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(54) Method and apparatus for the packaging of products.

(57) A method of and apparatus for packaging in which a product to be shrink wrapped is conveyed through a heating chamber throughout which air is maintained at a uniform heating temperature by a combination of heaters 5 and air circulating means 7.

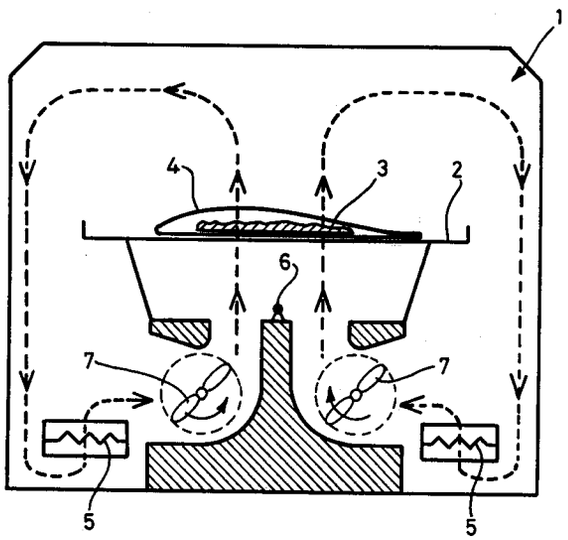

Fig. 1

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Field of the Invention

This invention relates to a method and apparatus for the packaging of products by the so-called "shrink wrapping" technique.

Background to the Invention

The method of "shrink wrapping" as a means of packaging products has been known for some time. Generally, the product to be packaged is covered with a flexible sheet of a suitable plastics film material. Heat is then applied for a brief period of time so as to shrink the plastics film to sit closely around the product. This results in an air-tight packaging for the product, which may nevertheless be transparent and therefore ideally suited for display purposes.

Although this technique is used to package a wide range of products for display on the shop shelf, from nails to audio cassettes, the air-tight nature of the resultant product covering means that the technique is particularly suited for the packaging of food products.

In conventional shrink wrapping processes, a product to be packaged is generally passed, with a sheet of a suitable plastics film laid loosely over it, through a heating chamber at a suitable temperature and for a suitable period of time such that the film shrinks around the product. In conventional heating chambers used for this purpose, heated air is usually directed onto the product from above through jets, providing a very localised source of heat. However, it has been found that heating the product in this way does not always result in a uniform shrink over the product area, and can result in unsatisfactory packaging finishes.

Modern plastics films used for shrink wrapping have advantages over the PVC films originally used in that they are completely transparent (ie do not "cloud" over) and non-toxic. However, these modern films generally require higher temperatures to achieve shrinking, creating a need for better heating systems in the field of shrink wrapping.

It is an aim of the present invention to provide a method and apparatus for shrink wrapping a product which overcomes or at least mitigates the disadvantages described above found in conventional shrink wrapping systems, and which can be used to provide a more uniform, high quality shrink for all kinds of modern shrink wrapping films and with a variety of different products.

Statement of the Invention

According to one aspect of the present invention there is provided a method of packaging a product, comprising locating the product for a suitable period of time inside a heating chamber, with an associated film of a suitable packaging material around the product, the air inside the chamber being heated to a suitable temperature to achieve shrinking of the packaging film; and directing heated air inside the chamber to flow around the chamber so as to achieve a substantially uniform air temperature throughout the chamber.

Directing the air to achieve a uniform air temperature throughout the heating chamber leads to uniform shrinking of the packaging film in which the product is to be packaged. An improved quality of packaging, and generally more repeatable results, can thus be achieved.

Heating is preferably effected at one or more points in the chamber below the level at which the product to be packaged is located. The air is then preferably directed to pass upwardly in the heating chamber, through or past the product to be packaged, back down the outer sides of the heating chamber and through the heating points, following a simple convection pattern.

The product to be packaged may be positioned inside the heating chamber for a predetermined period of time, more preferably, may be conveyed through the heating chamber on conveyor means, to achieve the same effect.

The method of the present invention preferably additionally comprises the step of adjusting one or more of the following parameters: the speed at which heated air is directed to flow around the heating chamber, the air temperature inside the chamber and the length of time for which the product to be packaged remains inside the chamber, so as to achieve the desired packaging results, having due regard to the nature of the product to be packaged and the nature of the film used for packaging.

Any suitable packaging material may be used in the method of the present invention, provided the material is in the form of a film which will shrink when heated. The film might be, for example, a soft shrink film, an anti-fog film, a barrier film or a stretch/shrink film. Suitable packaging films include those sold under the Trade Mark "Cryovac".

The packaging material is preferably loosely wrapped around the product and sealed before being

located in the heating chamber.

According to another aspect of the present invention there is provided apparatus for the packaging of a product, comprising a heating chamber for receiving the product to be packaged, together with suitable packaging film; heating means for raising the temperature of air inside the heating chamber; and air direction means for directing a flow of air around the heating chamber so as to achieve a substantially uniform air temperature throughout the chamber.

The heating means preferably comprises one or more heaters located at suitable points in the chamber, preferably below the level at which the product to be packaged is located. More preferably, the heating means comprises two heaters, each conveniently of 9 kw power and each conveniently comprising a series of sheath heaters.

The air direction means preferably comprises one or more fans, which are desirably of variable speed.

Conveniently, two such fans are provided, each of 375 W power and having a maximum rotation speed of 3000 RPM. These are conveniently positioned below the level of the product to be packaged, and preferably the speed of each can be individually controlled. The apparatus therefore preferably comprises air flow control means for controlling the speed at which the air direction means operates.

The air direction means preferably also comprises one or more fixed air guides adjacent the fan or fans, whereby air is directed upwardly on the chamber through or past the product and associated packaging film, back down the outer sides of the chamber and through the heating means and back through the one or more fans past the air guide or guides.

The apparatus desirably additionally comprises temperature control means enabling adjustment of the air temperature inside the heating chamber. This temperature control means will conveniently comprise a thermostat or other suitable device for measuring the air temperature inside the heating chamber at a given point (preferably as close as possible to the position at which the product to be packaged is located), and means by which the operation of the heating means can be controlled so as to maintain the temperature within the chamber at a certain predetermined level or within a predetermined range. This predetermined temperature level or range is preferably set by the user according to the type of product and of packaging film which he is using.

The apparatus preferably uncludes conveyor means for conveying the product to be packaged, together with the packaging film, though the heating chamber. The conveyor means is preferably of variable speed, so that the amount of time which the product spends inside the heating chamber may be controlled. The apparatus therefore preferably comprises speed control means for controlling the speed at which the conveyor means operates.

The apparatus of the present invention may form part of a production line for articles to be packaged. In this way, the articles would be conveyed directly from production through the apparatus of the present invention, emerging from the heating chamber packaged and ready for display on the shop itself.

It will be noted that, with the apparatus of this invention, it is unnecessary to have a localised heat source directed specifically at the product to be packaged. The heating means of the present invention may be positioned at any point in the heating chamber, since the air direction means will ensure that heated air is circulated uniformly throughout the chamber.

However, the above-described pattern of air flow is easier to achieve when the heating means are located in the lower part of the heating chamber, preferably below the product to be packaged.

The present invention also includes within its scope a packaged product which has been packaged in packaging film by the method of, or by the use of the apparatus of, the present invention.

The method and apparatus of the present invention will now be further described, by way of illustration, with reference to the accompanying drawings, in which:-

Figure 1 is a schematic cross-sectional view of one embodiment of apparatus in accordance with the present invention;

Figure 2 is a perspective view of the apparatus illustrated in Figure 1; and

Figures 3-5 show in graphical form the results of tests conducted using apparatus in accordance with the invention.

Detailed Description of the Drawings

The packaging apparatus shown in Figures comprises a heating chamber 1 of or lined with a suitable thermally insulating material, through which a variable speed conveyor belt 2 (the mechanism for which is not shown) passes. The conveyor is preferably of the "live roller" kind, the belt being supported on rollers at least some of which are driven in rotation. The heating chamber has dimensions appropriate to its applications, but typically may have a length of about 120 cm. A product 3 to be packaged, which may be a

food product such as a pre-cooked pizza or a tray of meat, or any other food or non-food product to be shrink-wrapped, is conveyed through the heating chamber 1 by the conveyor belt 2. The maximum speed at which the conveyor belt can travel is 30 metres per minute. A sheet 4 of a suitable plastics packaging material has been loosely wrapped around the product 3 and sealed before the product passes into the heating chamber 1.

The apparatus also comprises two 9 kW heaters 5 (each comprising 9 x 1 kW sheath heaters) for heating air inside the chamber 1. A thermocouple 6 is positioned just below the product 3 and measures the air temperature inside the chamber. The measured air temperature is then displayed on a control panel (not shown) provided with the apparatus.

Two blower fans 7, each of power 375 W, are arranged, approximately 175 mm apart, respectively on opposite sides of a shaped partial partition wall defining air guide means adjacent said fans, to rotate in the directions indicated by the arrows in Figure 1 at variable speeds up to 3000 RPM. These ensure that air flow around the heating chamber is maintained in the direction shown by the dashed lines, ie air heated by the heaters 5 is directed upwardly through the product 3 and circulated back down the outer sides of the chamber to be re-heated by the heaters. This circulation ensures that the air temperature in chamber 1 is maintained at a substantially uniform level, which results in a more even shrinking of the plastics film 4 around the product 3.

Various controls (not shown) are provided with the apparatus shown in Figure 1, which enable the user to control the speed of rotation of the fans 7 and the speed of the conveyor belt 2 (and thus also the amount of time which product 3 remains inside the chamber 1). The user may also set the temperature at which he wishes the air temperature inside chamber 1 to remain, and the apparatus then automatically ensures (by controlling the operation of heaters 5 in response to temperature measurements taken at thermocouple 6) that the air temperature is maintained at this user-determined level. Typically, the temperature inside chamber 1 will be variable between about 150 and 240 $^{\circ}$ C.

Figure 2 shows the external appearance of the apparatus. The apparatus comprises an external housing 8, inside which the heating chamber 1 is located. The conveyor belt 2 is also visible, on which a product to be packaged will pass into and out of the heating chamber. Flaps 9, provided at the points where the conveyor belt enters and leaves the heating chamber, are flexible enough to allow the passage of a product out of the heating chamber along the conveyor belt 2, but provide a certain degree of thermal insulation for the heating chamber.

A control panel 10 on the side of the housing 8 (shown schematically only) is equipped with various switches to allow the user to control the chamber temperature and fan speed, etc. The control panel may also display values for fan speeds, air temperatures, etc.

In order to use the apparatus shown in Figures 1 and 2, the user places a product to be packaged on the conveyor belt 2 at the point marked 11 in Figure 2. A sheet of a suitable plastics packaging film is loosely wrapped around the product and sealed. Suitable packaging films which might be used are those sold under the "Cryovac" trade mark, for instance, BDF250 Barrier Film, MR Film, DR Film, MD Film, ML Soft Shrink Film, MRX Anti-fog Film or SSD Stretch/Shrink Film.

On the control panel, the desired air temperature inside the heating chamber is set, and this automatically switches on the heaters 5 until the temperature inside chamber 1 reaches the desired level. At this point, which is indicated to the user by the display on the control panel, the user can switch on the conveyor belt 2 at a suitable speed, and the product is conveyed through the heating chamber, in which the air temperature will effect the shrinking of the plastics packaging film to sit closely around the product. When the product passes out of the heating chamber it is shrink-wrapped ready for display on the shop shelf.

During the passage of the product through the heating chamber, the air fans 7 are operational. Their speed of rotation is set by the user to a level which ensures the desired uniformity of shrink.

For any particular product and any particular type of packaging film, optimum values of fan speed, temperature and length of time for which the product is inside the heating chamber will vary. The user will generally experiment with the apparatus until he has selected these optimum values for a particular product and packaging type, and thereafter, he can set the controls of the apparatus to these levels and be confident that his product will emerge from the apparatus uniformly wrapped, with good qualities of shrink of the packaging film. In particular, the film should not have shrunk too much, which can result in distortion of any other packaging present, for instance a polystyrene tray on which the product sits, and nor will the film have shrunk too little, which can result in "puckering" of the package.

Because of the uniformity of air temperature inside the heating chamber 1, once optimum values for temperature and fan speed have been calculated for a particular product and film type, these values are likely to remain useful whenever the machine is used, providing a high degree of repeatability.

Nor is there any need with the apparatus of the present invention to adjust air flow through jets, as in conventional shrink-wrapping apparatus. The apparatus of the present invention is thus very simple to operate.

By way of example, Table 1 shows typical values for air temperature, fan speed and duration of heating using one particular type of film packaging, "Cryovac" (Trade Mark) MD film, to package a meat product. Duration of heating was equivalent to the amount of time that the product to be packaged remained in the heating chamber, and was controlled by varying the speed of the conveyer belt on which the product passed through the heating chamber. Those conditions resulting in a good quality of shrink and an acceptably packaged end product have been indicated by a cross and outlined in Table I.

It will be seen from Table I that for a particular product and film type, a reasonable range of values for temperature, fan speed and length of time for which the product remains in the heating chamber could be used to produce a good quality of shrink packaging. For instance, using a heating temperature of 200°C and a fan speed of 950 rpm, a whole range of heating times from 2.65-4 seconds produced acceptable qualities of shrink packaging. This will generally be true for any product and suitable film type, and provides an indication of the verstility and ease of use of the method and apparatus of the invention.

The graphs shown in Figures 3-5 also illustrate typical values for temperature (y axis) and duration of heating (x axis) for certain products and film types using the method of the present invention. Each point marked on the graphs indicates a particular temperature and duration of heating for which a good quality of packaging was achieved.

The results shown in Figure 3 were obtained using DR film of 17 micrometers thickness; those in Figure 4 using MR film of 15 micrometers thickness; and those in Figure 5 using MD film of 19 micrometers thickness (all films sold under the Trade Mark CRYOVAC). These types of film can be used to package all manner of products, from food products to books, toys and games.

Again, the graphs indicate (for a given film type) that at a particular heating temperature, a range of heating times will produce an acceptably packaged end product. Conversely, for a particular duration of heating, a range of heating temperatures can be used. Thus the method of the present invention is extremely easy to use to produce a good quality result.

The method and apparatus of the present invention may of course be used to wrap any type of product using most modern types of packaging film.

TABLE 1

** Temp & fan speed	Time * (seconds)	4	3.75	3.5	3.25	3	2.8	2.65	2.5
208°C/ 1000 rpm					X			X	X
208°C/ 975 rpm		X				X		X	X
205°C/ 1000 rpm		X							
205°C/ 975 rpm		X					X		X
205°C/ 950 rpm				X	X		X	X	X
200°C/ 1000 rpm									
200°C/ 975 rpm						X		X	
200°C/ 950 rpm		X	X	X	X	X	X	X	

* Time for which product remains inside heating chamber

** Air temperature inside heating chamber

Claims

1. A method of packaging a product, comprising locating the product for a suitable period of time inside a heating chamber, with an associated film of a suitable packaging material around the product, the air inside the chamber being heated to a suitable temperature to achieve shrinking of the packaging film; and directing heated air inside the chamber to flow around the chamber so as to achieve a substantially uniform air temperature throughout the chamber.

2. A method according to claim 1, in which air is directed upwardly past or through the product to be packaged, down the outer sides of the chamber and thence through heating positions and upwardly again.

3. A method according to claim 1 or 2, additionally comprising the step of adjusting one or more of the

following parameters: the speed at which heated air is directed to flow around the heating chamber, the air temperature inside the chamber, and the length of time for which the product to be packaged remains inside the chamber.

4. Apparatus for the packaging of a product, comprising a heating chamber for receiving the product to be packaged, together with suitable packaging film; heating means for raising the temperature of air inside the heating chamber; and air direction means for directing a flow of air around the heating chamber so as to achieve a substantially uniform air temperature throughout the chamber.

5. Apparatus according to claim 4, in which the heating means comprises one or more heaters located in the chamber, below the level at which the product to be packaged is located.

6. Apparatus according to claim 5, in which the heating means comprises two heaters, each comprising a series of sheath heaters, on opposite sides of an air guide means.

7. Apparatus according to claim 5 or 6, in which the air direction means is arranged such that air heated by the heating means is directed to pass upwardly in the heating chamber, through or past the product to be packaged, back down the outer sides of the heating chamber and thence through the heating means, following a simple convection pattern.

8. Apparatus according to any one of claims 4 to 7, further including conveyor means for carrying the product to be packaged, together with the packaging film, through the chamber.

9. Apparatus according to any one of claims 4 to 8, in which the air direction means comprises one or more fans of adjustable speed.

10. Apparatus according to any one of claims 4 to 9, including temperature control means for adjusting the air temperature inside the heating chamber, said temperature control means comprising a device for measuring the air temperature inside the heating chamber at a given point close to the position at which the product to packaged is located, and means by which the operation of the heating means can be controlled so as to maintain the temperature within the chamber at a certain predetermined level or within a predetermined range.

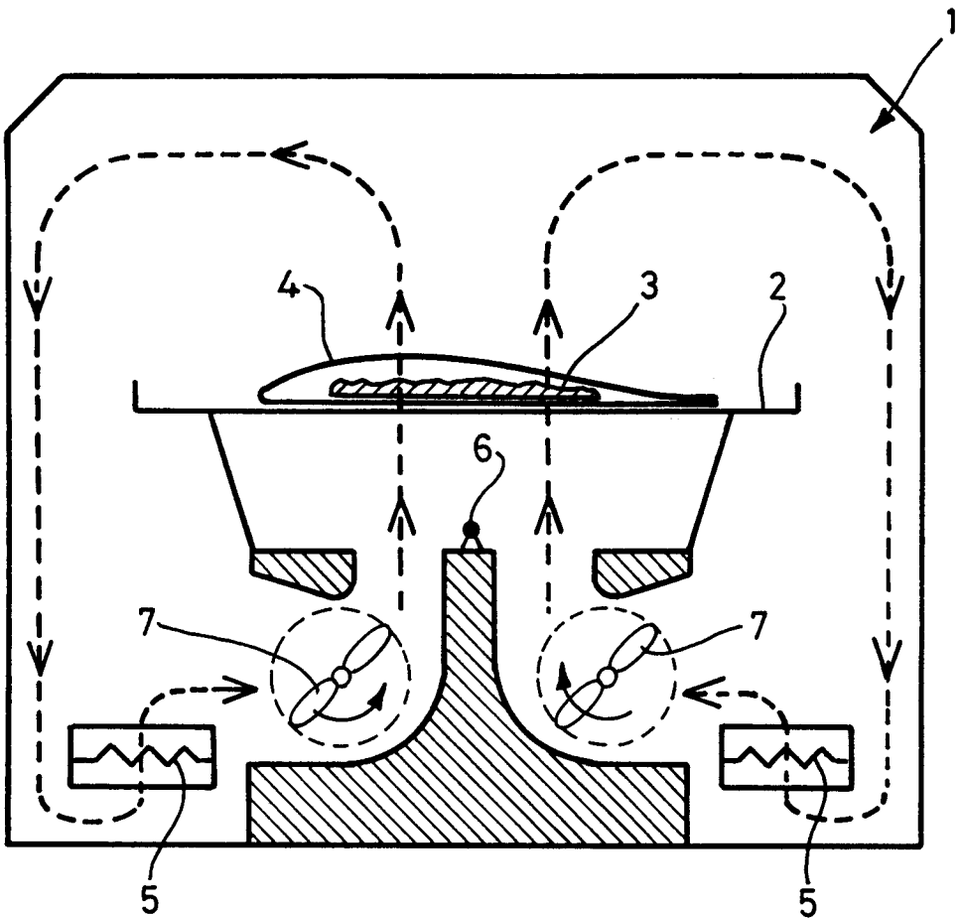

Fig. 1

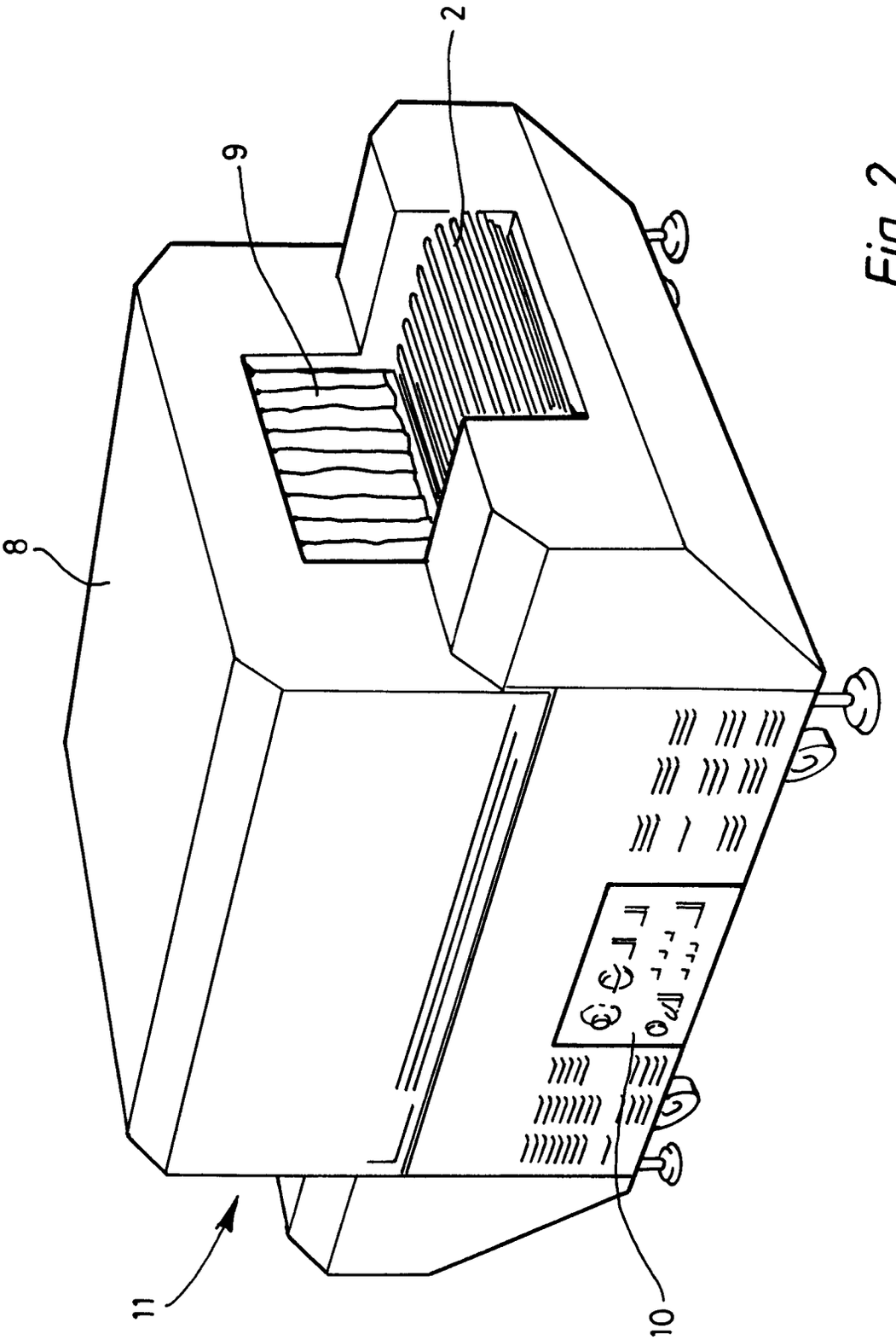

Fig. 2

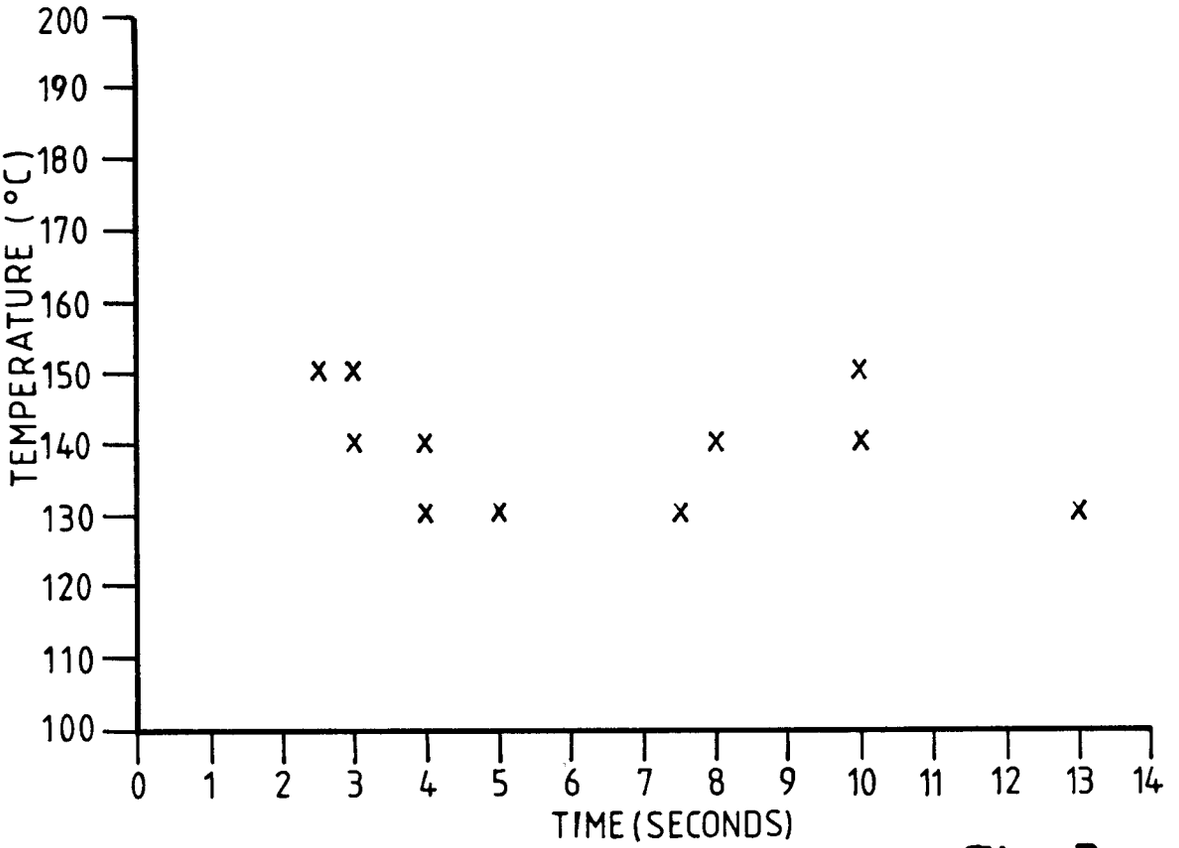
TEMPERATURE (°C)
200
190
180
170
160
150
140
130
120
110
100
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
TIME (SECONDS)

Fig. 3

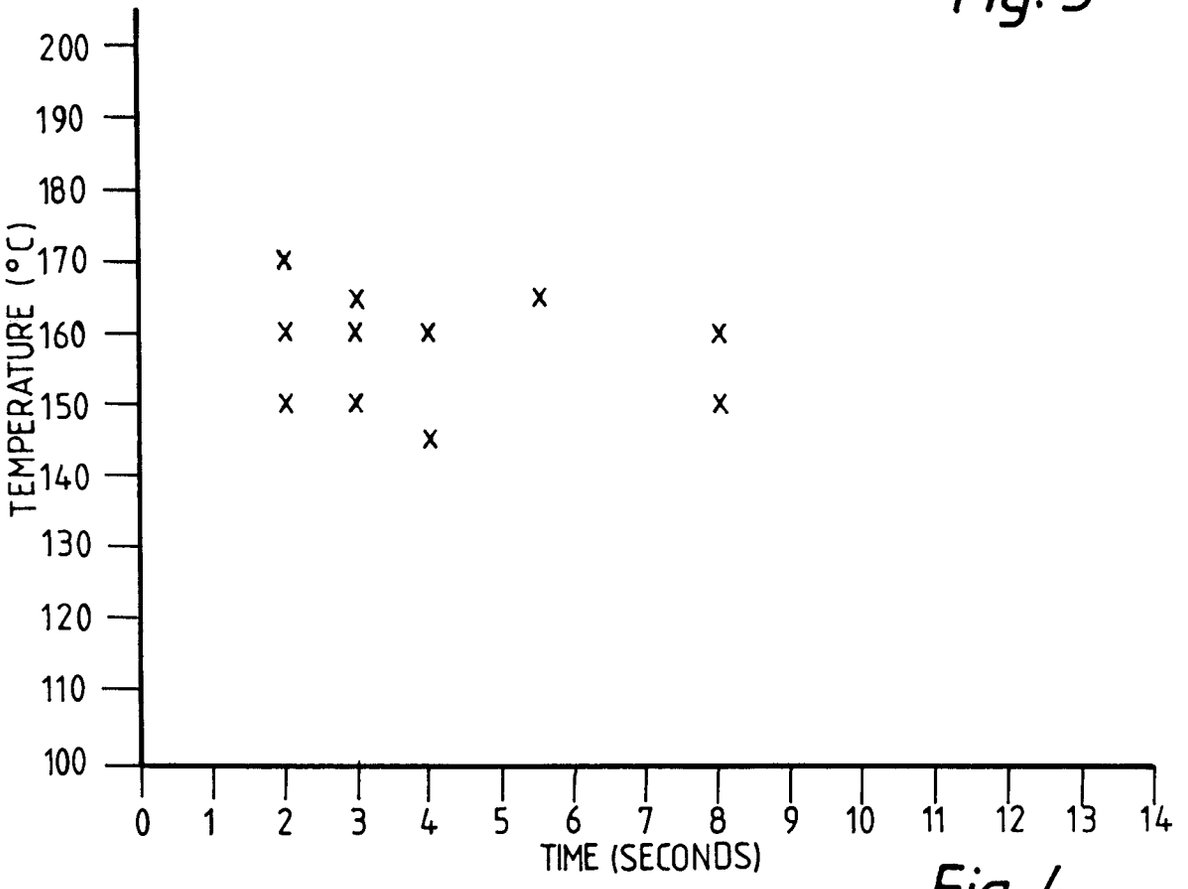
TEMPERATURE (°C)
200
190
180
170
160
150
140
130
120
110
100
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
TIME (SECONDS)

Fig. 4

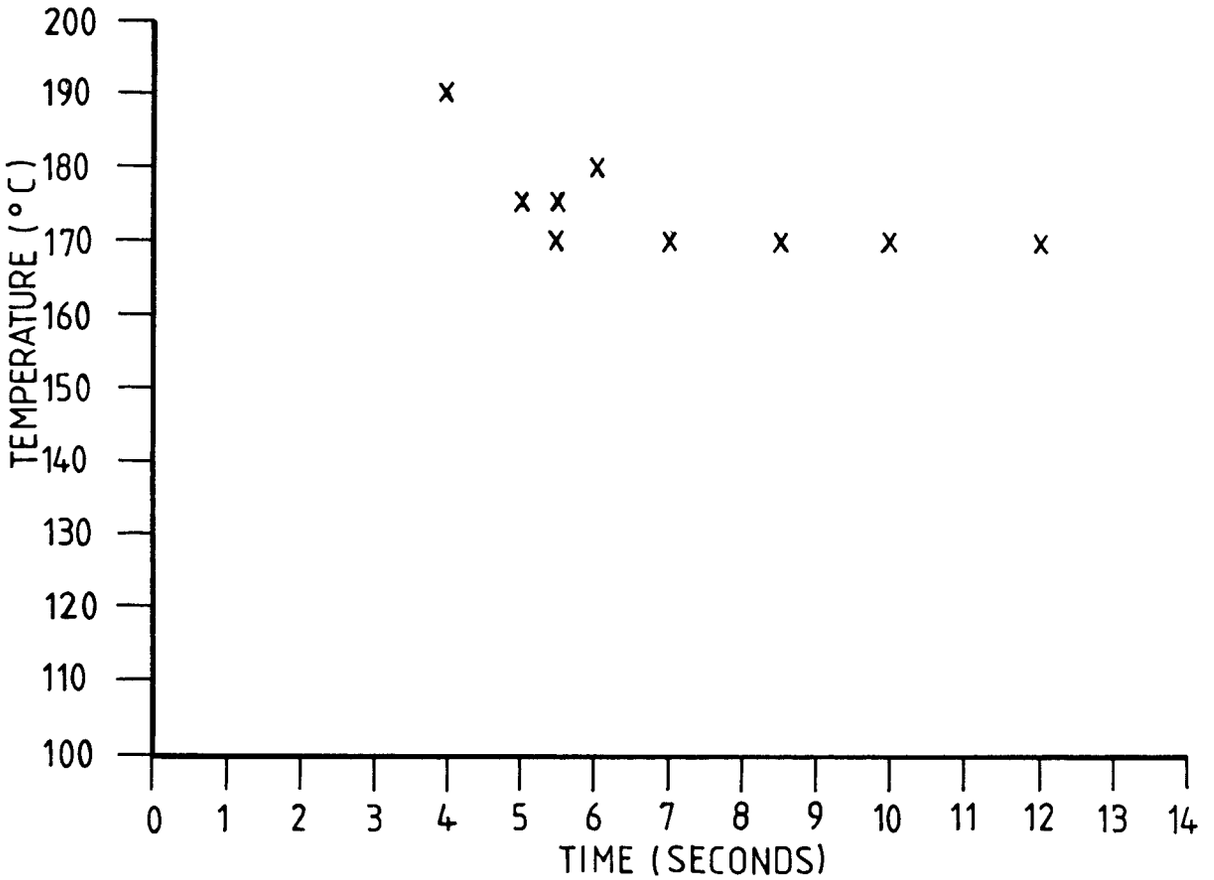
200
190
180
170
160
150
140
130
120
110
100
TEMPERATURE (°C)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
TIME (SECONDS)

Fig. 5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 30 7875

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	EP-A-0 136 654 (KALLFASS)	1,3,4,8,9	B 65 B 53/06
A	EP-A-0 136 654 (* page 7, line 5 - page 8, paragraph 1 *) * page 9, paragraph 2 * * * claims 1,2; figures 1,2 * *	5,6	
A	DE-A-1 945 047 (KALLFASS) * page 5 - page 7; figures 1-3 * *	2,7	
A	DE-A-1 761 545 (SCHAUS) * column 3, line 19 - column 4, line 10; figures 1,2 * *	10	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)
B 65 B

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	16 October 91	CLAEYS H.C.M.

CATEGORY OF CITED DOCUMENTS

- X : particularly relevant if taken alone
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