April 20, 1965 D. F. EDNELL ETAL 3,178,783

HOT TOP FOR INGOT MOLD

Filed May 21, 1962 3 Sheets-Sheet 1

Fig. 1

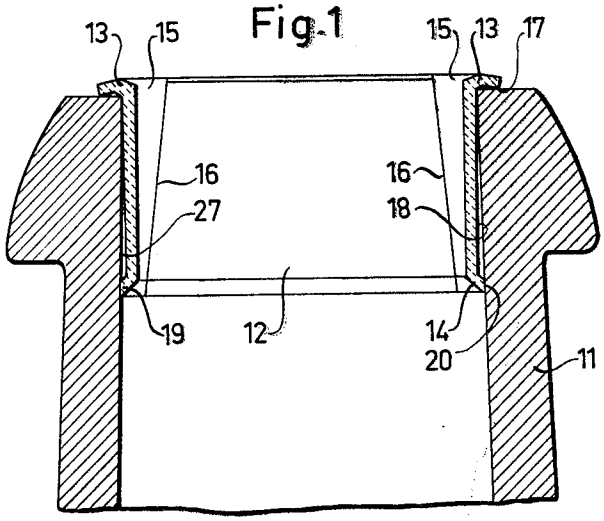
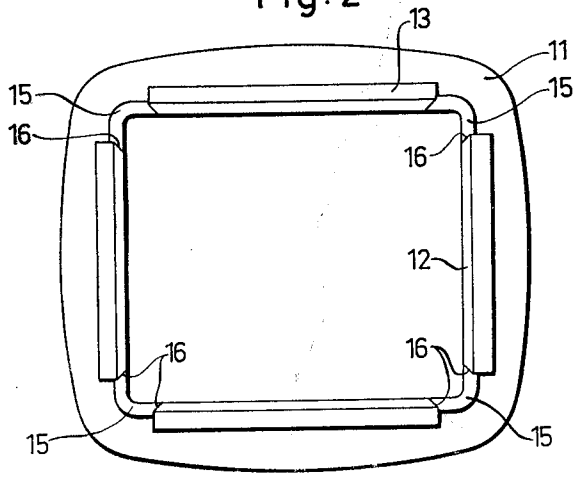


Fig. 2



April 20, 1965 D. F. EDNELL ETAL 3,178,783

HOT TOP FOR INGOT MOLD

Filed May 21, 1962 3 Sheets-Sheet 2

Fig. 3

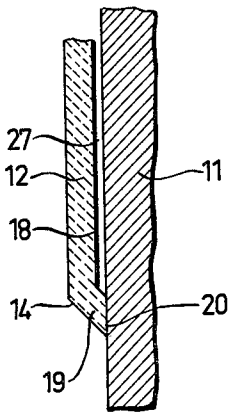


Fig. 4

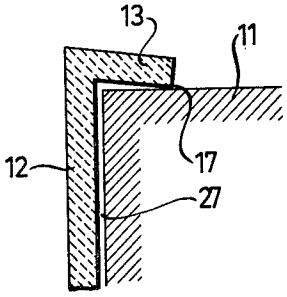
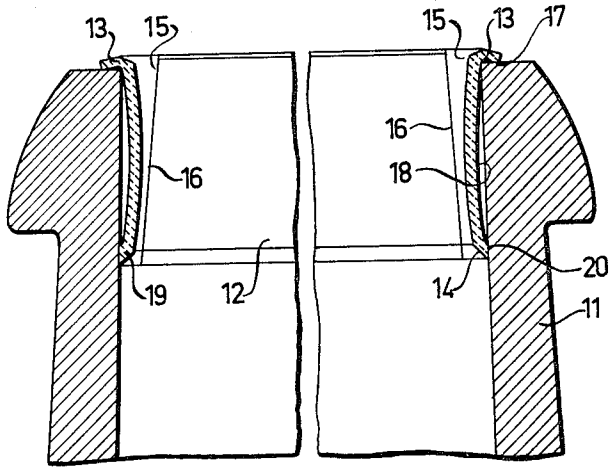


Fig. 5



April 20, 1965 D. F. EDNELL ETAL 3,178,783

HOT TOP FOR INGOT MOLD

Filed May 21, 1962 3 Sheets-Sheet 3

Fig. 6

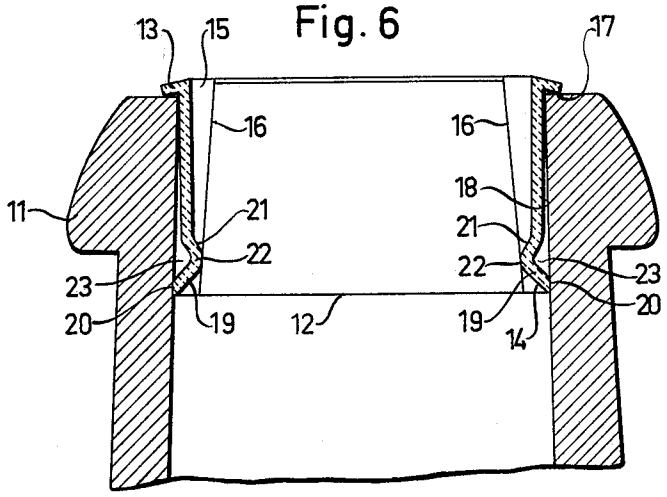
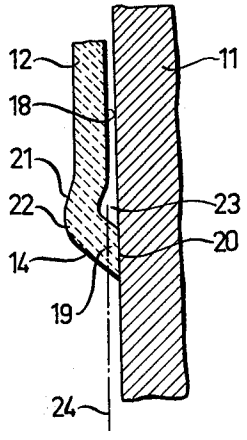


Fig. 7



United States Patent Office 3,178,783 Patented Apr. 20, 1965

3,178,783

HOT TOP FOR INGOT MOLD

Daniel Fredrik Ednell, Ed, and John Olof Edström and Per David Davidson, Sandviken, Sweden, assignors to Sandviken Jernverks Aktiebolag, Sandviken, Sweden, a corporation of Sweden

Filed May 21, 1962, Ser. No. 196,278
Claims priority, application Sweden, May 25, 1961, 5,446/61; Sept. 8, 1961, 8,940/61
7 Claims. (Cl. 22—147)

The present invention relates to hot tops for ingot molds or similar casting molds consisting of relatively thin heat insulating slabs designed to be placed against and adjacent to the upper parts of the inner walls of the molds.

A hot top is used for ingot mold casting in order to delay the stiffening of the top part of the ingot after the molten metal has been poured into the mold, thus limiting segregations and pipes as high up in the ingot as possible. The hot top should be easy to apply and cause as little influence as possible on the metal from gas formation, intrusion of foreign substances and the like. It should have a good heat insulation and mechanical strength and be so-shaped that it is firmly supported during the casting. The sealing at the lower edge of the hot top against the mold wall must be good in order to prevent the metal from intruding between the hot top and the mold wall thus forming fins which are of substantial disadvantage for the rolling of the ingots. It is also desirable that the hot top is durable during storage, requires little storing space and can be used without extra drying.

The present invention aims especially at achieving a good sealing of the hot top to the mold wall at the lower edge of the hot top. It is characterized by the feature that at least certain of the slabs are provided at their lower edges and at the side of the slab which is situated adjacent the mold wall with a ridge which extends outwardly beyond the remainder of the surface of the slab below the level of the top of the mold. The invention has been found to be especially suitable for hot tops made of a composition of a major part of finely grained refractory material and minor parts of a finely divided combustible material and a glue or binder.

The following specification explains the invention in connection with a few embodiments of the same which are illustrated in the accompanying drawings in which

FIGURES 1 and 2 are a sectional and a plan view respectively of a hot top according to the invention with a sealing rim between the slabs and mold,

FIGURES 3 and 4 are fragmentary sections of modifications of the slabs of FIGS. 1 and 2,

FIGURE 5 shows another modification of the embodiments of FIGURES 1–4, and

FIGURES 6 and 7 show sections of a further modification of the slabs of FIGS. 1–5.

In FIGURES 1 and 2 number 11 refers to an ingot mold and 12 to the slabs of a hot top. The slabs rest with their flange shaped upper edges 13 against the top surface of the mold 11. The lower edges of the slabs are beveled at 14. Between the slabs 12 there are wedges 15 in the corners of the mold 11 which contact the slabs 12 along inclined contact surfaces 16. The surfaces 16 of each slab converge inwardly so that the wedges 15 tend to press the slabs 12 outwardly into contact with the mold wall.

As appears from FIGURE 1 the flanges 13 are concave on the lower sides so that the slabs rest against the top of the mold on edges 17 remote from the vertical part of the slab. By this special arrangement the slabs 12 tend to swing by their own weight around the pivoting edges 17 so that the lower edges of the slabs tend to bear against the mold wall. The lower edges are provided with a

flange 19 protruding outwardly beyond the outer surfaces 18 of the slabs and having contact surfaces 20 coinciding with the wall of the mold. Between the slab 12 and the mold 11 there is an insulating layer of air 27. The flange 19 must not protrude too far beyond the outer surface 18 of the slab as the latter may yield under the pressure from the molten metal and then will have to be supported by the mold at parts above the flange 19 in order that the slab does not break. Evidently the insulating air layer 27 disappears at such contact points but will nevertheless be partly maintained and contribute to the insulation given by the slab itself. Also the wedges 15 may be provided with tightening flanges at their lower ends like the slabs 12.

As appears in FIG. 3 the space 27 may be of uniform thickness instead of wedge-shaped as shown in FIG. 1 and as shown in FIG. 4, the flange 13 may be straight and inclined downwardly instead of being concave as shown in FIG. 1.

FIGURE 5 shows a modification of the hot top described above in which the slabs 12 are curved in such a way that the surface turned towards the mold is concave. This may have the flange 19 as shown in the left hand part of FIG. 5 or the flange 19 may be substantially or completely eliminated as shown in the right hand part of FIG. 5. The sealing contact surface 20 is present in either case.

FIGURES 6 and 7 show an embodiment in which the lower edges of the slabs 12 and also of the wedges 15 if desired are provided not only with the flanges 19, which projects from the slab towards the mold wall, but also with a ridge 22 projecting in the opposite direction in order to make the lower edge stiffer and stronger. This could be achieved by making the lower edge portion of the slab thicker than the rest of the slab. This strengthening and stiffening ridge can also be achieved in the way shown in FIGURES 6 and 7, the thickness of the slab being in the main constant, by providing the lower edge portion of the slab with a curved portion 22 that bends first inwardly towards the axis of the mold thereby forming the inclined surface 21 and the widened space 23. Then it bends outwardly toward the wall of the mold thereby forming an inclined surface 14 and the flange 19 that extends outwardly beyond the imagined extension 24 of the surface 18 of the slab, so that the contact at the surface 20 is secured.

The invention is useful in connection with hot tops of several known materials but is especially useful for hot tops which consist of a major amount of finely divided refractory material and a minor amount of finely divided organic material as e.g. paper pulp and a glue. As a suitable composition may be mentioned 82–94% finely grained fire proof material as quartz, olivine or the like, 3–9% cellulose fiber and 1–8% of resin glue. It is also suitable to add up to 5% of asbestos, rock wool or some other fibrous fire proof material to this composition. The average grain size of the fine grained refractory material should be at least for the main part of the material within the range 0.2–0.02 mm. This composition fills the general requirement of a hot top as it has a very good heat insulation, and it also fills the special requirement of the present invention, as it gives a good seal at the contact surface between the hot top and the mold.

The tops according to the invention can be used also for other mold sections than the rectangular or square cross sectional shapes illustrated, as for instance circular sections and corrugated sections. The hot top has only to be given a shape corresponding to the section of the ingot mold.

The thickness of the slabs of the hot top suitably varies with regard to the size of the ingot. For an ingot weight of 1.7 tons and upper dimensions of 50 x 50 cm. a slab

thickness of 10–12 mm. is suitable. For a 7 ton ingot having upper dimensions of 60 x 70 cm. it is suitable to have a slab thickness of 20–25 mm. In general the thickness should lie within the limits 10–25 mm.

The invention does not comprises only slabs with supporting means integral with the slabs as the above described flanges **13** but also slabs with other supporting means which are known or obvious as separate metal hooks and similar. The integral supporting means have a certain advantage in that there are few separate and different parts in the hot top, which means a comparatively simple manufacturing, storing and handling of the same. The flange **13** is above shown as continuous along each slab but it may also be divided and comprise two or more separated shorter flange portions, lugs or similar along the upper edge of each slab.

In order to further delay the solidification of the top portion of the ingot it is possible to provide the hot top with an inner coating or layer of exothermic material.

The above specification does not define the limits of the invention but gives only examples of the invention within the scope of the following claims.

We claim:

1. An ingot casting mold comprising a mold body having a bottom wall and substantially vertical side walls surrounding a mold cavity and a hot top positioned in said mold cavity and supported by said side walls, said hot top consisting of a plurality of relatively thin, heat insulating slabs secured to said mold walls by a wedging action exerted against the substantially vertical edges thereof, said slabs each having along the lower edge thereof an outwardly extending ridge bearing against a mold wall, the body of each slab above said ridge being of substantially uniform thickness and being spaced from the adjacent mold wall substantially up to the upper edge thereof and said slabs each having an outwardly extending flange at its upper edge resting upon the upper edge of a side wall of the mold.

2. An ingot mold as defined in claim 1 in which each flange has a downwardly extending peripheral edge.

3. An ingot casting mold comprising a mold body having a bottom wall and substantially plane vertical side walls surrounding a mold cavity and a hot top positioned in said mold cavity and supported by said side walls, said hot top consisting of a plurality of relatively thin, heat-insulating slabs having upwardly convergent side edges and wedges having downwardly convergent edges in sealing contact with said convergent edges of said slabs whereby said slabs and wedges are secured to said mold walls by a wedging action between the convergent edges of said slabs and wedges, each slab and wedge having along the lower edge thereof an outwardly extending ridge the width of which in the certical direction is not more than a minor part of the height of said slab, said ridge bearing against a mold wall, and the body of each slab above said ridge being of substantially uniform thickness and being spaced from the adjacent mold wall substantially up to the upper edge thereof.

4. An ingot mold as defined in claim 3 in which each slab curves away from the adjacent mold wall between said ridge and the upper edge of the slab.

5. An ingot mold as defined in claim 3 in which each slab has an inwardly extending ridge adjacent to the lower edge thereof.

6. An ingot mold as defined in claim 5 in which said inwardly extending ridge is immediately above said outwardly extending ridge.

7. An ingot mold as defined in claim 6 in which each slab including said ridges is of substantially uniform thickness.

References Cited by the Examiner

UNITED STATES PATENTS

1,523,209	1/25	Howard et al.	22—147
1,692,491	11/28	Dumas	22—147
1,913,434	6/33	Dumas	22—147
2,444,838	7/48	Marburg	22—147
2,782,478	2/57	Marburg	22—147
2,822,591	2/58	Hampe	22—147
2,858,588	11/58	Hoffman	22—147
2,873,492	2/59	Vallak	22—147
3,072,981	1/63	Davidson	22—147
3,076,239	2/63	Davidson	22—147

FOREIGN PATENTS

491,982	4/53	Canada.
626,971	9/61	Canda.
695,752	9/40	Germany.

WILLIAM J. STEPHENSON, *Primary Examiner.*

MARCUS U. LYONS, MICHAEL V. BRINDISI, *Examiners.*