United States Patent

[11] 3,583,473

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[33] **Germany**
[31] **P 16 08 346.8**

[54] **LIQUID COOLED CONTINUOUS METAL CASTING CHILL MOLD**
14 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **164/273**
[51] **Int. Cl.** **B22d 11/08**
[50] **Field of Search** 164/273, 281, 282, 283, 280, 339, 341, 342, 343

[56] **References Cited**

UNITED STATES PATENTS

3,049,769	8/1962	Schultz	164/283X
3,237,252	3/1966	Ratcliffe	164/283X
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FOREIGN PATENTS

1,028,863	5/1966	Great Britain	164/283
1,125,594	3/1962	Germany	164/283

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ABSTRACT: A liquid-cooled continuous metal casting chill mold having plate units opposite each other whose surfaces run at a slant to the axis of the cast length of the metal.

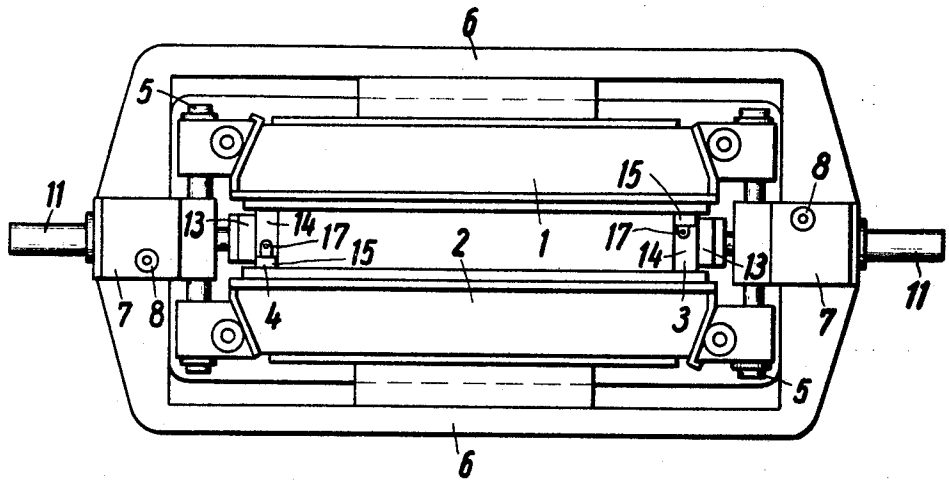
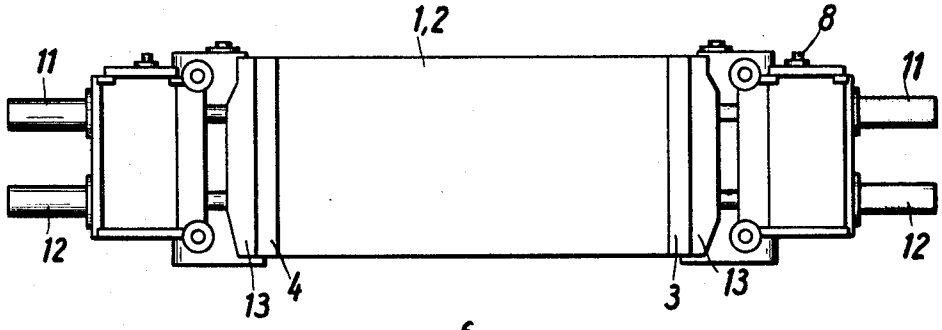


Fig.1



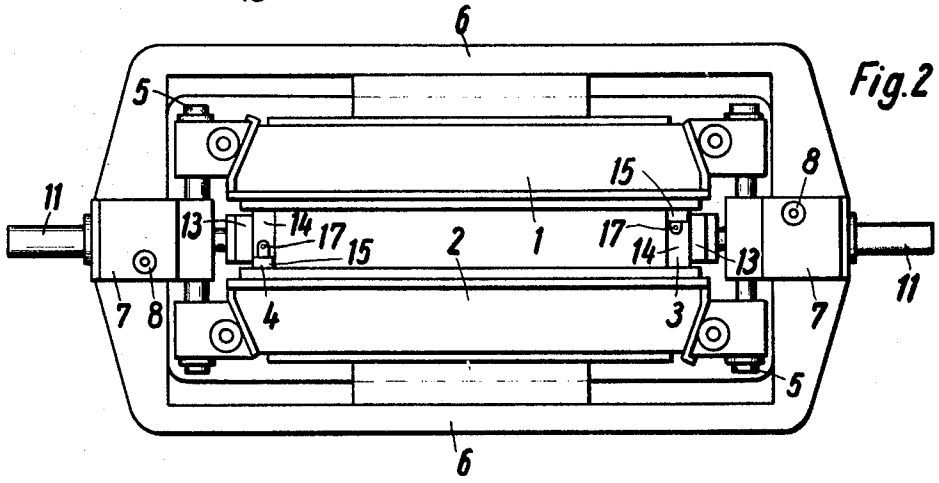


Fig.2

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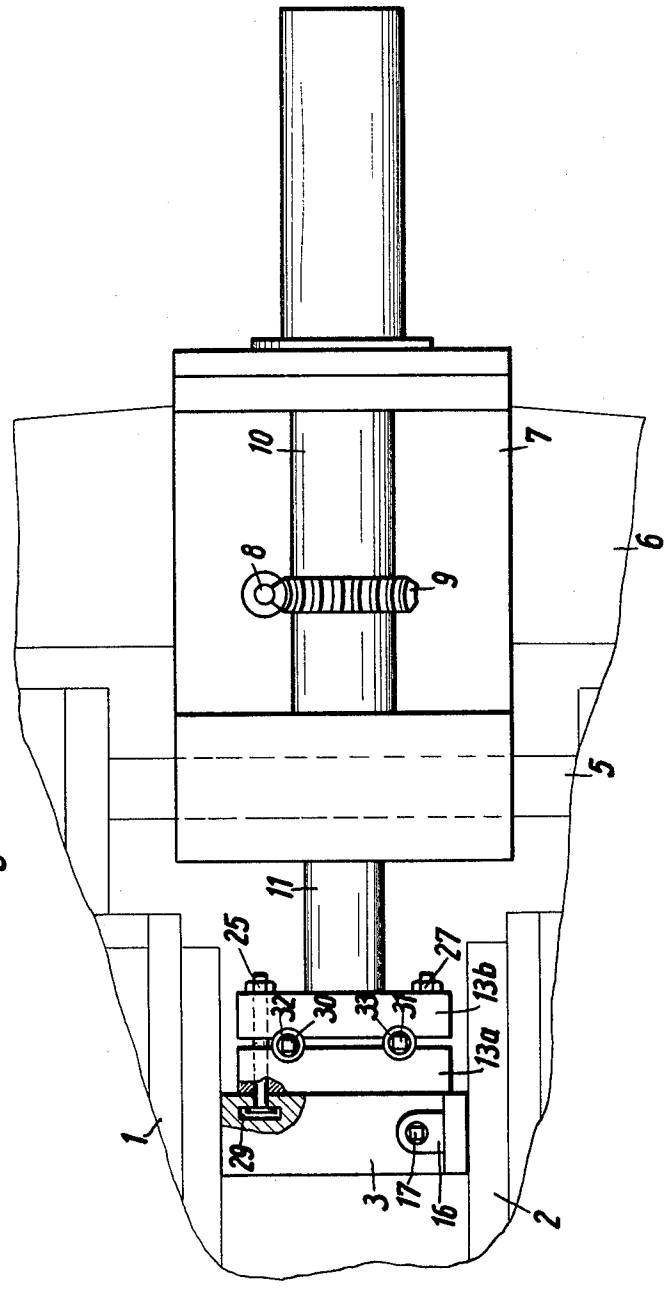

Fig.3

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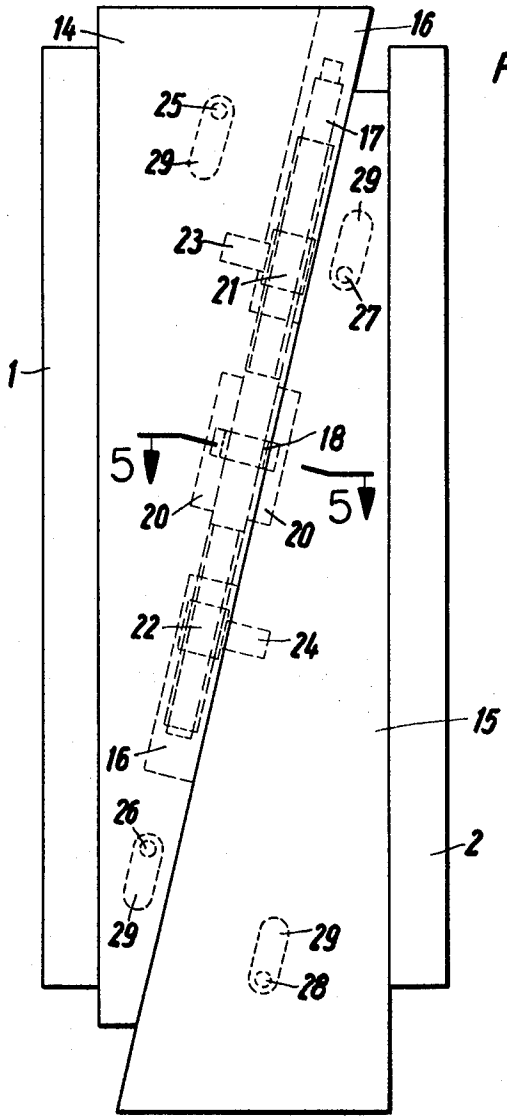

Fig.4

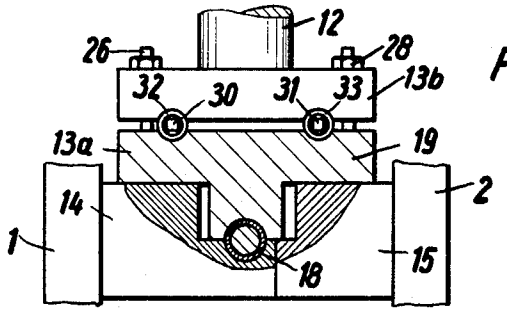

Fig.5

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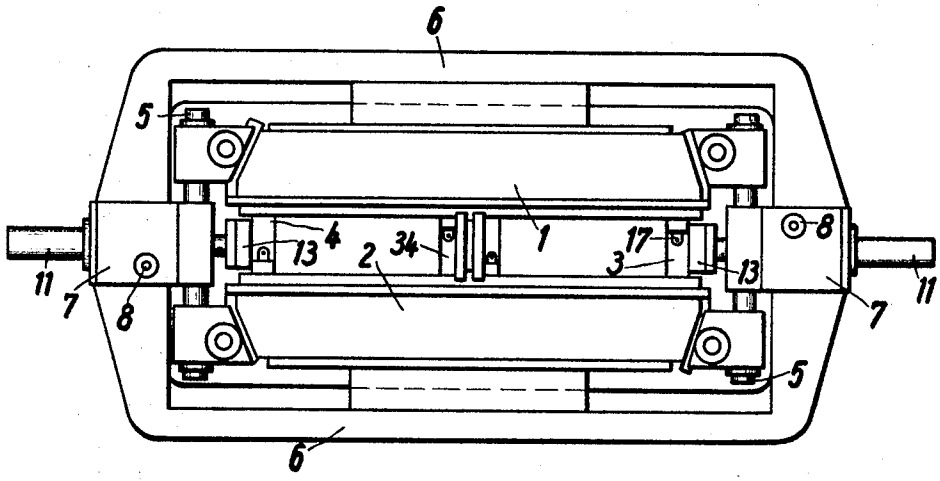
Fig.6



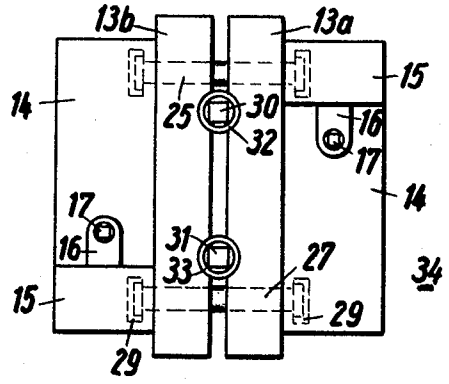


Fig.7

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LIQUID COOLED CONTINUOUS METAL CASTING CHILL MOLD

The invention concerns a liquid-cooled continuous-metal casting chill mold, made of plates, whose cross section is variable, and in which at least two of the plates are composed of integral plate units.

A plate-type chill mold for the casting of rectangular lengths of metal is known-namely German Pat. No. 1,125,594. In this patent there are broad sides and narrow sides and dimensions. The latter consists of individual plate units having their own cooling water system. The plate units have parallel edges, and are joined together by a tongue and groove. When worn, they can be replaced. Inside the broad sides and the narrow sides, each narrow side consists of an individual plate unit which is adjustable. By means of two adjusting screws disposed at the upper and lower ends, and associated adjusting nuts, the taper can also be adjusted. This known chill mold permits casting rectangular lengths of metal of different formats. The changeover from one cross section of the length of metal to another cross section is however possible only by disassembling the chill mold. The time required for a change of format, when interchanging chill molds, can therefore not be diminished by this known arrangement.

There also has been known a chill mold according to Austrian Pat. No. 258,497 which does not have the drawback of the German Patent and which during the adjustment of the narrow dimensions does this by the aid of two screw-threaded spindles, of different pitch but driven in common. For each breadth of the cast length of metal it is therefore possible to set the corresponding taper at the same time. The chill mold, in being changed from one format to another, does not need to be disassembled. However the format of the length of the cast metal can be changed in one direction only, namely in its breadth. If lengths of greater or smaller thickness are needed, then in this patent also the narrow sides have to be removed and replaced by sides of suitable dimensions.

The continuous-casting chill mold of said Austrian Pat. No. 233,187 also has the same drawback as the German patent. With it like the German patent, the narrow sides have to be shifted inside the overlapping broad sides. Thus in order to change the format of the cast length of the metal intermediate walls can be inserted between the narrow sides, and they divide up the hollow space of the mold. The insertion and the shifting of the intermediate walls can however be done only after the chill mold is disassembled.

There is furthermore known a chill mold U.S. Pat. No. 3,049,769 July 14, 1961, in which the individual mold walls are joined together in such a way that in each case the edge of a wall adjoins the side surface of the adjacent wall. Through shifting the edge on this side surface the hollow space of the chill mold can be adjusted as to breadth and thickness. This chill mold also has the same fundamental drawback as the molds mentioned above. Moreover, the construction needed increases the weight of the mold that has to be moved during the oscillation.

The present invention therefore deals with the fundamental problem of creating a continuous chill casting mold in which adjustment of the mold plates, for adaptation to the desired format of the cast length of the metal can be done in a simple way and without taking the mold apart.

In accordance with the invention this simplified construction is made in that the plates (mold walls) which consist of integral plate units are located opposite one another. The plate units are delimited by a surface running at a slant relatively to the axis of the length of metal being cast, and are arranged displaceably to one another on this surface. There may hereby be disposed in one plate unit a rotatable spindle, piloted in two oppositely-threaded nuts, and having pins fastened in them, each of which engages in one of the plate units. For the attachment of the plate units there are slanting slot-type guideways provided in these units and there are fastening screws, connected through the plate units to a back. The back is composed of two parts set one behind the other, and which

are held under stress opposite one another by screws having tapered nuts. The spindle is mounted in a fork connected with the back.

When the spindle is held in position and rotated, then the plate units shift relatively to one another. The plate composed of the plate units hereby becomes wider or narrower, depending on the direction in which the spindle turns. The means for attaching the plate units to the supporting back are arranged so that they do not permit the ability of the plate units to shift.

Only two opposite plates, or else all the plates forming the chill mold may be made in accordance with the above-described invention. It is advantageous if two opposite plates, composed of plate units are in known wise provided between overlapping undivided plates and are able to shift along them and are disposed adjustably in the taper. Furthermore, there may be present an intermediate wall heretofore known that divides the hollow space in the chill mold, and is composed of the above-described plate units.

The plates of the chill mold according to the invention may be positioned without the mold having to be disassembled. In this way it has become possible to make an adaptation to any desired format of cast length of metal in a short time, for example during the inevitable stoppage of the equipment between two pouring operations. The adjustment of the chill mold as to thickness is followed by an adjustment of the guide rollers and transport rollers following the mold. It is for example possible to use for this purpose the means provided in German Pat. No. 1,217,030. The opposite guide rollers are in this case connected by links, whose angular setting has to be changed depending on the thickness desired for the length of cast metal.

The invention will be explained in more detail by the aid of one example of construction. The drawing shows a chill mold in accordance with the invention.

FIG. 1 shows a side view of a continuous casting chill mold in accordance with the invention;

FIG. 2 is a plan view of the mold of FIG. 1;

FIG. 3 shows, on a larger scale, a portion of the plan view;

FIG. 4 shows, likewise to a larger scale, the side view of a mold plate;

FIG. 5 represents a partial section through FIG. 4;

FIG. 6 shows the plan view of a chill mold with an inserted intermediate wall;

FIG. 7 shows the intermediate wall to a larger scale.

The chill mold has plates 1 and 2, which represent the broad sides of the slabbing chill mold. Between the overlapping board sides are damped the narrow sides or plates 3 and 4. The plates 1, 2, 3, 4 are held together by bolts 5. The chill mold is supported on the frame 6. The plates 1 and 2 have a continuous wall which comes into contact with the fluid material being cast. This wall is cooled at its rear side with water, and is supported by a reinforced frame.

The plates 3 and 4 are adjustably positioned with the plates 1 and 2. A drive 7 associated with the frame 6 serves for this purpose. This drive, which has been heretofore known, consists of a worm shaft 8, which drives two worm wheels 9. These worm wheels are associated with two nuts 10, which are not shown in detail, in each of which nuts is piloted on a spindle 11 and 12 respectively. The spindles 11 and 12 engage at the upper and lower ends at the back 13 of the plates 3 and 4 respectively. Because the screw thread of the lower spindle 12 has a pitch less than that of the upper spindle 11, when the plates 3 and 4 are shifted in position their taper is at the same time also changed.

The opposite plates 3 and 4 are in accordance with the invention each composed of two independent plate units 14 and 15. Each plate unit itself consists of one wall which comes into contact with the fluid material being cast and of a rear cooling-water system.

As is shown in more detail in FIG. 4, the plate units 14 and 15 have approximately the shape of right triangles. Their hypotenuses abut with the result that a slanting contact surface is produced. By means of the bolts 5 the two plate units

are pressed firmly against one another. The plate units 14 has a bore 16, into which is introduced a spindle 17. The spindle 17 is mounted so that it is able to turn, by means of a ring 18, having at the middle of its length a fork, i.e. a bearing yoke 19, which surrounds one-half the ring 18. The bearing yoke 19 is fastened to the back 13 and engages in a recess 20 in the plate units 14,15.

The spindle 17 moreover is provided at its upper and lower ends with screw threads of opposite pitch. Round these screw threads the nuts 21,22 engaging same which are sent on lateral pins 23,24. The pins 23, 24 by these means engage respectively in plate units 14 and 15. Thus the pin 23 engages in the plate unit 14 and the pin 24 engages in the plate units 15.

By means of two fastening screws 25, 26, and 27, 28, which pass through the back 13, the plate units 14 and 15 are connected with the back. In order that this fastening may not hinder the contemplated shifting of the plate units relatively to one another, there are disposed in the plate units 14, 15 slanting slot-type guideways 29, in which engage the fastening screws 25 to 28. The back 13 is moreover divided in the direction of the cast length of metal. Between the two parts 13*a* and 13*b*, set one behind the other, are inserted screws 30, 31, provided with tapered nuts 32, 33. When the tapered nuts 32, 33, are tightened up, then the two parts 13*a*, 13*b* of the back are forced apart from one another against the force of the fastening screws 25 to 28. Thus the fastening of the plate units 14, 15, to the back 13 is effected, and the fastening screws 25 to 28, after the mold is once set up, do not need to be loosened or tightened again.

If two lengths of less width are to be cast in the chill mold, instead of one length of metal, then the hollow space of the mold is divided by inserting an intermediate wall 34, as shown in FIG. 6. In this case the intermediate wall 34 consists of two associated plate units 14, 15, which are fastened on a divided back 13*a*, 13*b* disposed between them in the way described. The back 13*a*, 13*b* lies against the broad sides 1, 2, and is fastened there.

The adjustment of the hollow space in the chill mold for adaptation to the desired format of the length of the case metal is done in the following way. In the first place the bolts 5 are loosened. A loosening of the tapered nuts 32, 33, gives the plate units 14 and 15 a certain freedom to move. By turning the spindle 17 all the plate units 14 and 15 become displaced relatively to one another along the slanting contact surface through the interaction of the nuts 21, 22 and pins 23, 24. Depending on the direction in which the spindle 17 is turned, the hollow space in the chill mold is enlarged or is diminished. During the displacement, the plate units 14 and 15 slide with their slanting slot-type guideways 29 over the stationary fastening screws 25 to 28. Thus, in spite of the mobility of the plate units 14 and 15 the hold together of the plates 3, 4 and 34 is not loosened.

The chill mold is changed in width in that the plates 3 and 4, by the aid of the spindles 11, 12, are moved toward or away from one another between the overlapping plates 1,2. The adjustment of the plates is done in a short time, and without having to disassemble the chill mold.

There has been used in the above example a straight chill mold. The invention may, however, be applied to chill molds having a curved axis, because the edges of the plate units 14, 15, which abut against the plates 1, 2, do not change their direction.

We claim:

1. A liquid cooled continuous metal casting chill mold, having mold plates adjustable for various cross sections, characterized in that at least two of said plates are oppositely disposed, said oppositely disposed plates being composed of integral plate units, said integral plate units being delimited by a surface that runs in a slant to the axis of the cast length of the metal and being displaceable on said surface with respect to one another, said mold further characterized in that there is a spindle rotatably mounted in one of said plate units along with two cooperating nuts each having a screw thread opposite to the other and two lateral pins to which said nuts are fastened, each lateral pin engaging a different one of said plate units, whereby upon rotation of the spindle the plate units are displaced relative to one another along said slanted surface.

2. A liquid-cooled continuous metal casting chill mold, defined by claim 1, characterized in that there is a slanting slot-type guideway in each of said integral plate units, in combination with a back and fastening screws through which said integral plate units are connected to the back.

3. A liquid-cooled continuous metal casting chill mold, defined in claim 1, characterized in that said back has two elements set one behind the other, in combination with screws and tapered nuts, holding said elements under stress opposite one another.

4. A liquid-cooled continuous metal casting chill mold, as defined in claim 3, in which there is a bearing yoke connected to the said back in combination with said spindle being mounted in the bearing yoke.

5. A liquid-cooled continuous metal casting chill mold, as defined by claim 1, in which there are two of said opposite plates which include plate units, said opposite plates are provided between overlapping, undivided plates, said opposite plates being able to shift between said undivided plates and are disposed adjustably in the taper.

6. A liquid-cooled continuous metal casting chill mold, defined by claim 1, characterized by the presence of an intermediate wall which divides the hollow space in the chill mold, and which consists of plate units.

7. A liquid-cooled continuous metal casting chill mold, as defined by claim 3, characterized in that said back has two elements set one behind the other, in combination with screws and tapered nuts holding said elements under stress opposite to each other.

8. A liquid-cooled continuous metal casting chill mold, as defined by claim 4, in which there is a bearing yoke connected to the said back in combination with said spindle being mounted in the bearing yoke.

9. A liquid-cooled continuous metal casting chill mold, as defined by claim 3, in which there are two of said opposite plates which include plate units, said opposite plates being provided between overlapping undivided plates, said opposite plates being able to shift between said undivided plates and being adjustable in the taper.

10. A liquid-cooled continuous metal casting chill mold, as defined by claim 4, in which there are two of said opposite plates which include plate units, said opposite plates being provided between overlapping undivided plates, said opposite plates being able to shift between said undivided plates and being adjustable in the taper.

11. A liquid-cooled continuous metal casting chill mold, as defined by claim 5, in which there are two of said opposite plates which include plate units, said opposite plates being provided between overlapping undivided plates, said opposite plates being able to shift between said individual plates and being adjustable in the taper.

12. A liquid-colled continuous metal casting chill mold, as defined by claim 3, characterized by the presence of an intermediate wall which divides the hollow space in the chill mold, and which consists of plate units.

13. A liquid-cooled continuous metal casting chill mold, as defined by claim 4, characterized by the presence of an intermediate wall which divides the hollow space in the chill mold, and which consists of plate units.

14. A liquid-cooled continuous metal casting chill mold, as defined by claim 5, characterized by the presence of an intermediate wall which divides the hollow space in the chill mold, and which consists of plate units.