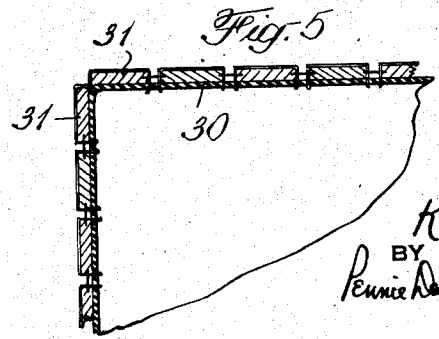
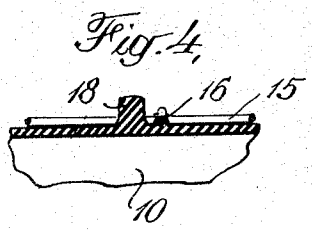
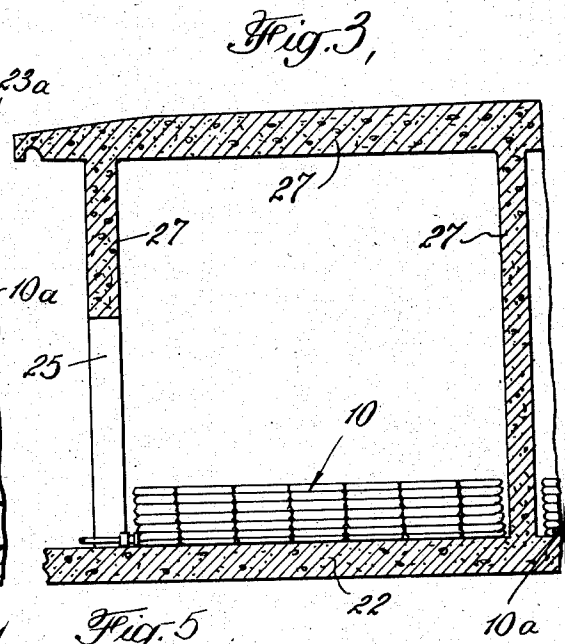
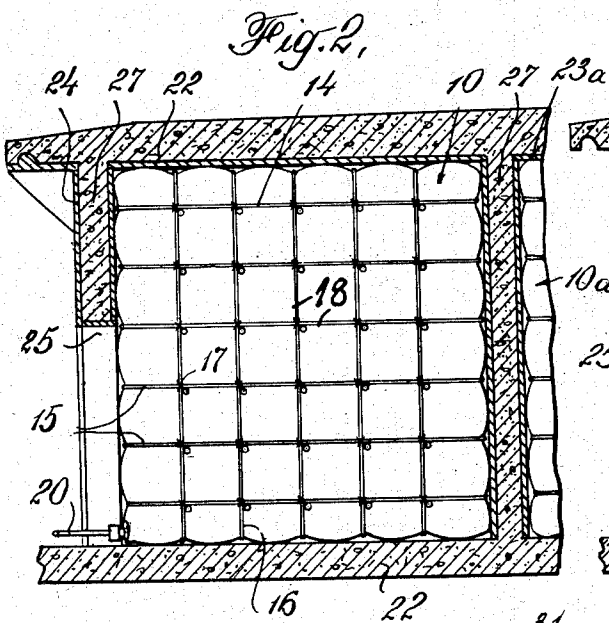
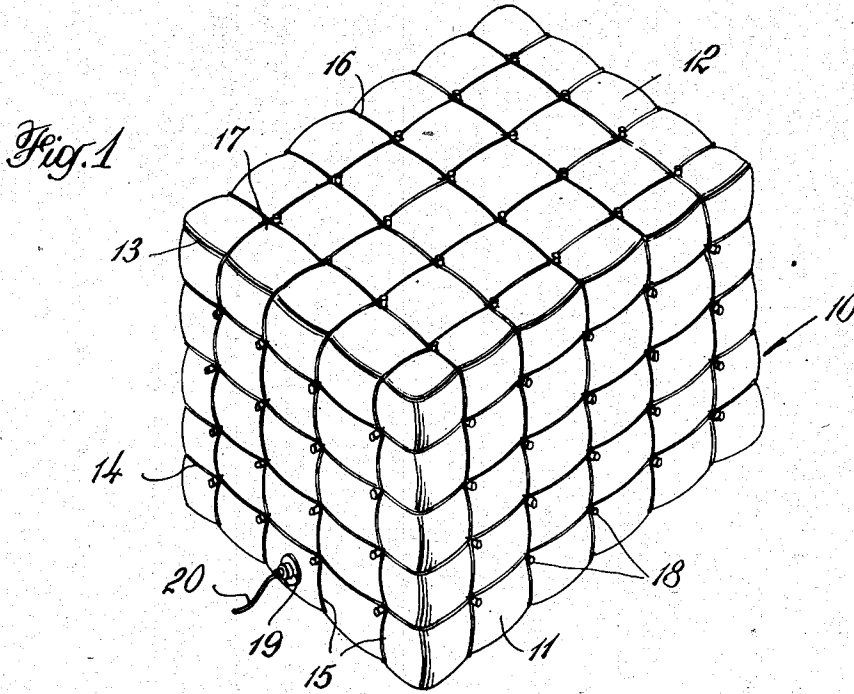


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K. P. BILLNER
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INVENTOR
Karl P. Billner
BY
Pennie Davis Thaman & Edmonds
ATTORNEYS

UNITED STATES PATENT OFFICE

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BUILDING CONSTRUCTION

Karl P. Billner, New York, N. Y., assignor to
Vacuum Concrete, Inc., a corporation of Penn-
sylvania

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This invention relates to building construction and more particularly to a novel method of building concrete structures, such as dwellings, and the like, by the practice of which the bracing of the forms in which the concrete is poured is greatly simplified. The new method is simple and efficient and may be practiced at low cost with the use of a novel apparatus which also forms part of my invention.

While the invention has application to structures other than buildings, it will be described for illustrative purposes in connection with a building of the type which includes concrete walls and partitions and a concrete roof or ceiling.

In the construction of concrete dwellings, and the like, it has been the practice to erect on the building site suitable forms in which the concrete is poured. Generally, these forms are made of wood and include an inner form having side walls and a top arranged on the foundation in the form of the desired room, and an outer form including side walls spaced from and opposing the walls of the inner form so that the concrete may be poured between the inner and outer forms. After the concrete has set, the forms are removed and the concrete surfaces may be covered or finished in any desired manner. In constructing buildings in this manner, it is necessary to brace the top and side walls of the inner form, which is commonly made of plywood, to prevent their being broken in by the weight of the concrete when it is poured. Heretofore, the bracing of the inner form has been effected by means of a system of beams, or the like, arranged between the side walls and extending from the floor to the walls and the top or extending directly between the walls. Each of the beams must be installed separately before the concrete is poured and removed separately after the concrete has set, and these operations consume a substantial amount of time and require relatively skilled labor.

One feature of the present invention, therefore, resides in the provision of a novel method of constructing concrete buildings, and the like, which overcomes this objection to the present practice in that it does not require the installation of beams for bracing the inner form. According to my invention, the concrete in its plastic state is confined in a generally hollow mass of any desired form, as, for example, in the form of walls of a room, and simultaneously the hollow mass is subjected from the inside to a relatively high fluid pressure sufficient to hold the mass in position and prevent it from col-

lapsing, the fluid pressure being released after the concrete has set so that it is self-supporting. Preferably, the usual inner and outer forms are erected but without the customary bracing beams for the inner form, and an inflatable supporting body is arranged within the inner form and inflated in any suitable manner so that it occupies all or substantially all of the space therein. As a result, the side walls and top of the inner form are braced from the inside by the walls of the inflatable body with which they contact. The pressure of the fluid in the inflatable body may vary depending on the weight of concrete to be poured between the forms, but the body is inflated sufficiently to withstand the pressure of the concrete against the inner form. The inflatable body may be constrained by any suitable means so that the outward pressure of its fluid content cannot break the inner form before the concrete is poured. After the concrete has set, the supporting body is deflated and removed through a door or window of the room, and the forms are disassembled.

Another feature of the invention resides in the provision of a novel apparatus for use in practicing my invention, to brace the inner form when the concrete is poured. A bracing apparatus made in accordance with my invention comprises an inflatable body preferably made of rubberized fabric or other impervious, flexible material, and constructed so that when the body is inflated sufficiently it is of the same general shape and size as the inner form for the concrete. To this end, the inflatable body may be provided with constraining means preferably in the form of flexible chains, bands or wires extending around the body in horizontal and vertical planes so as to hold the body in the desired shape and size when it is inflated. Thus, the pressure exerted by the fluid content of the inflated body is distributed substantially uniformly over the side walls and top of the inner form which is occupied by the body. If desired, the flexible constraining members may be tied together where they cross each other over the inflatable body, and the latter may be provided with outwardly projecting studs for engaging the constraining members to hold them in place.

It will be apparent that in the construction of concrete buildings, and the like, in accordance with my invention, the bracing of the inner form prior to pouring of the concrete may be effected quickly and easily and does not require skilled labor. The inflatable bracing apparatus of the invention is of simple construction adapted for

manufacture at low cost, and it may be readily installed in and removed from the inner form. The walls of the inner form may, if desired, be incorporated in the bracing apparatus itself by securing boards to the fabric of the inflatable body, the boards being arranged to present flat surfaces spaced from the walls of the outer form when the apparatus is inflated. With an apparatus of this construction, the erection of the forms for the concrete is greatly simplified, since some or all of the walls of the usual inner form may be eliminated.

For a better understanding of the invention reference may be had to the accompanying drawing, in which

Fig. 1 is a perspective view of one form of an inflatable support for use in practicing the invention;

Fig. 2 is a vertical sectional view through part of a building showing a cross-section of the inflatable support in position after the concrete is poured;

Fig. 3 is a view similar to Fig. 2 showing the inner and outer forms removed and the inflatable support deflated and ready for removal;

Fig. 4 is a detail view of part of the inflatable support showing one of the studs thereon for holding the constraining means in position, and

Fig. 5 is a horizontal sectional view of part of a modified form of the inflatable support.

Referring to the drawing, the apparatus shown in Fig. 1 comprises an inflatable body 10 made of a flexible, impervious material, such as a rubberized fabric. The body 10 is so constructed that when it is inflated it assumes the general shape and size of the desired concrete room, and to this end it may be made of a sheet 11 forming the side walls of the body, a sheet 12 forming the top of the body and secured to the sides by seams 13, and a similar sheet (not shown) forming the bottom. In order to hold the body in the desired form when it is inflated, it may be provided with suitable constraining means, such as flexible wires, bands, chains, or the like, one set 14 being arranged to extend around the body in horizontal planes, a second set 15 being arranged to extend around the body in parallel vertical planes, and a third set 16 being arranged to extend around the body in parallel vertical planes normal to the planes of the members 15. Where the constraining members 14, 15 and 16 intersect one another, they may be tied together as shown at 17, and the members may be held in position by means of flexible members 18 within the body 10 projecting outwardly from the body 10 at the intersections of the members. The fluid for inflating the body 10 may be pumped into the body through a nipple 19 from a conduit 20 connected to the nipple and leading to the fluid pump (not shown).

In the practice of the new method with the apparatus shown in Fig. 1, the usual forms for receiving the concrete may be erected on a suitable foundation 22, these forms as shown comprising an inner form 23 and an outer form 24. The forms may, if desired, be provided with aligned openings to form a doorway 25. After the forms 23 and 24 have been erected, the inflatable body 10 in its collapsed state may be placed inside the inner form 23, as, for example, through the doorway 25, and then inflated by pumping a suitable fluid, such as air or water, through the tube 20 until the body occupies all or substantially all of the space within the inner form, as shown in Fig. 2. When the body is so

inflated, the flexible members 14, 15 and 16 constrain it so that it assumes the general shape and size of the inner form and exerts a substantially uniform pressure over the top and side walls of the inner form. Also, any tendency for the body 10 to bulge outwardly and distort the inner form is opposed by these constraining members.

When it is desired to construct a concrete building having adjacent rooms separated by a concrete partition, a second inner form 23a similar to the form 23 may be arranged adjacent thereto on the foundation 22, and a body 10a similar to the body 10 may be inflated within the form 23a so as to brace the top and side walls thereof. It will be understood that instead of placing the inflatable bodies 10 and 10a within the respective inner forms 23 and 23a after the latter are erected, the bodies may be inflated prior to erection of the forms and the latter built around the bodies.

The concrete 27 is now poured between and on top of the forms in the usual manner. It will be apparent that the weight of the concrete at this time exerts a substantial pressure on the top and sides of the inner forms 23 and 23a which tends to collapse these forms. However, the inflated bodies 10 and 10a, by reason of their engagement with the top and sides of their respective inner forms, resist this tendency and exert a substantially uniform pressure over the adjacent surfaces of the forms so as to counteract the pressure of the concrete. The pressure in the bodies 10 and 10a is correlated to the weight of the concrete outside of the inner forms so that these bodies and their corresponding inner forms will hold their shapes after the concrete is poured.

After the concrete 27 has set, the expansible bodies 10 and 10a are deflated, as shown in Fig. 3, and the forms 23, 23a and 24 removed. The deflated bodies may be removed from the building, as through the doorway 25, and used again in constructing other rooms.

With the new method, the building may be constructed more rapidly and at lower cost than with prior methods because the bracing of the inner form by erection of the usual system of beams is unnecessary. The inflatable body 10 may be easily placed in position and expanded to the desired form, and after the concrete has set it may be readily collapsed and removed. Since the inflatable body engages the inner form throughout most of its area, the support for the latter is more uniform than the support afforded by the usual bracing beams.

A modified form of the inflatable supporting apparatus is shown in Fig. 5. As there shown, the apparatus comprises an inflatable body 30 having a top and a bottom and side walls, and a plurality of boards 31 secured in generally parallel, closely adjacent relation to at least one wall of the body. The boards may be secured to the body in any suitable manner, as, for example, by sewing them into the fabric of the body. With this construction, when the body is inflated the boards 31 present a substantially flat surface which may serve as part of the inner form for confining the concrete. Since the boards 31 are relatively narrow and have flexible connections between them, the wall which they present upon inflating the body will collapse when the body is deflated, so that the latter may be easily removed from the room. While I have shown the boards 31 extending vertically, they may be arranged horizontally if desired. Also,

a similar arrangement of boards may be provided on all four sides of the body and on the top as well. The boards 31 serve as a constraining means for the inflatable body, but the latter may be provided with additional constraining means such as flexible bands, or the like, similar to the members 14, 15 and 16. By employing an inflatable apparatus of the form shown in Fig. 5, the construction of the forms for receiving the concrete is further simplified for the reason that the walls presented by the boards 31 may take the place of the corresponding walls of the inner form.

I claim:

1. In the construction of concrete buildings, and the like, the method which comprises erecting inner and outer rigid supports of the desired form for receiving the concrete, inflating an expandible body within the inner form to brace said inner form, pouring concrete between the forms, and deflating and removing the expan-

sible body after preliminary setting of the concrete.

2. For use in supporting concrete when it is poured, an inflatable apparatus comprising an inflatable body, flexible tension members extending around the body in spaced relation for constraining it in a predetermined form when inflated and limiting the inflation thereof, the studs projecting from the body for holding said members in position.

3. For use in supporting concrete when it is poured, an inflatable apparatus comprising an inflatable body, flexible tension members extending around the body in spaced relation and against which the body is inflated for constraining it in a predetermined form and limiting the inflation thereof, and studs projecting from the body for holding said members in position.

KARL P. BILLNER.