United States Patent

Kazeef

[15] **3,682,235**

[45] **Aug. 8, 1972**

[54] **COOLING WATER CHAMBER FOR VERTICAL CASTING FRAME**

[72] Inventor: **Michel G. Kazeef,** 33 rue Jean-Jacques Rousseau, 92-Colombes, France

[22] Filed: **Sept. 23, 1970**

[21] Appl. No.: **74,675**

[30] **Foreign Application Priority Data**

Sept. 26, 1969 France.....6932885

[52] **U.S. Cl.**.....**164/283,** 164/273 R

[51] **Int. Cl.**.....**B22d 11/02**

[58] **Field of Search**..164/82, 89, 273 R, 273 M, 281, 164/283

[56] **References Cited**

UNITED STATES PATENTS

2,414,269	1/1947	Nichols	164/89
2,769,218	11/1956	Harter et al.	164/283
3,049,769	8/1962	Schultz	164/273 R
3,537,507	11/1970	De Rossi	164/89 X

FOREIGN PATENTS OR APPLICATIONS

1,028,863	5/1966	Great Britain	164/283

Primary Examiner—R. Spencer Annear
Attorney—McDougall, Hersh & Scott

[57] **ABSTRACT**

A universal water chamber for a vertical casting frame which can be adapted to a wide range of formats and which provides for easy regulation and distribution of water, including a supporting frame, crossmembers adjustably supported on said frame, and spray heads variably fixed to said crossmembers, a source for cooling water, and ramps connected by an independent variable-flow flexible coupling to each of the crossmembers and heads, whereby the number of crossmembers and heads and the positions thereof relative to each other and the frame can be varied to accommodate castings of different formats.

8 Claims, 8 Drawing Figures

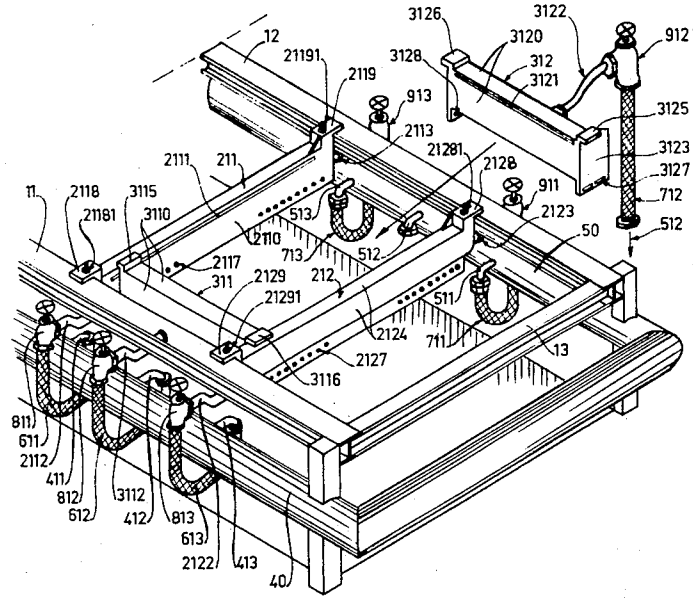
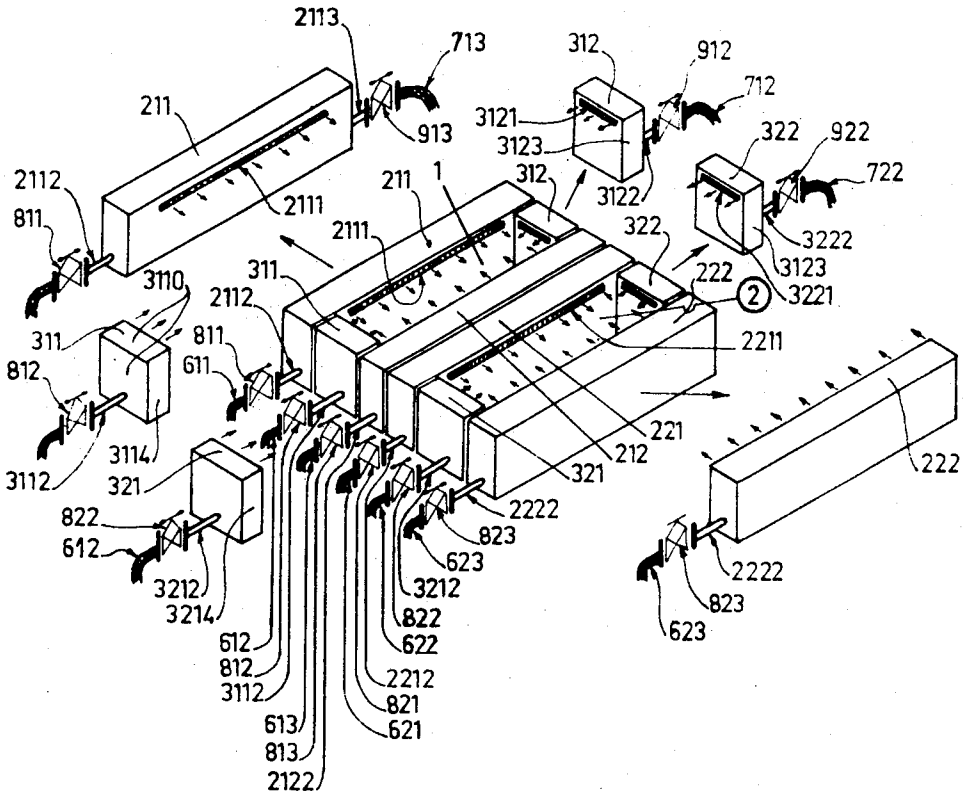


FIG. 1



INVENTOR.
MICHEL KAZEEF
BY
McDougall, Hersh & Scott
Attys

FIG. 2

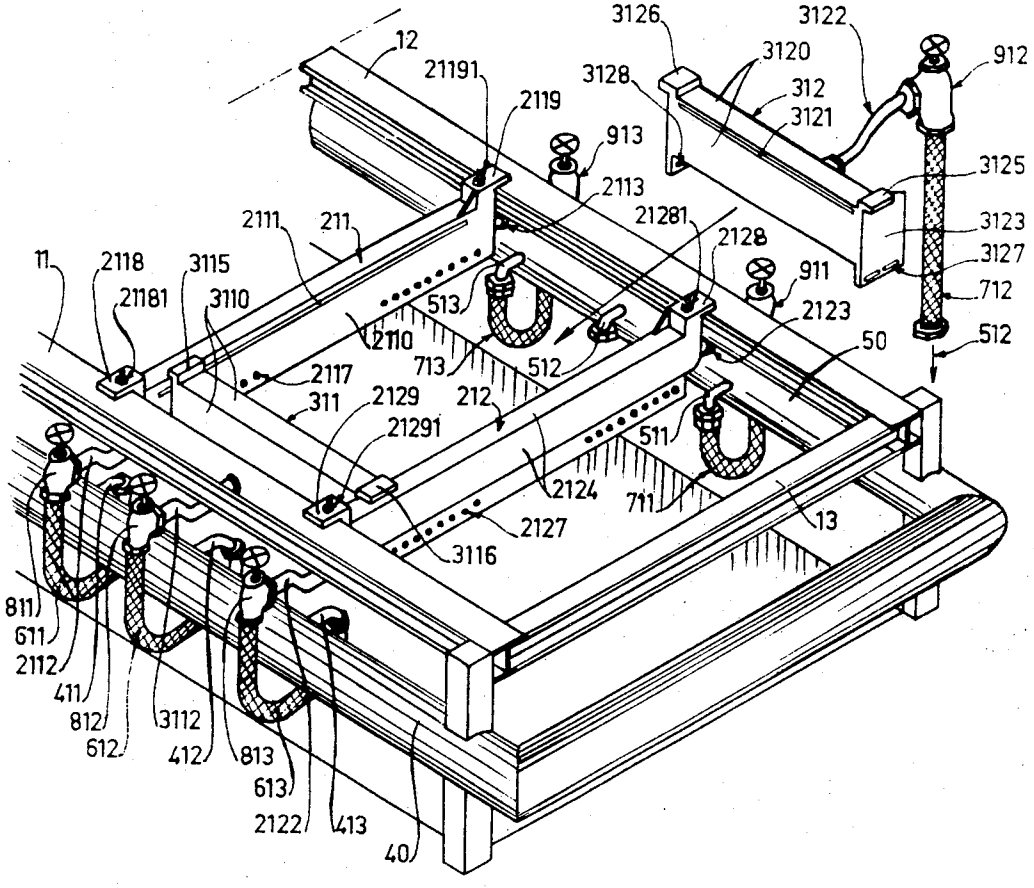

3126
3122
12
3120
912
21191
3128
312
2119
3121
913
3125
2113
2111
211
21281
3123
2128
3127
11
2118
3115
911
712
21181
3110
513
2123
2110
50
512
713
512
2117
311
2129
212
21291
511
2124
711
13
2127
3116
811
611
2112
411
812
612
3112
412
813
613
2122
413
40

FIG. 3

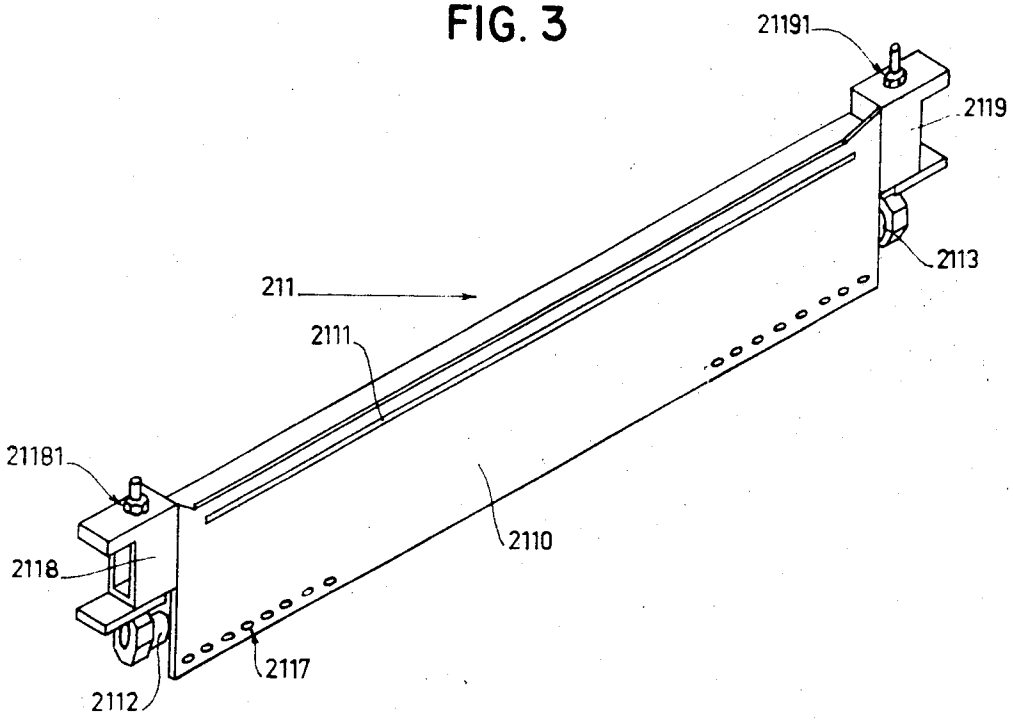

21191
2119
2113
211
2111
21181
2110
2118
2117
2112

FIG. 4

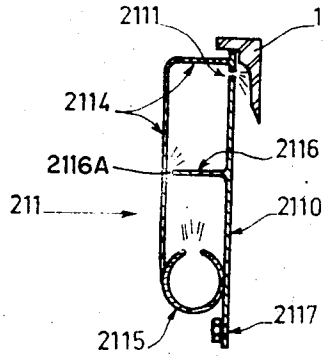
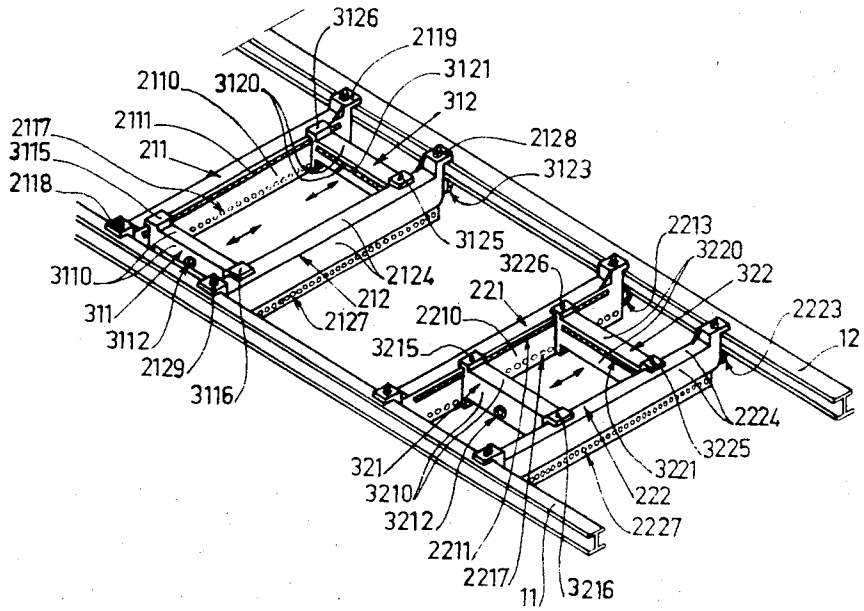

2111
1
2114
2116
2116A
211
2110
2117
2115

FIG. 5


3126
2119
3121
312
2110
3120
2111
211
2117
3115
2118
2128
3123
3125
2213
3220
322
3226
221
2210
2223
12
2124
212
2127
3110
311
3112
2129
3116
3215
2224
3225
3221
222
2227
321
3210
3212
2211
2217
11
3216

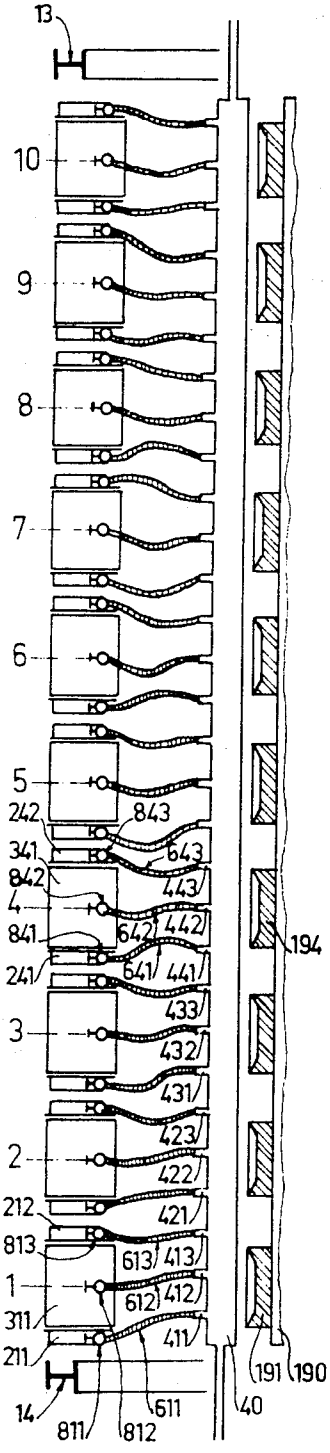


FIG. 6

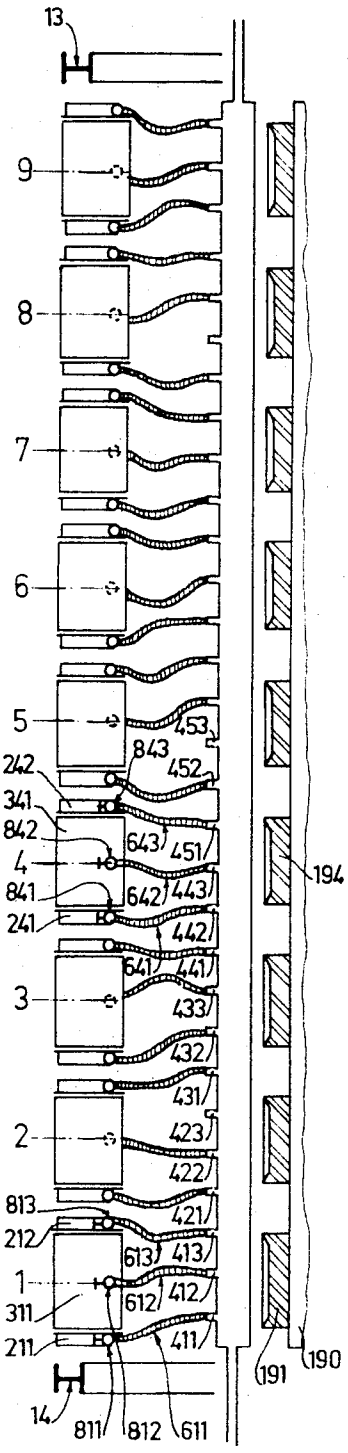


FIG. 7

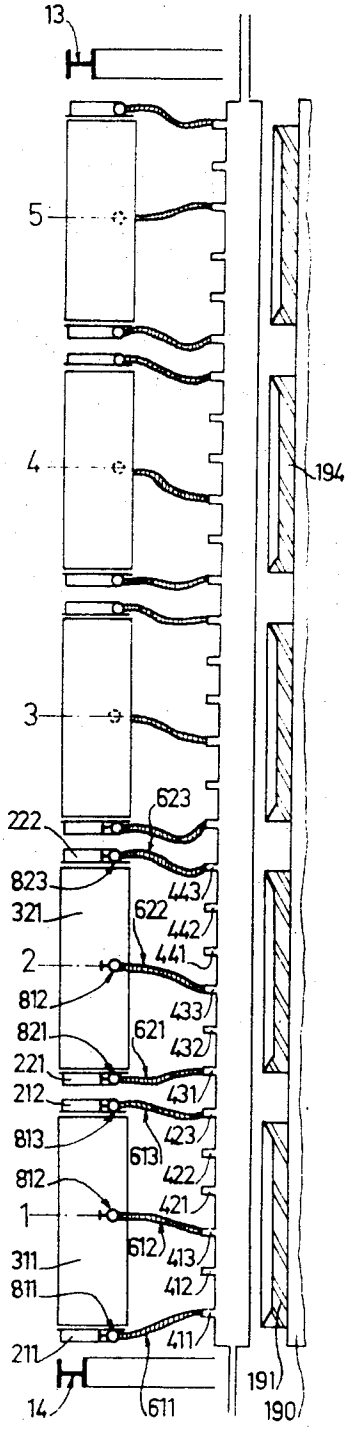


FIG. 8

COOLING WATER CHAMBER FOR VERTICAL CASTING FRAME

This invention relates to a universal water chamber for a frame for vertically casting rolled sheets, as used in the foundry industry.

A vertical casting frame comprises a water chamber with at least two crossmembers and two heads, defining compartments all of which have fixed dimensions and each of which is occupied by an ingot mould. A movable false bottom closes the ingot mould at the beginning of casting and, with a downward translatory movement imparted to it, retains the sheet after its lower end has solidified during casting. The crossmembers and the heads are formed with spray holes directed towards the outer wall of the ingot mould, the water chamber being continuously supplied with water under pressure which pours through the spray holes, thus cooling the ingot moulds.

In general, a water chamber has a monobloc structure designed for a single sheet format, although this format may vary by a few millimeters in width and thickness at the expense of some refitting. In cases where the format is of considerably different dimensions, it is necessary to provide a new water chamber which in turn is designed only to accommodate a very limited dimensional change of formats.

An improvement is provided by the extensible water chamber which is based on the knowledge that numerous rolling mills use several sheet formats which only differ from one another in width. Accordingly, this chamber has heads which can be displaced in dependence upon the desired width. However, in addition to the complicated structure, the water chamber becomes even heavier and its high cost is still further increased.

Even in the latter case, the water chambers can only accommodate formats which differ to a very limited extent, with the result that they have to be provided in large numbers and in which the numbers increase continuously due to the development of production programs. They can be used only for certain periods, for example, some chambers are only used 50 percent of the time, others for only 2 percent or 3 percent of the time, and still others only once. The value of the equipment is considerable and its profit-earning capacity, governed by market developments, cannot be forecast.

On the other hand, extensible water chambers, due to the decrease which they allow in the cast section, do not make any provision for emptying the casting furnace in a single operation which leaves it with a constant capacity. Hence there remains a residue of molten metal which in many cases makes it necessary to carry out the following operation in two successive castings.

Finally, the water is blindly distributed internally in the absence of any controlling action from the operator.

It is an object of the present invention to provide an inexpensive universal water chamber for a vertical casting frame for rolled sheets which can be adapted to a wide range of formats and which enables the supplied water to be readily regulated and distributed.

These and other objects and advantages of this invention will hereinafter appear, and for purposes of illustration, but not of limitation, an embodiment of the invention is shown in the accompanying drawings, in which:

FIG. 1 is a perspective view of the various elements arranged to illustrate the general principles of the invention;

FIG. 2 is a perspective view in elevation of a universal water chamber of this invention, with one of the heads removed;

FIG. 3 is a perspective elevational view of a crossmember;

FIG. 4 is a sectional view in end elevation of the cross member of FIG. 3;

FIG. 5 is a perspective view of the water chamber equipped for casting two types of sheets of different widths, with the water supply means having been removed;

FIGS. 6–8 are diagrams of a water chamber showing a casting frame in lateral elevation parallel to the crossmembers.

The water chamber of this invention comprises a supporting frame, crossmembers and heads and a means for supplying the heads with water.

It is distinguished by the fact that on the one hand the crossmembers, variable in number, are fixed to the supporting frame in any position, each head being fixed, again in any position, to two adjacent crossmembers, and on the other hand the means for supplying water comprise at least one feed ramp connected to each of the crossmembers and heads by an independent variable-feed flexible coupling.

Referring now to the drawings, FIG. 1 shows a water chamber with two compartments 1, 2, each of which is defined by two crossmembers 211, 212, and 221,222, and by two heads 311,312, and 321,322. The first number in each reference denotes the nature of the wall: 2 for the crossmembers, 3 for the heads, the second number is the reference for the compartment, and finally the third number denotes the position of the component relative to the compartment, the number 1 denoting the left-hand or front component while the number 2 denotes the right-hand or rear member.

The general concept is to dismantle the components of the water chamber and to render them independent so that they can be joined together and supplied with water independently and under control by means of one or two pipes, each of which is connected to a valve by which the rate of flow can be independently regulated. Each valve is connected to a feed ramp by means of a flexible coupling in the form of a flexible or swivel-joint tube. In this way, it is possible to position the crossmembers and heads at any point of the casting machine. The supply of water is able to follow these changes in position by virtue of the flexible coupling. The assembly as a whole has a level of rigidity compatible with the precision of casting machines and comparable with that of a conventional monobloc water chamber. It is thus possible to use the same material for casting different formats in a variable but optimum number, and the system as a whole permits considerable flexibility in regulation and absolute control over cooling. However, it is necessary to have one set of heads available for each sheet thickness to be cast.

The detailed description of the water chamber is illustrated in FIGS. 1 to 5 which are partial views, one complete chamber comprising a greater number of ingot moulds.

The chamber comprises a supporting frame consisting, in the example partly illustrated in FIG. 2, of four I-sections whose longitudinal sections 11, 12, act as supports for the crossmembers and the transverse sections 13, 14, shown in FIGS. 6 to 8.

The crossmember 211, shown in more detail in FIGS. 3 and 4, has a complex tubular structure consisting of a tube 2115 split so as to be open along its upper generatrix and joined at its ends to the water supply pipes 2112, 2113. This tube is fixed, on the one hand, adjacent the ingot mould, to a thick flat plate 2110 formed at its upper end with spray holes or spray slots 2111 and at its lower end with optionally tapped holes 2117 in which the heads are fixed, and on the other hand, externally to an L-shaped member 2114 fixed at the end of its minor surface to the plate 2110, the holes 2111 being situated beneath the fixing point. A partition 2116 divides the internal volume of the crossmember into two compartments, leaving free a passage 2116A for the spraying water. At each of its front and rear ends, the crossmember has a U-shaped fastener bracket 2118, 2119, by which it can be fixed to the longitudinal sections 11, 12, immobility being ensured by tightening a nut 21181, 21191. The other crossmembers can be given a similar specification by replacing in the foregoing description the first three numbers 211 of the references relating to the crossmember 211 by the reference relating to the crossmember in question.

The head 311 is of similar structure. It comprises a tubular body 3110 provided in its surface directed towards the ingot mould with spray holes 3111 and on its opposite surface with a water supply duct 3112. The tubular body is closed at its two bases by end plates 3113, 3114 provided, at their upper ends, with tabs 3115, 3116 designed to rest on the upper surface of the corresponding crossmembers 211, 212 and, at their lower ends, with fixing holes 3117, 3118, preferably oval in shape, enabling them to be screwed to the crossmembers by means of the corresponding contained holes 2117, 2127. It is evident that after two crossmembers 211, 212 and two heads 311,312 have been assembled, their upper surfaces, which are flat, are situated in the same plane with considerable precision so that the ingot mould can properly rest on them. The description of the other heads is obtained by replacing in the foregoing the first three numbers 311 of the references relating to the head 311 by the references for the head in question.

The supply means comprises a feed ramp consisting of two longitudinal water pipes or headers 40, 50, each of which is provided with sockets at least equal in number to the pipes in the crossmembers and heads arranged opposite, when the water chamber is equipped for the maximum number of ingot moulds. In the example shown, each tube comprises three sockets for each ingot mould, Each socket communicates with the corresponding pipe by means of the aforementioned flexible coupling and a variable-flow valve. The two pipes 40, 50 can be supplied with water either independently or together, in which case the pipes communicate through a transverse tube.

The references denoting the sockets have, as their first number, the first number 4 or 5 of the corresponding water pipe 40 or 50, as their second number a number increasing in order from left to right and increasing by one unit every three sockets (this number is that of the compartment removed when the chamber is equipped with the maximum number of ingot moulds) and, as their third number, a position reference 1, 2 or 3 increasing from left to right. The hoses each bear a reference in which the first number is 6 for the front hoses and 7 for the rear hoses, the second number is the reference of the corresponding compartment and the third number a positional reference 1, 2 or 3, increasing from left to right. The reference for each valve is obtained by adding two units to the first number of the corresponding hose.

FIGS. 6 to 8 show an identical casting frame equipped with a universal water chamber of the kind described above. The figures show the two transverse I-sections 13,14 of the supporting frame, the sections 11, 12 having been left out for purposes of clarity. The water chamber comprises, at most, 10 ingot moulds compartments 1 to 10. Beneath each compartment there is a false bottom identified by the number 19 followed by the reference of the corresponding compartment, the assembly of false bottoms being mounted on a common support 190 which is mounted for vertical movement.

The water pipe 40 has 30 sockets, three for each ingot-mould compartment in the case of maximum utilization. This case is illustrated in FIG. 6, which shows 10 compartments, such as 4. Each crossmember 241, 242 is connected to a socket 441, 443, the front head being connected to the center socket 442. The compartments are illustrated as being of equal width corresponding to sheets of the same thickness, although it is of course possible to cast sheets of different thickness, using heads of corresponding width.

According to FIG. 7, the same water chamber is used to cast slightly wider sheets with heads of corresponding width; the number of compartments is reduced to nine and three sockets remain unused and are of course closed. It can be seen that the members of the compartment 2 are joined, the crossmembers being joined to the sockets 421, 431 and the front head being joined to the socket 422 although it could also be connected to the socket 423. Similarly the members of the compartment 4 are joined, the crossmembers to the sockets 442 and 451, and the front head to the socket 443.

According to FIG. 7, the same chamber is used to cast sheet of considerable thickness, five in number. Fifteen sockets out of 30 remain unused and are closed. The members of the compartment 1 are joined, the crossmembers 211, 212 being joined to the sockets 411, 423 and the front head 311 being joined to the socket 413. The members of the compartment 2 are joined to the sockets 431, 453 and 443.

For the same number of castings, the method of connecting the hoses is by no means inflexible, their clearance eliminating the need to provide for rigid control.

The water chamber described has numerous advantages insofar as it eliminates the need to use a different water chamber for each new format. It increases production capacity through the use of a surplus number of compartments for other formats and reduces capital investments in furnaces and casting machinery. It is extensible in all directions without any limitations and in a strictly continuous manner. Disre-

garding the ingot moulds, it is possible for example to cast any number of formats which differ in width by only a few millimeters for formats having widths in the range from 100 to 600 mm. and more. The chamber described enables the same material to be used for 100 percent of the time for casting any formats without immobilization of the redundant material. The change from one format to another is obtained by adding a few crossmembers, all of which are identical or by removing others to obtain the optimum umber of compartments of the required size because the crossmembers are able to assume any position on the supporting frame. It is thus possible ultimately to arrive at a number of compartments enabling the furnace to be emptied in a single operation. Any orders relating to a new format can be dealt with quickly and at less expense because it is only new heads that are needed and then solely in cases where the order relates to a new thickness. Finally, since each compartment is independently supplied with water, the adjustments are easy, quick and accurate, and the quality of cooling is greatly improved.

This technique can readily be carried out with existing casting frames with the same advantages.

The invention is applicable to the vertical casting of rolled sheets of any metal or alloy, more particularly aluminum or a metal based on an aluminum alloy.

It will be understood that changes may be made in the details of construction and operation, without departing from the spirit of the invention, especially as defined in the following claims.

I claim:

1. A universal water chamber for a vertical frame for continuous casting comprising a supporting frame, crossmembers extending crosswise of the frame and means for securing the crossmembers in various positions of support over the length of said frame, head members supported by said crossmembers between adjacent crossmembers and means for securing said head members in variable positions to adjacent crossmembers over the lengths thereof, a source for cooling water, at least one ramp for receiving the cooling water from the supply source, and variable-flow flexible couplings connecting said ramp to the crossmembers and heads for directing the flow of cooling water thereto.

2. A water chamber as claimed in claim 1 in which the crossmembers comprise a tubular structure formed of a tubular member which is split along its upper generatrix, the opposite ends of said tubular member being connected with the water supply, a plate on which the tubular member is secured having spray openings in the upper portions thereof.

3. A water chamber as claimed in claim 2 in which the plate is provided with opening in the lower portion for attachment of the heads thereto.

4. A water chamber as claimed in claim 1 which includes a partition subdividing the crossmember into upper and lower compartments with a passage therebetween for communication between said compartments.

5. A water chamber as claimed in claim 1 in which the means for fixing the crossmember to the frame comprises a bracket on each end of the crossmember and bolt and nut means releasably interconnecting the crossmember to the frame.

6. A water chamber as claimed in claim 1 in which the head comprises a tubular body, spray holes through the inner surface of said tubular body, and a water supply pipe connected to the outer surface of said tubular body.

7. A water chamber as claimed in claim 6 which includes end plates mounted to close the ends of said tubular body, tabs on the upper portion of said end plates in position to rest on the upper surface of the corresponding crossmembers, and opening in the lower end portions of said end plates for attachment to said crossmembers.

8. A water chamber as claimed in claim 1 which includes a variable-flow valve in each flexible coupling.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,682,235 Dated August 8, 1972

Inventor(s) Michel Kazeef

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Assignee: Pechiney Ugine Kuhlmann,
Paris, France

Signed and sealed this 9th day of January 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334