July 4, 1967 D. B. CHESKIN 3,328,932

VOID FORMER AND VOID FORMER IN A CONCRETE FLOOR CONSTRUCTION

Filed Sept. 2, 1964

Figure 1

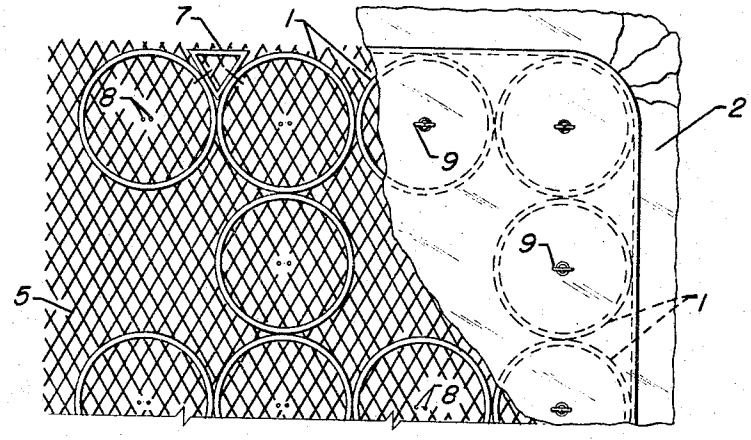


Figure 2

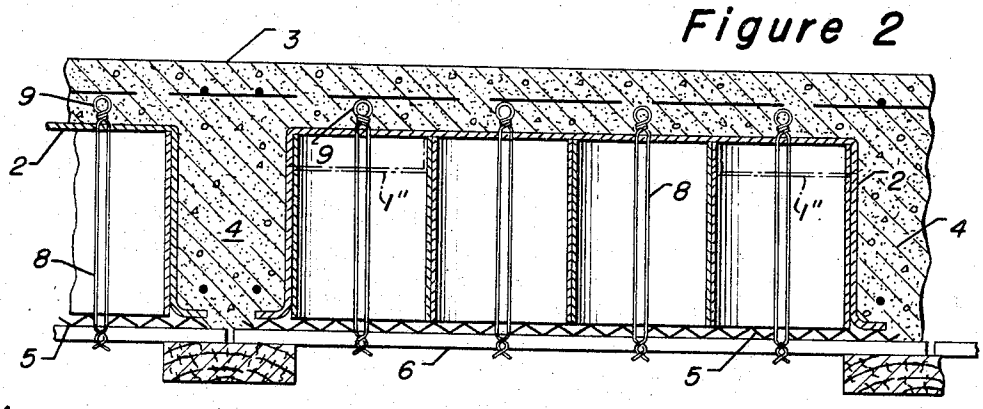


Figure 3

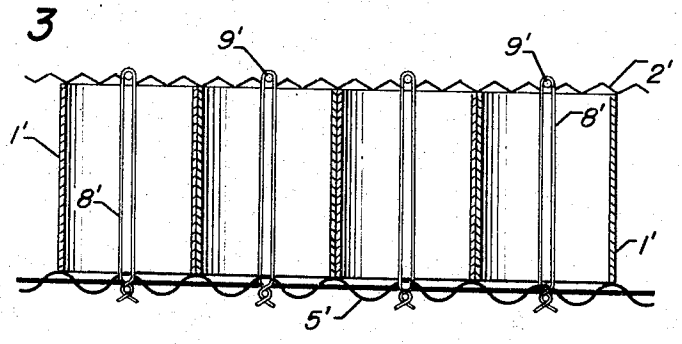
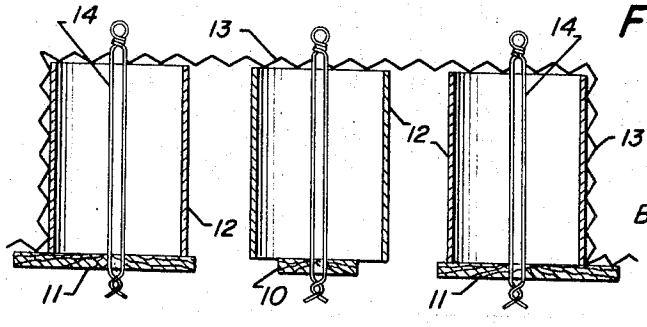


Figure 4



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VOID FORMER AND VOID FORMER IN A CONCRETE FLOOR CONSTRUCTION

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This invention relates to an improved lightweight form or mold useful for the construction of reinforced concrete floors or roofs of the slab and beam type.

The improved form is particularly advantageous in that it is not only light in weight, but of relatively inexpensive construction which permits all or a portion of the form to be left in place if it is so desired. The various parts or portions of the forms are also removably positioned adjacent one another or attached to one another by tie means and no gluing or bonding is necessary.

Usual types of forms, pans or molds are of relatively heavy sheet metal, being expensive and cumbersome to handle and place. In some instances corrugated sheet metal is arched or bent into U-shaped sections to aid in increasing strength while reducing the thickness of the metal and weight; however, there remains the fabricating and assemblying problem which necessitates the use of end pieces to fit with the arched sections to effect a complete pan or mold. The result is a relatively heavy and expensive type of form. Also, in connection with the use of sheet metal pans or molds, there is involved the labor and expense required to effect the removal of all of the molds from a poured floor, as well as the expense of cleaning such molds for reuse.

It is a principal object of the present invention to provide a lightweight type of form construction for use in forming reinforced concrete floors which readily embodies available inexpensive lightweight materials of construction and which substantially eliminates the use of metal.

Another object of the invention is to provide a form construction embodying means for readily effecting a finished ceiling below a resulting reinforced concrete floor.

Briefly, the improved form of the present invention embodies a plurality of separate tubular sections of substantially equal height removably positioned adjacent each other to provide a larger form base, a covering material which is substantially impervious to the passage of a concrete mix that is positioned over the form base, at least one lower transverse member, and tie members between said covering material and said lower transverse member providing thereby a unitary form member.

In a more specific embodiment, the improved form comprises a combination of plurality of separate open-ended tubular sections of substantially equal height nested vertically adjacent one another and forming a larger core or form base, a transverse ceiling forming member removably connecting to and extending below the open ends of said plurality of tubular sections and below said form base, and a non-rigid covering material substantially impervious to the passage of concrete attached to and extending over the top of said base.

The tubular sections may normally be cut from larger sections of tubing and may be of any fairly rigid lightweight material comprising cardboard or pressed paper, plastic or resins, or of the lightweight more inexpensive types of metals such as aluminum or magnesium metals. The tubes may be plain, corrugated or spiraled inasmuch as the particular method of fabricating the tubing is not a limitation to the present invention. The plurality of tubular sections may also be formed of sections which are other than round, i.e., oval, triangular, rectangular or other polygonal shape. Similarly, the covering material

which is positioned over the plurality of vertically placed tubular sections may comprise various lightweight sheeting materials, including plastic, wire-lath, paper and combinations of paper, plastic or cloth with metal reinforcement, such as "Steeltex." The latter material comprises a strong paper backing attached to a wire mesh material. It is, of course, necessary that the particular covering material used will preclude the passage of the concrete mix in its unhardened state into the space occupied by the tubular sections and the form as a whole. The covering material is not glued or otherwise bonded to the tube members, but, as will be pointed out more fully hereinafter, may be tied through the tube core section to the lower transverse member or members. Generally, the plurality of tubular sections need not be bonded, stapled or otherwise tied together laterally, but where desired for extra strength, or for handling purposes, there may be lateral tie means. Normally, the arrangement of tubes will be of rectangular form so that the resulting forms or molds may be readily usable for positioning along with a plurality of other forms, in a geometrical pattern to provide a resulting reinforced concrete slab and transverse beam type of construction. It is thus a feature of the present invention to eliminate the need of egg-crate or honey-comb type of filler sections which become bulky and cumbersome to handle.

It is also a particular feature of the present invention to provide a form which readily adapts itself to having various types of lower sheets or ceiling members attached thereto, to in turn provide a resulting finished ceiling below a floor. Ceiling members may comprise lightweight insulating fiber board materials such as "Celotex" and the like, or stiff plastic sheets, which may or may not be corrugated, or of hard-pressed composition sheets of Portland cement and asbestos, such as "Transite." Metal lath of various types, or the aforementioned "Steeltex," may also be utilized to provide a base for a coat of lightweight cement or plaster under the resulting floor.

The lightweight domes or forms of the present construction permit either shop or field assembly and while such forms may be removed after the setting of the reinforced concrete, the relatively inexpensive nature of their construction permits leaving them in place so as to save labor costs to effect their removal. Other features and advantages will be seen upon reference to the accompanying drawing and the following description thereof.

FIGURE 1 of the drawing is a partial plan view, with a part of the covering material removed, of the improved form utilizing a plurality of tubular sections.

FIGURE 2 of the drawing is a sectional elevational view through a reinforced concrete floor section, showing one embodiment of the improved light weight form being temporarily held in place by suitable supporting frame work for the construction stage.

FIGURE 3 of the drawing illustrates, in a sectional elevational view, a modified embodiment of the improved form having covering materials held against the open ends of the tubular sections in a manner forming a simplified form or mold useful to permit a finished ceiling below a resulting concrete floor.

FIGURE 4 of the drawing shows in section still another embodiment of the form, where removable lower transverse members serve to support the form body and provide holding means for tie member to the upper cover sheet.

Referring now more particularly to FIGURES 1 and 2 of the drawing, there is shown a plurality of open-ended tubular shaped pieces or sections **1** which are positioned vertically and close to one another in a manner to provide structural rigidity to a core or form-base. Each of the tubular sections **1** are preferably about the same length

or height so that as they are positioned adjacent to one another they provide a resulting form which is of a substantially uniform depth throughout its length and breadth. It is, however, within the scope of the present invention to provide tubular sections which vary somewhat in height. For example, a plurality of tubes **1** that have a height or length which are somewhat higher or longer in the central zone than the tubes **1''** (such as are shown in dashed lines in FIGURE 2) which surround such centrally located ones in a given nested arrangement, will result in a form-base that is somewhat arched or domed towards its central area as it is utilized in place to support concrete for the formation of a concrete slab. Also, as hereinbefore mentioned, the tubular members may be cut or fabricated from any of a variety of relatively stiff materials, such as cardboard, thin sheet-metals, fibrous materials, spun glass, or any of the readily available materials of the "plastic" type which are presently on the market, including, but not limited to polyethylene, polypropylene, ethylene copolymer, phenolic resins, etc. As indicated in FIGURE 1, the tubes **1** can be spaced apart and need not touch. It is, of course, necessary to provide vertical rigidity to the unit and adequate support means for the upper and lower covering materials.

A covering material **2** is positioned over and around the plurality of tubes **1** in order to cover the open ends of the tubular members **1**. The covering material **2** may be removably attached to the ends and/or sides of the tubular sections in order that the latter are held in place in a predetermined desired arrangement, but need not be glued or otherwise fixedly attached or bonded to the tubes. Tie members **8** are shown as tying the cover **2** through the tube sections **1** to a lower transverse cover member **5**.

The covering material **2** may be of plastic, of the nature of cloth, or of one of the varieties of relatively strong laminated papers which will not readily break after being wetted. It is also within the scope of the present invention to utilize various of the metallic types of meshes, such as screen, wire lath, expanded metal, or "Steeltex," which as previously stated is formed from the combination of a wire mesh and a tied-on backing material. It is, of course, a requisite that the particular covering materials utilized have the ability to preclude the substantial passage of any of the wet concrete mix which is poured over the forms after the latter are placed in position for the construction of a reinforced concrete floor.

FIGURE 2 of the drawing shows in elevational section the plurality of tubes **1** covered with the pliable covering **2** and in addition a concrete floor **3** and concrete beams **4** which result from the use of a plurality of spaced forms. The embodiment of FIGURE 2 further shows in section the sheeting material **5** positioned along the underside of the plurality of tubes **1** and resting on supporting platform members **6**. The lower cover material **5** is tied to the underside of the plurality of tubes **1** by tie members **8** so that upon the removal of the supporting boards **6**. Such lower cover is exposed on the underside of the resulting concrete floor to aid in providing a finished ceiling under the floor. Each tie member **8**, in a preferred construction, has a loop or extended upper ends **9** which will be embedded in the superimposed concrete **3**. Then, the tie members **8** are strongly held at their top ends so that they may serve as supporting hangers for the lower ceiling members **5**.

In the drawing, the member **5** is indicated as a screen or a wire lath type of material suitable for being covered with plaster or grout; however, under the scope of the present invention various other types of base and finish materials may be used, such as "Celotex" or an equivalent fibrous type of sheeting materials, gypsum board, plywood or any of the rigid plastic sheeting materials, and sheeting comprising cement mixed with asbestos, such as "Transite," any of which may be flat or corrugated, as may be desired.

A modification of the construction and arrangement indicated in FIGURE 1 makes use of a plurality of vertically positioned tubular shaped sections to provide stiffening for the form base and to delineate the size of the form; however, a certain number of the tubular sections may be eliminated to the point where strength is not jeopardized, in order to utilize a fewer number of the tubular sections **1** in the finished form or mold. As indicated hereinabove, the tubular sections need not be of circular cross-section nor is it required that each of the forms or domes be of a resulting rectangular shape as to length and width. In some instances for a particular type of reinforced concrete floor, or for architectural reasons, it may be desirable to provide a form which is generally circular or has the shape of a particular polygon, and to arrange a plurality of such forms in a particular geometrical arrangement to provide a slab and resulting grid work of intermediate beams in a special pattern.

Still another modification of the improved form embodies vertically positioned tubular sections of different sizes. It is not required that the plurality of tubes used be all of one size, such as the uniformly sized pieces shown as **1**. In FIGURE 1 of the drawing there is shown a triangularly shaped tube **7**, and where large round sections are used such as sections **1**, then a plurality of tubes **7** may be advantageously used around the periphery of the form-base in the manner of fillers.

In FIGURE 3 of the drawing, there is shown a specific simplified embodiment of a lightweight form which utilizes of tubes **1'** which are placed adjacent to one another to define the periphery and size of a resulting form and, of course, at the same time to provide stiffness and strength to the core or form base of the resulting form or mold. Positioned over the open ends of the tubes, both at the top and bottom thereof, are suitable covering materials **2'** and **5'** which in turn provide for covering the open tube ends of the tubular members **1'**, thus precluding the passage of the wet concrete mix from the top as the form is used in place to construct a slab and beams, and at the same time providing on the underside of each form section a base or covering material which will effect a ceiling under a resulting concrete floor or roof. As previously indicated, various materials may be used for the top covering material **2'** as well as for the ceiling base or bottom covering material **5'**. In connection with the present embodiment, there is indicated a plurality of tie members **8'** which wrap around transverse bars **9'** above sheet **2'**, and extend to below sheet **5'** through the various tubular sections **1'**. Such rods or bars **9'** and ties **8'** are effective for maintaining the covering materials in place against the open ends of the tubes **1'** and maintaining all of the tubular members **1'** in a proper nested arrangement adjacent to one another during the shipping and handling of the forms. Also, as with the embodiment of FIGURES 1 and 2, the ties **8'** serve as tension members or hangers for anchoring and holding the ceiling members **5'** in place.

In FIGURE 4 of the drawing, there is shown the use of removable transverse strip members **10** and **11** below spaced vertically positioned tube sections **12**. As in the other embodiment, a concrete impervious member or covering material **13** is placed over the tops or upper ends of tubes **12** to provide a resulting lightweight form. Also, as in the other modifications, suitable tie members **14** are used between the top and bottom sections so that a unitary form capable of being readily handled is obtained.

A particular feature of the embodiment of FIGURE 4 is the removability of the lower transverse members **10** and **11** as well as the tubes **12** after a superimposed concrete slab or floor is poured and set. The members **10** and **11** may be boards or planks suitable to support the form between spaced scaffolding or beams and, of course, at the same time provide a tie point for tie rods or wires **14** extending to the top cover **13**. A simple cutting of the

lower ends of ties **14** will effect the removal of lower members **10** and **11** and tubes **12**. A single removable continuous sheet may be utilized instead of spaced strips **10** and **11**, differing from **5'** in FIGURE 3, in that the member **5'** provides a transverse sheet suitable for remaining in place and aiding in forming a finished ceiling.

A desirable feature in effecting utilization of the plurality of stiff tubular sections in making molds and forms such as hereinabove described, is that such materials are readily available in lightweight materials that can be easily cut in the field and fabricated into forms with a minimum of labor and expense. The lightweight feature also permits them to be shipped inexpensively if it is desired to effect the shop fabrication of the units and thus eliminate the work in the field. The lightweight inexpensive feature still further permits a floor construction which lets the form stay in place after the pouring of the concrete, without excessive loads left within the floor and at a cost which may be less than that which would result from the use of standard types of heavy weight forms which would require the expense of labor in removing them from the poured floor.

I claim as my invention:

1. A lightweight form for concrete floor and beam construction which comprises in combination, a plurality of open-ended separate tubular sections of substantially equal height positioned adjacent one another and forming a larger form base, a transverse ceiling forming member attached to and extending below the open-ended portions of said plurality of tubular sections of said form base, a non-rigid and pliable covering material substantially impervious to the passage of concrete extending over the top of said form base, and tie members extending vertically between said covering material and said transverse ceiling member, with such tie members having portions thereof extending above said covering material and adaptable for being embedded in a superimposed concrete floor.

2. A lightweight form for concrete floor and beam construction which comprises in combination, a plurality of open-ended separate tubular sections of substantially equal height positioned adjacent one another and forming a larger form base, a transverse metal lath sheet connecting to and extending below the open end portions of said plurality of tubular sections of said form base, a non-rigid and pliable covering material substantially impervious to the passage of concrete extending over the top of said form base, and tie members extending vertically between said covering material and said transverse metal lath sheet, with such tie members having portions thereof extending above said covering material and adaptable for being embedded in a superimposed concrete floor.

3. A floor construction comprising a plurality of spaced substantially rectangular shaped forms embedded in the underside of reinforced concrete extending over the tops of and between the plurality of spaced forms providing a slab and beams for said floor construction, each of said forms comprising a plurality of open-ended vertically positioned separate tubular sections positioned adjacent one another in a geometrical grouping and covered by a non-rigid and pliable covering material substantially impervious to the passage of an unhardened concrete mixture and each form further having a lower suspended non-rigid ceiling member detachably extending transversely along the underside thereof, with tie members extending between said upper covering material and said lower ceiling member, and such tie members having an upper portion thereof extending above said upper covering material to become embedded in said reinforced concrete over the top thereof, whereby to provide for the removal of said lower ceiling member and said plurality of tubular sections as well as the support of a finished ceiling under said resulting floor.

4. The floor construction of claim **3** further characterized in that said plurality of tubular sections in each form are of varying heights and are arranged in a manner having the longer ones in the center portion thereof, whereby each form is of a domed shape and the resulting floor slab section thereover is slightly arched on its underside.

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