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Stegmeier

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[54] **FORM STRUCTURE**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 154,290, June 18, 1971.

[52] **U.S. Cl.** **249/189,** 249/2, 249/192, 249/DIG. 3

[51] **Int. Cl.** **B28b 7/06,** E04g 17/02

[58] **Field of Search** 249/2, 3, 6, 9, 188, 249/192, 194, 134, 189; 161/68, 69, 122; 156/244

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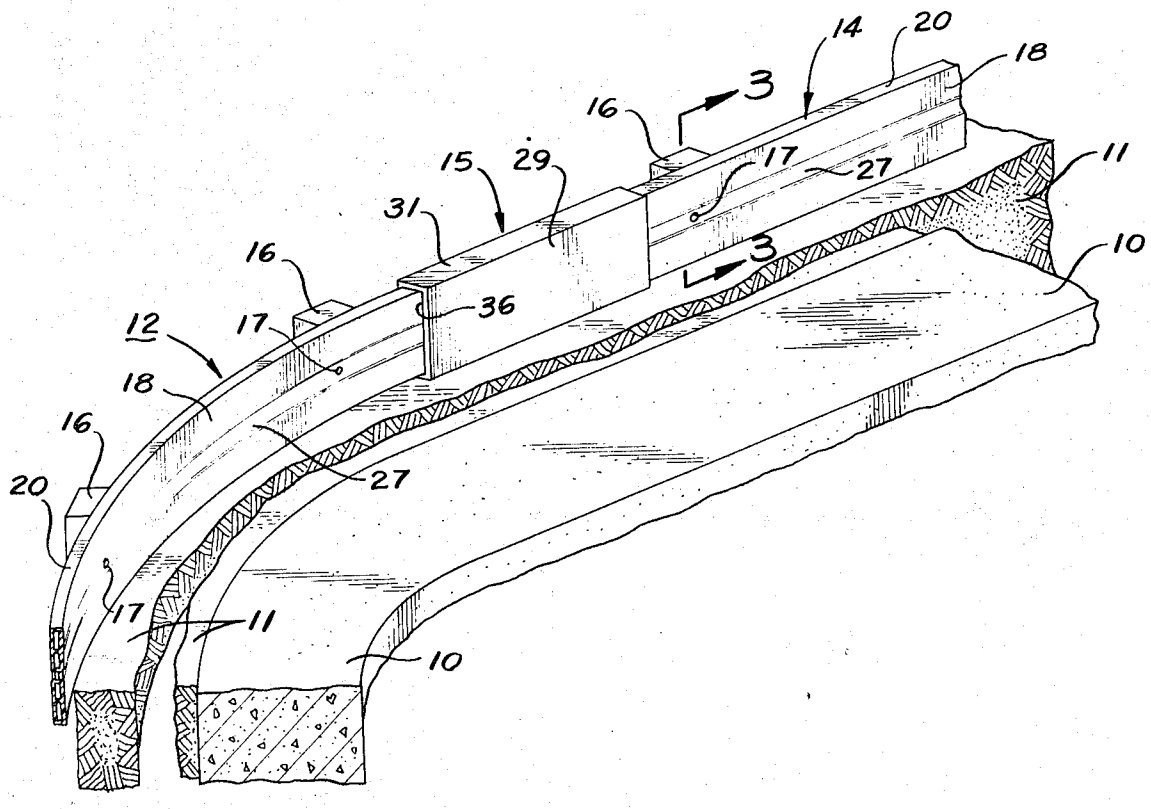
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Assistant Examiner—B. D. Tobor
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[57] **ABSTRACT**

Form structure for use in pouring the concrete deck for a swimming pool. The form structure includes a plurality of elongated board structures and one or more generally tubular connector structures each of which is hollow from end-to-end thereof and dimensioned to removably receive the end portions of two successive board structures inserted thereinto from opposite directions. The extent to which such board structures are insertable into the connector is defined by stop means projecting into the interior of the connector, and the boards are tightly held by frictional gripping means able to accommodate boards of various thickness while preventing sagging thereof. The board structures have sufficient flexibility in the longitudinal direction to permit mold forms comprising the same to be curved to accurate contours required by any particular installation. The board structures are also essentially hollow but are provided with transversely oriented webs certain of which define nailing spaces therebetween that permit the boards to be removably nailed to stakes or other support members provided for this purpose.

2 Claims, 5 Drawing Figures



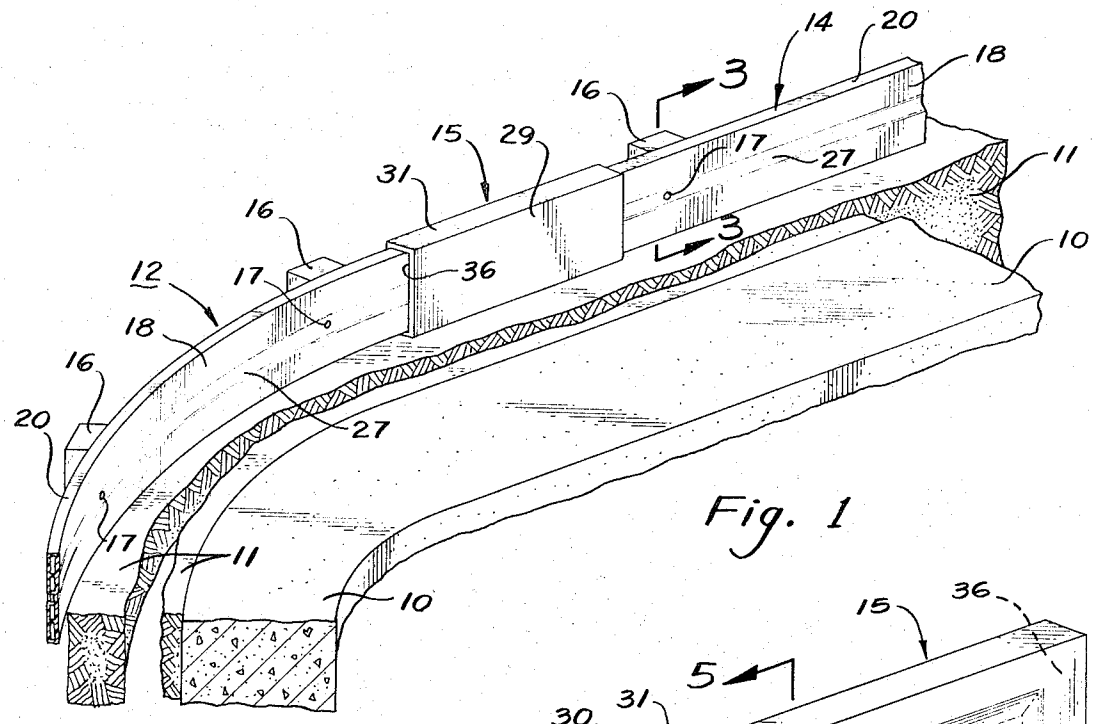


Fig. 1

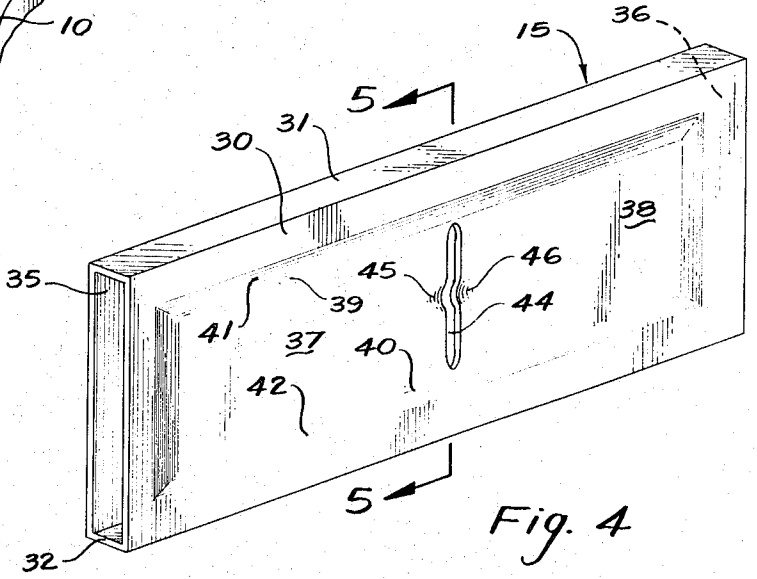


Fig. 4

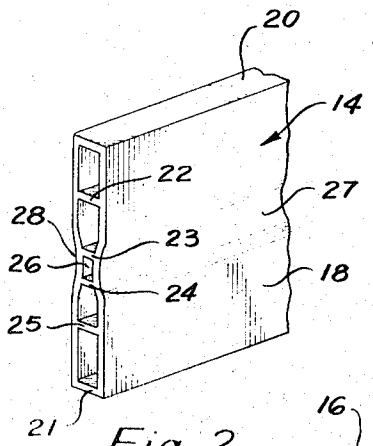


Fig. 2

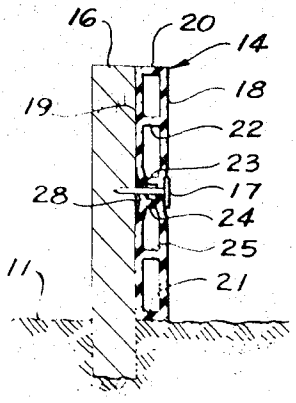


Fig. 3

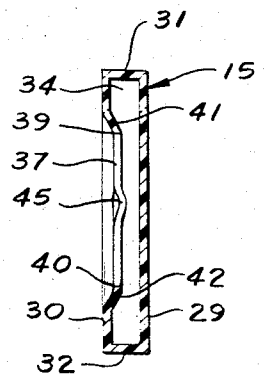


Fig. 5

FORM STRUCTURE

RELATED APPLICATION

This application is a continuation-in-part of my copending patent application Ser. No. 154,290, filed June 18, 1971.

This invention relates to form structure for poured concrete masses and the like and, more particularly, to board and connector structures cooperative with each other so that a plurality of board structures can be releasably interconnected in end-to-end succession by the connector structures to provide a shaping barrier against which a moldable mass of concrete can be poured.

The cost of materials used in building concrete mold forms makes it economically advantageous, if not mandatory in many instances, to reuse such materials wherever possible. With this end in view, it is necessary to minimize damage to mold forms in disassembling the same after each use thereof by exercising considerable care in their disassembly within the limitations, however, imposed by any increase in the labor cost required by careful removal and disassembly relative to the savings realized from subsequent reuse. The problem of disassembly is very often aggravated where wooden forms are employed because of the frangibility of thin wood components used for this purpose and the nonhomogeneity thereof, the latter of which causes areas of weakness to appear therealong at which breakage may occur during disassembly and, in many cases, even during assembly of the forms. As a specific example of a typifying environment in which form structures are advantageously reused, the construction of outdoor swimming pools may be considered.

In such construction of pools, it is common to provide a concrete deck of considerable width along the upper edge or bond beam of the swimming pool wall to define a walkway, drainage surface, and often a splash guard overhanging the upper edge of the pool to minimize upward and outward water splashing. These decks are constructed of poured concreted which is confined while it cures between inner and outer mold forms respectively located along the inner edge of the pool and at a spaced distance outwardly therefrom to define the remote extremity of the deck. The outer mold form, in the past, has generally been provided by interconnecting a plurality of relatively thin, bendable wooden boards (generally referred to as "bender boards") one to another by nailing or otherwise securing the ends thereof to short connector boards (often referred to as "scab pieces") provided for this purpose.

Although this system has been used heretofore in the construction of almost every outdoor swimming pool, it has a number of disadvantages which include the expenditure of a considerable amount of time in assembling successive bender boards to the connector boards therefor by means of clinching nails; the requirement that the mold form be constructed of relatively long runs or lengths which are then placed in position and require the services of several workman to lift and support the runs during such positioning thereof; the loss of time and cost of labor required to remove the forms and separate the successive bender boards from the connectors or scab pieces; the considerable loss of lumber occasioned by the breakage generally associated with an attempt to loosen the boards from the connector pieces and from the stakes or other supports used

to secure the forms in the positions required therefor; and the limitations imposed by the nonhomogeneity of natural wood products used for the bender boards, the variations in durability and bendability from one variety of wood product to another (redwood bender boards generally being most desirable but being available for use only in the State of California and adjacent regions), and the flaws that appear especially when a natural wood product is bent to a sharp radius.

In view of the foregoing, a general object of the present invention is to provide an improved form structure adapted for use with poured concrete and the like; and to provide an improved board structure and connector structure cooperative therewith for releasably interconnecting board structures in end-to-end succession.

Further objects, among others, of the present invention are in the provision of an improved board structure for use as a component in a form for poured concrete and the like that is characterized by its durability and susceptibility to repetitive reuse; that is lightweight and economical both initially and as a result of its reusability; that is relatively stiff in both transverse and vertical directions but is relatively flexible along its length so that it can be bent into the curvatures ordinarily encountered in construction of swimming pools and the like; that can be nailed to support stakes therefor and is equipped with locator means to facilitate positioning of nails and the like used to removably secure the same to stakes; that enables nails to pierce the same cleanly without tearing or breaking the board and provides a firm structural abutment for the heads of nails; that is removably interconnectable with an improved connector structure requiring no nails or other fasteners to effect a firm or solid interconnection between the board and connector structures; which interconnection between board and connector structures is accomplished by simple insertion of the end portions of the boards into the connector, and separation is accomplished by withdrawal of the board structures from the connector; in which the connector structure is able to accommodate automatically the varying thicknesses of board structures both in different installations and concurrently from end-to-end thereof; and in which the connector structure is also mechanically simple, relatively inexpensive, has a substantial life expectancy, can be reused substantially indefinitely, and requires substantially no skill in order to be used successively with the board structures.

Additional objects and advantages of the invention, especially as concerns particular features and characteristics thereof, will become apparent as the specification continues.

An embodiment of the invention is illustrated in the accompanying drawing, in which:

FIG. 1 is a broken perspective view illustrating the invention in association with the upper edge portion or bond beam of a swimming pool;

FIG. 2 is an enlarged broken perspective view of a bender board embodying the invention;

FIG. 3 is an enlarged broken vertical sectional view taken along the line 3—3 of FIG. 1;

FIG. 4 is an enlarged perspective view of a connector embodying the present invention; and

FIG. 5 is a transverse sectional view taken along the line 5—5 of FIG. 4.

Structure embodying the present invention is illustrated in use in FIG. 1 which shows the upper edge por-

tion 10, usually referred to as a bond beam, of a conventional swimming pool. In this latter respect, the swimming pool and bond beam 10 thereof may be entirely conventional and constructed by any usual technique, a gunite process for example. The bond beam is ordinarily of greater transverse width than the pool wall projecting downwardly therefrom, and in the usual instance it is bordered by an earthen back fill 11 over which a deck (not shown) is formed. Accordingly, the width of the earthen area 11 will depend upon the width of the deck to be formed thereover, usually of poured concrete. As a typifying example, the deck may vary in width from 5 feet to 15 feet in an ordinary residential pool.

In order to accommodate a poured concrete deck, forms must be provided for purposes of confining the concrete mass within the intended boundries therefor until the mass has hardened sufficiently to be self-sustaining. The mold form shown in FIG. 1 is designated in its entirety with the numeral 12, and it defines the outer boundary for the deck to be formed thereagainst. Assuming the case in which the entire deck is of poured concrete and is also a cantilever deck, an inner mold form is also required to establish the deck boundry adjacent the inner wall surface of the pool bowl, and since such inner form constitutes no part of the present invention it is not shown. However, should details concerning the same be desired, reference may be made to my issued Pat. No. 3,605,357 which illustrates such a form.

The mold form 12 includes a plurality of board structures 14 interconnected or coupled one to another in end-to-end succession by one or more connector structures 15. The form 12 is secured and constrained in the position intended therefor by a plurality of stakes 16 that may be driven into the earthen area 11 and to which the board structures 14 are attached by fasteners 17. In the usual case, the stakes 16 are ordinary wooden stakes and the fasteners 17 are nails driven through the board structure and into the associated stake, as shown in FIG. 3.

Each board structure 14 is an elongated, longitudinally extending component and is long relative to the transverse width and height thereof. It is also relatively flexible along its length to enable the same to describe curvatures that may be encountered in ordinary use thereof, such as the bend or arcuate section of the bond beam 10 shown in FIG. 1. Referring in particular to FIGS. 2 and 3, it will be observed that the board structure 14 includes a pair of longitudinally extending and transversely spaced sidewalls 18 and 19. At least one of the sidewalls is generally flat or planar since concrete is to be poured thereagainst (i.e., the sidewall 18 in the configuration illustrated in FIG. 1) and in the particular form of the invention being considered, the board structure is essentially symmetrical about both center planes therethrough so that the sidewalls 18 and 19 are essentially identical. The sidewalls are also seen to be generally parallel from end-to-end thereof.

Each board structure 14 further includes a pair of longitudinally extending and vertically spaced edge walls 20 and 21 that are also generally parallel from end-to-end thereof and are relatively flat or planar in the form shown. The sidewalls 18,19 and edge walls 20,21 are integrally connected and define a generally hollow interior for the board structure 14 that extends substantially from end-to-end thereof. Such hollow interior, however, is subdivided into a plurality of longitudinally extending compartments by web means located within the hollow interior and which, in the embodiment of the invention illustrated, comprises a plurality of transversely disposed, vertically spaced webs 22 through 25, there being four such webs as is best seen in FIGS. 2 and 3.

The webs 22 through 25 are substantially parallel and generally parallel the edge walls 20 and 21. The webs are also secured to at least one of the sidewalls of the associated board structure 14, and in the embodiment being considered they are secured to each of the sidewalls. More particularly, each of the webs is formed integrally with the sidewalls 18 and 19 to which they are respectively secured.

The webs 22 and 23 are disposed along one side of a transverse center plane through the form structure 14, and the webs 24 and 25 lie along the opposite side of such center plane. The centermost webs 23 and 24 are disposed in relatively close proximity and define therebetween a nailing spaced 26 of predetermined location extending longitudinally along the board structure essentially from end-to-end thereof. Disposed along the nailing space 26 are locator means 27 and 28 respectively associated with the sidewalls 18 and 19 and constituting depressions or recesses which, in the structure shown, constitute longitudinally extending channels or grooves running generally from end-to-end of the board structure. The particular locator means used in the board structure 14 may be enhanced by visual indicia disposed therealong which may take the form of coloring or other surfacing embellishments imprinted or otherwise disposed along the wall surfaces.

The web means comprising the elements 22 through 25 serve to stiffen the board structure 14 so as to prevent collapse or buckling thereof as it is bent to describe curves or radii, as previously noted. In this same general reference, the web means sufficiently stiffens the board structure 14 so as to prevent collapse thereof upon insertion of its end portion into a connector structure 15. The central webs 23 and 24 and close proximity thereof cooperate with the nail-type fasteners 17 in that they sufficiently strengthen and reinforce the board structure thereat such that the nails tend simply to pierce the sidewalls 18 and 19 with substantially no tearing or other breakage thereof which contributes significantly to the long life of the board structure and repetitive use thereof. Moreover, the webs 23 and 24 cooperate with the heads of the nails 17 to define strong, firm material against which the nail heads press to bring the board structure into proper positional abutment with the stakes 16.

The connector structure 15 is also a somewhat elongated longitudinally extending component in the form of a hollow tubular sleeve that is generally rectangular in cross section, as shown in FIG. 5. Accordingly, the sleeve has transversely spaced front and rear sidewalls 29 and 30, and vertically spaced top and bottom or edge walls 31 and 32. The sidewalls 29 and 30 are generally parallel, for the most part, and the top and bottom walls 31 and 32 are similarly substantially parallel. In the form shown, all of the walls 29 through 32 are integrally connected and they define a substantially hollow interior 34 extending from one end to the other of the connector structure.

Adjacent each of its ends, the sleeve-like connector structure 15 is provided with sockets generally denoted

with the numerals 35 and 36 respectively adapted to receive the end portions of the mold boards or board structures 14 therein, as shown in FIG. 1. As will be more evident hereinafter, the connector structure 15 is able to accommodate board structures that may differ in thickness even though the thicknesses of any two board structures coupled by a common connector structure 15 may vary significantly.

In this respect, the connector structure 15 also comprises gripper means operative adjacent each end portion thereof to releasably grip board structures 14 inserted into the sockets 35 and 36. The particular gripper means provided in the structure being considered constitutes inwardly displaced sections 37 and 38 formed along the rear wall 30 of the connector. The inwardly deformed gripper sections 37 and 38 are actually continuous and are defined by longitudinally extending, vertically spaced lines 39 and 40 formed by the mergence of the generally flat gripper sections 37 and 38 with the inclined areas or bands 41 and 42 of the rear wall 30. The inwardly displaced gripper sections 37 and 38 are space slightly from the ends of the connector structure so that the end portions thereof remain relatively wide to provide mouths facilitating insertion of the board structure 14 thereinto. It will be appreciated that the gripper sections 37 and 38 define with the front wall 29 of the connector structure a space somewhat narrower than the thinnest board structure 14 expected to be used with the connector structure so that such board structure inserted into the sockets 35 and 36 will be frictionally gripped by such sections 37 and 38 in combination with the front wall 29 and inner surface thereof.

Although the gripper sections 37 and 38 are essentially continuous, they are actually separated along the rear wall 30 at the center thereof by a vertically disposed slot 44 extending substantially between the lines of mergence 39 and 40. Disposed along the slot 44 on each side thereof are inwardly extending projections 45 and 46 defining stop means at about the center of the connector structure. The stop means functions to limit the extent to which any board structure 14 can be inserted into the connector structure 15, thereby obviating the possibility of one board structure being inserted into the connector to such an extent that the other board structure would be inadequately gripped thereby. In the particular connector structure 15 being considered, a specific example of which will be described hereinafter, the stop components 45 and 46 may be provided by depressing the relatively flat gripper sections 37 and 38 inwardly at the center thereof so as to form a somewhat cone-shaped depression. The slot 44 is then cut through such depression leaving the projections 45 and 46.

The connector structure 15 is a firm, relatively rigid member yet is also relatively flexible in the sense that the gripper sections 37 and 38 are displaceable outwardly to the extent necessary to accommodate the varying thicknesses of different board structures 14 inserted thereinto and to accommodate any necessary but usually minor curvilinear deformation from end-to-end to enable a succession of board structures and connector structures disposed therealong to be curved to the arcuate contour of any usual configuration for a concrete mass to be molded thereagainst. Also, the connector structure 15 must tightly grip and hold such board structures so as to prevent sagging thereof because such boards are used to grade the concrete molded thereagainst.

It will be apparent that if a board structure 14 is displaced from left to right into the connector structure 15 through the socket 35 (as viewed in FIG. 4), such board may engage the smoothly curved surface of the projection 45 to displace the same and associated portion of the gripper section 37 bordering the slot 44 outwardly but such board will abut the sharp edge defined by the projection 46, thereby limiting the extent to which the board is insertable into the connector. The same condition pertains respecting a board inserted into the socket 36 since, in the absence of any board within a socket 35 in abutment with the stop 46, such board will abut the sharp edge of the projection 45 after passing the projection 46.

In use of the form structure 12, a plurality of board structures 14 are connected in end-to-end succession by connector structures 15 respectively disposed therebetween and upon insertion of the end portions of the board structures into the connector sockets 35 and 36, as previously explained. The board structures 14 are then secured in position by fastening the same to structure provided for this purpose as, for example, by fastening the boards 14 to the stakes 16 with nails 17. The form structure 12 may be assembled completely before being placed in position, but ordinarily it is more convenient to assemble board structures 14 with others via connector structures 15 along the surface of the earthen back fill 11. The board structures 14 can be cut to any appropriate lengths on the job by means of conventional hand saws or other cutting mechanisms. Accordingly, it may be most convenient for a workman installing the form structures 12 to position the connector structures 15 along straight sections of the form structure rather than along arcuate segments thereof, thereby enabling the more flexible board structures 14 to be used for curvatures.

After the form structure 12 has been properly installed, concrete may be poured thereagainst and the upper edges 20 of the board structures 14 and 31 of the connector structures 15 used as guides for finishing the surface of the concrete mass prior to curing thereof. After the concrete mass has cured sufficiently to at least be self-sustaining, the form structure 12 is removed, the stakes 16 are separated from the board structures 14 and discarded, or saved for reuse depending upon the extent to which they are damaged, the fasteners 17 are removed, and the board structures are separated from the connectors 15. Both the board and connector structures 14 and 15 are saved for subsequent reuse, and by exercising reasonable care so that the board and connector structures are not damaged they can be reused almost indefinitely. In this latter respect, it is by no means necessary that the same apertures formed by any nails 17 be reused, because any such apertures are relatively small in area and do not permit significant, if any, quantities of concrete to pass therethrough when open and exposed to concrete masses poured thereagainst.

The sidewalls 18 and 19 are substantially identical for any board structure 14, as are the edge walls 20 and 21 thereof, thereby enabling the boards to be reversible with either sidewall serving effectively as the face against which a concrete mass is poured. The connector structures 15 are not similarly reversible, but the front wall 29 thereof is substantially smooth and rela-

tively thin so that substantially no appreciable indentition or irregularities in the molded concrete results from the presence of the connector structure. Similarly, very little deviation results along the upper surface of the form structure **12** at the juncture of the board structures **14** with the connectors **15** so that it is practicably possible to use the top edge **31** of each connector structure along with the upper edges of the board structures **12** for grading purposes, as previously explained. Also, the amount of the inward displacement of the depressions **27** and **28** is very limited so that they afford very little deviation in the edge contour of the concrete mass molded against the board structures.

As a specific example, the board and connector structures **15** may be formed of various resilient material having the requisite characteristics, such as a synthetic plastic material (namely, polyvinyl chloride), which is not adversely affected by ultraviolet light and ozone each of which is present in outdoor environments to which the connector structure is usually subjected. The structures **14** and **15** may be any suitable color, white being advantageous in that it reflects sunlight and thereby minimizes heat accumulation. In a specific instance of the board structure **14,** it may have an outside vertical dimension of approximately 3⅝ inches, an outside thickness or transverse dimension of about 7/16th of an inch, and any convenient length such as 8 to 16 feet. The wall thickness of such board structure may be about 1/16th of an inch, and the center-to-center spacing between the wall and web members **20,22** and **21,25** may be about ⅞ of an inch in each case. The center-to-center spacing of the web elements **22,23** and **24,25** is about 27/32nds of an inch in each case, and the center-to-center spacing of the webs **23** and **24** may be about ⅛ of an inch. Accordingly, the height or vertical dimension of the nailing space **26** is about 1/16th of an inch — it being understood that the aforementioned wall thickness of about 1/16th of an inch being also applicable to the thickness of each of the webs **22** through **25.** The depth of the recesses **27** and **28** is slightly less than 1/16th of an inch although the overall vertical width thereof slopes gently inwardly toward such depth throughout an overall distance approximating ¾ of an inch. The board structures **14** may be extruded plastic components, and the recesses **27** and **28** may be provided by means of shrinkage effected by the placement of the webs **23** and **24** and the resultant concentration of material at such location, or they may be enforced upon the sidewalls **18** and **19** as an integral part of the extrusion process.

As a specific instance of the connector structure **15,** it may have a wall thickness of about 3/32nds of an inch, an outside height or vertical dimension approximating 4 inches, an outside transverse width at the mouths thereof approximating ⅝ of an inch, and an overall length of the order of 9 inches. The inside dimension or spacing between the inner surfaces of the front wall **29** and gripper sections **37,38** may be about ¼ of an inch so as to readily accommodate variations in the thicknesses of board structures **14** from about ¼ to ½ inch.

As previously indicated, the board structures **14** provide many of the desirable attributes of bender boards provided by thin, rough cut redwood lumber in that they are quite flexible while being sufficiently strong to serve adequately as a mold form. They are much superior to the natural wood product, however, because they can be used repetitively (of the order of 100 times is not uncommon) whereas the natural lumber product has a very limited life expectancy often being discarded after a single use. Further, the board structures **14** are homogeneous components and may therefore be relied upon to exhibit consistant mechanical properties whereas the natural wood product is not homogeneous in this sense. As a result, the structures exhibit uniform bendability and are readily bent to a two foot radius whereas the natural wood product will not bend with uniform consistency to such radius.

While in the foregoing specification an embodiment of the invention has been set forth in considerable detail for purposes of making a complete disclosure thereof, it will be apparent to those skilled in the art that numerous changes may be made in such details without departing from the spirit and principles of the invention.

What is claimed is:

1. Flexible board structure for use as a component in a form for poured concrete and the like, comprising: a pair of longitudinally extending and transversely spaced sidewalls disposed in parallel relation; a pair of longitudinally extending vertically spaced edge walls disposed in parallel relation and integrally connected with said sidewalls and defining therewith a generally hollow interior extending substantially from end-to-end thereof; a plurality of transversely disposed longitudinally extending webs vertically spaced and each integrally connected with said sidewalls, said webs including a pair thereof disposed in relatively close proximity to define therebetween a nailing space of predetermined location extending longitudinally along said board structure from end-to-end thereof; and locator means disposed along each of said sidewalls in general alignment with said nailing space to facilitate identification and location thereof and including a depression in the associated sidewall; said board structure being symmetrical both about generally vertical and generally transverse center planes therethrough to enable the same to be inverted top-to-bottom and reversed end-to-end, and also being long relative to the transverse width and height thereof and flexible along its length to enable the same to describe curvatures that may be encountered in ordinary use thereof.

2. The structure of claim **1** and further comprising connector structure for releasably interconnecting successive board structures in end-to-end relation; said connector structure comprising an elongated unitary tubular sleeve member substantially hollow from end-to-end thereof and having adjacent each end portion a socket adapted to receive therein an end portion of an aforesaid board structure; gripper means operative adjacent each end portion of said sleeve to releasably grip an end portion of such board structure when located within the associated socket; and stop means projecting into said sleeve intermediate said sockets for engagement with the ends of board structures inserted thereinto to limit the extent to which any board structure can be inserted; said sockets being substantially closed components into which end portions of board structures are slidably insertable; said connector structure being generally rectangular in cross section and having front and rear walls and top and bottom walls, said rear wall having inwardly displaced sections spaced from the ends thereof and substantially paralleling said front

wall to engage such inserted board over a large area and define the aforesaid gripper means, the releasable grip provided thereby being a frictional engagement with an end portion of a board structure along each sidewall thereof and enforced thereon by said inwardly displaced sections of said rear wall; the end portions of said connector structure being relatively large to define mouths facilitating insertion of an end portion of such board structure thereinto.

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