(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 257 166 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **86420216.3**

(51) Int. Cl.⁴: **B22C 7/06**

(22) Date of filing: **25.08.86**

(43) Date of publication of application:
02.03.88 Bulletin 88/09

(84) Designated Contracting States:
DE FR GB IT

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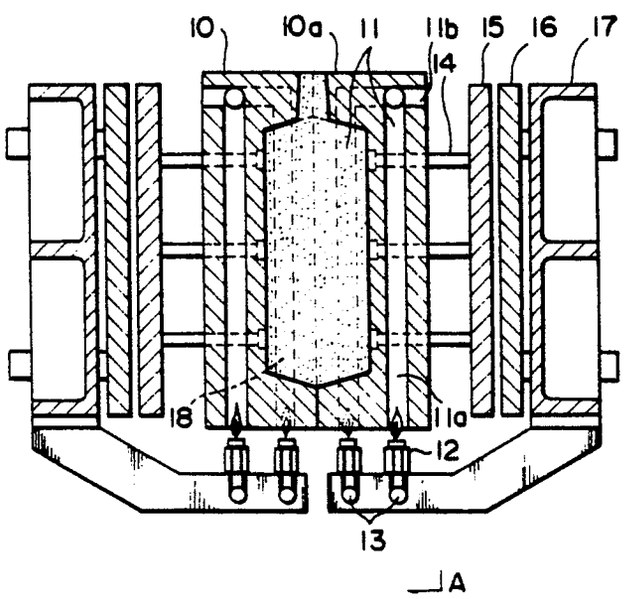
(54) Gas heating apparatus of core box for a moulding machine.

(57) A gas heating apparatus of core box (10,10a) for a moulding machine comprising boring a number of heating gas passages (11) in the rear surface of cavity for blowing of a core box (10,10a) and disposing gas burners (12) facing respectively opposite to the openings (11a) of one side of said heating gas passages (11).

FIG.1



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TECHNICAL FIELD:

This invention relates to a gas heating apparatus of core box for a moulding machine.

BACKGROUND ART:

As heating means of core box for moulding are considered both gas heating system and electric heating system.

Electric heating system has such drawbacks as restricted heater insersion means, requirement of longer time for raising the temperature of core box, large sizing of core box, and a trouble of replacing a heater due to broken coils of the heater, and in the present situation gas heating system dominates the heating of core box.

In the gas heating system there are two systems, one of which is a fixed furnace heating system where a core box assembly is moved in a fixed furnace thereby to be gas heated in the furnace, and the other a direct heating system where the rear surfaces of the core boxes are heated by a group of burners. Generally said fixed furnace heating system is not used, and said direct heating system is in general use.

There is usually known said gas heating system of the structure as illustrated in Fig. 7. That is, as shown in the drawing, the system is a gas heating apparatus constructed in such a manner that between a die plate I and a connecting plate 2 there is disposed a heating plate 4 bored with a combustion gas passage 3, a number of burner 5 are arranged facing the rear 5 surface of a core box 6, in said gas passage 3.

PROBLEMS INTENDED TO BE SOLVED BY THE INVENTION:

With the known gas heating system referred to above the following various disadvantages are known:

(I) Since heating is effected from the outer surface of a core box a great temperature difference is produced between the heating surface side and the opposite side (that is the cavity side for blowing) whereby the core box is greatly deformed;

(2) In the case of thick core box gas in an amount more than required must be used in order that a desired tempeature is brought about in the mating side (cavity side for blowing) of the core box;

(3) Since heating is carried out from the rear surface of the core box much radiation heat is generated to allow the heating efficiency to be bad;

(4) Due to much radiation heat the machine side is all affected greatly; and

(5) In order that the air for the combustion of gas is properly flown the minimum distance from the tips of the burners to the rear surface of the core box needs 25 mm, and therefore the core box assembly dominates a large space.

Because of the above drawbacks of gas heating system it has been found that the heat efficiency is such that in the case of core box of vertical split moulding system it is 20-25% and in the case of core box of horizontal split moulding system it is 30-35% at the drag side and I5-20% at the cope side, and that approximately 2/3 of the gas amount used is wasted.

According to the present invention such various drawbacks of conventional gas heating system can be eliminated, and the gas amount to be used can be reduced thanks to the shortened time of raising temperature of core box and improved heat efficiency.

MEANS TO SOLVE THE PROBLEMS:

The inventors of this invention has effected various studies and experiments to eliminate the above demerits of the gas heating system, and as a result they have developed a gas heating apparatus of core box for a moulding machine of the invention. The technical constitution of the invention will now be described more in detail, by way of example, with reference to the accompanying drawings.

Fig. I is a sectional view of a core box assembly of vertical split moulding system where the apparatus of the present invention is applied;

Fig. 2 is a sectional view taken along the line A-A of Fig. I;

Fig. 3 is a top view of only the said core boxes;

Fig. 4 is a sectional view illustrating an example of applying the heating system of the invention to a double-faced core box;

Fig. 5 is a sectional view taken along the line B-B of Fig. 4;

Fig. 6 is a graph showing a comparison of a temperature rising state of core boxes between the heating system of the invention and that of known type; and

Fig. 7 is a sectional view illustrating one example of conventional heating system of core box.

In Figs. I to 3, reference numerals I0, I0a are core boxes, and each of the core boxes is as known provided with a connecting plate I5 embedded at its rear surface with ejector pins I4, a core ejecting plate I6, a die plate I7 and the like. As shown in the drawings, said core box is bored with a number of heating gas passages II in the rear surface of cavity for blowing of a moulding I8. Said passages II are provided piercing the core box, a gas burner I2 is arranged facing one intake IIa of each passage II, and the other opening IIb serves as an exhaust port. Further, by constructing the heating gas passages II in such a way that they mutually communicate in the core box body I0, I0a a quick and uniform heating of the core box can be contemplated, as shown in the drawings. Additionally reference numeral I3 designates gas manifolds.

Fig. 4 is a sectional view showing an example in which the heating system of the invention is applied to a double-faced core box, and Fig. 5 is a transverse sectional view taken along the line B-B of Fig. 4. The detailed structure of the double-faced core box referred to herein is described in the Applicant's own U.S. Patent Application SN. 840,764.

In Figs. 4 and 5 reference 20 designates a double-faced core box, each of which is provided at both its side faces with cavities for blowing, and reference 20a designates core boxes, each of which is disposed facing opposite to said double face core box. Similarly to the core boxes illustrated in Figs. I to 3, each of said core boxes is equipped with heating gas passages II, intakes IIa of heating gas, and openings IIb.

A burner I2 is provided facing opposite to each of said intakes IIa for ejecting heating gas, and these burners I2 communicate with gas manifolds I3 mounted to U-shaped die plates 2I thereby to receive a supply of combustion gas. Additionally, in Fig. 4 reference 22 designates core box mounting platforms,reference 23 side core box mounting platforms, reference 24 ejecting cylinders of moulds, reference 25 core ejecting plates for ejector pins, and reference 26 ejector pins respectively.

The heating time in each portion of the core box according to the gas heating apparatus of the invention and the temperature rising mode of the core box are shown in contrast in Fig. 6. In said graph, a, b, c and d are temperature measuring curves at equal intervals in the neighborhood of the mating face of core box halves, and e, f, g and h are heat measuring curves in the neighborhood of burners to said curves a to d. It has become clear from the measuring result in Fig. 6 that according to the gas heating system of the invention the temperature of the core boxes to be heated is raised approximately evenly.

Whereas according to conventional system of gas heating the rear surface of a core box a heating time of about I.5 times is required to raise the temperature of a core box to the same level as in the present invention, as shown with curves x and y.

As described above, the gas heating apparatus of the present invention has been explained with reference to one embodiment in which the apparatus is applied to a core box assembly of vertical split moulding system, but it will be clear that the present invention is also applicable to a core box assembly of horizontal split moulding system similarly.

EFFECTS OF THE INVENTION:

(I) Since the heating gas passages are oriented the exhaust of waste gas is ensured and the thorough combustion in said passages is achieved.

(2) There is produced very good heating efficiency thanks to said constitution (I) above. The heating efficiency is improved to about 40-50%.

(3) Since heating is effected from the inside of corebox there is not appeared irregular temperature rising over the whole core box, and the core box is hardly caused with deformation.

(4) Since heating is effected from the inside of core box the temperature at the mating face of core box halves is more quickly raised than in conventional systems.

(5) In known systems, in the midst of a die plate and a core box there is arranged a heating plate embedded with burners whereby the rear surface of the core box is gas heated through the burner holes of a core ejecting plate. According to the gas heating system of the invention, however, the heating plate is unnecessary, a core ejecting plate only is arranged between the die plate and the core box, and the vice mechanism is simplified and made compact.

(6) Since combustion gas is passed through the heating gas passages bored within the core boxes, few flame is exposed, radiation heat is scarcely generated, other members of the moulding machine are hardly affected thermally, and an excellent working environment is provided.

Claims

1-A gas heating apparatus of core box (10,10a) for a moulding machine comprising boring a number of heating gas passages (11) in the rear surface of cavity for blowing of a core box (10,10a), and disposing gas burners (12) facing respectively opposite to the openings (11a) of one side of said heating gas passages (11).

2-A gas heating apparatus as described in Claim 1 wherein said heating gas passages (11) are disposed to mutually communicate.

3-A gas heating apparatus as described in Claim 1 wherein said heating gas passages (11) are provided piercing the core boxes (10,10a), and the openings (11b) at the other side of said passages (11) are made exhaust ports of waste gas.

FIG.1

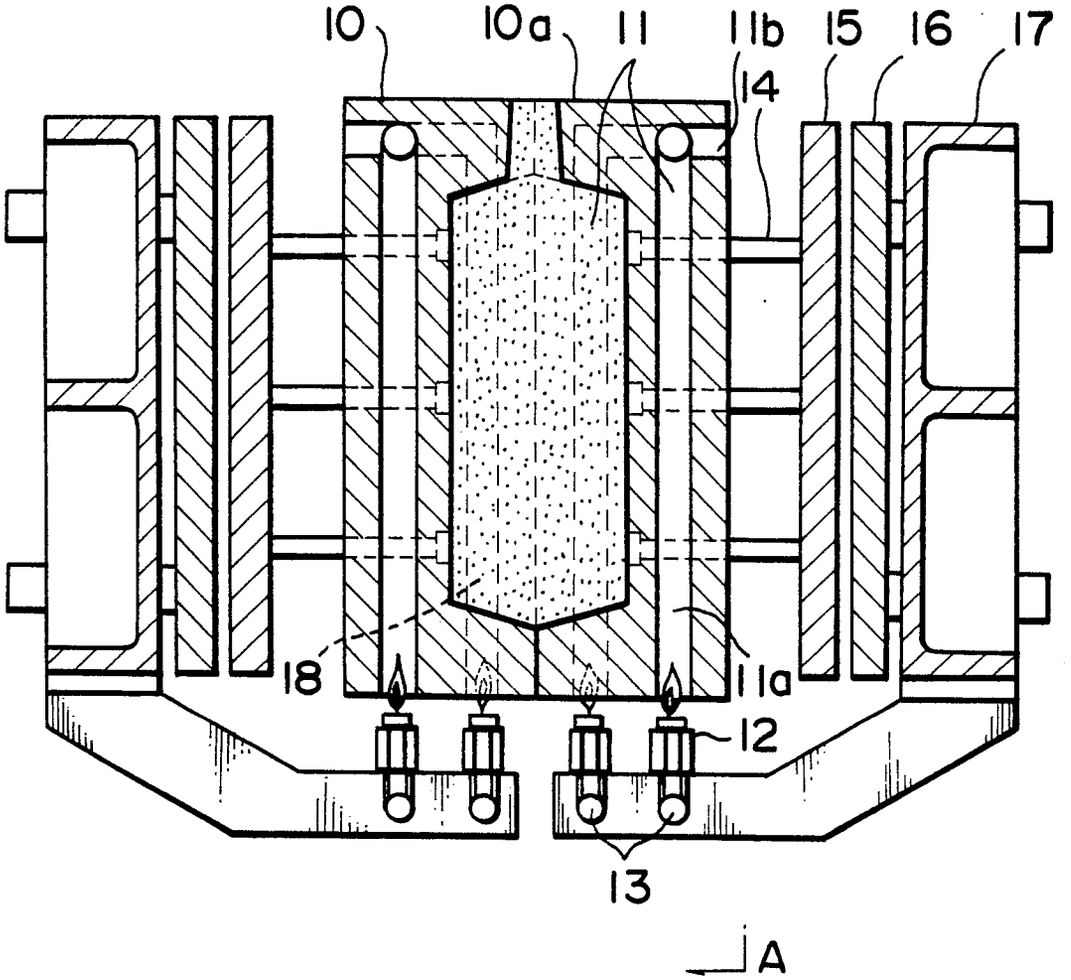


FIG. 2

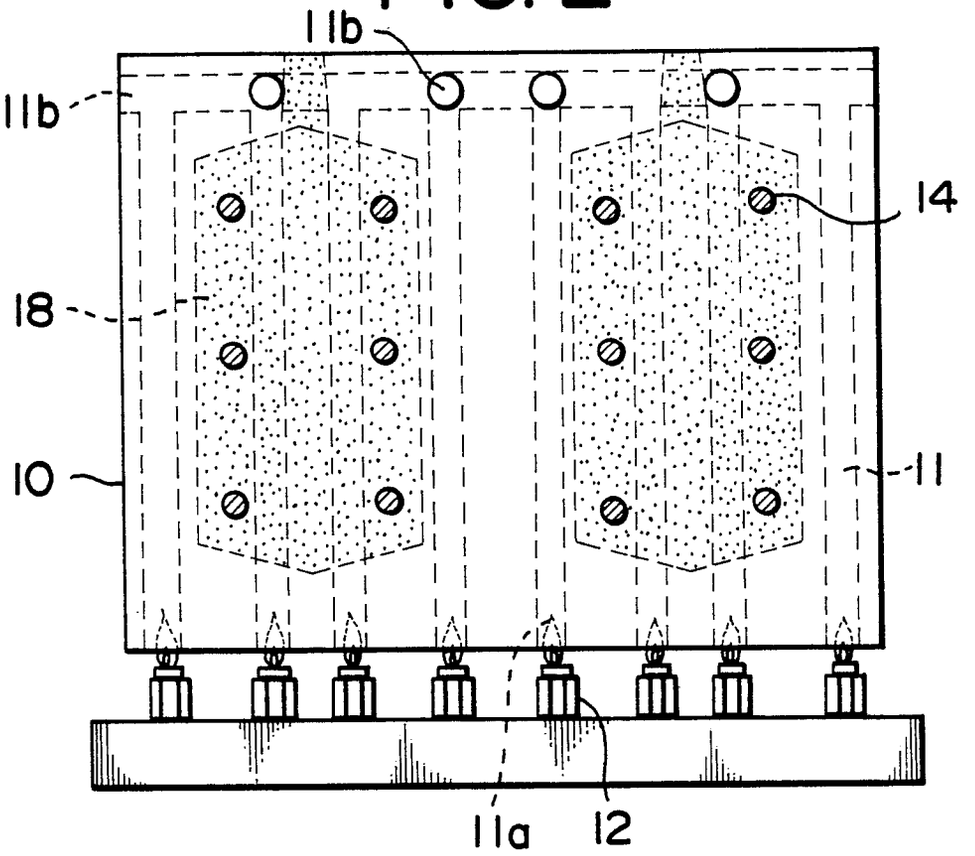


FIG. 3

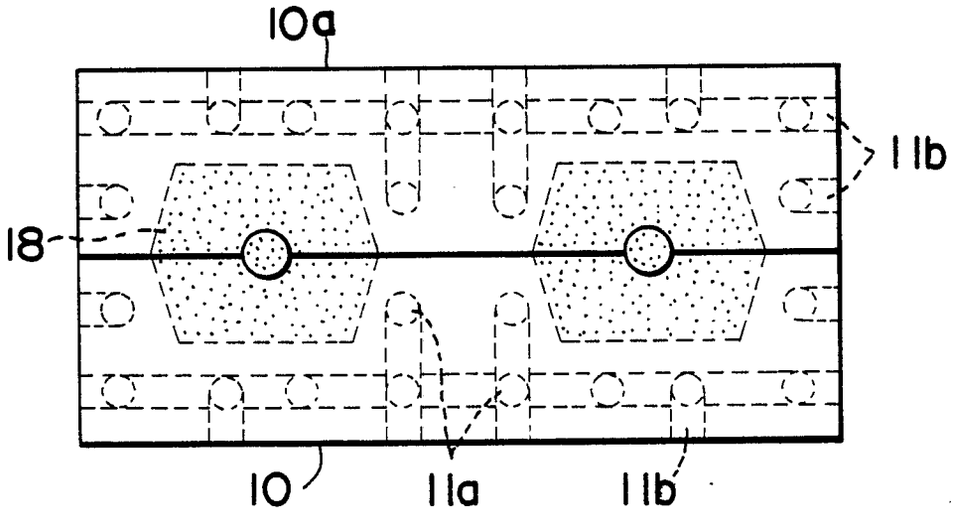


FIG. 4

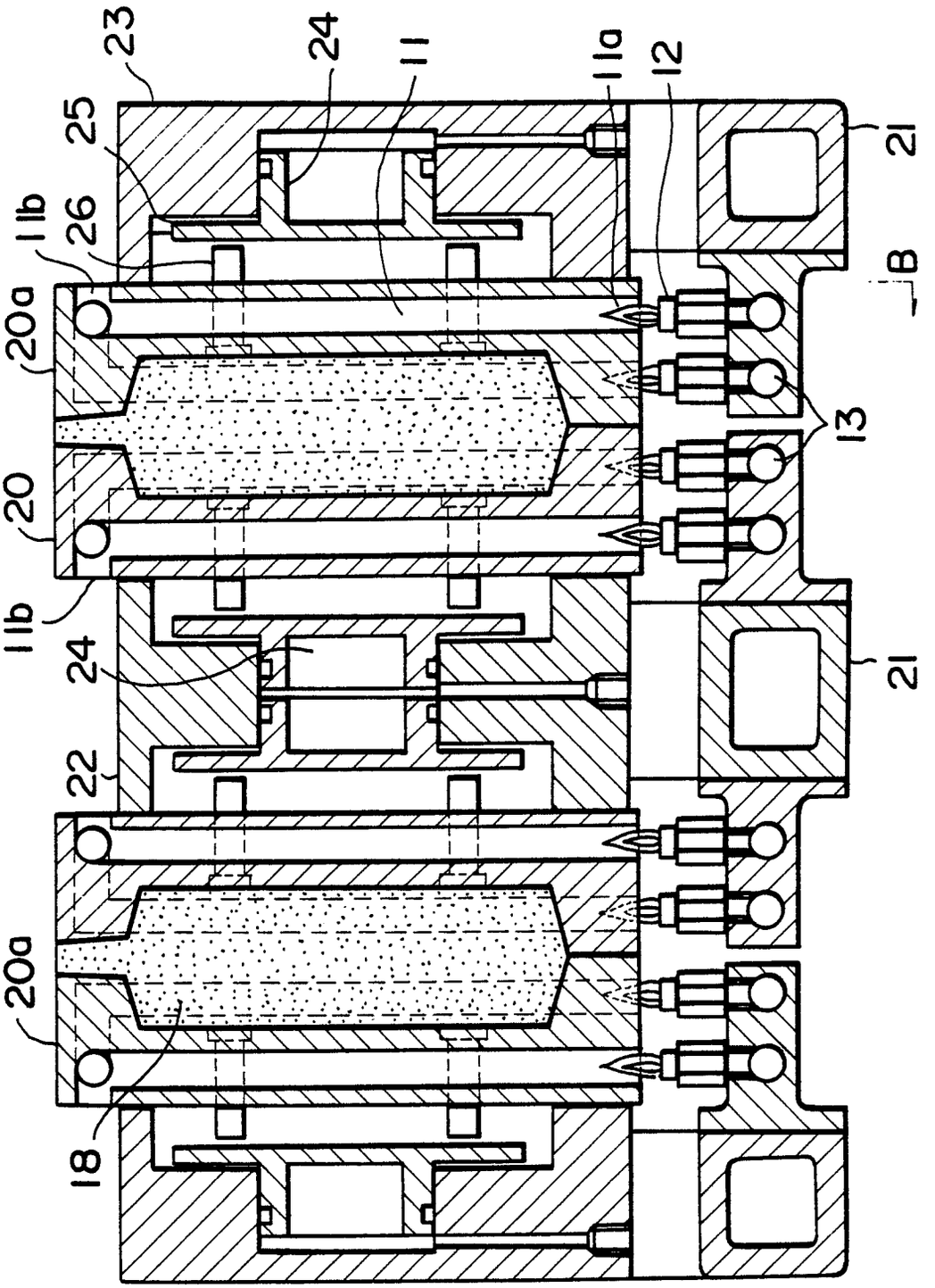


FIG. 5

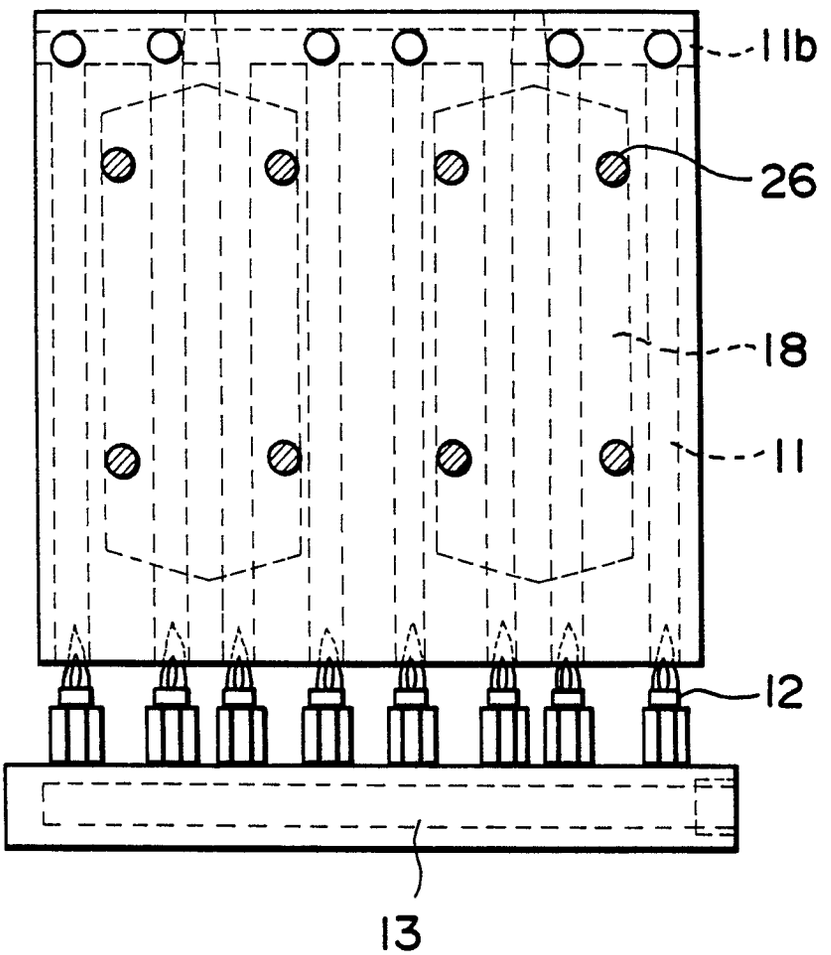


FIG.6

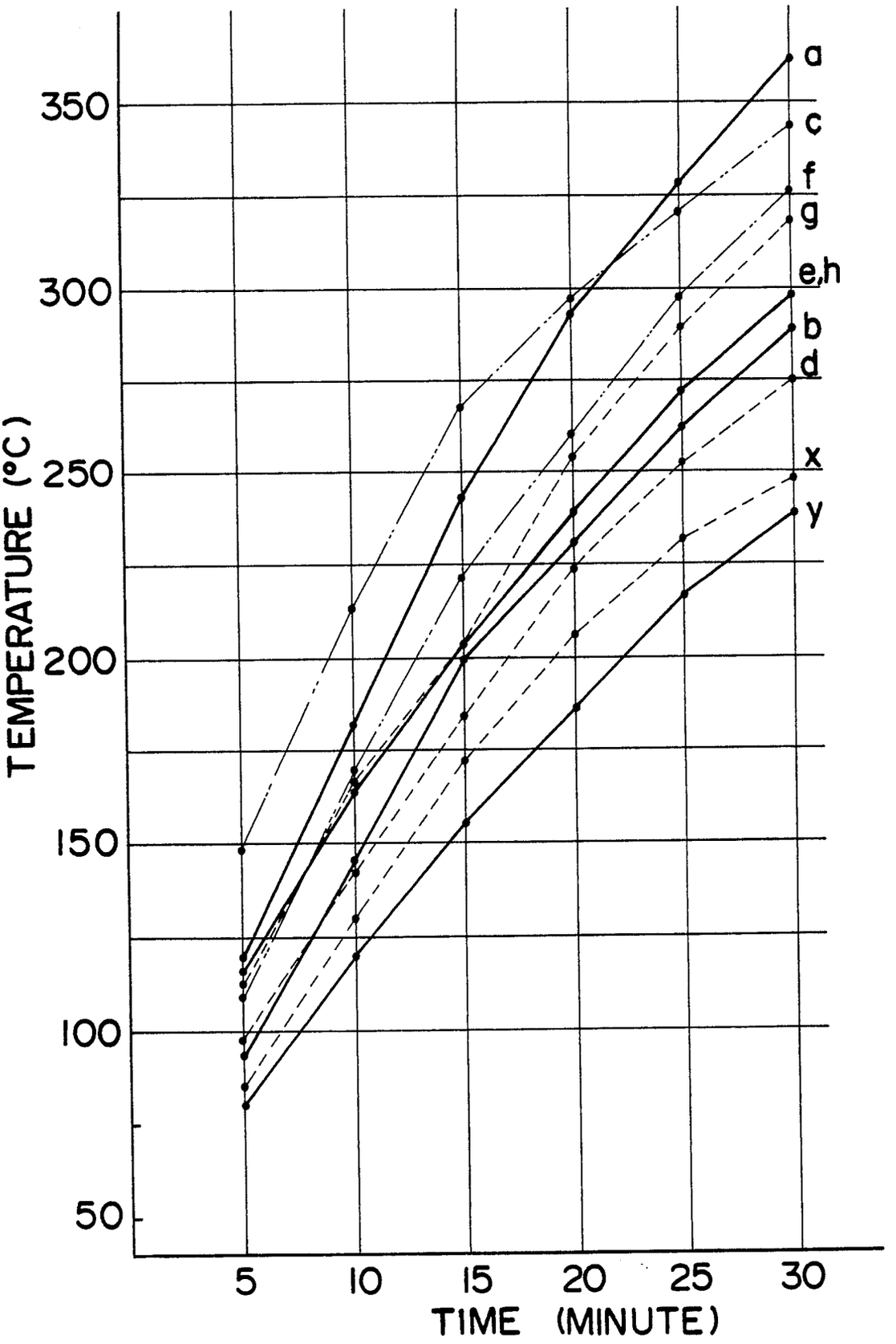
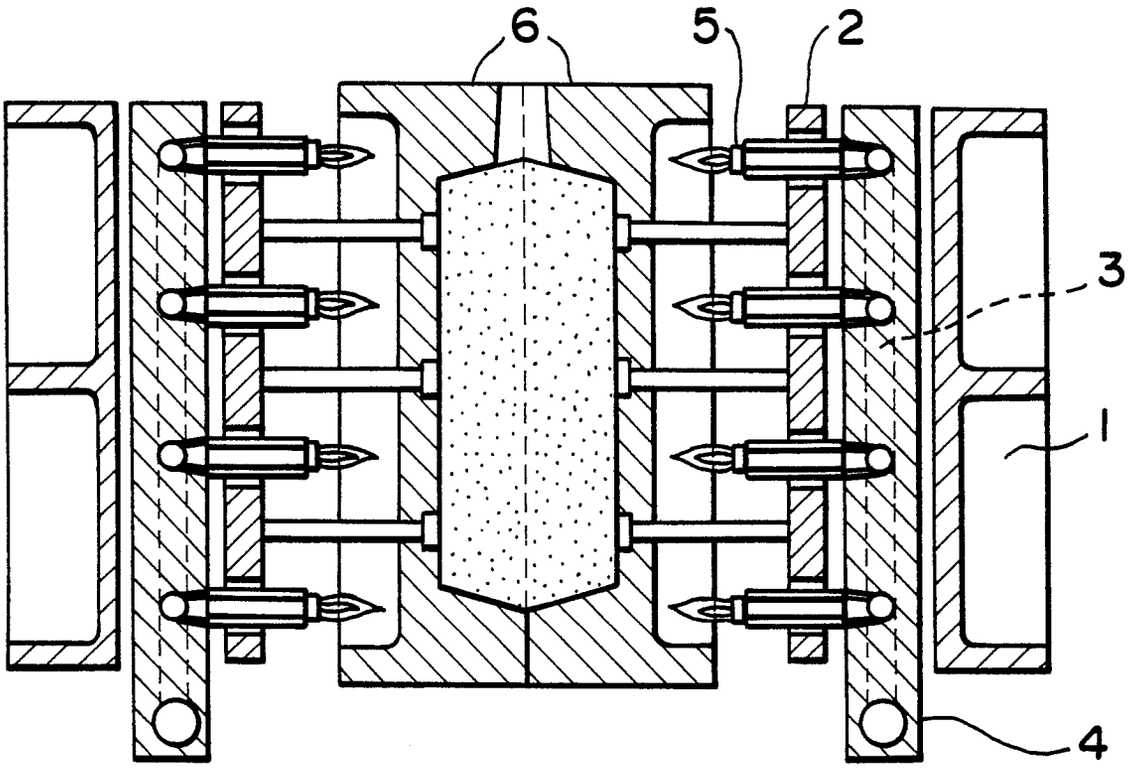

TEMPERATURE (°C)
350
300
250
200
150
100
50
5
10
15
20
25
30
TIME (MINUTE)
a
c
f
g
e,h
b
d
x
y

FIG. 7



European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 86 42 0216

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.4)
X	DE-C- 245 720 (W. STORK) * Whole document *	1	B 22 C 7/06
Y	US-A-2 892 224 (A.F. BAVER) * Figures 1,2; column 2, line 53 - column 3, line 42 *	1,2,3	
Y	GB-A-1 191 199 (CROMING & CO.) * Figures 1,2; page 2, lines 67-86 *	1,2,3	
A	US-A-2 592 340 (R.A. ROMCERAY)		
A	US-A-3 114 181 (A.W. MILLWARD)		TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	US-A-2 887 741 (R.H. SABEL)		B 22 C B 22 D
A	GB-A- 896 417 (DEPENDABLE PATTERN WORKS)		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23-04-1987	MAILLIARD A.M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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