United States Patent [19]

Karn

[11] **3,763,029**

[45] **Oct. 2, 1973**

[54] **CHEMICAL EQUIPMENT STRUCTURES**

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[22] Filed: **Oct. 19, 1971**

[21] Appl. No.: **190,521**

[52] **U.S. Cl.**..... **204/279,** 52/309, 52/406, 204/286, 204/297 R

[51] **Int. Cl.**..... **C23b 5/70,** B01k 1/00, B01k 3/00

[58] **Field of Search** ..... 52/309, 406; 264/45, 264/267, 268; 204/279, 286, 297 R

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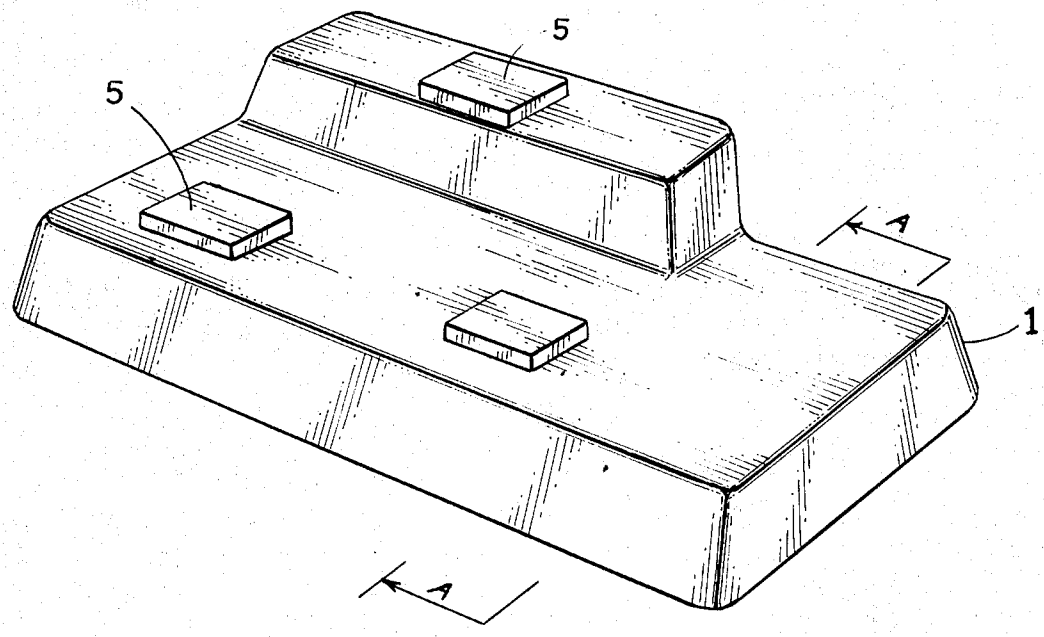
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Primary Examiner—F. C. Edmundson

[57] **ABSTRACT**

An insulator to be used on electrolytic copper refining cells to support the bus bars and electrodes is constructed of a thin sheet of polyvinylchloride thermoformed into a pan shaped cavity into which is cast a mixture of polyester resin and quartz sand. After casting, the piece is inverted and strips of more refractory material such as chlorinated polyvinylchloride are cemented onto the insulator where the hot bus bar will contact the insulator in service.

5 Claims, 2 Drawing Figures



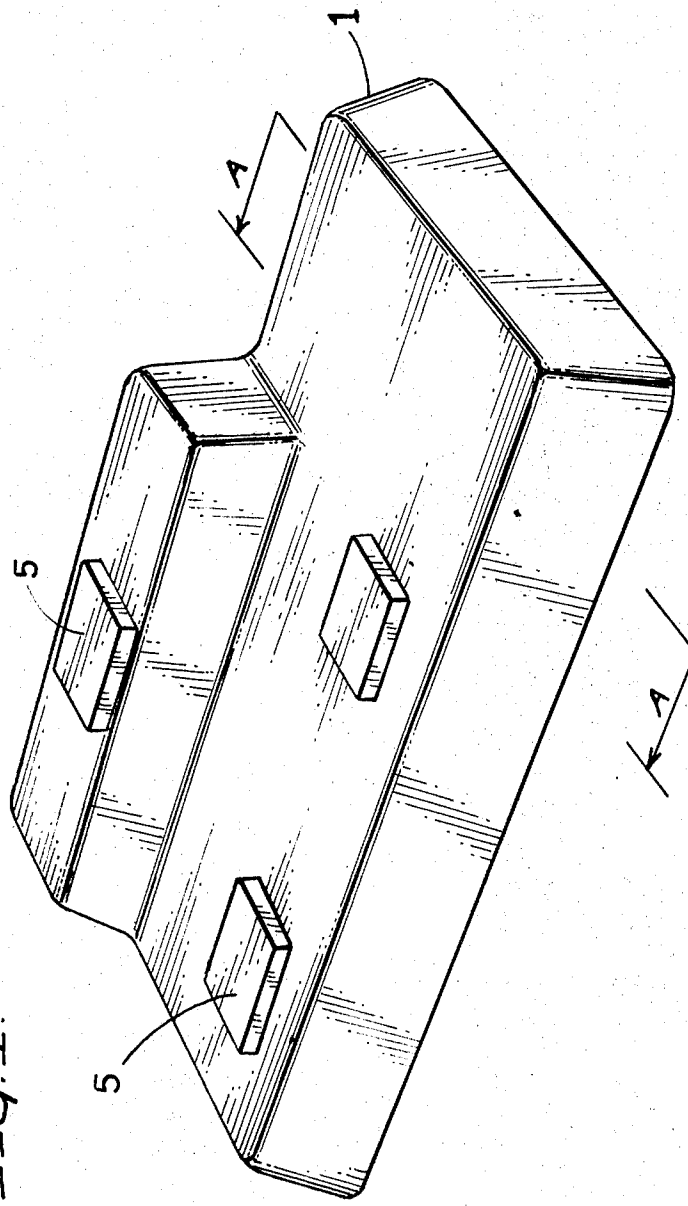


FIG. 1.

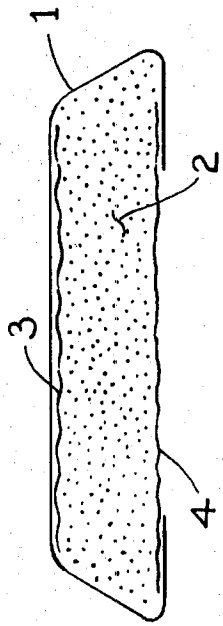


FIG. 2.

CHEMICAL EQUIPMENT STRUCTURES

The invention relates in general to chemical equipment structures and more particularly to means for providing a sturdy support member for bus bars and electrodes used in electrolytic copper refining cells.

An object of this invention is to utilize the best structural strength properties of a thermosetting material while protecting its surface with an organic polymeric thermoplastic material which has optimum surface properties for the exposure conditions.

Another object of this invention is to provide convenient means for forming a thermosetting material into a structural member while simultaneously providing for protection of the surface of the thermosetting material.

FIG. 1 is the insulator. FIG. 2 is a cross sectional view of the insulator along the line A—A of FIG. 1.

A fuller understanding of the invention may be had by referring to the description taken in conjunction with the accompanying drawing which shows a structural member comprising a shell (piece 1), a core (piece 2), additional variations of core and shell compositions (pieces 3 and 4), and second surface materials (pieces 5) attached to the shell.

In the past wood has been widely used as bus bar insulator supports in electrolytic cells for refining copper. Wood has also been used in structural service in other acid containing tanks and systems. In more recent years some of the organic polymeric materials such as polyolefins, polyvinylchloride, chlorinated polyethers, among the thermoplastic materials and the polyesters and epoxies among the thermosetting materials have lent new scope to construction materials for chemical equipment. One electrolytic copper refining plant employed slabs of polyvinylchloride to support the copper bus bars which are placed along the edges of the electrolytic refining tanks. The copper bus grows hot from the heavy current which it conducts. In this particular installation the polyvinylchloride slabs scorched slightly and turned brown in the vicinity of contact with the hot copper. Also the free ends of the polyvinylchloride slabs bowed upward under the weight of the copper combined with the thermal softening action. Aside from these difficulties, polyvinylchloride was a meritorious choice for its chemical resistance to the hot 17 percent sulfuric acid copper sulfate bath solution. My design offers means for removing the hot bus bar from immediate contact with the polyvinylchloride. My design offers means for using a rigid, thermosetting material for the structural support while still having the freedom to select an exposed surface material of high chemical resistance.

EXAMPLE I

I made a pattern for thermovacuum forming. It was several feet long, about 6 inches wide, about 1 inch high, with sloped sides, with rounded edges, and with certain desired salient contours. A sheet of polyvinylchloride one-sixteenth inch thick was thermoformed over the pattern. The sheet was not afterward trimmed of the flared edges. Instead I exposed a narrow line to a reheating step and folded each edge inward to form a pan with re-entrant lips (See section A—A, FIG. 1). After making several short slits I similarly folded in the ends. The thermoformed shell was then laid open side up on a frame that held it bent slightly concave downward. This was to off-set a shrinkage distortion that occurs in the casting step. A mixture of 60 percent by weight dry quartz sand, 40 percent by weight catalyzed polyester resin was prepared and poured into the shell to form a core. After the resin had cured the composit structure made a very strong, durable structure suitable as a mechanical support in industrial chemical service.

EXAMPLE II

The structure of Example I was formed, but several layers of glass fiber mat were applied to the interior of the shell as the initial interior layer and as the final core surface (pieces 3 and 4 of FIG. 1, section A—A). In addition, pads of fiberglass mat were cemented with a rubber cement onto the top surface of the core filled structural member where the copper bus bars would bear. Some alternate pad materials are chlorinated polyvinylchloride and chlorinated polyether cemented with a tetrahydrofuran solvent base cement. Any one of these attached pad materials is considered a second surface material as described in the claims section. It may be noted that this was a sample test piece and a full length insulator may be about 15 feet long and support electrodes every 2 inches.

EXAMPLE III

The shell of Example I is prepared. A thin layer of fiberglass mat wetted with a thermosetting resin is placed against the interior surface. After curing of the resin the remainder of the void is filled with concrete prepared with a hydraulic cement.

In Example III the shell and concrete may be the only materials used to form the structural member. With a convoluted shell there can be sufficient keying to lodge the concrete securely. One may form the structural members as described in the examples. The members may then be grouped or stacked so as to form tanks, walls, troughs, pans, etc. The joints may be readily closed with an appropriate plastic cement or plastic welding technique.

Below are presented a definition of several terms and their scope as used in this patent application.

By a thermosetting material is meant any material capable of being cast, poured, or molded after which it sets to an infusable, unworkable mass. Such materials include polyester resins and epoxies. The hydraulic cements such as portland cement also fall within the scope of a thermosetting material.

An organic polymeric thermoplastic material includes the many common plastics like polyvinylchloride, chlorinated polyvinylchloride, polyolefins and new materials under development, all of which are repeatedly formable by the application of heat. I choose also to include under my usage of the term thermoplastic in this patent application such materials as are commonly thought of as thermoplastics but may by such means as incorporation of peroxides or exposure to ionizing radiation become crosslinked and rendered infusable, e.g. crosslinked polyethylene.

I claim:

1. A bus bar insulator support for electrolytic cells comprising a shell formed from sheet thermoplastic material selected from the group consisting of polyvinylchloride, chlorinated polyvinyl chloride and polyolefin and having a rigid core formed of a thermosetting plastic material, selected from the group consisting of polyester and epoxy resins said core being formed by

casting said thermosetting plastic material into said shell.

2. A bus bar insulator support for electrolytic cells comprising a shell formed from sheet polyvinylchloride and having a rigid core formed by casting a mixture of polyester resin and sand in said shell.

3. The bus bar insulator support of claim 1 wherein said shell has pads of chlorinated polyvinylchloride attached to the surface of said shell in the bus bar support bearing regions of said shell.

4. The bus bar insulator support of claim 1 wherein said shell has pads of glass fiber attached to the surface of said shell in the bus bar support bearing regions of said shell.

5. The bus bar insulator support of claim 2 wherein said shell has pads of chlorinated polyvinylchloride attached to the surface of said shell in the bus bar support bearing regions of said shell.

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