Dec. 12, 1961 W. J. THOMAS, SR., ET AL 3,012,525

REFRACTORY BRICK WITH SPLIT INTERNAL CHANNEL AND STAKED HANGER TAB

Filed Sept. 15, 1959 2 Sheets-Sheet 1

FIG. 9

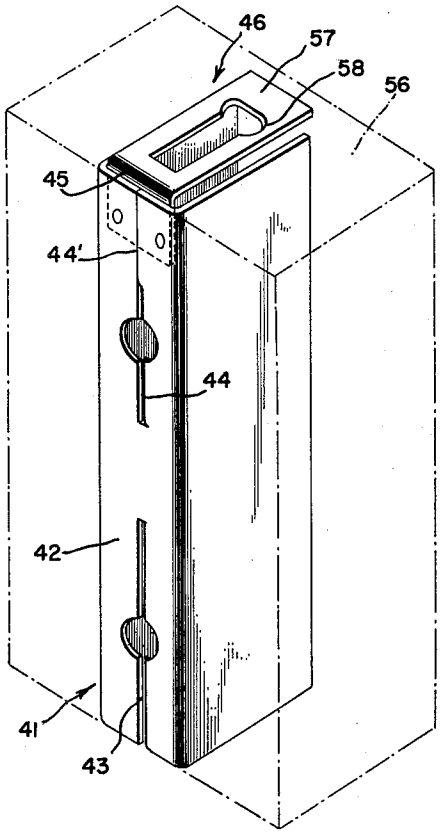


FIG. 1

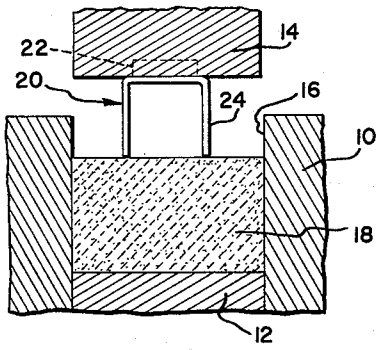


FIG. 2

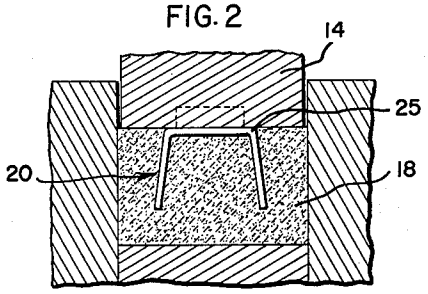


FIG. 3

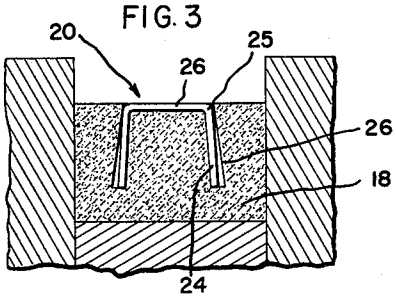
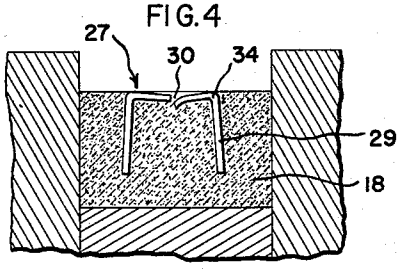


FIG. 4



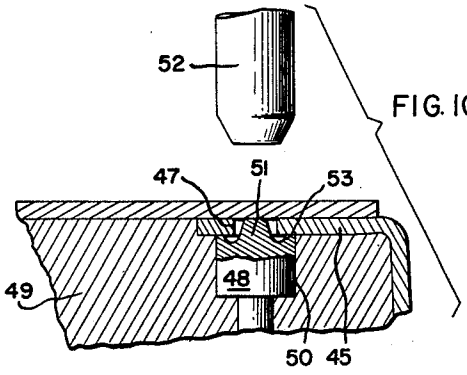


FIG. 10

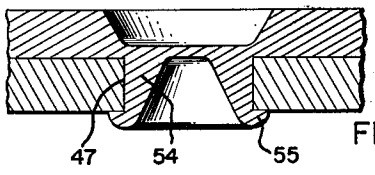


FIG. 11

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Dec. 12, 1961 W. J. THOMAS, SR., ET AL 3,012,525

REFRACTORY BRICK WITH SPLIT INTERNAL CHANNEL AND STAKED HANGER TAB

Filed Sept. 15, 1959 2 Sheets-Sheet 2

FIG. 5

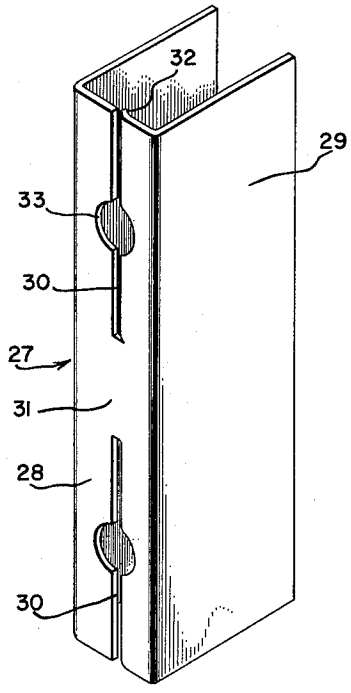


FIG. 7

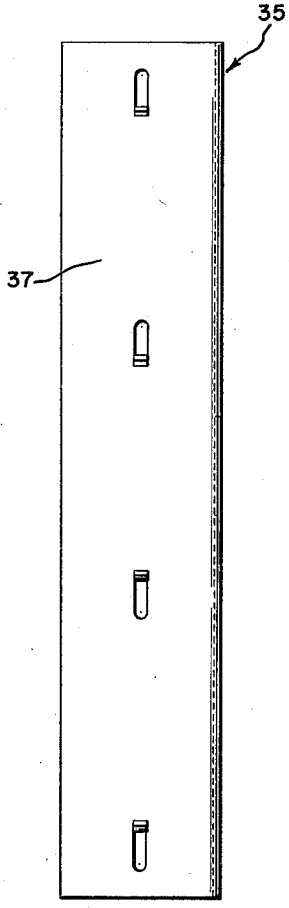


FIG. 6

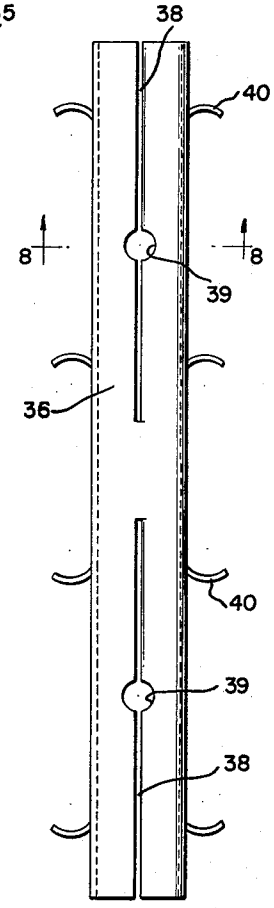
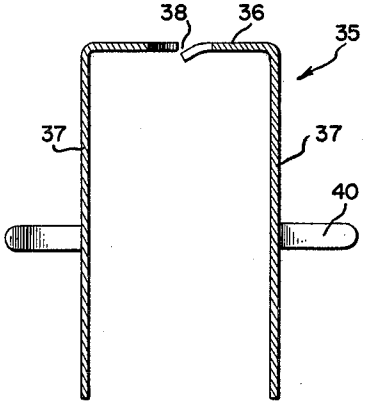


FIG. 8



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REFRACTORY BRICK WITH SPLIT INTERNAL CHANNEL AND STAKED HANGER TAB

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11 Claims. (Cl. 110—99)

This invention relates to the manufacture of refractory brick and is directed particularly to improvements in internal channel bodies embedded therein.

In the manufacture of refractory brick having metal channels embedded therein, certain problems are present which make it difficult to produce a brick which is free of certain internal stresses which tend to cause the brick to crack.

The use of such internal metal channels in refractory brick and particularly in conjunction with outside metal plates secured to the refractory brick, is a common manufacturing practice. Such internal metal channels are conventionally formed with a solid web and the intense pressure required in pressing the metal channel into the material in the forming of the brick causes distortion of the channel which results in the setting up of internal stresses which produce the undesirable cracks in the finished brick.

It is a particular object of the present invention, in the light of the foregoing, to provide an improved metal channel structure for use in the manufacture of refractory brick, which is so designed that any distortion which may develop in the channel as a result of the intense pressure applied thereto in inserting it into the brick material and in pressing the brick, will not result in the production of cracks or weakened areas in the finished brick.

It is another object of the invention to provide an improved internal metal channel for use in refractory brick which is designed in a novel manner to facilitate its attachment to and maintenance in proper position on the pressing plunger employed in connection with the molding of the brick.

In the manufacture of refractory brick having internal metal channels, an effort is made to obtain a brick in which the porosity does not exceed 20% after the brick is fired. In using a solid web internal metal channel it is necessary to allow for as much as 40% porosity in order to keep the finished brick from cracking. It is accordingly another object to provide a metal channel which is so designed that a satisfactory brick having not more than 20% porosity may be obtained and at the same time obtain a brick which is free from stresses and cracks.

Another object of the invention is to provide an improved internal metal channel structure carrying a staked hanger tab which is so designed that the tab will break away from the channel web to which it is staked or secured as the channel is being pressed into the brick in the molding thereof to thus obtain the desired resultant brick structure carrying the metal channel and the tab and free of those stresses which would, in the use of a solid web channel, produce an unsatisfactory finished brick.

Specifically, it is an object of this invention to provide a refractory brick having a metal channel embedded therein wherein such channel is designed so as to insure the formation of a brick of maximum density and free of excessive internal stresses such as are caused by the use of a solid web channel.

The foregoing desirable results are attained by the provision of a metal channel wherein the web is provided with a longitudinal split extending from each end of the web and continued to within a prescribed distance

from the transverse center of the channel. By the provision of such a split web the slight distortion to which the channel is subjected when it is forced into the material of the brick in the pressing of the latter, will not result in the formation, through any tendency of the legs of the channel to return to their former position, of voids in the brick material so that when the brick is fired it will be of the maximum desired density without cracks or internal stresses.

In the case of the employment of a metal channel having a hanger tab secured to the web thereof, provision is made for the attachment of the tab to the web on opposite sides of the split in such a manner that the connection or attachment will yield or break away as the metal channel is distorted upon being pressed into the material of the brick so as not to defeat the function of the split in the web.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, since the scope of the invention is defined by the appended claims rather than by the description preceding them, and all changes that fall within the metes and bounds of the claims or that form their functional as well as conjointly cooperative equivalents, are therefore intended to be embraced by those claims.

In the drawings:

FIGS. 1, 2 and 3 illustrate diagrammatically the action occurring in connection with the pressing into a refractory brick of a solid web metal channel of the type at present commonly used;

FIG. 4 is a diagrammatic view illustrating the manner in which a split web metal channel constructed in accordance with the present invention appears when pressed into the refractory brick;

FIG. 5 is a view in perspective of the split web metal channel of the present invention;

FIG. 6 is a view of the back of a split web metal channel in which the sides or legs have out-struck locking keys or fingers;

FIG. 7 is a view in side elevation of the channel shown in FIG. 6;

FIG. 8 is a transverse sectional view taken substantially on the line 8—8 of FIG. 6;

FIG. 9 is a view in perspective of the split web metal channel having attached to one end of the web a hanger tab, the refractory brick in which the channel is embedded being delineated by broken lines;

FIG. 10 is a view illustrating the manner of forming the coupling stake between the hanger tab and the channel web;

FIG. 11 is a sectional view on an enlarged scale of the staked connection between the hanger tab and channel web.

Referring now more particularly to the drawings, reference will first be made to the diagrammatic views forming FIGS. 1 to 3, inclusive. These figures illustrate a procedure in the pressing or formation of a refractory brick where a solid web metal channel is forced into the brick material as the material is pressed to the desired shape or form. The numerals 10 and 12 represent respectively the sides and bottom of a mold while the numeral 14 designates a plunger adapted to enter into the area 16 in which the brick material 18 lies to press the latter to form.

The numeral 20 generally designates a conventional solid web metal channel which is carried by the plunger as, for example, by means of a magnet 22 with the legs 24 of the channel directed downwardly.

As the plunger 14 forces the solid web metal channel 20 into the material 18 it will be seen that the legs 24

of the channel will be spread apart. In this spreading action the metal at the angles 25 between the legs 24 and the web 26 of the channel will be placed under considerable stress. When the plunger is withdrawn, as illustrated in FIG. 3, the tension or stress at the angles 25 will tend to draw the legs back toward their original position thereby producing on the outer sides thereof the voids 26 in the brick material.

In accordance with one aspect of the present invention the metal channel has the web thereof provided with longitudinal splits.

FIG. 5 illustrates such a metal channel which is here generally designated 27 and which comprises the web portion 28 and the side legs 29.

The web has formed longitudinally and centrally thereof from each end the splits 30, the inner ends of which terminate a predetermined distance from the transverse center of the web thus leaving a short solid central web portion 31. Preferably the split, starting from each end of the web as stated, is continued to within ¾ of an inch of the center line or transverse center of the channel, thus allowing a length of web of 1½ inches solid.

A portion of the web material along one side of each split is bent or turned down or inwardly slightly as indicated at 32.

While the web of the metal channel may be provided with only the longitudinal splits 30 without defeating the object of the invention, it is here shown as having two circular openings 33 formed therein each of which extends across or lies equi-distantly on opposite sides of a split. Such openings are provided to facilitate locating the channel in proper position upon the pressing face of the brick mold plunger by means of centering lugs or pilot pins so as to insure the proper placement of the channel in the refractory brick material as the latter is being pressed.

Diagrammatic FIG. 4 illustrates how the split web metal channel is set or pressed into the brick material without the formation of voids or creation of stresses therein. In this figure the channel is illustrated as having the legs thereof spread apart slightly as a result of the channel being forced into the refractory brick material and as will be seen, the two portions of the web lying on opposite sides of each split are bent down slightly into the brick material without the formation of stresses in the angles 34 where the legs join the portions of the web which border the splits. Some slight stress will be set up in the angle between each leg of the channel and the solid metal portion 31 of the web, but this stress or tension will not be sufficient to pull the legs back toward their initial parallel relation. Consequently by the use of a split web metal channel of this character, the porosity of the manufactured brick in which such a channel is embedded can be maintained at the desirable 20% level and entirely free of voids, cracks or stresses.

FIGS. 6 to 8 illustrate a metal channel constructed in accordance with the present invention and having in addition anchoring lugs in the sides or leg portions thereof. In these figures the channel is generally designated 35 and the longitudinally split web is designated 36 while the sides or legs of the channel are designated 37. The longitudinally formed splits in the web 36 are designated 38 and extend to within approximately ¾ of an inch of the transverse center of the web or channel as in the previously described structure, and this lug carrying channel is shown with the web having the pilot openings 39 therein.

The sides or legs 37 have struck outwardly therefrom the relatively long curved anchoring lugs or fingers 40 the side faces of which lugs are directed longitudinally of the channel so that as the channel is forced into the refractory brick material in the mold the edges of the lugs will cut into the material and the latter will be firmly pressed therearound as the mold plunger applies pressure to the brick material, thus avoiding the formation of any voids therein.

FIG. 9 illustrates the application of the present invention to a metal channel to which a hanger tab is fixed by a novel means which permits the slight deformation of the channel in the manner illustrated in FIG. 4. In this modification the channel is generally designated 41 and the web portion 42 thereof is shown with the longitudinal splits 43 and 44. Here one of the splits, designated 43, is formed like the channels shown in FIGS. 5 to 8, with a portion of the web along one side of the split turned in throughout the entire length of the split. The other split 44, however, has the opposing edges thereof from the outer end of the web inwardly for a short distance lying in the same plane as indicated at 44' with the remainder of the split having a portion of the web along one edge turned in in the same manner as the split 43 and as indicated at 32 in FIG. 5.

The coplanar disposition of the web portions on each side of the split in the part designated 44' facilitates the placement of a right angularly turned end portion 45 of a hanger tab, generally designated 46, flat against the inner face of the web to permit the attachment of this angled portion of the hanger tab in the novel manner about to be described.

The angle portion 45 of the hanger tab is attached to the web in such a manner that when the web is subjected to the stresses resulting from the forcible application of the channel into the brick material, such attachment will yield or give so as to allow the necessary separation of the edges of the split 44 in the portion 44' thereof.

The attachment of the hanger to the web is effected in the following novel manner.

The angle portion 45 of the hanger tab is provided with two transversely spaced apertures 47. This angle portion is located upon a suitable support or anvil having sockets therein to receive a pair of die members 48. In FIG. 10 the numeral 49 designates such an anvil while the numeral 50 designates one of a pair of sockets in which the die members are supported. These die members carry the upwardly projecting substantially frustoconical points 51 and each point is encircled at its base by a channel 53, the diameter of which is slightly greater than the diameter of the opening 47 in the angle portion 45 of the hanger tab. The points 51 of the die members are located in the apertures 47 and the end portion of the channel web in which the slot part 44' is located is positioned over the apertures 47 and a suitable die punch 52 is then forced down against the metal of the web over each opening 47 to extrude a portion of the metal into the openings 47 and into the channels 53.

FIG. 11 illustrates the resultant stake which is formed by this action to effect the coupling together of the hanger tab and the channel. This securing stake is here designated 54 and it will be seen that because of the forcing of the metal of the web into the channel 53 around the die point 51, the end of the stake is given an outturned lip or flange 55 which engages against the under face of the angle portion 45 of the tab to thus couple firmly together the tab and channel.

The metal channel 41, when pressed into the refractory brick, which is indicated in broken lines in FIG. 9 and designated 56, will have the leg portions forced apart slightly as hereinbefore stated, and due to the narrow flange or lip 55 formed at the inner end of each of the stakes 54, separation will be effected between the angle portion 45 of the hanger tab and the metal channel web, thus permitting the legs of the web to spread without creating a stress condition which will cause the legs to tend to pull together or pull toward one another when the pressing force is removed. The angle end portion of the hanger tab will, however, be held in place so as to become firmly embedded in the refractory material, the tab remaining on the outer end of the brick where it can be grasped to be bent into desired position for hanging or

securing the brick in place in the structure of which it is to form a part. To this end the major portion of the hanger tab which is designated 57 is provided with the opening 58.

We claim:

1. A metal channel for insertion in a refractory brick, said channel comprising a web portion and side leg portions, the web portion having at least two splits therein each extending from and opening through one end edge thereof and terminating short of the transverse center of the web whereby the web retains a transverse portion of solid form between the adjacent ends of the splits of a length such as to prevent lateral separation of the parts of the web portion lying on opposite sides of the splits.

2. A metal channel according to claim 1, wherein said splits lie in the longitudinal center of the web and said transverse portion of solid form is plane and of relatively short extent longitudinally of the web as compared to the length of the splits.

3. A metal channel for insertion in a refractory brick, said channel comprising a web portion and longitudinal side leg portions, the web portion having at least two splits longitudinally therein each extending from and opening through one end edge thereof, the splits terminating short of the transverse center of the web whereby the web retains a transverse portion of solid plane form and said splits being bordered along one side and through at least the major extent thereof by an inturned lip.

4. A metal channel for insertion in a refractory brick, said channel comprising a web portion and longitudinal side leg portions, the web portion having at least two splits longitudinally therein each extending from and opening through one end edge thereof, a hanger tab having an angled end portion disposed against the inner face of the web at one end of the chanel, said angled portion spanning the adjacent split, and means joining the angled portion with the web on both sides of the split and adapted to at least partially release the tab from the channel under stresses imposed upon the channel when the latter is inserted into the material of a brick.

5. A metal channel designed to be forced leg first under pressure into the material of a refractory brick, said channel comprising a web portion and longitudinal side leg portions, the web portion having at least two longitudinal splits therein each extending from and opening through an end thereof and terminating short of the transverse center of the web, a hanger tab having an angled end portion positioned against the inner face of the web at one end of the latter with the remaining portion of the tab extending from the web in the same direction as the leg portions, the web spanning the adjacent split, and a fastening means between the angled portion of the tab and the portion of the web abutting thereagainst and lying on opposite sides of the split, said fastening means comprising an extension of the material of one of the portions through an aperture in the other portion and adapted to break away at least on one side of the split under stresses imposed upon the channel and tending to distort the same during the forcible pressing of the leg portions into the brick material.

6. The invention according to claim 5, wherein the portions of the flange lying upon opposite sides of the split and engaged by the angled portion of the tab are in straight edge opposed relation, through a part of the length of the split, the remaining part of the last mentioned split being bordered along one side by an inturned flange, and the other split being bordered throughout its length along one side by an inturned flange.

7. A metal channel designed to be forced leg first under pressure into the material of a refractory brick in the manufacture of the latter, said channel comprising a web portion and longitudinal side leg portions, the web portion having at least two central longitudinal splits therein each extending from and opening through one end edge of the web, one of the splits having the edges thereof in closely spaced opposed relation in a common plane, a hanger tab comprising an elongate flat body having an angularly extending portion at one end, said tab portion being positioned against the inner face of the web to span the split in the part thereof having the opposed edges, the remaining body portion of the tab extending from the web in the same direction as the leg portions, and means on opposite sides of the last mentioned split securing the angled portion of the tab to the web, said means comprising posts constituting extruded portions of the material of the web and extending through apertures in the angled portion of the tab and said extruded portions having outwardly extending flange means engaging against the face of the tab angled portion on the side thereof remote from the web and adapted to be broken away under stresses imposed upon the channel causing distortion thereof during the forcing of the channel legs into refractory brick material in the manufacture of the latter.

8. A metal channel to be forced leg first under pressure into the material of a pressed refractory brick in the pressing thereof, said channel comprising a web portion and longitudinally extending side leg portions, said web portion having at least two longitudinally extending splits therein each extending from and opening through one end of the web, the splits terminating their inner ends short of the transverse center of the web whereby the web retains a solid form centrally of its ends, a portion of the web material bordering each split being directed inwardly forming a split bordering lip, and a plurality of integral outwardly extending portions of the material of the channel leg portions forming anchoring lugs or fingers having longitudinal edges directed transversely of said leg portions for edgewise entry with the leg portions into the brick material.

9. A metal channel for insertion into a refractory brick, said channel comprising a web portion and longitudinal side leg portions, the web portion being weakened medially along two longitudinal lines from each end edge to points short of the transverse center of the web to permit flexing of the web between said points upon application of pressures upon the inner sides of the legs tending to spread the legs apart, a hanger tab having an end portion disposed against the inner face of the web at one end of the channel, said end portion spanning the adjacent weakened line, and means joining the end portion with the web on both sides of the weakened line and adapted to at least partially release the tab from the channel under stresses imposed upon the channel when the latter is inserted into the material of a brick.

10. In a refractory brick, a metal channel for insertion therein, said channel comprising a web portion and side leg portions, the web portion having at least one split therein extending from and opening through at least one end edge thereof and terminating short of the other end edge of the web, whereby the web retains a transverse portion of solid form of a length such as to prevent lateral separation of the parts of the web portion lying on opposite sides of the split.

11. A refractory brick comprising a refractory body portion, a metal channel embedded therein and comprising a web portion and longitudinal side leg portions, said web portion having at least one split therein extending longitudinally from and opening through at least one end edge thereof throughout a major portion of the length of the web, whereby the web retains a transverse portion of solid form of a length such as to prevent lateral separation of the parts of the web portion lying on opposite sides of the split.

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