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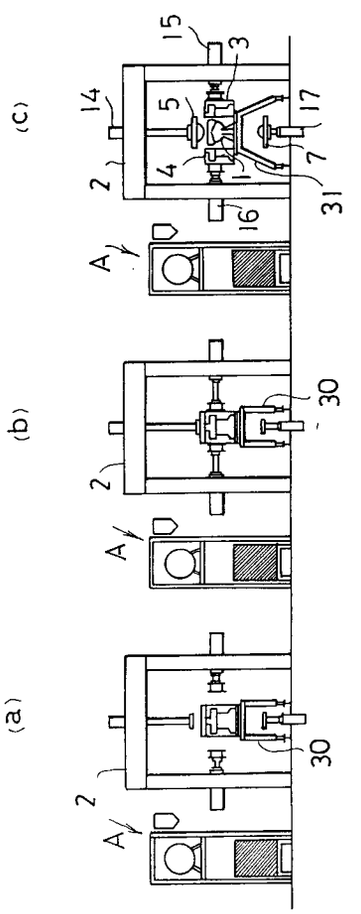
(54) Molding flask mating mechanism for a pressure cast molding apparatus.

(57) There is described a molding flask mating mechanism at a slip pressure cast molding apparatus for molding green articles (1), such as sanitary ware, before being fired. In the technique of cast molding the slip to the green article (1), the present invention provides molding flasks (3, 4, 5, 7) with wedge-like shaped abutting portions which make sure that the molding flasks (3, 4, 5, 7) are positioned with accuracy as a whole. Thus the gap of allowance between the molding flasks (3, 4, 5, 7) which exists with the known cast molding technique and leads to an undesired shifting of the composed molding flasks is avoided by the invention.

FIG.1



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The present invention relates to a molding flask mating mechanism for cast molding a slip under pressure and molding green articles of sanitary ware or the like, before being fired.

The sanitary ware represented by stool ware and wash basin is produced in such a manner that green articles are molded by cast molding a slip of muddy materials and then fired in a kiln. In a step of cast molding the slip for producing the green articles, the technique of cast molding the slip under pressure has hitherto been well known as disclosed in, for example, EP-A-352056, EP-A-389234, GB-A-792351, JP-A Sho 63-288705, JP-A Hei 3-69313, JP-A Hei 3-67604, JP-A Hei 3-69304, JP-A Hei 3-81103, JP-A Hei 3-67605, and JP-A Hei 3-83608.

At the pressure cast molding apparatus, a mating and positioning mechanism as shown in Figs. 11 and 12 has hitherto been used during the joining of the molding flasks with each other. In detail, left and right molding flasks 3, 4 as well as upper and lower molding flasks 5, 7 composed of porous bodies and metallic capsules are provided with projecting knock pins 6, and knock pin bores 19 are bored in the positions at opposite molding flasks respectively, so that both the lateral molding flasks and the vertical ones are mated to be positioned.

With the above-mentioned conventional technique, in case of using a mechanism for fitting the knock pins 6 into the knock bores 19 respectively, an allowance during the insertion and pull-out is required. Therefore a little gap of allowance must be provided, whereby the inconvenience that the molding flasks cannot be positioned with accuracy as a whole has been created. The present invention aims at solving the above problem.

The invention is explained in more detail by means of the accompanying drawings wherein

Fig. 1 is a side view of a pressure cast molding production line of the present invention,

Fig. 2 is a plan view of the production line of Fig. 1,

Fig. 3 is a side view of molding flasks for stool ware, divided into left and right molding flasks 3, 4 and vertical ones 5, 7,

Fig. 4 is a perspective view showing the left and right molding flasks 3, 4 being mated and wedge-like shaped abutting portions 28 being exposed,

Fig. 5 shows the positional relationship between the vertical wedge-like shaped abutting portions 28,

Fig. 6 is a plan view showing wedge-like shaped abutting portions 9 provided at tank molding flasks,

Fig. 7 is a sectional side view of tank molding flasks 23, 25,

Fig. 8 is a side view of exchange type abutting surfaces 8a, 9a disposed on vertical wedge-like shaped abutting portions 8, 9,

Fig. 9 is a side view of an embodiment of the present invention which is provided with two wedge-like shaped abutting surfaces,

Fig. 10 shows an adjusting mechanism for the wedge-like shaped abutting portion,

Fig. 11 is a side view of the conventional mating positioning mechanism comprising knock pins 6 and knock pin bores 19, and

Fig. 12 is an enlarged view of a portion of a knock pin 6 and a knock pin bore 19.

In the following an explanation will be given on the construction of a pressure cast molding line.

In the Fig. 2 plan view of the pressure cast molding apparatus, a molding flask transportation line 11 is disposed at the right side and a green article transportation line 12 at the left side. Pressure cast producing apparatus are disposed at an intermediate portion between the molding flask transportation line 11 and the green article transportation line 12. Each pressure cast producing apparatus comprises a pressurized machine casing 2. A slip stand A for supplying a slip to the pressure cast producing apparatus is attached to each pressure cast producing apparatus.

The molding stations each comprise the pressurized machine casing 2 and slip stand A. A casting mold transported on the casting mold transportation line 11 is transported to the molding station so as to be fixedly disposed from a casting mold branch line 32 which leads to the inside of the pressurized machine casing 2. At a branch T of the molding flask transportation 11, the molding flask transportation line 11b is divided into a molding flask transportation line 11a and a green article branch line 13, so that it is decided by discriminating the part number of molding flask whether the molding flask enters into a green article branch line 13 or directly passes the molding flask transportation line 11a to reach a molding flask housing line.

According to Fig. 1, inside each pressurized machine casing 2 there is fixed a whole molding flask comprising left and right molding flasks 3, 4 as well as upper and lower ones 5, 7, the left and right molding flasks 3, 4 being urged by left and right urging cylinders 15, 16 and the upper and lower molding flasks 5, 7 being urged by upper and lower urging cylinders 14, 17. According to the above, the four molding flasks are urged from four

directions to be one molding flask and thereafter the pressurized slip is charged therein so that the slip is deposited onto porous bodies at the inner surface of the molding flask. The left and right molding flasks 3, 4 as well as upper and lower molding flasks 5, 7 are composed of porous bodies disposed inside the flask and metallic capsules cover the outside thereof.

After deposition, a demolding work is carried out inside the pressurized machine casing 2 and a finished green article 1 is transferred to the green article transportation line 12 from the green article branch line 13. At the slip stand A there are disposed a slip pressure-feeding pump, a slip temporarily storing tank and the like.

As shown in Figs. 1 and 2, the molding flask transportation line 11 and the molding flask branch line 32 each have a smaller track width, so that, as shown in Figs. 1(a) and 1(b), the molding flask is put on and transported by a molding flask loading truck 30 having a smaller distance between the wheels. After having been molded the green article 1 is put on a green article loading truck 31 having a larger distance between the wheels travelling on the green article branch line 13 and green article transportation line 12 having a larger width of track.

Fig. 1(c) shows that the green article 1 after having been molded and demolded is put on the green article loading truck 31. A casting mold is constructed based on the left and right molding flasks 3, 4 as well as upper and lower molding flasks 5, 7. The entire molding flask is urged by the left and right urging cylinders 15, 16 for urging the left and right molding flasks 3, 4 and by the upper and lower urging cylinders 14, 17 for urging the upper and lower flasks 5, 7.

Next, explanation will be given on an embodiment of a four molding flasks mating mechanism for sanitary ware shown in Figs. 3, 4 and 5. The four molding flasks of the pair of left and right molding flasks 3, 4 and the pair of upper and lower molding flasks 5, 7 each has therein a porous body and is covered at the outside thereof with a metallic capsule. At the edges on which the porous bodies contact each other in the four molding flasks there are provided long wedge-like shaped abutting portions 28, respectively. When the four molding flasks, namely the left and right molding flasks 3, 4 as well as upper and lower ones 5, 7 are mated, all the long wedge-like shaped abutting portions 28 are adapted to come into close contact with each other. The wedge-like shaped abutting portions 28 in the embodiment are made longer to be wedge-like shaped at all the rectangular edges. As shown in Fig. 4, the left and right molding flasks 3, 4 at first abut against each other through the wedge-like shaped abutting portions 28 as a guide and thereafter the upper and lower molding flasks 5, 7 are positioned vertically and mated by the portions 28 as a guide.

Next, explanation will be given on two upper and lower molding flasks 25, 23 in an embodiment shown in Figs. 6, 7 and 8. In the embodiment there is shown a molding flask for constructing a green article 26 for a tank of porcelain, like a low tank, disposed at a flush stool. The lower molding flask 23 and the upper molding flask 25 both are composed of inner porous bodies and metallic capsules covering them around, the green article 26 being deposited onto the inner porous bodies. Wedge-like shaped abutting portions 9 project upwardly from the upper surface of the lower molding flask 23 and wedge-like shaped abutting portions 8 project downwardly from the lower surface of the upper molding flask 25, so that the upper molding flask 25 and the lower molding flask 23 are completely brought into close contact with each other at the position where both flasks are completely mated in the abutting state.

As shown in Fig. 8, exchange type abutting surfaces 8a, 9a are disposed on the abutting surfaces of the wedge-like shaped abutting portion 8 attached to the upper molding flask 25 and of the wedge-like shaped abutting portion 9 attached to the lower molding flask 23, so that, when only the abutting surfaces 8a and 9a are worn, the portions 8 and 9 are exchangeable. Hence, even when the number of times of the use increases, the molding flasks engage with each other always with accuracy. In an embodiment in Fig. 9, the wedge-like shaped abutting portions 8, 9 each are provided with two wedge-like surfaces, whereby the abutting portions 8 and 9 can be collectively disposed at one position.

Fig. 10 shows an embodiment for making the wedge-like shaped abutting portions 8 and 9 fine adjustable in position to each other, in which an adjusting bolt seat 18 and an adjusting bolt 20 are provided at a part of the porous body of the left and right molding flasks 3, 4 so that the wedge-like shaped abutting portion 9 can be fixed by a fixing bolt 21 to the left or right molding flasks 3, 4. Hence, the fixing bolt 21 is unscrewed and the adjusting bolt 20 is rotated so that the wedge-like shaped abutting portion 9 can be adjusted into a predetermined position and again fixed by the fixing bolt 21.

Next, explanation will be given on operation of the present invention. In the case of the embodiment of left and right molding flasks 3, 4 as well as upper and lower molding flasks 5, 7, the porous bodies composed of synthetic resin are disposed inside the four molding flasks and metallic capsules cover the outside thereof. The wedge-like shaped abutting portions 28 are disposed at the entire surfaces of edges abutting against the porous

bodies at the molding flask, so that, in the state where the wedge – like shaped abutting portions 28 abut against each other, the molding flasks are completely brought into close contact with each other.

For the two upper and lower molding flasks 25, 23, the wedge – like shaped abutting portion 8 projects from the upper molding flask 25 and the lower wedge – like shaped abutting portion 9 projects from the lower molding flask 23, so that when both abutting portions 8, 9 abut against each other, the upper molding flask 25 and the lower one 23 are adapted to mate each other.

The present invention has the following advantage. Since the knock pins 6 have hitherto defined the mating position of the molding flask, a gap of allowance is required in the size of each knock pin 6 and knock pin bore 19, so that there is a risk of shifting the molding flasks relative to each other. Contrary to this, the wedge – like shaped abutting portions 8, 9 and the wedge – like shaped portions 28 according to the present invention clearly define and fix the positioning portions, whereby the disadvantage of the conventional technique is eliminated.

Claims

1. A molding flask mating mechanism at a pressure cast molding apparatus for mating and positioning molding flasks (3, 4, 5, 7; 23, 25) of a pressure cast producing apparatus which provides at the inside thereof porous bodies and at the outside thereof metallic capsules for covering said porous bodies respectively, said molding flask mating mechanism being characterized in that wedge – like shaped abutting portions (8, 9; 28) are disposed on junction surfaces of said molding flasks (3, 4, 5, 7; 23, 25), so that, when said molding flasks come into close contact with each other, said wedge – like shaped abutting portions (8, 9; 28) are put into the complete abutting state.

2. A molding flask mating mechanism at a pressure cast molding apparatus according to claim 1, characterized in that four molding flasks of a pair of left and right molding flasks (3, 4) and a pair of upper and lower molding flasks (5, 7) constitute a molding flask of a pressure cast producing apparatus, and mutually abutting edges at a part of said porous bodies in said two pairs of molding flasks are entirely formed as wedge – like shaped abutting portions (28), so that, when said left and right molding flasks (3, 4) are mated with said upper and lower molding flasks (5, 7), all said wedge – like shaped abutting portions (28) come into close contact with each other.

3. A molding flask mating mechanism at a pressure cast – molding apparatus according to claim 1 or 2, characterized in that said molding flask of said pressure cast producing apparatus comprises an upper molding flask (25) and a lower molding flask (23), so that a wedge – like shaped abutting portion (8) projects downwardly from said upper molding flask (25) and a wedge – like shaped abutting portion (9) projects upwardly from said lower molding flask (23), so that said wedge – like shaped abutting portion (8) and the wedge – like shaped abutting portion (9) are adapted to be fitted in close contact with each other.

4. A molding flask mating mechanism at a pressure cast – molding apparatus according to any of claims 1 to 3, characterized in that exchange type abutting surfaces (8a, 9a) are disposed at the abutting surfaces of said projecting wedge – like shaped abutting portions (8, 9) so as to be exchangeable when worn.

5. A molding flask mating mechanism at a pressure cast molding apparatus according to any of claims 1 to 5, particularly claim 3, characterized in that two wedge – like surfaces are provided at each of said abutting surface of said wedge – like shaped abutting portion (8) attached to said upper molding flask (25) and said wedge – like abutting portion (9) attached to said lower molding flask (23).

6. A molding flask mating mechanism at a pressure cast – molding mechanism according to any of claims 1 to 5, particularly claim 3, characterized in that said wedge – like shaped abutting portions (8, 9) are made finely adjustable in position.

FIG.1

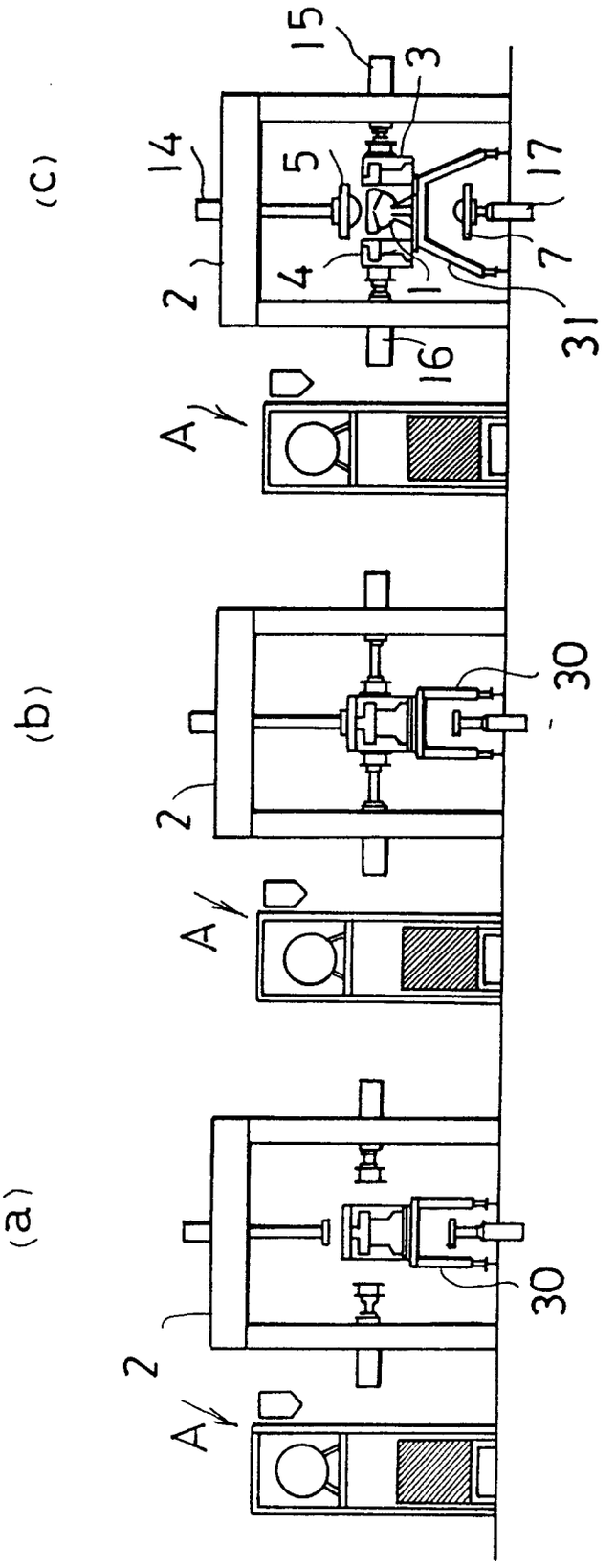


FIG. 2

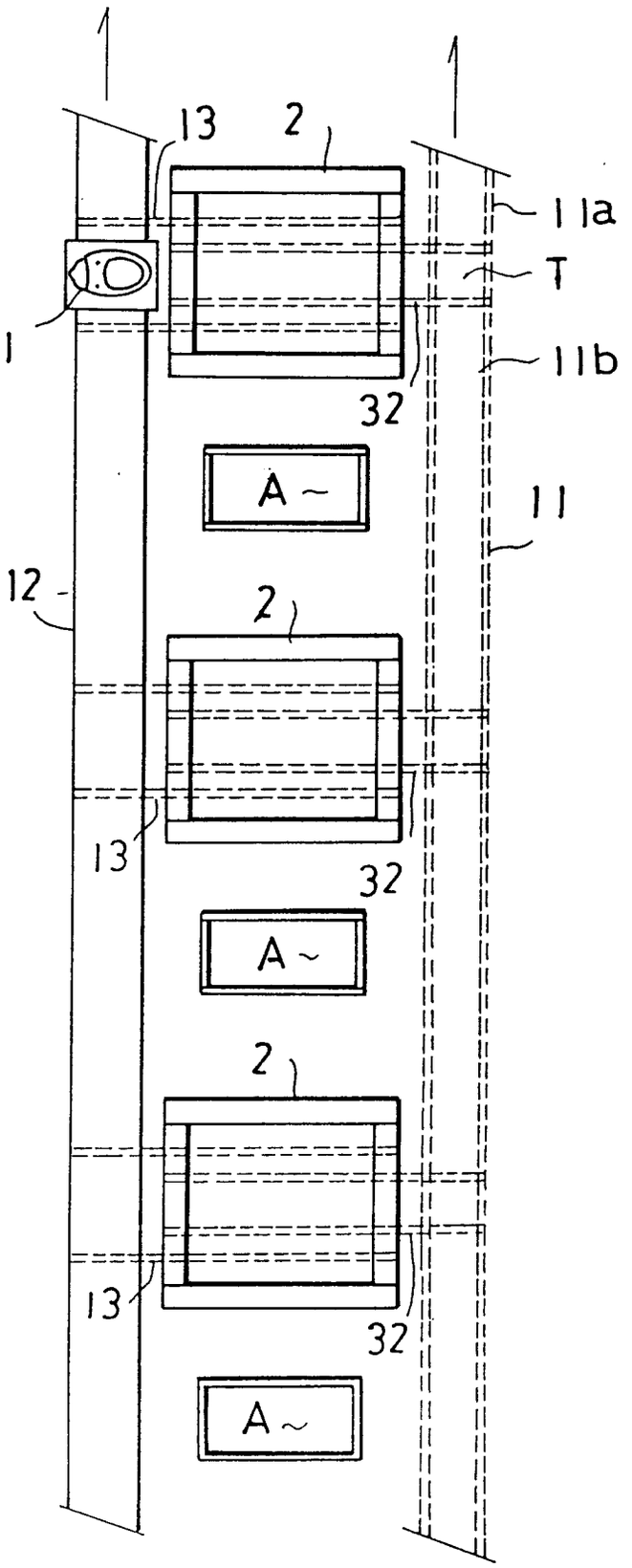


FIG.3

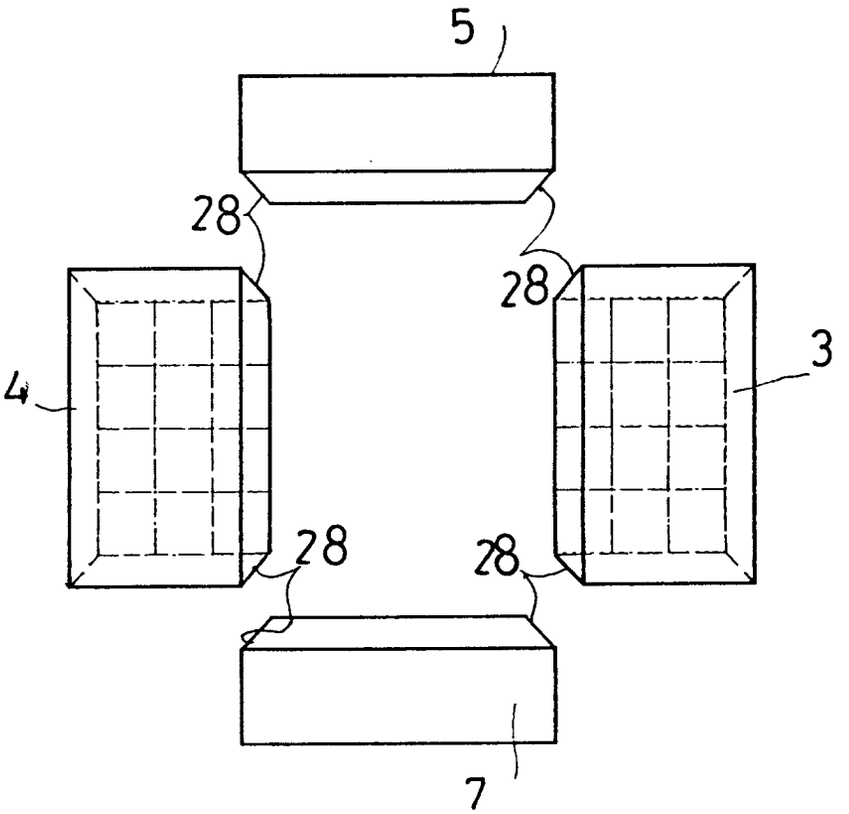


FIG.4

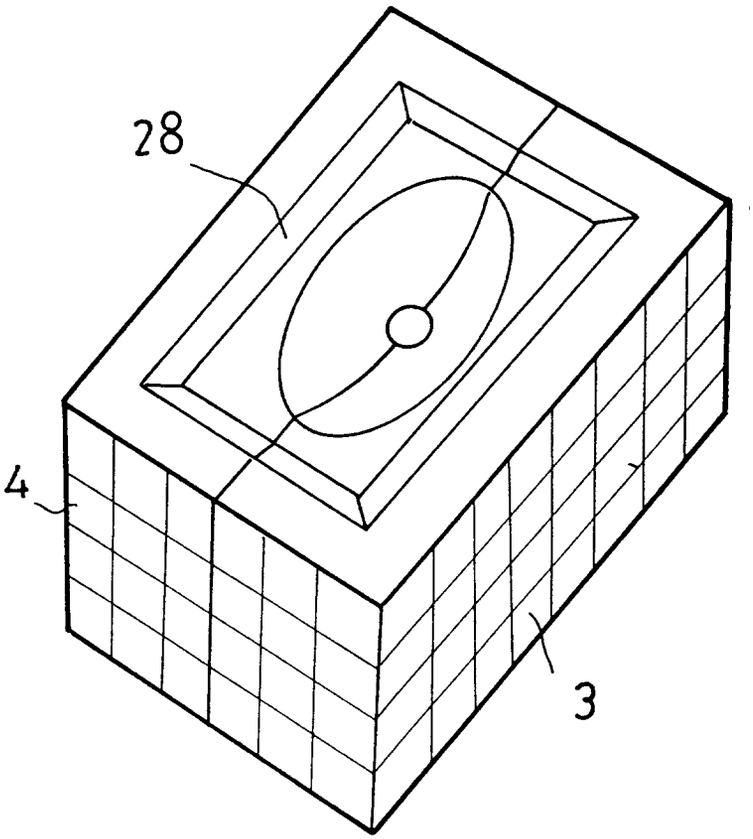


FIG.5

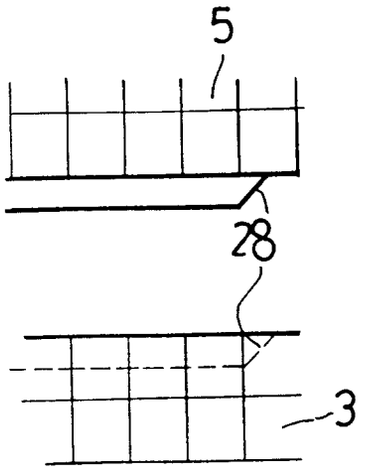


FIG.6

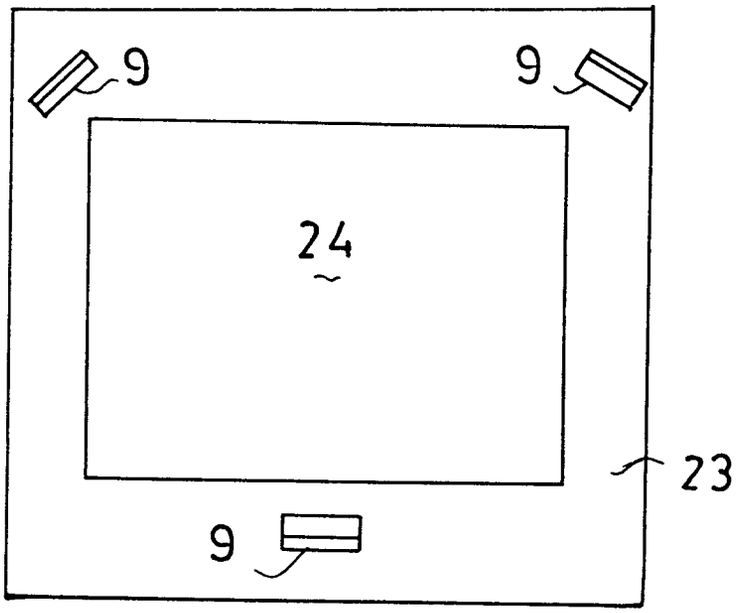


FIG.7

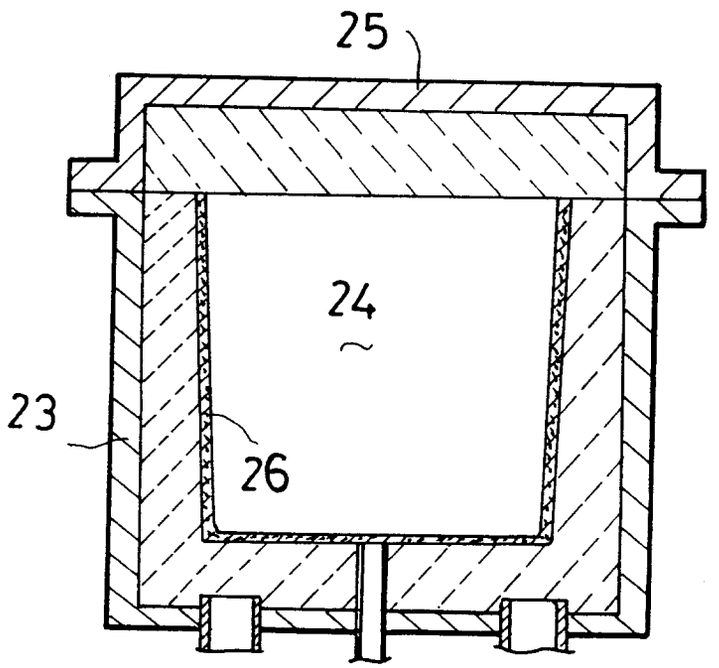


FIG. 8

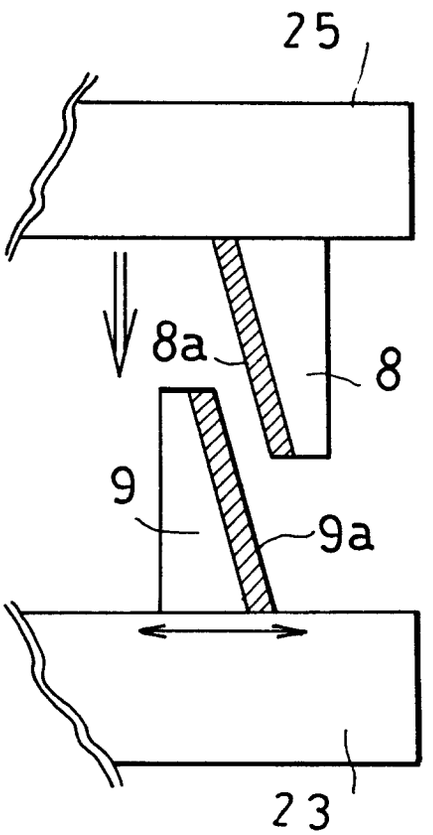


FIG. 9

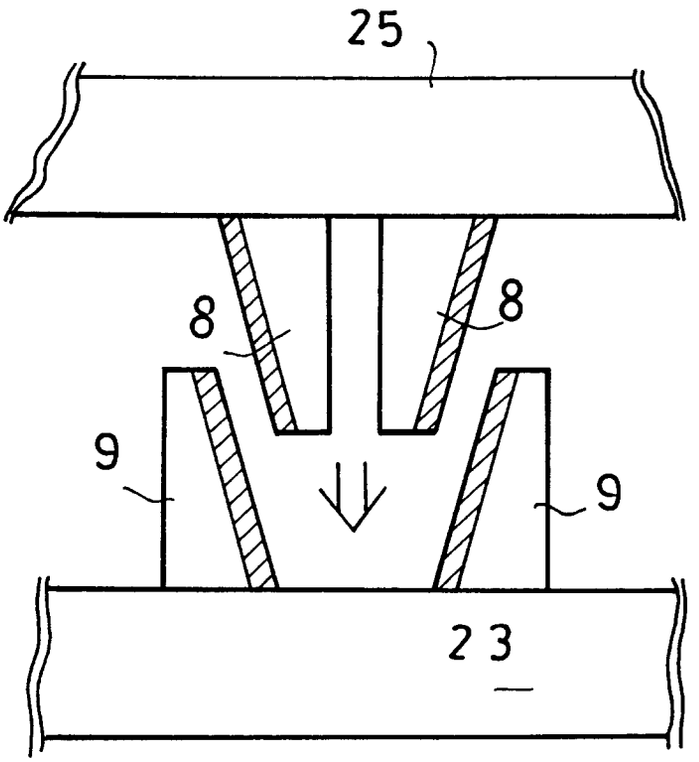


FIG.10

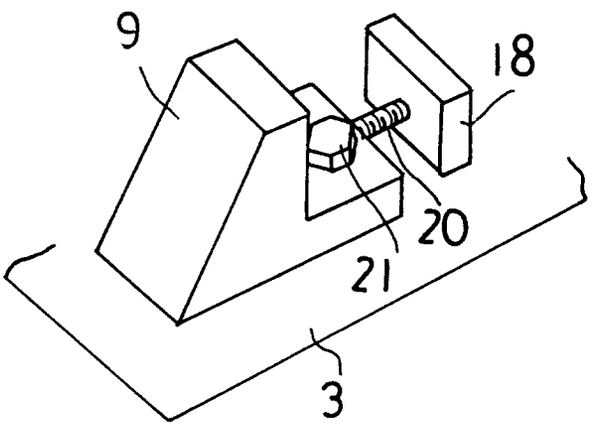


FIG. 11

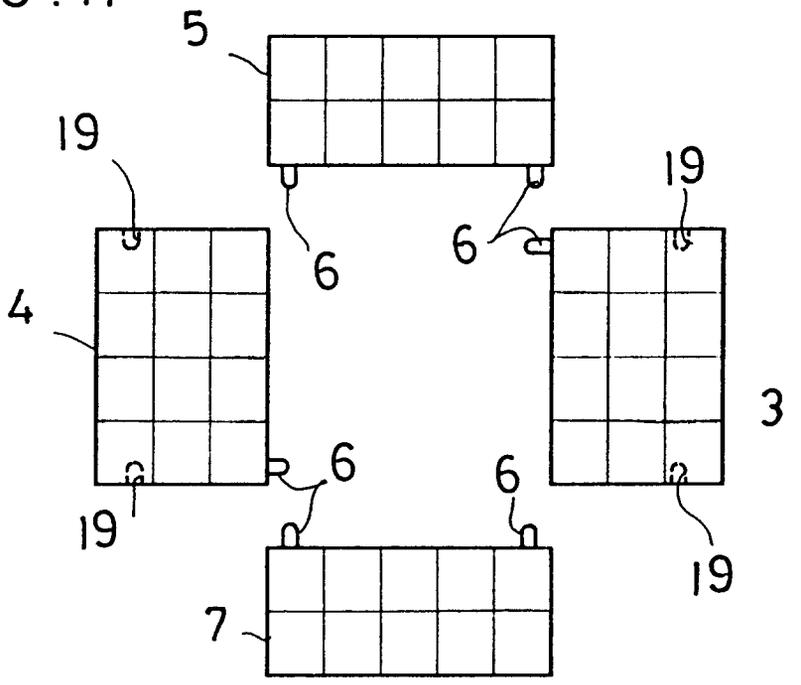
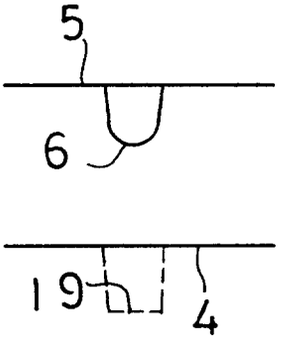


FIG. 12



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EUROPEAN SEARCH REPORT

Application Number

EP 92 11 8544

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	US-A-3 989 795 (T. D. MCGEE) * column 3, line 58 - column 3, line 64 * * column 7, line 34 - column 7, line 36; figures 3-5 *	1,2	B28B1/26 B28B7/00
Y	GB-A-2 099 804 (INOUE-JAPAX RESEARCH INCORPORATED) * the whole document , in particular fig. 5 *	1,2	
Y	WO-A-8 702 304 (UNIPORT POLYESTER-FORMENBAU TH. HIRZEL) * figures 1-3 *	1,2	
Y	FR-E-38 776 (K. GLÄSSER) * the whole document , in particular fig. 19-27 *	1,2	
Y	EP-A-0 211 653 (INAX CORPORATION) * the whole document *	1,2	
A	FR-A-1 161 596 (GRANDE POTERIE ALSACIENNE (S.A.)) * the whole document *	1-3	TECHNICAL FIELDS SEARCHED (Int. Cl.5) B28B B30B B29C
A	FR-A-2 109 111 (M. F. PERRIER) * the whole document *	1,5	
A	US-A-1 577 132 (A. V. LAWTON) * the whole document *	1,2	
A	US-A-3 838 960 (W. R. LOVEJOY) * the whole document , in particular fig. 3,5 *	1-6	
A	GB-A-1 537 746 (F. THEYSOHN) * the whole document *	1-6	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21 JANUARY 1993	GOURIER P.A.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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L : document cited for other reasons

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EUROPEAN SEARCH REPORT

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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)
A	PATENT ABSTRACTS OF JAPAN vol. 12, no. 14 (M-659)(2861) 16 January 1988 & JP-A-62 174 121 (HONDA MOTOR CO LTD) * abstract * ---	6	
A	EP-A-0 061 072 (MASCHINENFABRIK KÖPPERN GMBH. & CO. KG) * the whole document , in particular fig. 3 * -----	6	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)

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