Dec. 29, 1953

B. F. ANTHONY

2,663,920

HOT TOP COVER

Filed Jan. 4, 1951

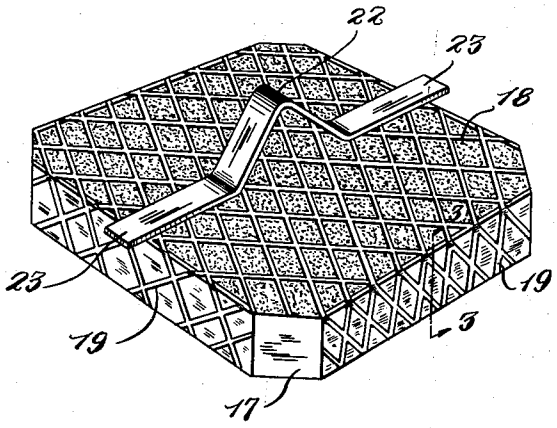


FIG. 1

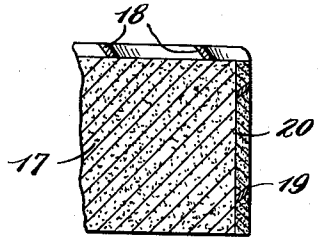


FIG. 3

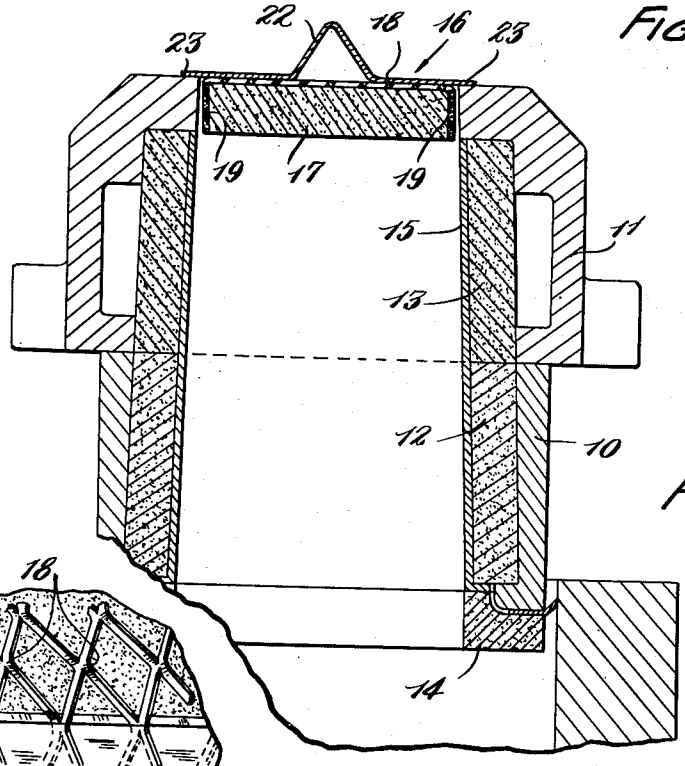


FIG. 2

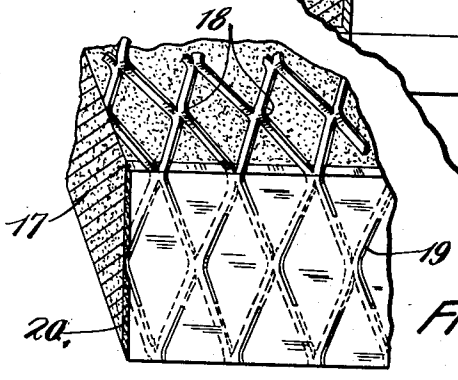


FIG. 4

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Patented Dec. 29, 1953

2,663,920

UNITED STATES PATENT OFFICE

2,663,920

HOT TOP COVER

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Application January 4, 1951, Serial No. 204,411

7 Claims. (Cl. 22—147)

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This invention relates to improvements in covers for hot tops, and has reference particularly to multi-use covers having good insulating qualities, the cost of which is economically justified by their saving of sinkhead metal, their convenience and their relatively long life.

In the operation of hot topping killed steel various practices have been tried for preventing the escape of heat from the exposed upper surface of the sinkhead of the solidifying ingot. In steel mills today the majority of ingot sinkheads are covered by shoveling onto the exposed molten surface some bulk material such as rice or oat hulls, straw, sand, lime, waste refractory fines or some of the proprietary compounds of more or less exothermicity. Each time an ingot is poured a quantity of some such material is used. Some operators are conscientious in controlling the quantities used to get the best effect economically. Others are careless. Some mills furthermore dismiss the problem by using no covering. In such cases upwards of twenty-five percent of the heat loss in hot topping is accounted for by the heat which escapes from the uninsulated or uncovered sinkhead surface.

There have been attempts to use preformed rigid covers of measured quantity refractory materials to be placed across the hot top or dropped in onto the sinkhead itself. Such covers because of their fragility and because of thermal shock are generally single use covers. Attempts to increase their life by encasing the refractory material in metal frames have been not infrequent, but no satisfactory development has come of such attempts, because of several shortcomings. One such shortcoming is the great weight of a metal frame, usually steel, which was needed to maintain rigidity. To this weight must also be added that of the insulating refractory. Inasmuch as these covers are placed into position by a man reaching out from a platform, light weight is very desirable. Another disadvantage was the cost of fabricating such a frame especially for sinkhead shapes with rounded corners or many sided cross sections. Still another disadvantage is the tendency of such frames when exposed to the high temperature of molten metal to warp badly and become ill-fitting to such a degree as to be dangerous in handling and to allow heat to escape. Replacement costs were high and life was short.

The present invention overcomes the difficulties previously experienced in seeking a solution of the problem, and results in a multi-use insulating cover possessing all of the desirable features and

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none of the disadvantages of so-called permanent covers tried heretofore and abandoned.

In accordance with the invention there is provided a basket or pan of retiform metal, preferably expanded metal similar to that used in place of lath in building construction, in which pan there is placed the desired thickness of insulating refractory, about two and one-half inches for an average size hot top. In use the casing or pan is preferably turned upside down. This casing or container or retiform metal accommodates itself to the expansion and contraction of the refractory slab due to thermal changes, and any tendency for the metal casing to warp is resisted by the rigid refractory and is dissipated in the mesh of the retiform metal, expanded metal being particularly effective in this respect.

The vertical or bent down sides of the casing protect the refractory and hold it in place. The protection thus afforded enables one to use fragile light weight high insulating fire brick under the severe handling requirements connected with ingot pouring practice, which of course promotes efficiency in the retention of heat and permits relatively smaller quantities of molten metal to be used for filling the piping of the ingot.

An object of the invention is the provision of a hot top cover of such character as to effect the results outlined above, and especially one in which a fragile high insulation refractory is held in place and protected by retiform metal, such as expanded metal which is capable of accommodating itself to changes in the refractory due to expansion and contraction under the influence of great temperature variations.

Other objects and features of novelty will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawing, in which

Fig. 1 is a perspective view somewhat diagrammatic in character of a hot top cover embodying the invention.

Fig. 2 is a fragmental sectional view of a hot top in connection with which the cover of this invention is used.

Fig. 3 is a fragmental sectional view on a larger scale, the view being taken substantially on the line 3—3 of Fig. 1, and

Fig. 4 is a fragmental perspective view on a still larger scale.

Referring to Fig. 2 there is here shown a composite hot top comprising a housing made up of iron castings 10 and 11 secured together by

any convenient means and lined with refractory blocks 12 and 13 and a single use bottom ring 14. In some cases a refractory veneer 15 may be applied to the inner surfaces of blocks 12 and 13. The refractory lining material 12, 13 and 15 insulates the side walls of the hot top, and in order to insulate the upper end of the hot top an insulating cover embodying the present invention is mounted on the housing, being designated generally by the reference numeral 16.

The cover 16 comprises a slab of rigid refractory 17 which may consist of a single block shaped to fit loosely within the upper end of the hot top, or it may be built up of two or more blocks cemented together. Any refractory material may be employed including concrete, but preferably this slab should be constituted of a refractory material having high insulating qualities. Porous fire brick is the presently preferred material. It has been found that fire brick of the grade known in the trade as 2600° F. brick is very satisfactory for the purpose. Its insulating qualities are much superior to those of ordinary high grade fire brick rated at 2800° F., but it is porous and fragile. Its comparative light weight is advantageous but it is easily damaged by shock and abrasion. Fire brick of still higher insulating qualities are obtainable, but are less desirable for the purposes of this invention.

In order to protect the slab 17 and hold it together in case of any breakage or deterioration, the slab is encased in what may be termed an inverted pan 18 of retiform metal, preferably expanded metal. While this could enclose the slab completely it is preferred to have the pan encase only the upper flat surface and the side walls, as shown in the drawing. A sheet of such material cut to the proper size is bent to provide the downwardly extending side portions 19. The slab 17 is placed within this pan. The free edges of the side portions 19 may be bent inwardly slightly to grip the slab, or other means may be employed to secure the slab and casing together. At the present time it is preferred to rely exclusively upon a layer of mortar 20 applied to each side of the cover and scraped off flush with the outer surface of the retiform metal as shown best in Figs. 3 and 4. The mortar which is used for this purpose is a high temperature air setting mortar capable of withstanding the heat to which the cover is exposed in use. This mortar fills the interstices in the mesh of the retiform material, adheres firmly to the slab and thus forms a tight bond between the slab and the casing.

To form a handle for the cover and a means to support it upon the hot top there is provided a strip of sheet metal bent upwardly in its middle section to form the handle 22. This strip extends entirely across the cover and has end portions 23 which extend beyond the cover and are adapted to rest upon the top of the hot top casting 11. Intermediate the handle and the ends 23 this strip is tack-welded to the top 18 of the retiform casing. Although this is a preferred arrangement it is practical to omit the handle strip or its exposed ends 23 and permit the cover to enter the hot top and rest directly on the ingot metal. It is also permissible to build the cover large enough to rest upon the hot top housing rather than to extend down into it as herein illustrated. It should be understood also that the application of the cover is not limited to composite hot tops as herein illustrated but that it may be extended to hot tops built of clay exclusively.

The cover of this invention may be used repeatedly. If it suffers any damage due to thermal or mechanical shock it may be repaired between heats, that is any cracks or breaks in the refractory slab may be filled with high temperature cement and if some of the mortar 20 cracks off of the cover it may be renewed. It is good practice furthermore to coat the cover with thin slurry between heats by dipping or spraying or otherwise.

In practice as the ingot molds on a train of buggies are set up with reusable hot tops, a cover is hung in each hot top. This helps to keep the hot top warm and dry until it is ready for use. When the "drag" is pulled away from the pouring platform the covers ride with the hot tops and they are not removed until the hot tops have been stripped from the sinkheads and set on the handling means. The covers when taken out of the hot tops can be piled on a buggy, placed on a conveyor or by any other means moved to where reconditioned hot tops are ready to be set on molds again. If the covers require any attention they can be patched or slurried as are the refractory parts of the hot tops.

In case it is desired to employ bulk exothermic material, such material may be shoveled onto the freshly poured sinkhead and the cover then immediately placed on the hot top. The casing or pan of the cover is of expendable material so that in special cases where the covers are subjected to excessive abuse and are relatively short-lived the loss is not great as compared with covers in which fabricated metal frames subject to warping are employed. Because any warping tendency is absorbed in the mesh of the retiform material, stresses that would be developed in the warping of a fabricated structural cover are absent and mechanical damage to the brick or concrete slabs is greatly reduced or entirely eliminated.

The retiform material of which the pan or casing is made may be woven metal or round wire or other cross-sectional form, but the preferred material as previously stated is expanded metal made from sheet metal by a well-known slitting and stretching procedure. This material is cheap and it yields readily to stresses which may be imposed upon it. Furthermore in its expanded condition the individual elements of the mesh are angularly disposed and consequently their retention by the mortar especially good.

Having thus described the invention, I claim:

1. A light weight hot top cover comprising a slab of rigid refractory material encased upon its sides with retiform metal, whereby the refractory material is protected against physical damage and whereby expansion and contraction of the retiform metal due to thermal changes cause no strains in the refractory material.

2. A light weight hot top cover as defined in claim 1, comprising high temperature air setting mortar on the sides of the cover engaging and adhering to the slab and to the retiform metal.

3. A light weight hot top cover comprising a slab of porous fire brick of high insulating qualities encased upon its sides with retiform metal, whereby the fire brick is protected and expansion and contraction of the retiform metal due to thermal changes cause no strains in the refractory material.

4. A light weight hot top cover comprising a slab of insulating fire brick of substantially the grade known at 2600° F. brick, encased upon its sides with retiform metal, whereby the slab is protected against physical damage and whereby

expansion and contraction of the retiform metal due to thermal changes cause no strains in the refractory material.

5. A light weight hot top cover comprising a slab of rigid refractory material of high insulating qualities combined with an expanded metal casing covering the sides of the slab and secured thereto along the sides thereof.

6. A light weight hot top cover as defined in claim 5 comprising high temperature air-setting mortar filling the interstices of the expanded metal along the sides of the slab and forming a firm bond between the expanded metal and the sides of the slab.

7. A light weight hot top cover comprising a slab of rigid refractory material and a retiform metal casing covering the sides of the slab and secured thereto along the sides thereof, and a sheet metal handle welded to the top of said casing and having flat ends projecting beyond the cover for engagement with the upper surface of a hot top.

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