June 19, 1956 E. KRIEG 2,750,647

HOLLOW CONCRETE CORE FORM

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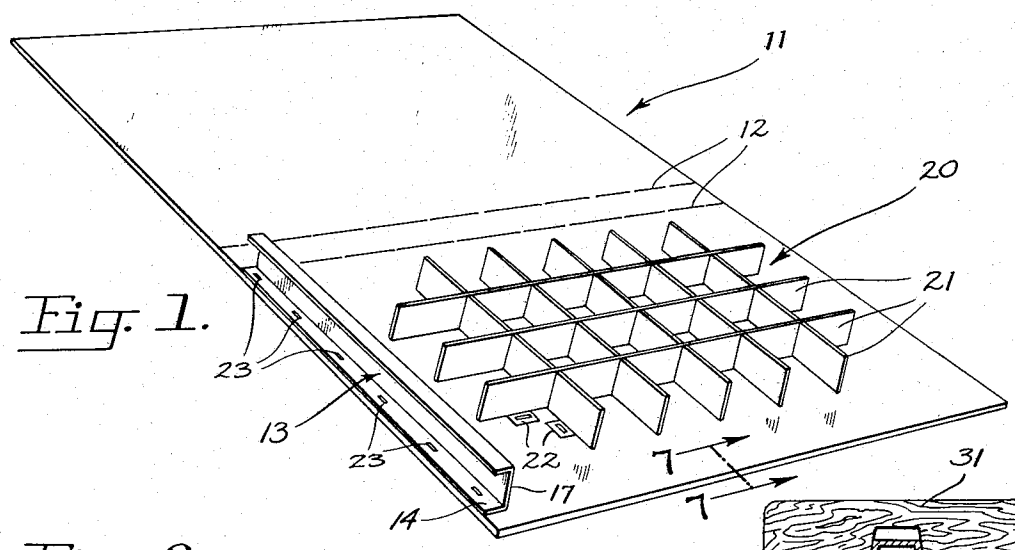


Fig. 1.

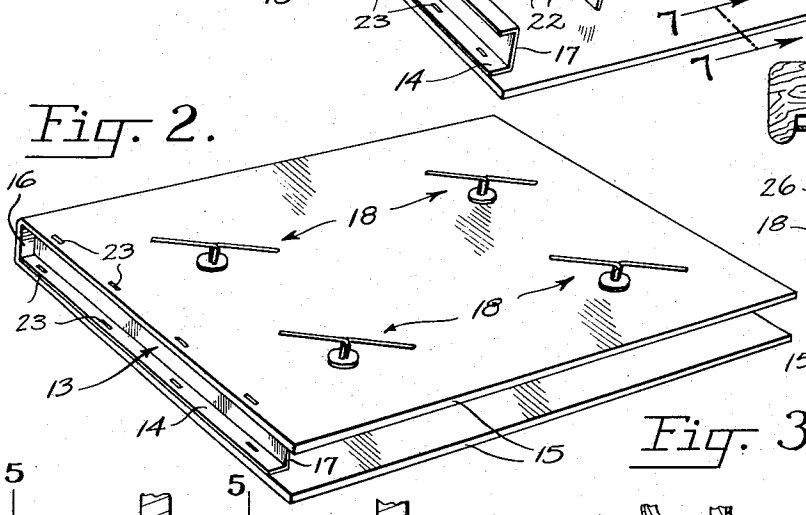


Fig. 2.

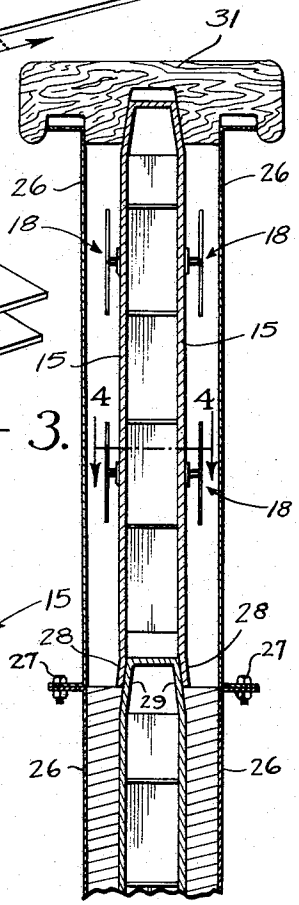


Fig. 3.

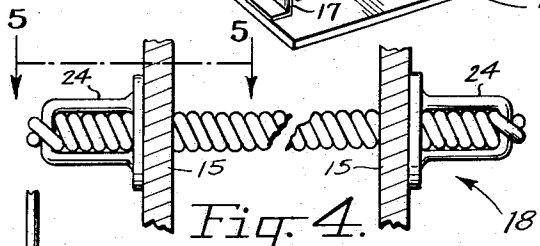


Fig. 4.

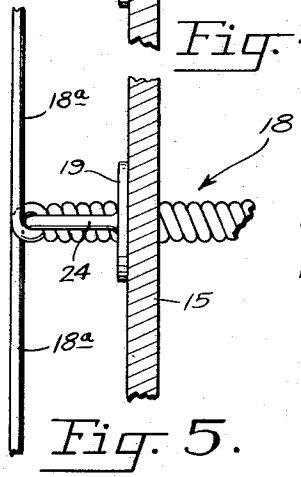


Fig. 5.

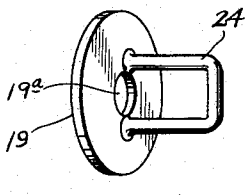


Fig. 6.

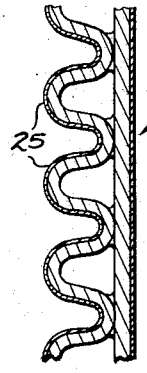


Fig. 7.

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Fig. 8.

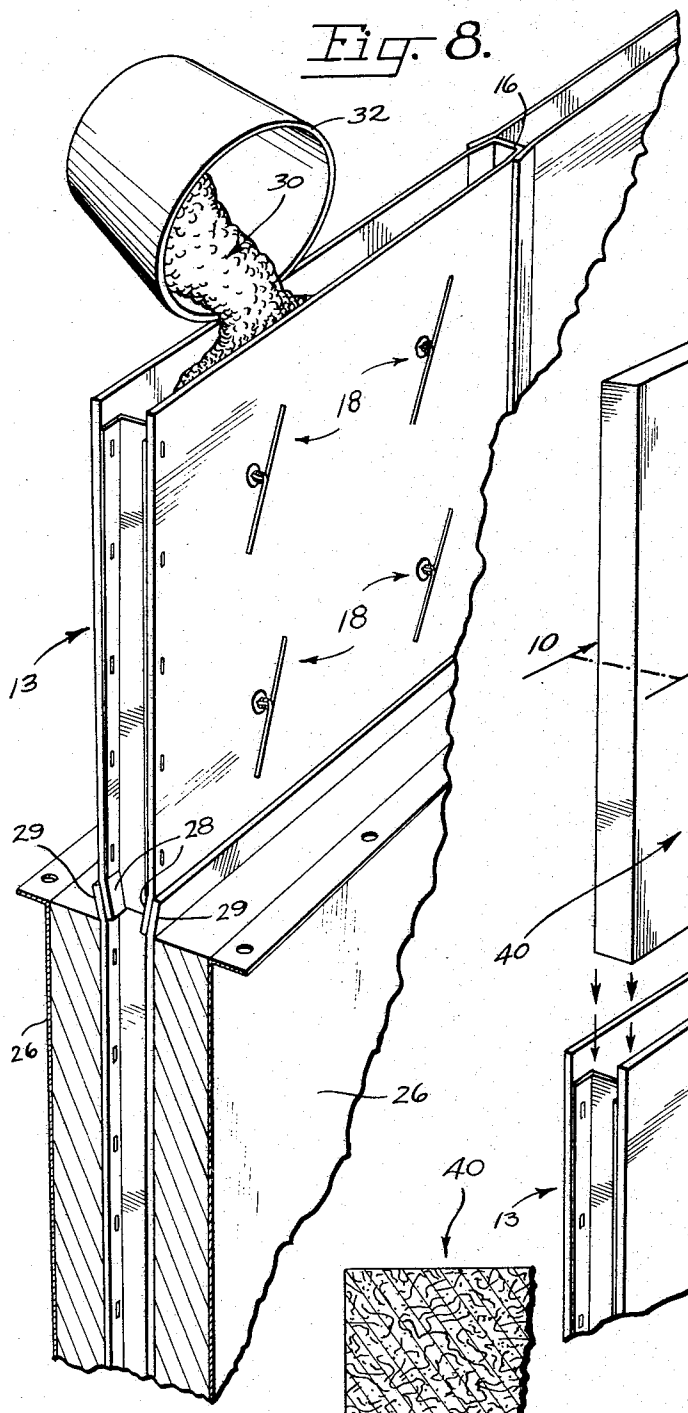


Fig. 9.

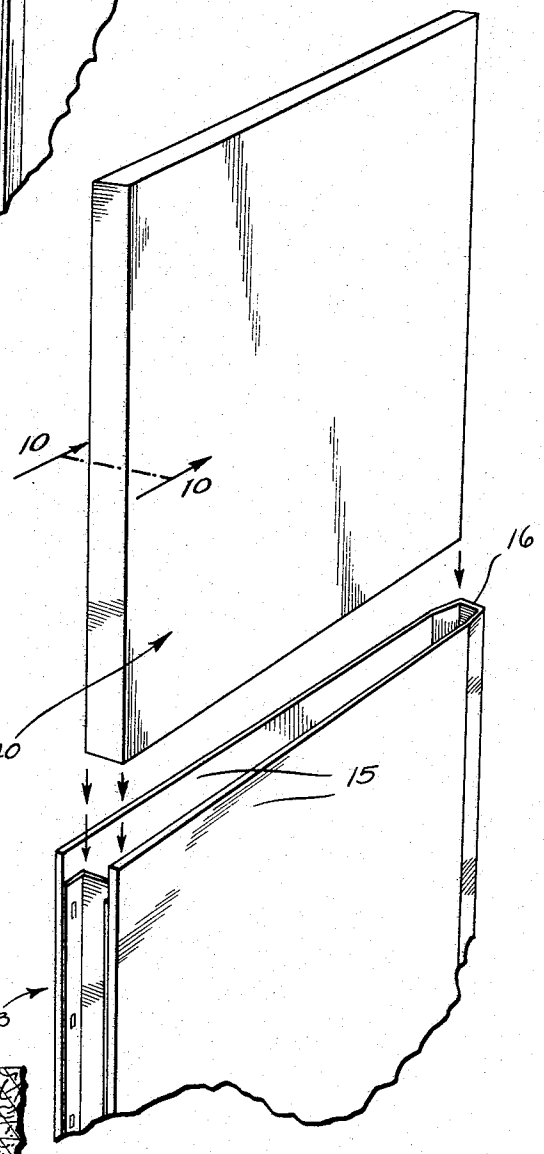


Fig. 10.

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United States Patent Office 2,750,647 Patented June 19, 1956

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HOLLOW CONCRETE CORE FORM

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Application March 3, 1952, Serial No. 274,543

4 Claims. (Cl. 25—131)

My invention relates to a form or mold used in the construction of a hollow concrete wall and, more particularly, to a center form which is inexpensive to a degree that disposition thereof after a single use is practical and, economically, is sound. By way of example, such a form may be made integral with and left embedded within the center of a finished concrete wall.

Increasing labor, lumber and steel costs today are turning the attention of many contractors toward the feasibility of constructing homes and small commercial buildings either (1) with concrete blocks or (2) on-the-job poured hollow concrete walls. Of these two constructions, precast concrete blocks heretofore have been more economical. This has caused many contractors to shy away from the poured hollow wall construction in spite of the fact that more strength can be gained by the latter. Further, block walls are easier to construct in that less skill is required and fewer man hours are consumed in comparison to a poured hollow wall of similar dimensions. This latter advantage is born of the fact that hollow wall construction heretofore has been practical only when rather expensive and complex molds or forms are employed to form the core of the hollow wall. Thus, the typical mold or center form for a hollow wall is made of metal, such as stainless steel, and is collapsible so the mold may be withdrawn after the concrete takes an initial set. Many patentees have turned their inventive efforts toward the improvement of these collapsible metal forms. In summary, however, I have found that all of these metal forms are expensive and are complex in use to a degree which renders their use impractical for any but the largest contractors or for use in any but large housing projects and buildings.

Accordingly, a primary object of my invention is to provide a novel and improved mold or center form for the construction of a hollow concrete wall, said center form to be inexpensive, practical, and easy to use and to be disposable in the sense that the wall can be poured about the form and the form then can be left in place permanently. Such a form, it will be evident, eliminates the need for manipulability in the parts thereof so that less skilled labor may be employed and the construction of structurally superior poured walls once more can compete with block walls.

In general, both a precast concrete block wall and a hollow poured concrete wall are designed to provide a central dead air space. Such a space serves to insulate against heat loss, to trap moisture, to deaden the transmission of sound, and to provide an inexpensive quick construction technique of universal appeal. At the same time, it is evident that both the block and the poured type of wall must possess sufficient structural strength to support the floor loads and/or lateral earth or wind pressures which will be imposed thereon. With a block wall, of course, lateral tie wires and vertical reinforcing rods are difficult to place and most walls constructed therefrom depend for their stability and strength upon the dead weight of the blocks. This dependence dictates the use

of a relatively large and expensive block in most home construction. Further, block wall construction per se is not moisture impervious since the wall is continuous laterally through the ends of the blocks and through the mortar joints. These all are deficiencies or disadvantages which it is an object of my invention to eliminate in the construction of a wall.

The poured hollow wall which heretofore has been in use also possesses certain inherent disadvantages. Thus, the complex and expensive collapsible metal forms or molds heretofore used make difficult the placing of reinforcing rods or tie wires since these elements must be retained yet the forms must be removed after the wall is poured. Similarly, it heretofore has been difficult to achieve a continuous hollow core in the wall since the wall is poured in vertically stacked horizontal courses and the mold or center form in each course must rest upon some support member provided either by the next lower course or by the outer forms. A continuous hollow core, on the other hand, is the most efficient type as concerns insulation, moisture trapping, and sound deadening.

Having in mind the above disadvantages of prior hollow wall construction techniques, it is one object of my invention to provide a novel center form which will define a continuous insulation core of uniform lateral width running centrally up through a hollow poured wall.

Another object of my invention is to provide, in that construction of a hollow concrete wall which proceeds in successive vertically stacked horizontal courses, a center form or mold which will carry, adjacent the top and bottom thereof, the respective mated halves of a two piece intermeshing grip means frictionally for interconnecting the center forms of adjoining horizontal courses. Thus, the wall may be poured in the conventional horizontal courses yet the insulation core will be continuous and of substantially uniform lateral width.

To define a poured hollow wall having the strength of a solid wall, it is a further object of my invention to pierce the novel center form with a plurality of elongated tie wires which project beyond the sides of the center form so the opposite ends of the wires will be buried in the opposite halves of the finished hollow wall to tie these halves together.

Yet another object of my invention is to provide a novel spacer means for use with the tie wires above explained, said spacer means serving to grip the ends of the laterally projecting tie wires in order to maintain the said lateral projection while the wall is poured. In this manner, a wall of uniform and unvaried strength, through course after course, can be constructed.

In conjunction with the center form or mold above defined, it is another object of my invention to provide three species of insulation means, any one of which will occupy a majority of the hollow interior of the form and will abut the sides of the form both to maintain the lateral spacing of the sides during construction and to enhance the insulation properties of the finished wall.

In service of the above inventive objects, the center form of the instant invention is positioned intermediate two spaced vertical outer forms which are adapted to be removed after the wall is finished. In contrast with these outer forms, the center form is constructed of paper board, cellulose fiber insulating board, or the like and is adapted to remain permanently embedded within the finished wall in definition of the core thereof. Thus, the center form per se defines a box-like structure having a hollow interior which is occupied by an insulation means in the form of any one of the three species above mentioned. Further, a plurality of elongated tie wires extend laterally through the center form and project beyond the sides thereof. These tie wires terminate short of the outer forms so the opposite ends thereof will be buried in the opposite halves

of the finished hollow wall to tie them together. Still further, the projecting ends of each tie wire are gripped by a spacer means which bears upon the outer face of the corresponding center form side wall to maintain the said lateral projection of the tie wire ends during pouring and curing. Thus, the entire center form assembly is inexpensive to fabricate and is simple to use. Additionally, the novel disposition of the tie wires and insulation means strengthens the form during construction of the wall and ties the two halves of the wall together so the strength thereof is equal to that of a solid wall, yet a continuous central insulation core is provided.

The above and other desirable objects, points of novelty, and advantages inherent in and encompassed by my invention will become apparent from the ensuing description, taken in conjunction with the accompanying drawings, wherein;

Fig. 1 is a perspective view of a first species of my invention showing the center form in process of assembly with the intersecting and interlocking partition strips thereof exposed to view;

Fig. 2 is another perspective view of the first species of my invention, this figure showing the center form completely assembled with the tie wires and spacer means projecting from the exposed face thereof;

Fig. 3 is a section view through a partially completed hollow concrete wall with one horizontal course already poured and with the center form of the first species in place just prior to the pouring of a second horizontal course;

Fig. 4 is a foreshortened detail view, taken substantially on the line 4—4 of Fig. 3, showing one of the twisted tie wires and the manner in which this wire extends laterally through the center form and projects beyond the sides thereof;

Fig. 5 is a further detail view, taken substantially on the line 5—5 of Fig. 4, more particularly indicating the manner in which the ends of the tie wires are bent to project substantially parallel to the sides of the center form more efficiently to tie the halves of the hollow concrete wall together;

Fig. 6 is a detail perspective of one of the spacer means through which the end of a tie wire is threaded and about which the end of the tie wire is bent in order that the lateral projection of the wire will be maintained during pouring;

Fig. 7 is a sectional detail view, taken substantially on the line 7—7 of Fig. 1, showing one preferred construction material for the center form, this material being a corrugated paper board having the outer face thereof coated with a water impervious substance such as asphalt;

Fig. 8 is a perspective view of a partially completed concrete wall in which the second species of my invention is disclosed, said second species having a mass of loose grains of granular insulating material confined within the hollow interior of the center form; and

Figs. 9 and 10 illustrate the third species of my invention, Fig. 9 showing a large rectangular block of fibrous insulating material or cellulose insulating board and Fig. 10, taken substantially on the line 10—10 of Fig. 9, showing the fibrous nature of this material in cross-sectional detail.

Each of the three species of my invention is designed for assembly on the job by a contractor. To this end a plurality of elongated rectangular sheets of non-metallic insulating material, such as that shown at **11**, are shipped in a package to the construction site. Each such sheet is provided with two score lines **12** for folding purposes. Additionally, under separate package, a plurality of smaller rectangular sheets having longitudinal score lines may be provided. At the building site, these latter sheets are folded to define a channel shape as shown at **13** in Figs. 1 and 2. This channel shape defines an end wall adapted to space the side walls which are formed from the larger sheet **11**. Thus, when assembled, the sheet **11** and the channel shape **13** will define a hollow rectangular box having an open or hollow interior as hereinafter will be described.

It is in conjunction with the hollow interior of each box that the three species of my invention are used. Thus, each of these species defines an insulation means which occupies a majority of the hollow interior and abuts the sides of the box to maintain the lateral spacing thereof during pouring and curing of the wall. In Figs. 1, 2 and 3, this insulation means takes the form of a plurality of intermeshed and interlocked strips **20** which bound and define a dead air space in the finished wall. In Fig. 8, on the other hand, the second species of the insulation means includes a mass of loose grains of granular insulating material **30** and, in Figs. 9 and 10, the insulation means is a rectangular block of fibrous insulating material **40** of the type which may be used in making the form per se. Thus, each of the center form species provides a hollow envelope or rectangular box in which an insulation means is retained. A typical, on-the-job assembly of one of these envelopes or boxes now will be described.

Referring to Figs. 1 and 2, the first species of the insulation means is formed from a plurality of elongated plane partition strips **21** which intercept and interlock substantially at right angles one to another. Thus, they define an open egg-crate appearance and are arranged to lie perpendicular to and substantially centrally of one-half of the sheet **11**. To fix the partitions in place, depending tabs **22** may be provided and staples **23** are driven therethrough. Thereafter, the channel shaped end piece **13** may be assembled with one of the flanges **14** thereof in contact with the sheet **11**. Similar staples **23** can be utilized to secure this flange to the sheet.

As a further step in the assembly of a center form, the sheet **11** is bent along the score lines **12** to assume the position shown in Fig. 2. In this position, the sheet defines two parallel rectangular side walls **15** and an integral connecting top wall **16**. Additionally, the other flange **14** of the channel shape **13** is stapled, as at **23**, to the abutting sidewall so as to define a connecting end wall spacer for the hollow box, the web **17** of the channel being arranged perpendicular to the two side walls.

As a final step in the assembly of each of the species, a plurality of elongated twisted tie wires **18** are provided. These tie wires are punched laterally through the hollow center form so as to pierce both the sidewalls thereof. Thereafter, each end of the wire is threaded through an aperture **19***a* (see Fig. 6) in a spacer means **19**. The spacer then is moved laterally against the outer face of the corresponding sidewall **15** and the ends of the wire are bent about the protruding U-shaped bar **24** to bind the spacer and wire into an integral piece, the terminal ends of each wire being arranged substantially parallel to the sidewalls **15** with an elongated straight portion **18***a*. In substance, the overall length of each spacer **19** and bar **24** is made equal to half the thickness of one side of the wall for a purpose hereinafter to be described.

Before describing a typical construction technique utilizing the hollow center form above described, reference should be had to Fig. 7. In this figure, an enlarged cross-sectional detail of one of the side walls **15** has been shown. Thus, I prefer to use one of two materials in forming the hollow box. Both of these materials are inexpensive and can be termed a non-metallic insulating material, the first being a fibrous cellulose insulating board such as shown at **40** in Figs. 9 and 10 and such as is sold under the trade names "Firtex" or "Cellotex." The second material is a corrugated paper board having one flat face and one corrugated face such as shown in Fig. 7. When wet, the insulating board is somewhat stronger than the paper board so the latter preferably is treated, as indicated at **25**, with a coat of water impervious material such as asphalt or a synthetic resin. Selecting asphalt as typical, the coating **25** is sprayed or wiped over the corrugations on that side of the paper board which the wet

concrete will contact. I have found that this disposition of the asphalt not only will make the paper board water impervious but will cause the asphalt to bond to the concrete after the wall is formed. Thus, should the paper board itself disintegrate or rot away after a number of years, the water impervious asphalt layer will be retained in intimate contact with the inner faces of the hollow concerete wall.

During construction of a hollow concrete wall in vertically stacked horizontal courses, two spaced vertical outer forms **26** (see Fig. 3) first are erected. If a previous lower horizontal course already has been poured, the upper outer forms may be secured to the companion lower forms with a nut and bolt assembly **27**. In any event, these outer forms are adapted to be removed after the wall is erected and the hollow center form of the instant invention is arranged intermediate the two outer forms. This arrangement makes evident another important feature of my invention. Thus, as shown in Figs. 1 and 2, the end channel shape **13** terminates short of the lower margin of the side walls **15**. Similarly, the partition strip **21** of the insulation means **20** also terminates short of the lower margin of the side walls. This leaves the lower margins free to flex and, in generic language, it defines a grip means. For example, referring to Fig. 3, the lower margins **28** are straddling and compressing the upper margins **29** of the next lower center form. This allows the upper center form to rest upon and to grip the lower form so that successive courses of the hollow box will be positioned correctly with respect to one another. I define these overlapping portions **28** and **29** as the respective mated halves of a two-piece intermeshing grip means frictionally for interconnecting the center forms of adjoining horizontal courses. Further, where desired, a wood spacer block **31** may be interposed between the vertical outer forms **26** to hold the top of the center form in place during the pouring operation. Thus, I need not tie the center form permanently to the outer forms **26** and am saving of metal and complex tying forms.

In Fig. 3, another important feature of my invention is illustrated. As therein indicated, the tie wires **18** project laterally out from the side walls **15** a distance which substantially is equal to half the thickness of one portion of the wall. That is to say, the tie wires **18** terminate short of the outer forms **26** so the opposite ends thereof will be buried in the opposite halves of the finished hollow wall to tie them together across the center form. This tie-in, of course, is intended to produce a hollow wall having superior structural strength, yet one which is possessed of a continuous insulation core running centrally up through the entire wall.

Once the various hollow center forms for a particular horizontal course are in place, the wall is poured to a one course height. This pouring, as is evident in Fig. 3, progresses to the top of the outer forms **26** but leaves a portion of each center form projecting thereabove. This projection is essential in order that the next higher center form frictionally may grip the projecting portions and thus be retained in proper position intermediate the outer forms.

After the wall has been poured, the outer forms **26** are stripped away but the center or inner forms are left in place permanently. This permanent embedding of the center forms in the finished wall is of little consequence cost-wise since the center forms preferably are formed of paper board or of an inexpensive cellulose fiber insulating board. In any event, the labor cost of erecting a hollow wall with my novel center form materially is reduced since the center forms do not have to be collapsed and stripped away. Still further, the overall strength of the finished wall materially is enhanced because the tie wires **18** extend completely through the center form and tie together the respective halves of the wall.

Turning now to the species of my invention which is shown in Fig. 8, the hollow center form has been turned on its side with the top wall **16** now resting adjacent the next center form rather than adjacent the center form in the higher or next lower horizontal course. At the same time, however, the lower margins **28** and the upper margins **29** of adjoining horizontal courses are intermeshed and interlocked as with the previous species to define the respective mated halves of the two piece grip means. In essence then, the hollow center form of this species is the same as the hollow center form of the previous species except that the partition strips **21** are left out and an open top is provided. As shown in Fig. 8, the open top of the form is essential since the insulation means which occupies the hollow interior of this species is defined by a mass of loose grains of granular insulating material **30**. This insulating material is poured into the hollow interior of the center form from a bucket or the like **32** after the center forms are assembled and in place. Thus, once again, the insulation value of the finished hollow wall materially is enhanced yet the cost of both the center form per se and the labor for assembling the wall materially are reduced.

Referring lastly to Figs. 9 and 10, a hollow center form such as that used with the previous species is illustrated. This form, however, does not have the tie wires **18** assembled therethrough prior to the time the insulation means **40** is inserted in the hollow interior. Thus, the insulation means **40** of this species consists of a large rectangular block of fibrous insulating material or insulating board. Fig. 10 illustrates the fibrous nature of this material and, as is known in the art, such a material is expensive yet is possessed of superior insulation qualities. In asembling the form of this third species, the block of insulating material **40** first is positioned within the hollow interior of the form and, thereafter, the tie wires **18** are assembled through the form. As is evident, the tie wires then will pierce both the block of insulating material and the walls of the form to tie the entire mass together in an integral unit. A plurality of these third species forms then may be assembled in horizontal courses with the tie wires in place.

In summation, I have provided a novel center form for use during construction of a hollow concrete wall in vertically stacked horizontal courses. This center form allows the definition of a continuous insulation core which runs centrally up through the wall and the form itself may employ any one of three species of insulation means. With each species, the form is inexpensive to the end that it may be left in place permanently embedded within the finished wall. Further, in combination with the insulation means, I have provided a plurality of elongated tie wires which extend laterally through the center form and insulation means and which protrude laterally beyond the side walls of the form. This protrusion terminates short of the outer forms in which the wall is poured so the opposite ends of the wires will be buried in the opposite halves of the finished hollow wall to tie them together. Thus, a hollow concrete wall of superior structural strength and of superior insulation qualities is provided at a minimal cost and with as little complexity of construction technique as is practical.

I claim:

1. In the construction of a hollow concrete wall, the combination of two spaced vertical outer forms adapted to be removed after the wall is erected and a hollow center form adapted to be made integral with and to be embedded within the center of the finished wall, said center form being arranged intermediate the two outer forms and comprising; two laterally spaced side sheets formed of non-metallic insulating material and an end spacer means interconnecting said side sheets to define a box-like structure having a hollow interior, insulation means carried within said hollow interior and abutting said side sheets to maintain the lateral spacing thereof, and a plurality of elongated tie wires extending laterally through said

center form, the ends of said tie wires projecting beyond said side sheets but terminating short of the outer forms to tie the wall together across the center form, at least a portion of said center form being deformable and protruding above said outer forms to receive a removable spacer for inter connecting said outer and center forms during construction of said wall.

2. The combination of claim 1 wherein said insulation means includes a plurality of elongated interlocking partition strips which intersect substantially at right angles and are arranged to lie perpendicular to the plane of each side sheet.

3. The combination of claim 1 wherein said insulation means includes a mass of loose grains of granular insulating material confined within the hollow interior of the center form.

4. The combination of claim 1 wherein said insulation means includes a rectangular block of fibrous insulating material having the same general size and configuration as the hollow interior of the center form.

References Cited in the file of this patent

UNITED STATES PATENTS

1,193,542	Gregory	Aug. 8, 1916
1,984,007	Babbitt	Dec. 11, 1934
2,192,183	Deutsch	Mar. 5, 1940
2,344,749	Stevens	Mar. 21, 1944
2,442,962	Rumble	June 8, 1948
2,460,848	Rover	Feb. 8, 1949
2,645,929	Jones	July 21, 1953