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HOT TOP

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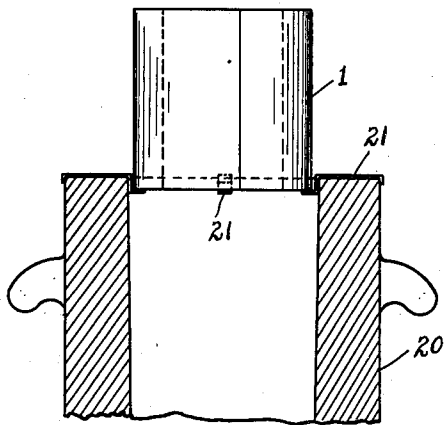


Fig. I.

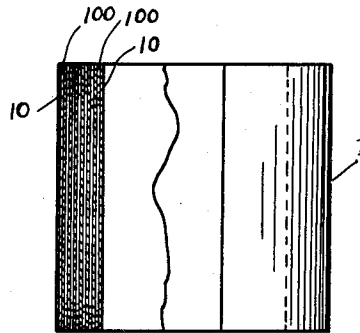


Fig. II.

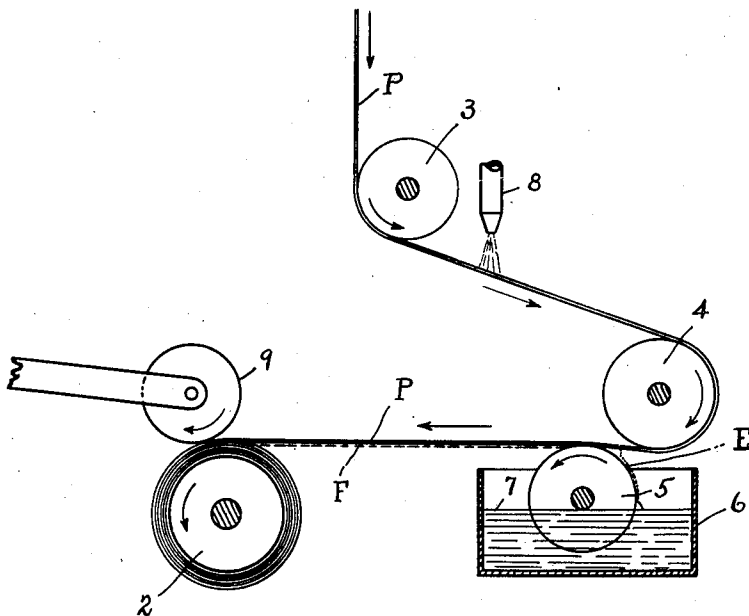


Fig. III.

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HOT TOP

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2 Claims. (Cl. 22—147)

My invention relates to hot tops for ingot molds, and is found in a hot top whose body consists in a coiled tubular body of combustible fibrous material. Paper provides an excellent material, and advantageously, if not essentially, the paper is treated with a fire-retarding chemical.

The invention embraces the discovery that a coiled multi-ply paper structure has a tensile strength that peculiarly suits it to withstand the destructive stresses of molten metal.

A hot top of such structure is inexpensive to manufacture. It is relatively light and may be easily handled, requiring the services of only one workman in installing it upon an ingot mold. Contrary to the usual hot tops of molded refractory material, my structure is durable and will not fracture; in the field there is no problem of breakage; and savings in storage and transportation costs are realized. And, as will presently appear, my hot top may be readily removed from the neck of a cast ingot. By virtue of these features, notable advantages in mill practice are enjoyed.

In the accompanying drawing a hot top embodying the invention is illustrated in Figs. I and II. In Fig. I the upper portion of an ingot mold is illustrated in vertical section, and the hot top is shown in side elevation, seated in position of service in the mouth of the mold. In Fig. II the hot top is shown to larger scale, partly in side elevation and partly in vertical section. Fig. III is a diagrammatic view of apparatus used in the construction of the hot top.

Referring to the drawing, the hot top of the invention consists in a tubular body 1, in this case a body of circular cross-section. In service the hot top is assembled over the mouth of an ingot mold 20, providing with known advantage a heat-retaining, vertical continuation of the mold cavity. Various devices may be employed to support the body 1 in position on the mold, and in exemplary way I show metal straps 21 of known sort.

The body of the hot top is of laminated paper construction, and advantageously consists in a tube of coiled paper, in which the coils are held together, coil upon coil. The coiled structure may be held together in a great many ways. Preferably, I use an adhesive between the coils. Sulphite pitch or lignin liquor—a by-product of the paper mills—may be used; alternately, a glue, such as the animal and vegetable glues commonly used in the paper industry, will do. However, I prefer to use an adhesive which is

unaffected by high temperatures, and, as will appear in the ensuing specification, an aqueous solution of sodium silicate comprises such an adhesive.

The paper may be a coarse, highly porous sheet paper, or it may be an inexpensive paper board. The body of the paper is impregnated with a combustion-retarding substance, such as sodium silicate, and the impregnation may be effected in one of several ways. For example, in the manufacture of the paper, sodium silicate may in suitable form be worked into the pulpy cellulosic material of which the paper is formed. Alternately, the paper may be saturated with an aqueous solution of sodium silicate. In this case I apply such solution to the paper immediately before (or during) the coiling operation. In this way the desired impregnation and adhesion of the successive layers of paper are effected with one and the same material, it being noted that sodium silicate dissolved in water provides an efficient adhesive or cement.

In refinement, I introduce a combustion-inhibiting material between the layers or coils of paper. Powdered lime or magnesite is such a material, and, conveniently, the powdered material is mixed into the adhesive which is used to integrate the laminar paper structure. In the finished hot top, the layers 100 of adhesive between the successive coils 10 of paper carry a dispersion of the non-combustible substance that serves, in conjunction with the sodium silicate in the paper, to inhibit the burning of the hot top in service.

It is contemplated that the provision of combustion-retarding layers 100 between the successive layers 10 of paper will in many cases prove so effective that the paper itself need not be impregnated.

I show diagrammatically in Fig. III apparatus which may be used in the construction of my hot top. Such apparatus includes a rotating mandrel 2, whose body is externally contoured to the tubular shape desired in the body of the hot top. From a supply roll (not shown) paper is led in a continuous band P, over rolls 3, 4 and 5, to the mandrel; the leading end of the paper is given one or two turns about the mandrel, and a pressure roll 9 is moved into the position shown. Then, the mandrel is set in rotation, and the paper, advancing in the direction indicated in the drawing, is coiled upon the mandrel. The roll 5, coextensive in width with the band P, is mounted within a container 6 that includes a supply of liquid adhesive; the roll 5 rotates

under the tangential drag of the advancing paper, and as the roll so rotates adhesive is by the face of the roll carried upward and applied to the nether surface of the paper, in the form of a heavy film or layer F. The film-bearing paper is coiled upon the mandrel. When the tubular wall of the coil reaches desired thickness, the operation is interrupted, and the band of paper is transversely severed adjacent to the roll 5. Then, the mandrel is momentarily rotated, to wind in the trailing flap of paper and effect its union with the coiled body on the mandrel, whereupon the coil is removed from the mandrel and dried, with solidification of the adhesive between the coils of paper. The hot top is ready for service.

In some cases it may be found desirable to spray the combustion-retarding material (or adhesive) upon the paper, and to such end I organize one or more nozzles 8 (with suitable spraying equipment, not shown) adjacent to the path of the traveling band P of paper. The nozzles operate to apply the desired material to the paper, in proper and sufficient quantity. If the material to be applied is in powdered form, the nozzles 8 are arranged between the roll 5 and the mandrel 2, in such manner that the powder is blown into the applied film F of adhesive. And as had been already mentioned, a powdered combustion-retarding material may be mixed and applied with the adhesive; that is to say, powdered lime or magnesite may be mixed with the liquid adhesive in container 6.

It is contemplated that the good results of my invention may in some measure be gained by the use of an incombustible fibrous material, such as

asbestos paper. However, I prefer to employ a material which in the body of the hot top is superficially combustible. In the case of the hot top described, I have found that in service the interior surface of the paper body chars and slowly burns to a depth of one-quarter of an inch, more or less. This charring or burning away of the inner wall of the hot top provides a clearance between the body of the hot top and the neck of the cast ingot, by virtue of which the hot top is freed from the metal during solidification, and may be readily stripped away from the ingot when solidification is complete.

I am aware that the presence of air cells within a heat-insulating body tends to increase the insulating efficiency of the body, and within the scope of the invention I include corrugated paper board as a material which may be assembled, layer upon layer, to form the wall of the hot top.

I claim as my invention:

1. A hot top for ingot molds consisting in a rigid tubular body of coiled fibrous sheet material that in service endures the stresses of the poured-in mass of molten metal, that affords heat insulation during solidification of the metal, and that is readily removable from the solidified ingot.

2. A hot top for ingot molds characterized by possessing a multi-ply wall of fibrous material that is superficially combustible, said wall being adapted in service to endure the stresses of the poured-in mass of molten metal, and affording heat insulation during solidification of the metal and looseness for stripping away after solidification.

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