

Electric toaster

The invention relates to an electric toaster comprising a timer to provide toasting time control and a carrier for an article to be toasted, e.g. bread, which is movable by means of a displacement device between
5 a toasting position and a toast removal position.

Electric toasters which eject the bread upwardly are provided with vertically movable and vertically guided bread carriers which are lowered into the operating position by hand, thereby simultaneously
10 switching on the heating current. After the toasting operation has ended, the bread carrier is released under the control of a timer and a return spring abruptly raises the toast from the bottom position to the top position. In this position, the toast
15 can be taken out.

In order to reduce the noise which accompanies the movement of the bread and to prevent the bread from being ejected out of the toaster when the bread carrier is raised, it has already been provided
20 that a bread carrier be provided with a damping device. Thus, a toaster is known (German Patent 20 14 024) in which the upward movement of the bread carrier is delayed by a flywheel. This additional damping device not only necessitates more individual
25 parts for the lifting device but also unnecessarily increases the manufacturing costs.

A construction is also known in which the bread carrier is vertically movable by means of electric resistance wires which change length when
30 heated (German Offenlegungsschrift 17 53 124). However, the necessary lifting movement of the bread carrier can only be achieved in this appliance by means of considerable gearing or leverage to

amplify the relatively small movements of the resistance wires. The technical effort involved and the limited service life of the resistance wires, which may be subjected to very considerable mechanical stress particularly in the cold state, are major disadvantages of this toaster.

According to the invention there is provided an electric toaster comprising a timer to provide toasting time control and a carrier for an article to be toasted which is movable by means of a displacement device between a toasting position and a position for removal of the toasted article, wherein the displacement device for the carrier comprises at least one shape memory spring mounted in the toaster and operatively connected to the carrier so as to move the carrier between the toasting and removal positions in response to a temperature change of the shape memory spring. In general, the toaster will be used to toast bread.

With such an arrangement, the shape memory spring can move the carrier automatically and in a smooth manner, whilst no additional damping devices are needed to limit the speed of movement and the technical effort required for the displacement device is minimal. Thus the known abrupt raising of the carrier when the toasting operation has ended can be avoided. This is achieved by the shape memory spring which has a so called memory effect. These known springs have temperature-dependent form-changing characteristics, a distinction being made between one-way and two-way effects. Both types of spring may be used in the displacement device according to the invention.

The shape memory spring will normally be heated during toasting and will be allowed to cool down at the end of the toasting time. The spring may be heated either directly or indirectly. When

connected directly, the spring is provided with electrical connections and forms a resistance in a separate heating circuit which is controlled by means of the timer for the toasting time. When the spring is heated in this way, no additional heating for the spring is required. When the timer is switched on for the desired toasting time, the heating of the spring is also switched on and the spring is heated up. The effects of heat cause the spatial shape of the spring to change.

If the spring is of the type exhibiting a two-way memory effect, by heating the spring the carrier may be automatically and smoothly drawn into the toasting area of the toaster, and when toasting is finished, the heating of the spring may be switched off by means of the timer so that the spring cools down. The spring returns to its original shape and the bread carrier moves back into its original position for toast removal. Since the lifting movement of the carrier takes place automatically and smoothly, there is no need for any additional damping devices to restrict the lifting speed.

For reasons of cost, it is generally preferred to use a shape memory spring with one-way effect. Thus the shape memory spring may be arranged to provide the force for movement of the carrier from one to the other of its two positions, whilst an energy store or a second shape memory spring may be arranged to provide the force for the reverse movement of the carrier. In general the first mentioned shape memory spring will move the carrier to the toasting position, with the return movement of the bread carrier to the removal position being brought about by a conventional energy store, such as a conventional spring, or a second shape memory spring made of memory metal with a one-way effect.

Preferably the energy store or the second shape memory spring has one portion secured in the toaster and another portion connected to a flexible connecting spring, e.g. a cable, a steel strip or the like, the connecting spring being guided by a rotatably mounted guide roller and arranged to act on the carrier. In this way, the mechanical stresses on the connecting spring are reduced and its service life is increased. Preferably the arrangement is such that the directions of pulling of the shape memory spring and the energy store are substantially the same, and this will normally be achieved by the connecting spring being guided by the roller through an angle of substantially 180°. The energy store may for example be a tension spring with one end secured in the toaster and the other end connected to the flexible connecting spring.

The guide roller is advantageously constructed as a cam disc. If a conventional tension spring is used as the energy store with a linear-elastic characteristic, the lever arm of the force applied by the operative end of the return spring may be changed in inverse proportion to the spring force and in this way the torque of the return spring may be kept constant, analogously to the torque of the shape memory spring. In this way, the normally increasing force of the return spring is compensated so that the displacement effort of the shape memory spring largely corresponds to the effort required to move the bread carrier.

Some preferred embodiments of the invention will now be described by way of example and with reference to the accompanying drawings, in which:-

Figure 1 diagrammatically shows the displacement device according to the invention for a toaster;

Figure 2 shows the displacement device according to Figure 1 in side view;

Figure 3 shows another embodiment; and

Figure 4 shows another embodiment.

5 Figures 1 and 2 diagrammatically show a toaster in which a bread carrier 2 is guided in vertically movable manner. The displacement or lifting device for the bread carrier 2 consists of a spring 3 which has temperature-dependent shape changing
10 characteristics, the so-called memory effect. The spring 3 is secured at one end to the toaster 1 and at the other end to the bread carrier 2. The spring 3 is a two-way spring the shape changing characteristics of which are reversible. The spring
15 3 is provided with electrical connections 7 and is directly heated when the heating current is switched on. The heating current is switched on by means of the timer shown for the desired toasting time. As a result of the effect of the heat the
20 spring 3 contracts and pulls the bread carrier 2 together with the bread which is to be toasted continuously into the toasting area. After the toasting operation has ended, the timer switches off the heating current for the spring 3. The
25 spring 3 cools down, moving continuously back into its original shape and returning the bread carrier to its original position for toast removal.

 In the embodiment shown in Figure 3, the memory spring 3 has a one-way effect and the bread
30 carrier 2 is returned to its original position by means of an energy store 6 in the form of a tension spring. The tension spring 6 is fixed with one end in the toaster 1 and connected at its other end to a cable 4. The cable 4 is guided
35 over a guide roller 5 and fixed to the bread carrier 2. The guide roller 5 is rotatably mounted in the toaster 1. The spring 3 which is directly

heated via a timer contracts continuously when heated up and pulls the bread carrier 2 into the toasting area together with the bread to be toasted, counter to the tensile force of the spring 6.

- 5 When the toasting operation has ended, the timer switches off the heating current for the spring 3 as well and the spring 3 cools down. During the cooling process the spring 3 is continuously returned to its original shape by means of the
10 biased tension spring 6 and consequently the bread carrier 2 which is operatively connected to the spring 6 is also returned to its original position. The force of the spring 3 counter to that of the spring 6 prevents an excessively abrupt return
15 movement.

- Figure 4 shows another embodiment in which the guide roller 5 is constructed as a cam disc. The mode of operation of the lifting device shown corresponds to that of the embodiment shown in
20 Figure 3. When there is a tension spring 6 with a linear-elastic characteristic as the energy store, the lever arm at the operative end of the spring 6 can be changed in inverse proportion to the spring force by means of the cam disc and in this way
25 the torque of the spring 6 can be kept constant analogously to the torque of the spring 3. In this way, the normally increasing force of the energy store 6 is compensated so that the lifting effort of the spring 3 substantially corresponds to the effort involved in moving the bread carrier 2.



Claims

1. An electric toaster comprising a timer to provide toasting time control and a carrier for an article to be toasted which is movable by means of a displacement device between a toasting position
5 and a position for removal of the toasted article, wherein the displacement device for the carrier comprises at least one shape memory spring mounted in the toaster and operatively connected to the carrier so as to move the carrier between the toasting
10 and removal positions in response to a temperature change of the shape memory spring.
2. An electric toaster as claimed in claim 1, wherein the shape memory spring is arranged to
15 provide the force for movement of the carrier from one to the other of its two positions, and an energy store is arranged to provide the force for the reverse movement of the carrier.
- 20 3. An electric toaster as claimed in claim 2, wherein the energy store has one portion secured in the toaster and another portion connected to a flexible connecting spring, the connecting spring being guided by a rotatably mounted guide roller
25 and arranged to act on the carrier, the arrangement being such that the directions of pulling of the shape memory spring and the energy store are substantially the same.
- 30 4. An electric toaster as claimed in claim 3, wherein the energy store is a tension spring with one end secured in the toaster and the other end connected to the flexible connecting spring.



5. An electric toaster as claimed in claim 3 or 4, wherein the guide roller takes the form of a cam disc.

5 6. An electric toaster substantially as hereinbefore described with reference to Figures 1 and 2 or Figure 3 or Figure 4 of the accompanying drawings.
