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J. F. HINES

2,006,240

MOLD JACKET

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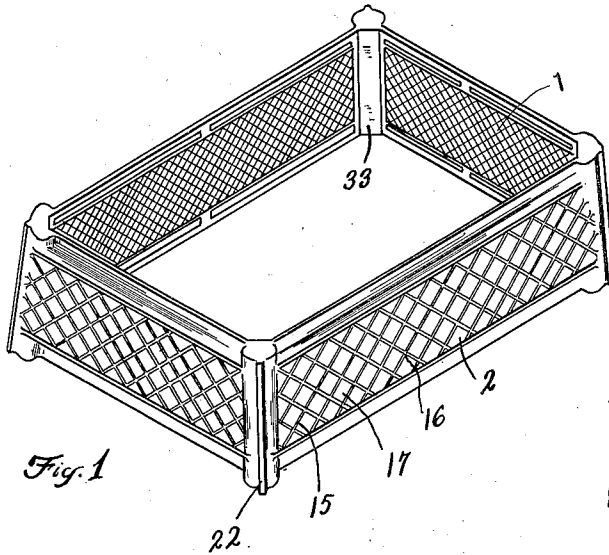


Fig. 1

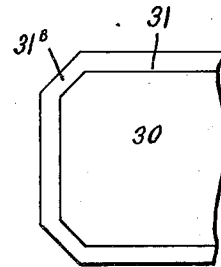


Fig. 7

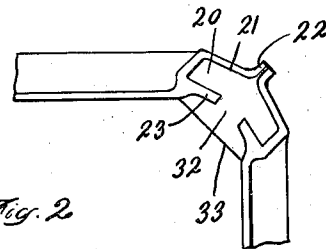


Fig. 2

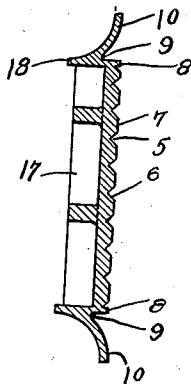


Fig. 3

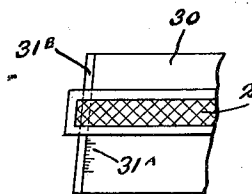


Fig. 6

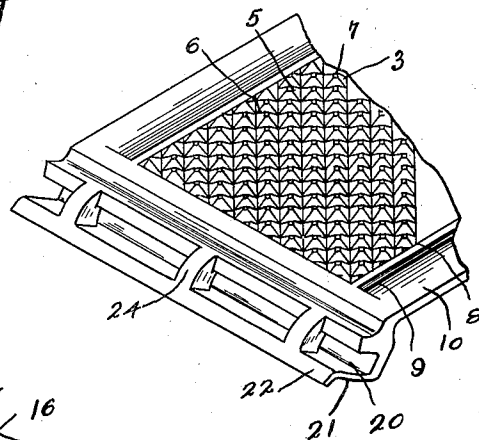


Fig. 4

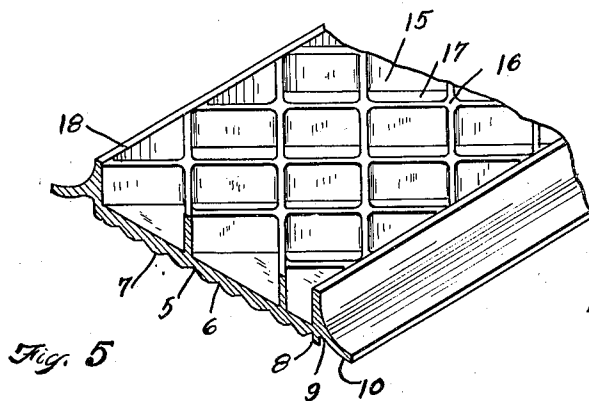


Fig. 5

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MOLD JACKET

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3 Claims. (Cl. 22-112)

This invention relates to mold jackets and a method of making the same and has among its purposes the production of a mold jacket which will be accurate under severe and sustained usage, of long life, light in weight, economical to manufacture and which will facilitate production of perfect castings. These and other objects and results of the invention will be fully developed in the following specification which, with the drawing appended thereto, discloses a form in which I prefer to embody my invention, although it will be understood that other forms of the jacket and other methods of making it may be used, all within the scope of the invention.

In the accompanying drawing, Fig. 1 is a view in perspective of the completed jacket; Fig. 2 is a detail of the corner construction; Fig. 3 is a vertical cross section through either an end or side wall of the jacket; Fig. 4 is an enlarged detail showing the inside surface; Fig. 5 is an enlarged detail showing the outside surface; Fig. 6 is a diagrammatic illustration of apparatus and a method of assembling the jacket; and Fig. 7 is a plan view of the same apparatus.

Referring now particularly to Fig. 1, it will be seen that the improved jacket comprises side members 1 and 2 inclined inwardly toward the top in the usual manner of foundry jackets, with permanently secured corners, making in effect a unitary structure.

It will of course be understood that jackets of other than rectangular shape may be made having the same surface characteristics as here shown, or that the jacket illustrated might be made in a single casting. I find it most desirable, however, to make the four sides of the jacket separately and assemble them.

Among the most important characteristics of the jacket are the inner and outer surface formations.

The inner surface, best seen in Fig. 4, is formed of a large number of small projections with their tops smaller than their bottoms and having the tops all finished off in a common plane. The most convenient formation found in practice is that of a large number of truncated pyramids 3 with adjoining square bases. By this formation diagonal channels such as 5 and 6, intersecting at right angles, are formed between the various rows of pyramids in either direction while the flat tops 7 form collectively the effective holding surface for the molding sand. The greater part of the inner face of the jacket is so formed, but this broken surface is conveniently bounded at top and bottom by narrow smooth ridges 8 fin-

ished off to the common effective plane of the elements 7, while beyond these ridges there are horizontal grooves 9 which drop off quickly to about the depth of the channels 5 and 6 but gradually slope back to the controlling inner level and merge into wider strips whose inner surfaces 10 curve into tangency with the plane of the elements 7. This arrangement of the elements 8, 9 and 10 gives a channel formation which stiffens the sides against outward bulging. Also the grooves 9 slightly lighten the jacket.

For using the jacket the mold is formed in the usual manner in a flask the sides and inclination of which agree precisely with that of the jacket. The jacket will thus engage and support the mold by means of the surfaces 7, 8 and 10. The flasks in which the molds are made often have slight irregularities of their inner surface because they are generally cast without machining, for the reason that machining would cut off the casting scale and diminish the strength of the flask. Such irregularities result in corresponding irregularities in the outer surfaces of the mold. When my improved jacket is put on the mold these irregularities are smoothed off by the action of the flat surfaces 7 against the sand of the outer mold surfaces, these surfaces 7 all being at a common correct plane. However, such smoothing is without injurious effect to the mold for the reason that excess material shaved off is deposited in the immediately adjacent grooves 5 and 6 instead of accumulating between the mold surface and the inner surface of the jacket, and tending to crush the mold cavity inward. Thus when the jacket is forced down it makes its own perfect fit on the mold without any injury thereto. Although the pressures within the mold in pouring may be very heavy, the numerous points of support 7 are evenly distributed and are separated by grooves which are small enough so that there is a certain bridging effect of the wet packed sand over the grooves. It has been found in practice with this jacket that the formation described gives as complete support as a smooth solid surface. The grooves 5 and 6 do not fill rapidly, although some sand adheres in the baking process. However, these grooves remain sufficiently open to allow passage of any gas which escapes through the mold so that no harmful gas pressures build up. In case the grooves become too much filled with baked sand they can readily be cleaned out with a wire brush.

The numerous small elevations on the inner face of the jacket also have the effect of increasing the exposed area of metal in the wall. It

being a known fact that in cast metal the surface has the greatest strength, this increase of metallic surface, most of it being in the sides 3 of the pyramids which are not machined, adds greatly to the strength of the jacket so that the reduction in weight due to the grooves 5 and 6 is not accomplished by any diminution in strength below that which would be present in a smooth surfaced side wall of corresponding thickness, but rather, gives greater strength.

Referring now to the outside of the jacket, this consists over the greater part of its area of a honeycomb formed by relatively deep ribs cast integral with the remainder of the jacket wall, and thus strengthening the back of the inner face. These ribs may in any one of a variety of shapes to form pockets therebetween as well as to back up the inner surface. The preferred form comprises ribs in diagonal series 15 and 16 crossing each other at right angles, thus forming a large number of diagonally disposed square pockets 17 on the outer face of the jacket. Along the top and bottom edges the outer surface is strengthened by a concave quarter round flange the outer edge of which consists of the strip whose inner surface is indicated at 10 and the inner edge of which slightly overhangs the ribs 15, 16 as shown at 18. At the top this flange, outwardly overhanging as it does at 18, directs spilled metal away from the sides of the jacket thus preventing burning of the jacket. The flange described also strengthens the sides against bending by reason of its channel formation. In using the jacket the pockets 17 have the top and bottom flanges serve to some extent as hand holds, but the pockets are found useful in that they collect and hold the damp molding sand, which sand protects the metal of the jacket from injury by spilled molten metal. It is never necessary to clean the sand out of the pockets of the outer surface because the greater the accumulation of sand the greater the insulating effect.

The corner construction illustrated herein is an improvement upon that shown in my earlier patents, No. 1,577,718, issued March 23, 1926, and No. 1,790,921, issued February 3, 1931. It comprises a deep groove 20, Figs. 2 and 4, each having its outer wall 21 terminating in an outwardly directed flange 22, faced to lie on or parallel with the bisector of the corner angle as finished. Thus with a rectangular jacket the face of the flange 22 will make an angle of 45° with the plane common to the surfaces 7. The inner walls 23 of the groove 20 are shallower, so these adjacent inner groove walls are spaced apart some distance in the finished corner as shown in Fig. 2. These flanges 22 on abutting corners are very slightly spaced apart in the finished jacket, as shown in Fig. 2. Posts 24 are disposed across the groove 20 at intervals, but do not extend to the bottom of the groove 20.

In making the jacket the sides and ends 1 and 2 are placed against a master die 30, Figs. 6 and 7, of very accurate construction, and the exact size of the jacket is determined by the height of the elements on the tapered sides 31 of this master die, gauge marks 31^A being placed thereon for convenience. The sides 31 are inclined to the same angle as the inner surfaces 7 of the jacket sides and the corner edges, beveled off as shown at 31^B. The jacket members being held in position, molten metal, preferably the same metal as used in the jacket construction, usually aluminum, is poured into the grooves 20, thus making in ef-

fect an integral joint. This cast binding metal is indicated at 32, Fig. 2. The interior corners of the jacket will consequently take a shape corresponding to the corners 31^B of the master die and as here shown will be flat, as shown at 33, forming an angle of 135° with the inner planes of the jacket. This corner construction may be concave, as shown in my above mentioned Patent No. 1,790,921. I have found, however, that the use of a flat face 33 is ordinarily preferable because it allows a more accurate fit of the jacket over the mold. An advantage of a filled corner over a square corner, such as shown in my Patent No. 1,577,718, is that when the jacket is lifted off the mold the 90° corner catches and carries away some sand, and this sand has a tendency to bake and stay in the corner thus breaking the corners of new molds and sometimes seriously injuring the mold itself. The flat corner face 33 has an advantage over the rounded corner face shown in my Patent No. 1,790,921 in that the obtuse angles of 135° are as free from the evil of catching sand as are the rounded corners, while it is easier with the present form to make a larger number of identical jackets on a series of master dies such as 30 on account of the readily apparent fact that it is easier to make a series of identical flat surfaces the corresponding dihedral angles of which are absolutely equal than it is to make several rounded surfaces of precisely the same curvature. This being the case it is cheaper, and there is greater assurance of accuracy in making a number of master dies, such as 30, than there would be in making corresponding dies with rounded upright corners such as would be necessary for making the jackets shown in my Patent No. 1,790,921. Still another advantage of the flat corner over the concave is that the flat corner has been found in practice to come off the mold without the necessity of tapping the jacket. This result was unexpected but has been demonstrated in practice to be reliably found in the use of the present flat corner form as compared with the earlier concave form.

It may be here noted that the corners of molds are generally the most troublesome parts for the reason that the mold maker in tamping or peening down the sand with the handle of his shovel, as usually practiced in foundries, cannot reach well back into the corner. Speed being a very important feature in mold making, it is not feasible to use a special tool for tamping the corners.

An advantage of a cast corner over one made by riveting, bolting or other similar means, is that the cast corner always remains absolutely accurate and any derangement which will impair accuracy will be serious enough to give a plain warning that the jacket is unfit for use, such as a break or crack.

A further advantage of a cast corner, especially when made on a master die, is that it stands re-heating without strain because originally made with hot metal. The degree of accuracy is the same as though the entire jacket were cast in one piece, but by casting each side separately and afterwards putting them together, casting strains in the entire structure are prevented.

In making the jacket by the method of fitting to a master die and pouring the corners as described, it will be noted that the method is almost one of die casting. On account of the taper of the master die a high degree of accuracy as to dimension is obtainable by setting the side and the end members up or down on the die 6. It

will also be observed that the position on the die instead of the exact meeting of the flanges 22 is depended on for the final accuracy. For this reason the flanges 22 need not have their abutting 5 faces machined off unless it is necessary to get some of the metal out of the way to permit a smaller size jacket to be made from the same piece. Usually in the finished jacket there will be some slight clearance between the flanges 22 10 but this will be filled by the cast metal 32.

It will be seen from the foregoing that I have constructed a jacket which is light, strong, accurate, and which cannot in any way injure molds on which it is placed, but rather rids them of any 15 slight irregularities of side and end surface and gives perfect support to the sand, which jacket includes means for allowing escape of leaking gas during the pouring. This jacket is also convenient to handle either with gloves or with tools 20 for the reason that the exterior surface gives a greater number of holds. Furthermore, the jacket when new is well protected against spilled molten metal by reason of the outwardly directed top ledges 18, and in use very quickly acquires 25 additional protection by the sand which catches in the spaces 17. Furthermore, on account of the cellular reenforcement an occasional hole accidentally burned through the thin part of the side will weaken only a very small area and will 30 not ordinarily be sufficiently serious to destroy the usefulness of the jacket. Nor will cracks work out from such a hole beyond the next reenforcing rib 15. My method of making the jacket provides 35 means for quick and accurate work and allows a number of exact sizes of jackets within a given range to be made from end and side pieces of given sizes, although close accuracy to any desired size within the range is obtainable by the gauge marks 31^A on the master die.

In situations where weight is of no particular 40 consideration this jacket can be made of cast iron, although for most purposes aluminum is advantageous. Where cast iron is the material used, the corner joints 32 may be cast either of iron, 45 aluminum, or any other suitably strong metal. When the jacket is made of iron, the sides some-

times warp, particularly if they are shaken out too quick, and it is therefore frequently necessary to grind the faces 7 to an even plane, whereas 5 when the sides are cast of aluminum such grinding is rarely required. Even when made of iron and ground, my inner surface construction has an advantage in manufacturing for the reason 10 that the channels 6 allow air cooling of the iron during the grinding operation so that the grinding can be carried on quickly without danger of the heat of abrasion inducing further warping.

The foregoing description and accompanying 15 drawing are to be taken in an illustrative and not in a limiting sense. The scope of the invention is to be determined from the following claims.

What I claim is:

1. A mold jacket having its outer surface formed with a plurality of intersecting ribs reenforcing a side plate element, and edges of approximately the depth of said ribs and of outwardly concave arcuate cross section extending 20 along the top and bottom of said side plate element, the inner extremity of said arcuate edge intersecting said ribs, and the outer extremity of said arcuate edge being approximately tangent to 25 the inner surface of the jacket.

2. A mold jacket having an outer surface comprising a plurality of intersecting reenforcing ribs forming pockets therebetween and horizontal 30 grooves along the top and bottom edges, said grooves being of approximately 90° cross section, outwardly concave, and lying approximately tangent to the plane of the inner surface of said jacket and approximately tangent to a perpendicular 35 to said plane, said last-named tangent portion extending outwardly a distance greater than the depth of said pockets.

3. In a mold jacket, inner faces composed of a large number of relatively small elevations forming the major portion of the inner surface of 40 said jacket, said elevations having flat tops in a common plane, and horizontal grooves at opposite sides of each inner face, and ridges along the edges of said grooves, said ridges being disposed 45 in the plane of the tops of said projections.

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