embodiment of the cooking utensil according to the invention.

FIG. 4 shows a top view of the cooking utensil according to FIG. 3.

FIG. 5 shows a vertical section through a further embodiment of the cooking utensil according to the invention, and

FIG. 6 shows a top view of the cooking utensil according to FIG. 5.

FIG. 7 shows a top view of a further embodiment of the cooking utensil according to the invention.

FIG. 8 shows a vertical section of the cooking utensil according to FIG. 7.

FIG. 9 shows a sectional view through a still further embodiment of the cooking utensil of the invention and FIG. 10 shows the handle portion of the cooking utensil of FIG. 9 in top view.

**DESCRIPTION OF THE PREFERRED EMBODIMENTS.**

In the drawings, 1 is the bottom part of a pot which for example is prepared from aluminum and in which a piece of meat 2 is located. The bottom part of the pot has a lid 3 prepared from a transparent glass or plastic material. In the lid-handle of the pot shown in FIGS. 1 and 2 there is embedded an indicator consisting of a thermometer having a bulb 4 which is insulated against the interior and exterior of the pot by means of a suitable heat insulating material 5. In order to prevent transmission of radiation heat to the surroundings the upper surface of said bulb 4 may be provided with a layer of a radiation heat reflecting material such as a silver layer. A thermometer tube 6 extends transversely of the lid-handle and comprises a scale 7 provided with a numerical graduation which, if desired, may be supplemented with texts defining the values which should be obtained in order to cook given amounts of given food products.

Due to the presence of the insulation material 5 the temperature of the steam-air mixture within the pot is registered on the indicator with a time delay corresponding to the design of the pertaining insulation. The
values registered on the indicator will increase gradually as the insulation material is heated, but due to the presence of said insulation material the temperature obtained by the sensor of the indicator depends i.a. on the heating period.

The thermometer tube may be designed with varying cross sections if it is desired to obtain a registration which changes at a desired rate. A preferred embodiment comprises a thermometer tube with a larger cross section of the end adjacent to the bulb. The cross section is gradually reduced towards the end opposite to the bulb at a rate corresponding to the desired time delay of the indicator. The thermometer can be designed either with a capillary tube or a tube with a larger cross section allowing free flow of the thermometer liquid.

Instead of the thermometer the heat registering device may be compounds changing color with increasing temperature. These compounds, e.g. in the form of crystals, may be bonded in a duct in the lid by means of for example lacquer. An embodiment of the cooking utensil according to the invention based on said principle is shown in FIG. 3. In the lid 3 of the cooking utensil shown in FIG. 3 a duct is provided comprising a color-changing layer 8 which is provided above a wedge-shaped insulation layer 9. A scale is located above said color-changing layer. A gradual change of color at a given rate is obtained during the cooking process by means of the said design of the insulation layer.

The insulation is placed between the color changing layer and the source of heat, thus facilitating a gradual reduction of the heat conduction in a direction along the wedge-shaped insulation layer.

A handle 11 prepared from a transparent plastic material is fastened to the lid 3 of the cooking utensil shown in FIGS. 5 and 6. In a heat insulating duct in said handle there is provided a rod 13 of a material of low heat conductivity coated with a crystal layer 12. The material has a heat conductivity which causes the temperature in said material to increase from room temperature at a temperature at which all of the crystals have changed their color during a period of 30–120 min. The duct has such a shape that one end of the rod inserted in said handle is exposed to the interior of the pot. The heat supplied to the pot is conducted through the rod thereby gradually producing a change of color within the crystal layer. This change of color can be compared with a scale provided in the upper portion of the handle.

In a preferred embodiment the insulation is obtained by designing the handle in such a manner that the color change of the crystals causes a color change of the entire handle by an optical, illusive effect.

The heat registering device may be combined, if desired, with an alarming device which for example can be initiated photoelectrically.

In FIGS. 9 and 10, 21 is a cooking utensil having a lid 22. A handle 23 is attached to the upper side of the lid 22 and comprises an angularly shaped tube 24. The end of said tube 24 adjacent to the lid 22 has a bulb 25 containing a liquid 26. Along the opposite end of the tube 24 there is provided a suitably calibrated scale 27. At the start of the cooking process the liquid 26 is transferred to the bulb 25. During the heating of the cooking utensil the liquid 26 is evaporated and the vapors flow from the bulb 25 to the opposite end of the tube 24 at which a condensation takes place. Thus, the opposite end of the tube 24 is gradually filled with liquid evaporated in the bulb 25. When using a suitably calibrated scale 27 the position of the surface of the liquid contained in the end of the tube 24 at which the liquefaction takes place is indicative of the amount of the heat supplied to the cooking utensil.

We claim:

1. A cooking utensil comprising:
   a cooking container having an enclosed cooking space for containing articles being cooked and including means for transmitting heat to said space; and
   a heat quantity indicator operably associated with the utensil including means in communication with said space which are proportionally responsive to the total amount of heat supplied to the article being cooked in said cooking space and means for providing a visual indication of the response of the heat responsive means, said means in communication with the space comprising a thermometer sensor and a thermal insulator disposed to retard the rate of flow of all heat transmitted from said space to the sensor.

2. A cooking utensil as set forth in claim 1 wherein said means for providing for a visual indication comprises a calibrated scale.

3. A cooking utensil as set forth in claim 2 wherein said container includes a lid and said scale is embedded in the lid.

4. A cooking utensil as set forth in claim 2 wherein said container has a handle and the scale is mounted on the handle.

5. A cooking utensil as set forth in claim 1 wherein said insulator comprises an element of polymeric material in which said sensor is embedded.

6. A cooking utensil as set forth in claim 1 wherein said indicator comprises an angularly shaped tube.