April 22, 1958 V. F. LAWSON 2,831,232

TONGUE-AND-GROOVE CONCRETE PLANK MOLDING APPARATUS

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Fig. 3.

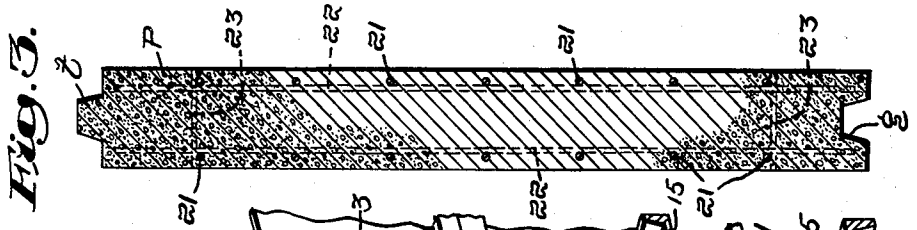
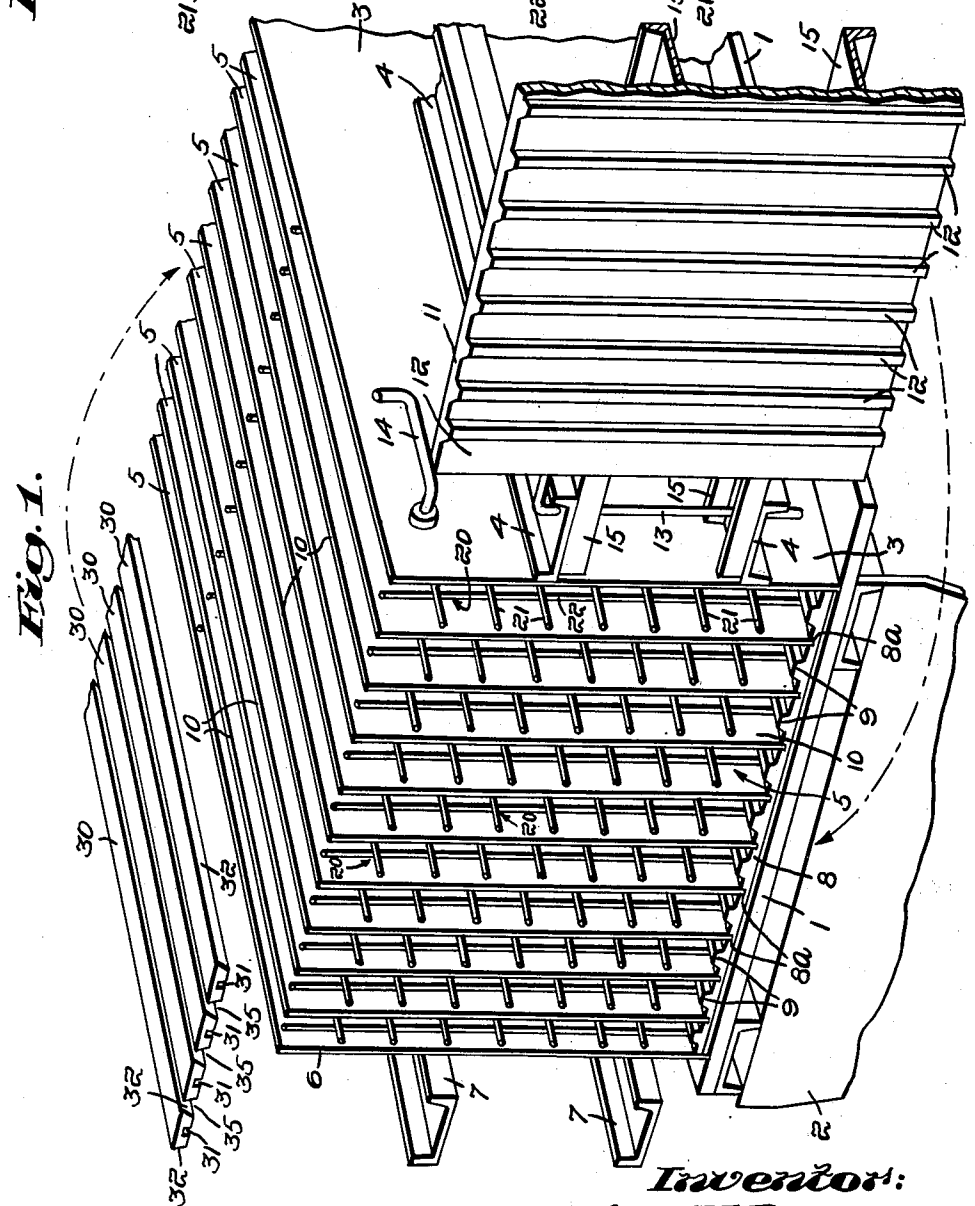


Fig. 1.



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Fig. 2.

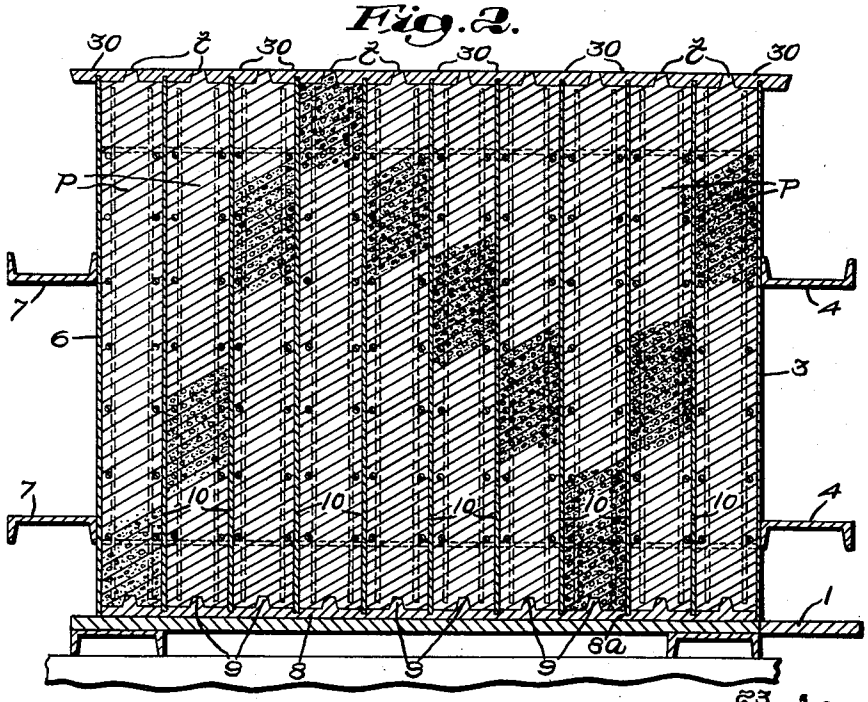


Fig. 4.

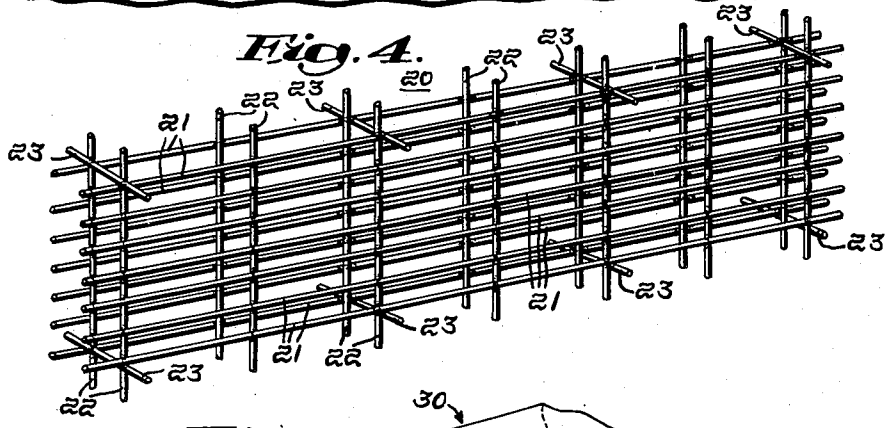
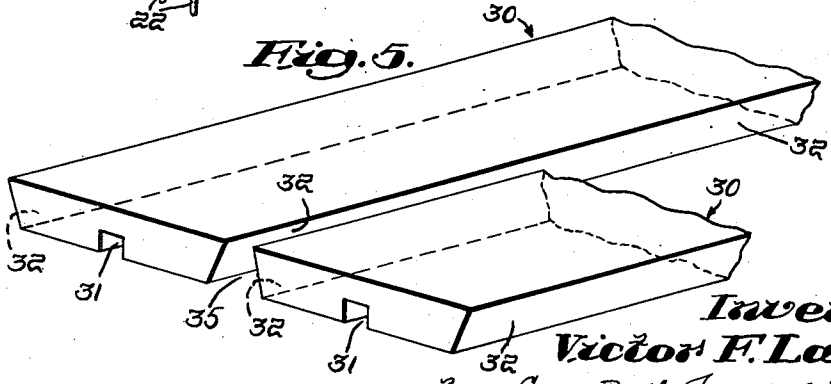


Fig. 5.



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TONGUE-AND-GROOVE CONCRETE PLANK MOLDING APPARATUS

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Application May 19, 1954, Serial No. 430,842

1 Claim. (Cl. 25—121)

This invention relates to the art of molding or casting concrete. More particularly it aims to improve the production of tongue-and-groove concrete planking, through a new and improved means for making the same.

In the accompanying drawings illustrating one embodiment of means for the practice of the invention:

Fig. 1 is a perspective view looking down onto one end portion of a complete molding assembly or box for forming a gang of individual planks in erect position with the long dimensions horizontal, the mold being shown opened at the near end and with the several plank cavities empty of concrete mix;

Fig. 2 is a cross-section through the mold of Fig. 1 with the tongue-forming topping bars in place upon the top edges of the longitudinal separator plates and with the filling of the series of plank cavities completed;

Fig. 3 is a cross-section of a tongue-and-groove concrete plank as resultant from the apparatus of the invention;

Fig. 4 shows separately a cage of reinforcement such as employed in each plank cavity; and

Fig. 5 is a perspective view on a larger scale showing portions of an adjacent pair of topping bars further illustrating the manner of forming the tongue along the top longitudinal edge face of each plank.

Precast light-weight tongue-and-groove concrete planks are now known and extensively used in building construction. They are relatively thin molded concrete slab elements adapted for laying horizontally as flooring and roofing upon metal or other supporting framework members. They are nailable, also can be cut on the job with a power abrasive saw. Such concrete planking can be laid in continuity over the supports, wtih random end joints, and with a minimum of labor and cutting. Building erection is accordingly simplified and expedited.

The individual precast concrete planks may be variously dimensioned. A currently accepted standard is 16 inches wide, 10 feet long and 2 inches in thickness. The planks have uniform tongues and grooves, generally at all four sides, a tongue along one long edge and a corresponding groove at the opposite long edge, and similarly with respect to the end edges. The tongues and grooves usually have inclined sides, giving them a trapezoidal cross-section. The planks are usually cast in gangs in an overall coffin-like mold divided longitudinally by spacer plates into the selected plurality of individual plank cavities, having the longer dimension horizontal.

Heretofore considerable difficulty has been experienced in the formation of the edge interlock element for that longitudinal edge face of the plank which is at the top in the mold. The general practice has been to form the tongue along the bottom edge of the individual planks, in their molding position, to fill the cavities completely and thereafter fashion a tongue-receiving groove along and in the top surface of the filling concrete mix at each plank cavity. This has generally been done manually and individually for each plank by running an appropriately formed trowel along in the concrete before it sets. Another attempt has been to employ rods of general groove

shape in cross-section and to force them down into the filling material at the top of each plank mold cavity, thus again hand-treating each plank individually. Such procedures are tedious and labor-consuming and have proved generally unsatisfactory. The resulting planks frequently display much irregularity in the longitudinal groove element, incomplete formation thereof and also there is objectionable wastage of fill material displaced from the groove in the manual troweling or in the compressive formation thereof mentioned, together with a tendency for distortion and irregularity in the formation of the entire plank.

In accordance with the present invention I have devised a process and means for the practice of the same, novelty employing groove formation at the longitudinal bottom edges of the planks and tongue formation along the top edges, as opposed to the prior procedure, and in such fashion that the top tongues are readily and quickly formed to shape and size with requisite certainty and accuracy, with little or no excess and waste material, and with a minimum of labor.

Referring now to the drawings in more detail, the mold equipment or mold box in general comprises a rigid floor plate 1 which may be set on any suitable bed or support 2. Along one side portion of the floor plate is erected one outer side wall or plate 3, this being preferably secured permanently to the floor plate 1 as by welding and being suitably reinforced as by one or more longitudinal stringers 4, 4 welded along it. The box may be of any desired width to accommodate a corresponding number or gang of individual plank cavities, each designated generally in Fig. 1 at 5, some ten such cavities 5 being shown in Figs. 1 and 2, in side-by-side relation and arranged for the on-edge formation of the like number of individual tongue-and-groove planks P such as that of Fig. 3 and as seen in the molding position in Fig. 2. The opposite outer side wall 6 of the mold box may be generally similar to side plate 3 and including longitudinal reinforcement as at 7, 7 but is removably disposed with respect to the other mold parts.

The mold further comprises a bottom form 8 set onto the bed plate 1 and of a width to extend across the entire mold interior either integrally or in sections. This bottom form 8 has fashioned along it a series of upstanding ribs 9, one disposed centrally along each plank cavity 5 and of cross-sectional shape to effect formation of the tongue-receiving groove *g*, Fig. 3, along the bottom edge of each plank P. The bottom form 8 also has at its upper face a series of longitudinal notches 8*a* distributed in equal spaced relation and adapted to receive and position the lower edges of the removable longitudinal separator plates 10 which define the individual plank cavities. The mold box further comprises end walls one of which is seen in Fig. 1 in open position as though swung around laterally in the manner of a door, the other end of the mold box being similarly equipped. The end wall 11 carries a series of plank end groove-forming ribs 12 of similar cross-section as the bottom ribs 9 and spaced across the end plate 11 so as to align with the bottom ribs centrally of the respective plank cavities 5. The other mold end wall, not shown, is similar to end plate 11 but instead of ribs 12 carries a series of similarly spaced vertical recesses for the molding of correspondingly shaped tongues at that end face of each of the planks P.

The openable end walls 11 and the removable outer side plate 6 are adapted to be securely locked in closed position upon the bed plate 1 and with respect to the fixed side wall 3 as by means of removable pins and interlocking latches of which two are seen at 13, 14 in Fig. 1, the end walls having appropriate external flange projections 15 apertured to align with pin-receiving apertures

in the external longitudinal stringers 4 and 7 of the mold sides. Any known or preferred form of releasable securer means for the mold parts may be used.

The mold equipment further comprises for each individual plank cavity 5 a reinforcement cage as indicated generally at 20 in Fig. 4 showing one cage separately, portions of the several cages in the respective cavities being seen also in Figs. 1 and 2 and in the final product position in Fig. 3. These comprise longitudinal steel members 21 disposed in parallelism and symmetrically spaced and arranged to afford the desired distribution of reinforcement. The example of Fig. 4 represents tiers of seven longitudinal rods 21, two tiers for each plank disposed in horizontally paired relation. These rods are held in fixed relation by similar upright rods or chairs 22, of which seven also are shown in lateral paired relation, together with a number of transverse members or spacers 23. All of these members are welded together, each to those adjacent to provide a welded steel mesh cage unit which may be manipulated as such and readily dropped into place, one in each plank cavity 5 of the mold. By reason of the integration of the reinforcement into such cage unit wherein all the component parts are relatively fixed it is insured that in the finished precast planks P the reinforcement will be located where it is designed to be.

It will be understood that the numbers of longitudinal members 21 and also of the chairs 22 and spacers 23 may be varied as appropriate to the character and dimension of the particular planking. The illustrative form shown having seven pairs of the longitudinal steel and also a like number of the chairs 22, with spacers 23 at alternate chairs, is well suited to the production of planks to a standard size such as 2 inches thick, 16 inches wide and 10 feet long. The cage parts in such instance may be for example No. 7 gauge steel wire. The spacers 23 in the instance of a 2-inch thick plank, are made exactly 2-inches long, for accurate reception between each two adjacent longitudinal plates 10 of the plank cavitise 5, aiding to place the plates while presenting the respective reinforcement cages 20 in proper position in the corresponding cavities.

In addition to and in cooperation with mold equipment so far described and forming a part theerof, I utilize a plurality of novel topping plates each herein designated at 30. A number of these are shown in exploded position as prior to installation at the upper left portion of Fig. 1, while in Fig. 2 the appropriate number of topping bars 30 for the given mold is shown in their operative use position. These topping bar or top tongue-forming elements are shown separately on a larger scale in Fig. 5.

Each such topping bar 30 comprises a single unitary strip or bar of steel, each of a length corresponding to that of the plank mold cavities 5 and adapted to provide in effect top wall forms for the cavities, the ends of the topping bars being received between the opposite end walls 11 of the mold box. These topping bars 30 are of a thickness, in the vertical direction with respect to the installed position of the bars, corresponding to that desired for the height of the plank tongues, one of which is seen at *t* in Fig. 3 and also in Fig. 2 on the several planks. Each topping bar 30 has a longitudinal recess or channel 31 centrally along its under or inner face and dimensioned to fit snugly in secure seated position upon and along the top edge of any one of the longitudinal spacer plates 10 of the mold. Each topping bar 30 is of a width to overlie the adjacent approximately half-width of the mold cavities 5 to each side of the spacer plate 10 on which the given bar is mounted, while leaving between each two adjacent bars 30 an open-top cavity space 35 centrally of each given cavity and of a width, height and shape to form thereon the longitudinally continuous top tongue *t* for the corresponding planks P.

In the illustrated example the tongues *t*, likewise the grooves *g* in which they are to fit in the use position of the planks, are of a truncate or trapezoidal cross-sectional shape. Accordingly the opposite side faces 32, 32 of each topping bar 30 are inclined at the appropriate angle, oppositely and downwardly toward each other in the use position, that is, toward the particular separator plate 10 on which the bar is to be installed. The bars 30 each being of uniform width throughout and of the approximate half-cavity width to each side of the particular supporting plate 10, less an amount equal to one-half the thickness of the tongue, it results that there is presented between each two adjacent bars the desired truncate or trapezoidal tongue-forming channel or elongate cavity space as indicated at 35 in Fig. 5 and in Fig. 1. It will be evident also that in the installed or use position of Fig. 2 with a topping bar 30 applied along the top edge of each spacer plate 10 that the latter are afforded substantial additional longitudinal reinforcement and resistance against flexure, warping or like displacement or deformation in the course of the molding and setting operation. The flat under faces of the topping bars 30 define the horizontal corner or shoulder portions for the upper longitudinal edges of the planks in the corresponding cavities.

In the practice of the invention a mold box such as represented in Fig. 1 is completely set up and the removable wall parts secured in molding position. A reinforcement cage 20 is set into each plank cavity 5. In the following initial stage of the molding process the several individual plank cavities 5 are left open at the top. The appropriate number of topping bars 30 are made ready for installation, eleven of them in the illustrated example of a ten cavity mold comprising nine spacer plates 10 and the two outer side walls 3 and 6 which complete the outermost cavities. It will be understood that said outer side walls 3 and 6 may be of the same thickness as the intermediate spacer plates 10 in which case the topping bars for installation upon them may be the same in all resepcts as those for the spacer plates, as represented in Fig. 2. Or if preferred or if found more convenient the topping bars for the outside walls may be of reduced width upon the outside of the walls and need not have the outermost edges inclined and likewise the underseating channel or recess 31 in the case of a side wall of a thicker dimension than that of the spacer plate 10 will be correspondingly proportioned, and in some instances one or both of the outermost topping bars may be fixed on or formed as a part of the corresponding side wall 3 or 6.

With the mold set up, the appropriate quantity of concrete mix having been prepared and made available, for example an aerated concrete using a light-weight slag aggregate, preferably free of cinders, and with a Portland cement, such concrete mix is poured into the several cavities 5 of the mold to a predetermined upper level close to but desirably just enough short of the top edge of the spacer plates and side walls so as to leave an open volume approximately corresponding to that of the top tongue to be formed at each cavity top. With the cavities thus nearly but slightly less than filled the series of topping bars 30 are set down into the T-like straddling position along the top edges of the separator plates 10 and the side walls 3 and 6 and accurately seated in level position upon them. With the appropriate predetermined level of filling as described this operation causes some of the moist concrete mix at the top of the respective cavities to be forced up into the tongue-forming channels 35 between the paired inclined sides of the adjacent topping bars 30. Under the use of the described appropriate quantity of concrete fill, the top tongues *t* are accurately and substantially fully formed throughout their major volume. Any slight excess is levelled off or compressed into any voids and any needed quantity of the concrete mix is then supplied along and into any minor remaining gaps or

voids of the several tongues *t* as by the use of a pressure applicator or otherwise.

The entire mold assembly with the topping bars **30** in position as in Fig. 2 is let stand for an appropriate period for setting of concrete. Thereafter the topping bars are lifted off and the mold opened, releasing the entire gang of completed tongue-and-grooved concrete planks P ready for storage, shipment and use. It is found that the resultant longitudinal top tongues *t*, with reference to the molding position, are in all respects equal or superior to those as heretofore formed by recessing at the bottoms of the mold cavities, while the planks as a whole are materially improved as to accuracy of dimension and particularly thickness and as to uniform evenness of the side faces which are to be presented horizontally in the subsequent use position as flooring, roofing and such purposes. This improved regularity and accuracy of dimensions is largely attributable to the use of the topping bars **30** and their rigidifying function with reference to the spacer plates which are thereby retained throughout the molding and setting process in accurate planar presentation.

It will be understood that my invention, as to means, is not limited to the exemplary embodiment herein illustrated or described, and I set forth its scope in my following claim.

I claim:

Tongue-and-groove concrete plank molding equipment comprising a separable mold including a bottom wall, opposite longitudinal side walls and opposite end walls, longitudinal separator plates defining individual plank cavities, metallic reinforcement elements in each cavity and laterally spanning between and positively spacing the adjacent separator plates thereof to dimension the mold cavities for receiving plank-forming material to encase said elements, the bottom and one end wall having groove-forming ribs centrally of each cavity and the other end wall having corresponding tongue-forming recesses, and a plurality of topping bars, one for each separator plate and side wall, said bars centrally longitudinally slotted at the under faces for positive interlocked seating on the top edges of the respective longitudinal plates, each said topping bar having a width to overlie lateral marginal portions of the two plank cavities at opposite sides of the given plate on which it is seated so as to define between the proximate vertical longitudinal side faces of adjacent topping bars a central longitudinal upwardly open top tongue-forming channel for each plank cavity, each topping bar being centrally positively supported by a separator plate and having the flange portions at each side thereof cooperating with two mold cavities spaced by the supporting plate, the side faces of the topping bars being inclined toward the respective supporting plates to afford a trapezoidal cross-sectional shape for the tongue-forming channels between the bars so as to correspondingly taper the plank top tongues to be molded therein.

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