

Jan. 3, 1967

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3,295,172

CONTINUOUS CASTING MOLD

Filed Feb. 6, 1964

4 Sheets-Sheet 1

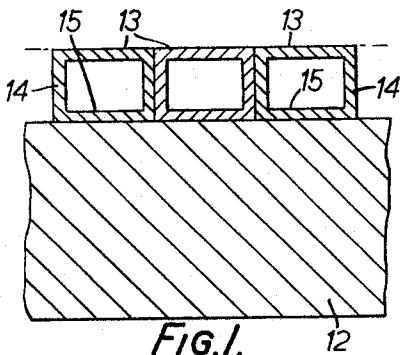


FIG. 1.

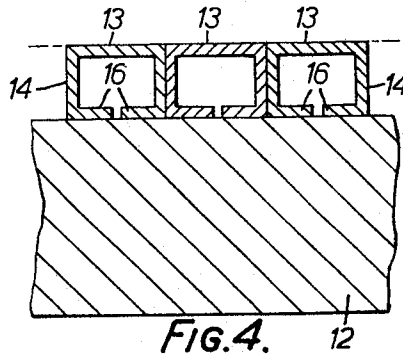


FIG. 4.

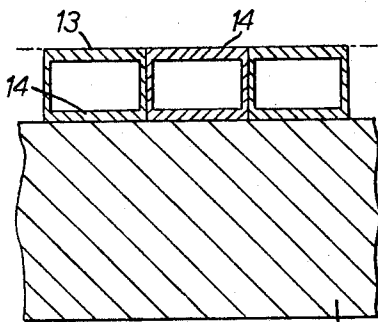


FIG. 2.

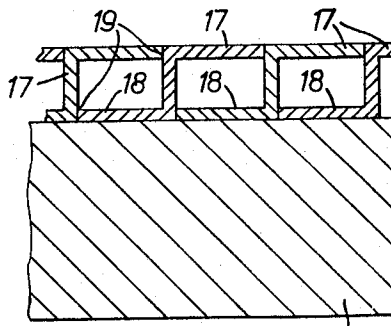


FIG. 5.

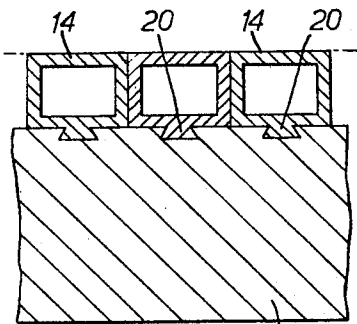


FIG. 3.

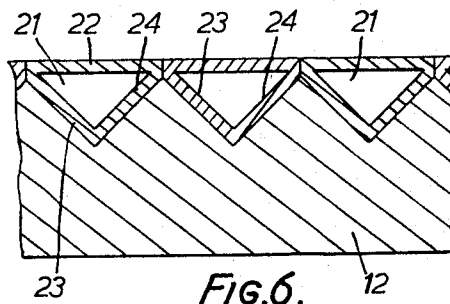


FIG. 6.

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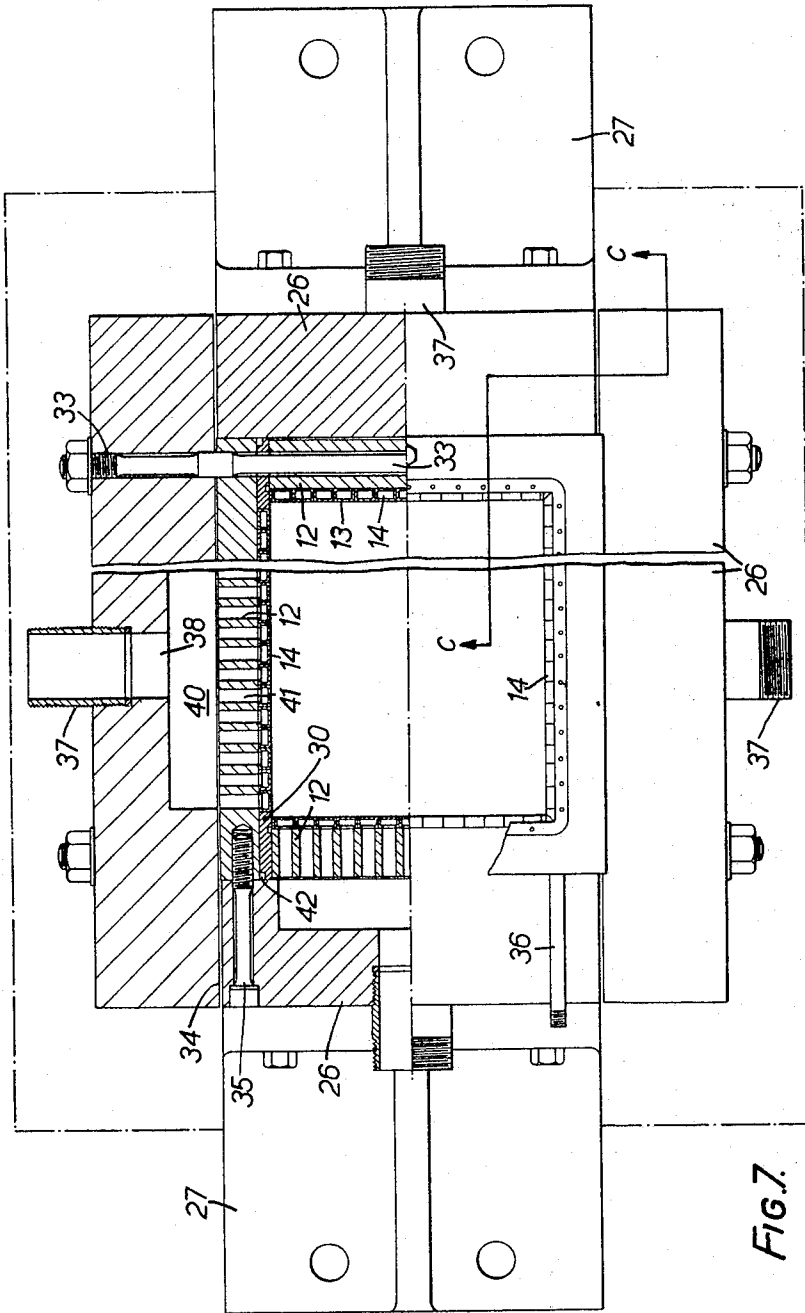


FIG. 7

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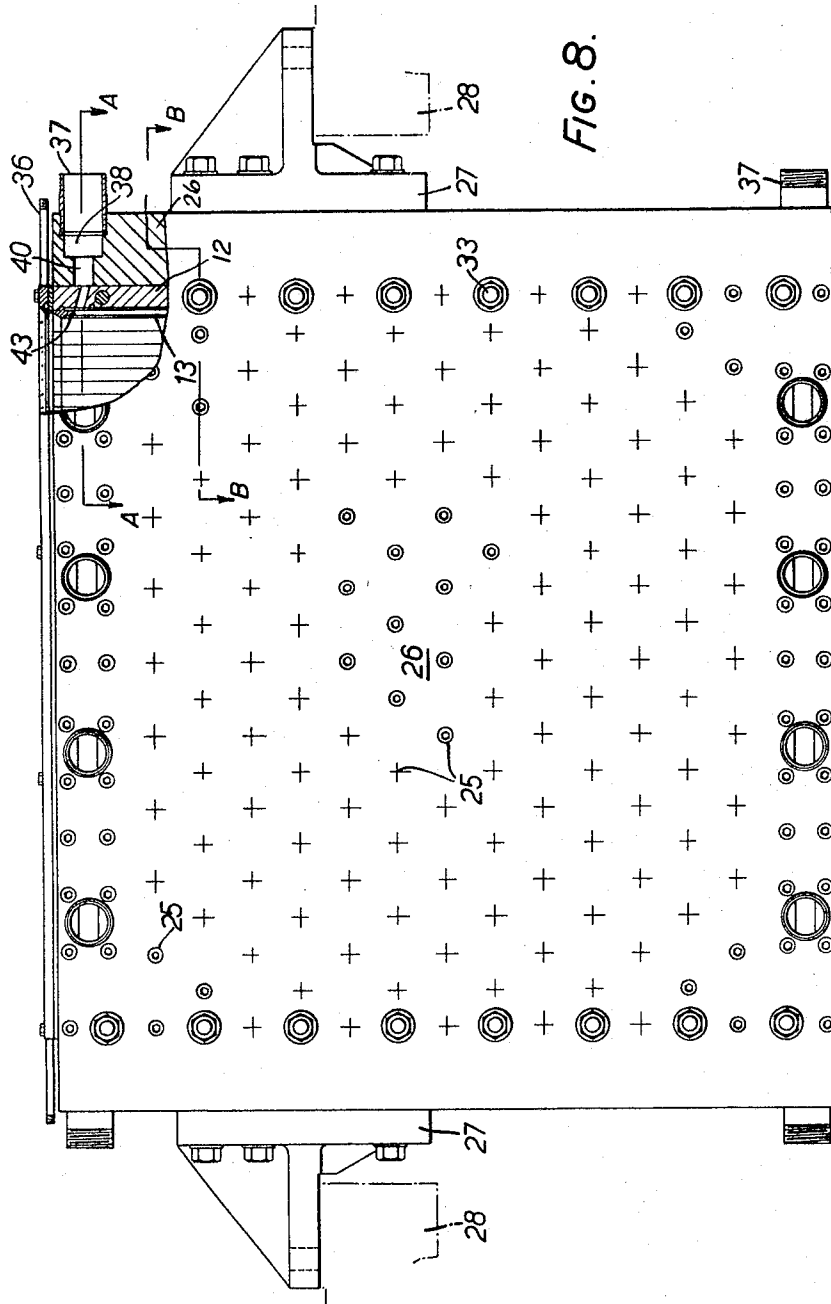
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4 Sheets-Sheet 4

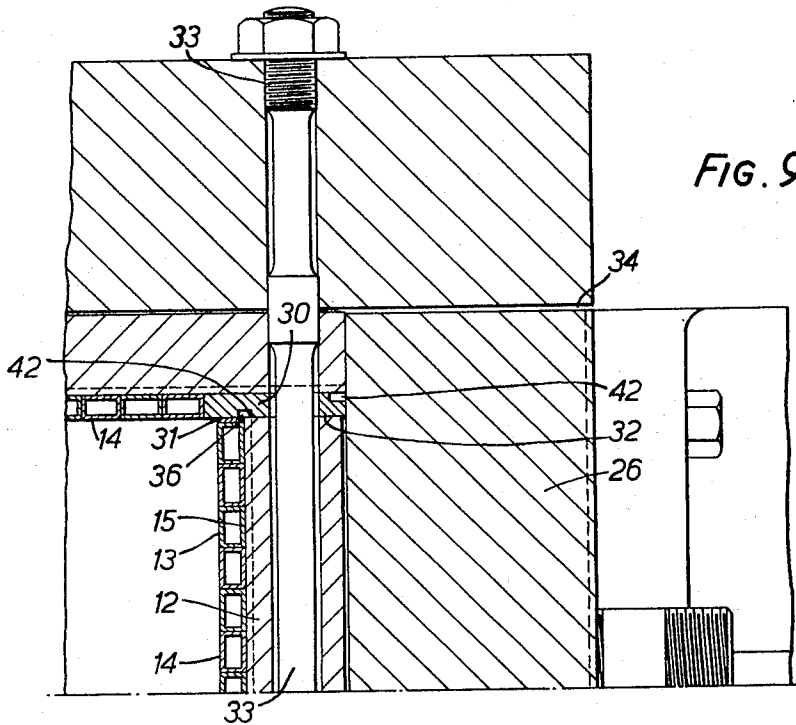


FIG. 9.

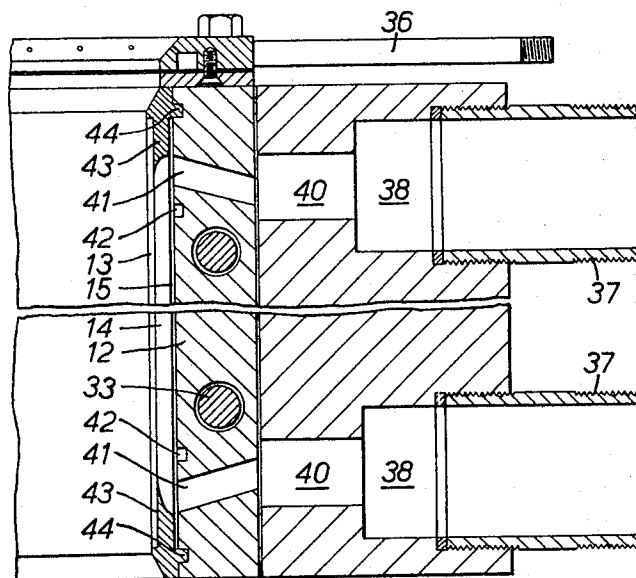


FIG. 10.

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3,295,172

CONTINUOUS CASTING MOLD

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13 Claims. (Cl. 22—57.2)

This invention relates to continuous casting of molten metal and particularly, but not exclusively, to the casting of steel. The invention is primarily concerned with the construction of moulds for this purpose.

In accordance with one aspect of the present invention, a mould for the continuous casting of molten metal comprises a series of contiguous tube-forming elements which are secured to a backing member or members and one wall of each of which, with the like walls of the other elements, constitutes at least a part of the interior wall of the mould. Another wall of each element may be brazed to the backing member or members and the passage formed by each tube may be arranged to pass coolant. In this case, a large surface area is obtained for brazing each element to the backing member or members, while at the same time a large surface area is provided for the heat transfer from the metal being cast to the coolant. The invention will be more readily understood by way of example from the following description of moulds in accordance therewith, reference being made to the accompanying drawings, in which

FIGURE 1 is a section, at right angles to the mould axis, of part of the mould wall,

FIGURES 2 to 6 are sections similar to that of FIGURE 1, but showing modifications,

FIGURE 7 shows a view of a complete mould, the lower half of which is a plan view, the upper right-hand half of which is a section on the line B—B of FIGURE 8, and the upper left-hand half of which is a section on the line A—A of FIGURE 8,

FIGURE 8 is a section on the line C—C of FIGURE 7,

FIGURE 9 shows a part of FIGURE 7 on an enlarged scale, and

FIGURE 10 shows a part of FIGURE 8 on an enlarged scale.

The mould of FIGURE 1 comprises a backing plate, a part of which is shown at 12, to the interior surface of which is brazed a thin mould wall, which, in this instance, is constituted by the inner walls 13 of a series of contiguous tubes 14, each of rectangular cross-section. Each tube 14 is made, as for example by extrusion, from a suitable metal, which may be steel, copper or a copper base alloy or the like, having a high hot yield strength and good conductivity. Each tube 14 extends the full axial length of the mould and has its outer wall 15 brazed to the backing plate 12; contiguous side walls of the tubes 14 are also brazed together.

It will be seen that the use of tubes 14 to form the mould-defining wall enables there to be obtained simultaneously a large surface area for transfer of heat from the molten metal to the coolant and a large surface area for brazing to the backing plate 12. At the same time, rigidity is given to the mould-defining wall, formed by the tube walls 13, by virtue of the close spacing of the side walls of the tubes.

In order that the mould forming wall 13 of the tubes 14 may present the maximum surface area to the cooling water, the contiguous side walls of the tubes may be made relatively thin compared with the mould forming the walls 13. FIGURE 2 shows such an arrangement where each mould forming wall 13 is twice the thickness

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of the side walls so that the resulting support walls, each constituted by the contiguous side walls of two tubes 14, has a total thickness equal to that of the mould forming wall 13.

Each tube 14 may have an integral dove-tail joint 20 extending the full length of the tube and received in a corresponding recess in the backing plate 12, as illustrated in FIGURE 3. The dove-tail joints between the tubes 14 and the plate 12 reinforces the brazing to secure the tubes in place and position the tubes during brazing.

In the arrangement shown in FIGURE 4, each tube 14 is formed out of sheet, the edges 16 being brazed to the backing plate as before. This form of construction involves some economies as compared with that of FIGURE 1.

FIGURE 5 shows another construction using sheet metal, Z-shaped elements 17 being employed in this instance. One leg 18 of each element is brazed to the backing plate 12, while the free edges 19 of each element are brazed to the adjacent elements, so that the other leg of each element constitutes a part of the mould forming wall.

In the arrangement shown in FIGURE 6, each tubular element 21 is of triangular section, one of the walls 22 forming a part of the mould wall as before, and the other two walls 23, 24 being brazed to the serrated face of the backing plate 12. This form of construction increases the brazing area, as compared with the forms previously described, without loss of area of the mould-forming walls 22.

FIGURES 7 and 9 show a rectangular section mould, the sides of which are formed from four separate inner backing plates 12 secured by numerous bolts 25 to four outer thicker backing support plates 26, which in turn are mounted by brackets 27 on a bed plate 28. Copper spacing blocks 30, 31 are provided at the corners of the mould between the adjacent surfaces of the inner backing plates 12. The blocks 30, 31 are held tightly against the adjacent faces 32 of the inner backing plates 12 and the tubes 14 by tension bolts 33 passing through the outer backing plates and right through those inner backing plates at the sides of the mould. A gap 34 is allowed between the adjacent surfaces of the outer backing plates so that all the compressive force caused by tightening bolts 33 acts at the surfaces 32 to form a good seal between the inner backing plates.

Further bolts 35 are secured between the outer backing plates at the sides of the mould and the inner backing plates at the front and rear of the mould.

To assemble the mould, first the tubes 14 are brazed to the inner backing plates, then the inner backing plates are secured to the outer backing plates which in turn are mounted in position on the bed plate, and finally bolts 33, 35 are inserted.

Pipes 36 are provided for supplying lubricant to the mould walls 13.

At the top and bottom of the mould a series of similar pipes 37 are connected to the outer sides of the backing plates 26. Each pipe 37 connects through a bore 38 in the backing plate 26 with a chamber 40, which in turn opens into a series of bores 41 passing through the backing plates 12 and connecting with the individual tubes 14 at their upper and lower ends. In operation, coolant, such as water, entering through the bottom pipes 37 is pumped upwards through the interior of each of the tubes 14, in order to extract heat from the metal being cast and thereby to cause solidification of the metal, and leaves through the upper pipes 37.

Small passages 42 are provided across the width of each backing plate 12 at the interface of each plate 12 and the inner surfaces 15 of the tubes 14. These passages 42

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open into the plates 30, 31 and provide an easy efflux passage for any coolant which should leak between the plates 12 and the tubes 14.

As shown in FIGURES 8 and 10, each end of each tube 14 is stopped by a plug 43, which is brazed to the inner wall of the tube 14 and keyed at 44 to the backing plate 12. This limits shear stresses in the braze material caused by expansion of the tubes 14 relative to the backing plates 12.

I claim:

1. A mould for the continuous casting of molten metal, said mould comprising a plurality of backing members assembled to define a cavity which is rectangular in section, and for each backing member a plurality of contiguous metal tubes having outer walls brazed to the inner surface of said backing member and inner walls which constitute at least part of the interior wall of the mould.

2. A mould according to claim 1 in which the area of the part of each element secured to its backing member is at least as great as the area of the part forming the interior wall.

3. A mould according to claim 1 in which the tube-forming elements brazed to a backing member are also brazed to one another.

4. A mould according to claim 1 including a dove-tail joint between each tube-forming element and its associated backing member.

5. A mould according to claim 1 in which each tube-forming element comprises a rectangular sectioned tube, the side walls of which are thinner than the mould forming wall.

6. A mould according to claim 1 in which each tube-forming element comprises a Z-shaped element, one leg of which is brazed to a backing member, the other leg of which forms a part of the interior wall of the mould, and the free edges of which are brazed to adjacent elements.

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7. A mould according to claim 1 in which each tube-forming element is of triangular section, one of the walls forming a part of the interior wall of the mould, and the other two walls being brazed to the serrated face of a backing member.

8. A mould according to claim 1 in which each backing member is secured by bolts to a further backing support.

9. A mould according to claim 1 and including means for securing the backing members together to form a seal between their adjacent surfaces.

10. A mould according to claim 1 including four outer backing plates bolted to the outside of the backing members, spacing blocks between the adjacent surfaces of the backing members and means for holding the backing members in sealing engagement with the spacing blocks.

11. A mould according to claim 1 including means for circulating coolant through the interior of the tube-forming elements.

12. A mould according to claim 10 including a plurality of bores in the outer backing plates connecting with bores in the inner backing members which in turn connect with the upper and lower ends of the tube-forming elements.

13. A mould according to claim 1 including a passage extending across the width of each backing member at the interface of that member and the tube-forming elements for collection of leakage coolant.

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