Nov. 21, 1939. L. T. SIBLEY ET AL 2,180,373

HEAT INSULATING PANEL

Filed Oct. 29, 1937

Fig. 1

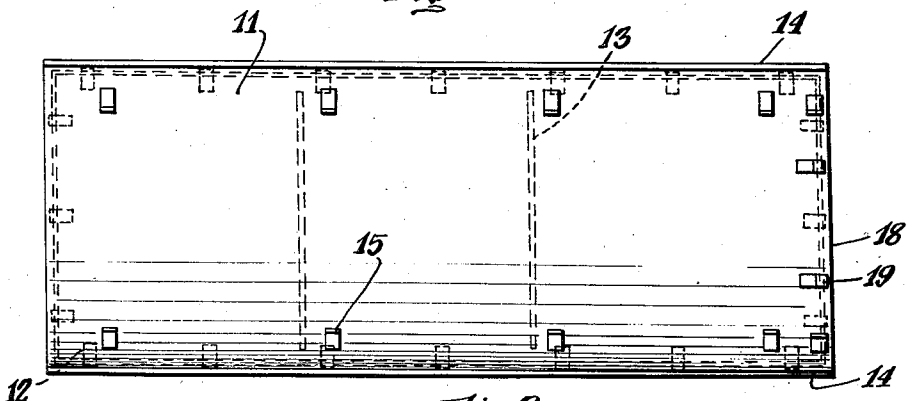


Fig. 2

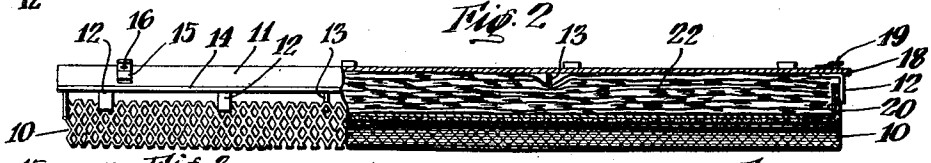


Fig. 3

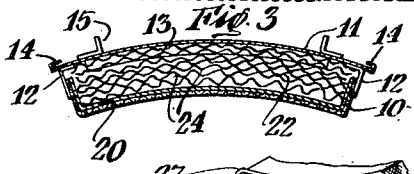


Fig. 6

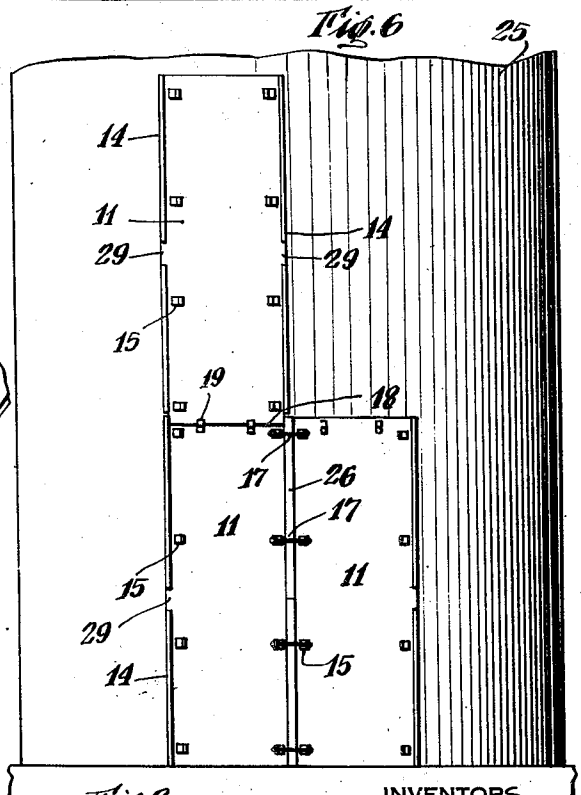


Fig. 7

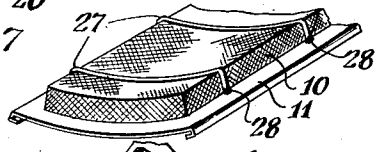


Fig. 4

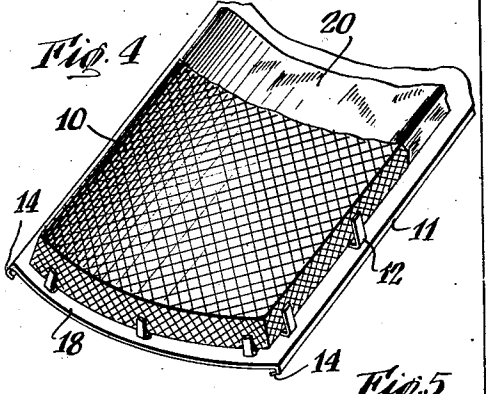


Fig. 5

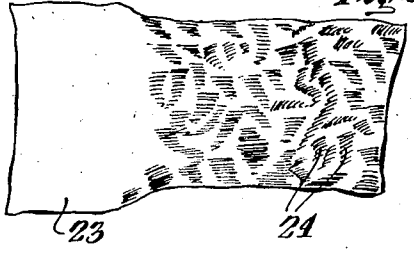
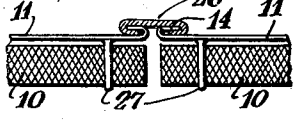


Fig. 8



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HEAT INSULATING PANEL

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Application October 29, 1937, Serial No. 171,681

2 Claims. (Cl. 189—34)

This invention relates to heat insulating devices and more particularly to a pre-fabricated panel-type of metal assembly that may be used on various industrial equipment such as for example oil tanks to preserve heat. The panel is characterized by having a metal basket connected to a sheet metal cover and spaced therefrom by metal connectors.

Heretofore, the conventional methods of heat insulating various industrial equipment such as storage tanks, fractionating columns, and vacuum towers was to rigidly fasten to the equipment layers of insulating material such as magnesia or cement or layers of rock wool. These insulating layers were fastened to the device to be insulated by means of chicken wire, metal laths, galvanized wires, etc. In some instances particularly where high temperatures are involved, several of these insulation layers with metallic supports have been commonly used on the industrial equipment. After these insulating layers are applied, which in itself is time consuming and expensive, the entire outer surface is then plastered with a layer of asbestos or rock wool cement to which is added a mixture of Portland cement or other plastic materials to produce a hardened surface. This cementing operation is necessary to seal the cracks, joints and broken segments of the previously applied insulation layers.

In view of the fact that the above described heat insulating materials as used are exposed to general weather conditions which would normally cause deterioration, it has heretofore been necessary to waterproof the entire exposed area. A number of different weather-proofing methods have been tried but have been found to possess certain practical disadvantages. One of the best of these attempts consists in the application of a plastic water-proofing cement trowelled or otherwise spread over the hard-finish cement to a thickness of approximately one-quarter of an inch. This method gives satisfactory results initially, but over a period of time under weathering conditions the plastic cement coating deteriorates and loses its water-proofing effectiveness. It is also subject to rupture by leaks of hot air from the insulated equipment and by contraction and expansion of the insulated material with changes in temperature.

An object of the present invention is to provide a self-supporting weather resistant heat insulating device having high heat preserving efficiency.

In accordance with the present invention the above described disadvantages and limitations characteristic of the insulating devices used heretofore have been overcome by the use of a simple but efficient metal panel-type of heat insulator. This heat insulating device may be prefabricated and may be made in units of any desired size and shape whereby installation of these units around or upon the equipment to be insulated can be easily effected. The device of this invention comprises generally, an expanded metal or mesh-like basket having a complete inner lining made of relatively thin metal foil, or foil coated paper, or other heat insulating material and having a series of strips or layers of crumpled thin metal foil spaced apart and arranged within the metal foil inner lining, or a mass, or strips of any other suitable heat insulating material such as rock wool, cotton etc., loosely or compactly arranged, and a sheet metal cover attached to and covering the top of the metal basket; the attachment being made by separate metal connectors that space the basket away from the sheet metal cover. The strips or layers of metal foil or other heat insulating material arranged in the basket may be spaced apart to provide desired air spaces between strips for preventing transfer of heat across or through the basket.

This new type of heat insulating unit is easily applied to flat or round surfaces such as, for example, square or round tanks, columns, pipes, etc. without any positive physical attachment of the unit to the equipment which it insulates, the metal baskets with outer sheet metal covers being placed around and in close contact with the structure to be insulated. When used on rounded surfaces the metal panels are given a suitable curvature. Upon installation, the baskets are joined together by means of connecting clips and bolts mounted on the outer surface of the sheet metal cover so as to provide a self-supporting unitary cover for the insulated structure. The metal basket or panel of this invention is light in weight, is characterized by high heat insulation efficiency, is fire proof, vermin-proof, and water-proof and may be easily assembled.

The novel features of this invention are set forth with particularity in the appended claims. The invention itself, however, both as to organization and method of operation may be easily understood from the following description taken in conjunction with the accompanying drawing in which:

Fig. 1 is a top plan view of the heat insulating metal basket panel;

Fig. 2 is a side view of the panel partly broken away to show the metal foil inner lining and spaced strips of metal foil;

Fig. 3 is an end view of a curved form of the metal basket panel;

Fig. 4 is a bottom perspective view of a curved form of the metal basket panel;

Fig. 5 is a plan view of one of the metal foil strips used in the basket, only part of the strip being crumpled to show the irregular formation; and

Fig. 6 is a front view illustrating the method of application of the metal basket panels to a surface to be insulated.

Fig. 7 is a modification of Fig. 4.

Fig. 8 is a detail of the clincher strip and its mode of application.

Referring now more in detail to the several figures of the drawing, it will be seen that the metal panel comprises an expanded metal or mesh-like basket 10, the top of which is covered by a sheet metal jacket 11, the latter being attached to the metal basket by means of a number of metal clips 12. These clips are welded at different points around the periphery of the top edge of the expanded metal basket. The clips are angular in form and the metal basket rests upon one extended leg of the angle and is welded to one or two of the wires in the side wall of the basket. This type of small surface contact connection between the metal basket and sheet metal jacket avoids any appreciable through-metal contact between these two members. In place of the clips 12 bent metal rods 27, shown in Fig. 7, may be used. These rods are welded to the sheet metal cover 11 at the points 28 and may also be welded to the metal basket 10 if necessary. The outer sheet metal jacket 11 may be reinforced whenever necessary by means of angle-irons such as shown at 13 welded to the inside of the jacket.

The long side edges of the sheet metal jacket 11 are folded back a suitable distance for example, one half of an inch to form a clincher edge shown at 14. This clincher edge extends along each side of the panel jackets. On the outside face of the metal jacket 11 are welded a suitable number of angular metal clips 15. These clips are drilled to form holes 16 which accommodate a carriage bolt 17 as shown in Fig. 6. When the panels are erected these carriage bolts are placed in the clips of adjacent panels to temporarily hold the panels in approximately correct position, as explained more in detail hereinafter. These clips 15 and bolts 17 are not always necessary and may be omitted if desired.

The bottom edge of each panel is constructed so that it has an overhanging jacket 18 extending a suitable distance, for example three inches, beyond the edge of the basket 10. The top edge of the jacket 11 is approximately flush with the end of the basket 10. On the outside surface of the jacket 11 near each of its ends are welded several Z-shaped clincher clips 19. These clips may be approximately ¾ of an inch wide and may be made of 13-gauge metal. They may be located conveniently about 3 inches from the end of the metal jacket 11. The clips 19 may be replaced by sheet metal screws if desired.

Located within the metal basket 10, as shown in Fig. 2 is a heat reflective inner lining 20. This inner lining may be made of thin metal foil such as aluminum foil or it may consist of foil coated paper or any other suitable heat reflective material. The lining is applied flat against the bottom and sides of the metal basket 10 and with its reflective surfaces exposed through the meshes of the basket on all five surfaces. This lining may, if desired, cover the open top of the basket just beneath the outer sheet metal jacket 11. Located within the inner lining 20 are a plurality of thin strips of heat reflective material 22. These strips may be made of aluminum or other metal foil sufficiently thin to have negligible heat conducting capacity and having a bright reflective surface to efficiently reflect heat transmitted thereto. These metal foil or other suitable thin strips of heat insulating material extend the length of the metal basket and are fastened at each end by any suitable means. For example they may be cemented to the inner lining of the metal basket on each end by means of sodium silicate or other adhesive. These heat reflective strips are spaced apart sufficiently to provide heat insulating air spaces between the strips. It has been found advantageous to space these strips so that an air space of approximately ⅜ of an inch will be provided between adjacent strips.

A suitable form of metal foil heat insulating strip for use in the metal baskets as described above, is shown in Fig. 5. The metal foil strip 23 which is preferably made of thin aluminum foil is crumpled by hand or any suitable means to form a very large number of irregular surfaces illustrated at 24. This formation may be produced by simply wadding and lightly compressing the flat sheet of metal foil by hand and then pulling out the crumpled sheet to its new effective length. It will be noted that the crumpling of the sheet reduces its width. The purpose of the crumpling of the sheet is to provide surfaces of various heights and formations so that when the sheets are laid side by side in the metal basket any contact between sheets will be only point contact instead of continuous flat surface contact. This arrangement insures a minimum amount of heat transfer between adjacent sheets. This feature is illustrated in Fig. 3, wherein the several sheets of crumpled metal foil 24 are shown as having only point contact with each other.

The method of applying the heat insulating metal panels shown in Figs. 1 to 4 is illustrated in Fig. 6. The panels are arranged vertically as shown in the latter figure and joined together in sufficient number to cover the entire exposed surface of the equipment generally shown at 25. Adjacent panels are fastened together by means of the metal clips 15 and bolts 17 as described above. Tightening of these bolts brings the clincher edges 14 of adjacent panels near each other. A clincher strip 26 shown in Fig. 8 is then driven down over the clincher edges 14 of each of the abutting jackets 11 thereby securely locking the two panels together and in proper position. This clincher strip 26 is easily removable and replaceable, by means of a notch 29 in the clincher edge 14, which notch is located at the junction of clincher strips 26. The strip 26 serves several functions including locking the two panels together, forming a waterproof and heat insulating joint therebetween and maintains the joined panels in their proper positions, preventing buckling or sagging.

At the time the panels are being installed in the manner described above, compressible and expansible gaskets (not shown) are placed around the edges of each panel as they are erected. These gaskets may be made of any suitable material such as for example, glass wool, mineral wool, rock wool, lead wool, matted asbestos, etc. The expanded metal basket 10 will securely maintain the gasket in position and at the

same time permit any necessary expansion of the gasket into the panel without materially increasing its density, thereby maintaining its original insulating effect. By means of the bolts 17 the panels may be pulled together or spread apart so that a suitable variation of about ⅜ of an inch is permitted at each panel joint. The clincher strip 26 cover the maximum opening at each joint and the bolts 17 cooperating with the clincher edges 14 of the abutting panel jackets limits the minimum opening at each joint. The size of this opening may of course be varied by using different width clincher strips. When the panels are erected and locked together with the clincher strips as described, they are self supporting. No additional support is required nor is it necessary to attach the panels in any manner to the surface to be insulated. For these reasons the panels are easily removable and replaceable one unit at a time and independent from any other unit.

The metal foil inner lining 20 provided in each of the baskets serves to reflect the majority of the radiant heat back against the surface on which the insulation is applied, resulting in quick preheating or quick cooling of the surface as desired. The inside face of the metal jacket 11 may be covered with aluminum paint or with foil coated insulating material or aluminum foil, as suggested above, to provide a heat reflective surface which will reflect the major portion of the radiant heat that may be carried by convection currents through the surrounding edges of the insulation in the panel back toward its source. This feature effects minimum heat transfer at all joints.

The outer exposed surface of the metal jacket 11, as well as all surfaces of the metal basket 10 are preferably coated with aluminum paint applied in such a manner that it will withstand high temperatures without disintegration or discoloration. These aluminum coated surfaces act not only as reflectors of radiant heat on the inside of the panel toward the surface being insulated but they also insure a very low emission of radiant heat on the outside surface of the tank. In summer daylight operation the outside aluminum painted surfaces will serve to reflect a large portion of the incident solar radiant heat.

It will be understood that the materials, sizes and modes of construction described hereinabove, by way of example to illustrate the general principles of this invention may be changed to meet varying heat insulating requirements without departing from the scope of the invention. Some of the novel features of the heat insulating panels of this invention are set forth in the appended claims.

What is claimed is:

1. A heat insulating metal panel comprising an outer sheet metal cover, a substantially rigid reticulated metal basket having one normally open side and being attached to said metal cover at peripheral points along the edges of said normally open side by means of metal connectors which space said reticulated metal basket from said sheet metal cover to provide a heat insulating dead air space therebetween which substantially prevents flow of heat between said cover and basket, a metallic foil, basket shaped, member located within said basket and forming an air impervious heat reflective lining for said reticulated basket and providing an effective heat insulating dead air space within said basket such that flow of air into and out of said basket is substantially prevented, and heat insulating material loosely arranged within said metal foil, basket-shaped member so as to divide said dead air space into a plurality of smaller dead air spaces which substantially prevent transfer of heat through said basket.

2. A heat insulating panel as defined in claim 1 in which the connectors that connect the reticulated metal basket and sheet metal cover are angular shaped metal clips welded to said basket and cover.

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