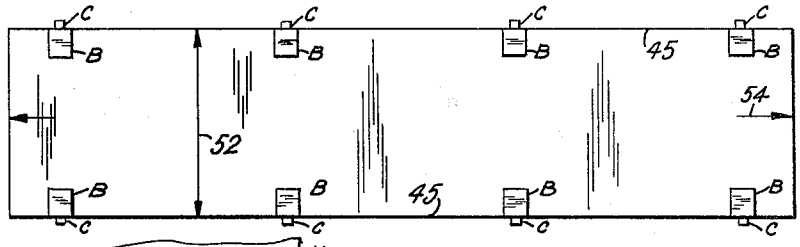
Oct. 18, 1966 W. A. MEYERS 3,279,738

CONCRETE FORMING SYSTEM

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FIG. 1



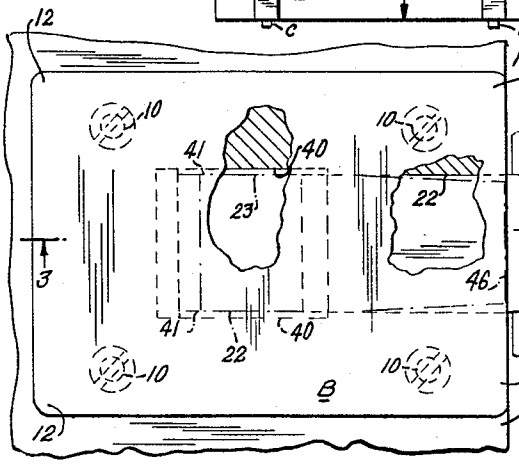


FIG. 2

FIG. 4

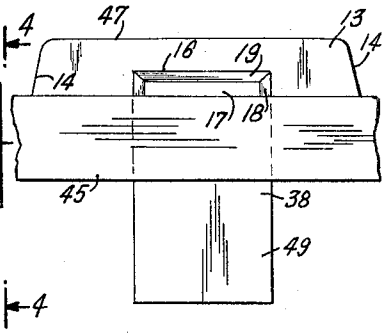


FIG. 3

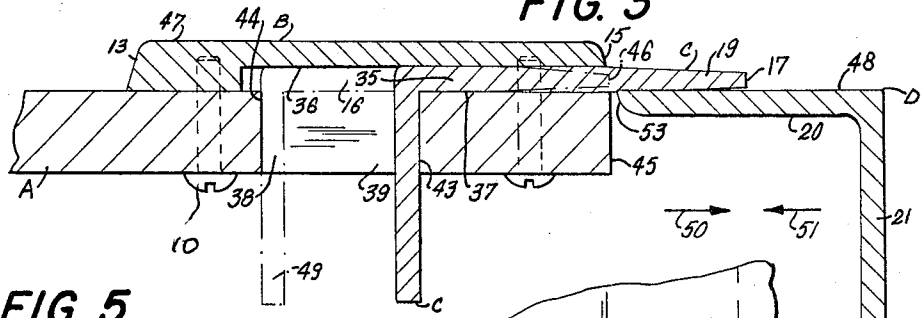
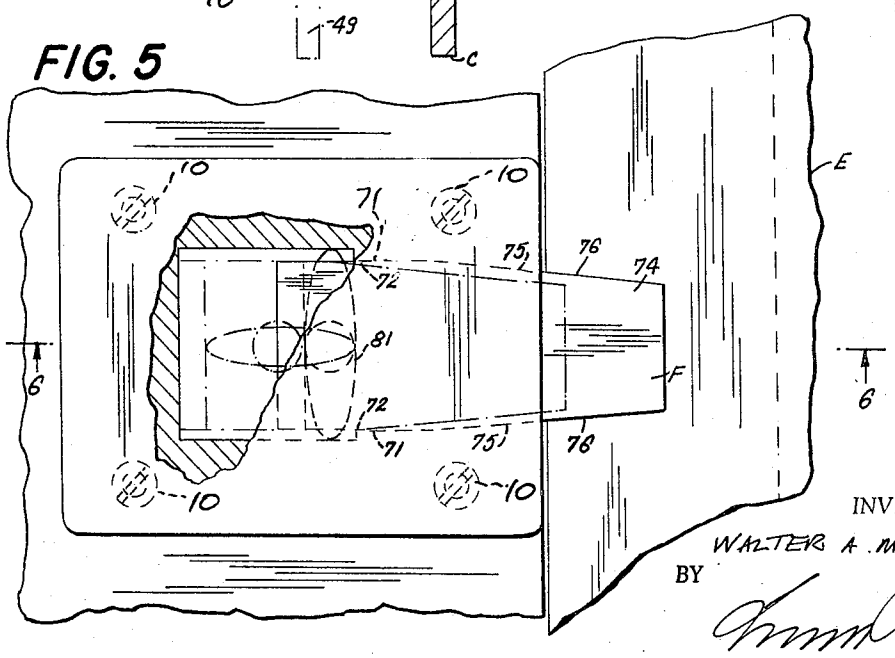


FIG. 5



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FIG. 6

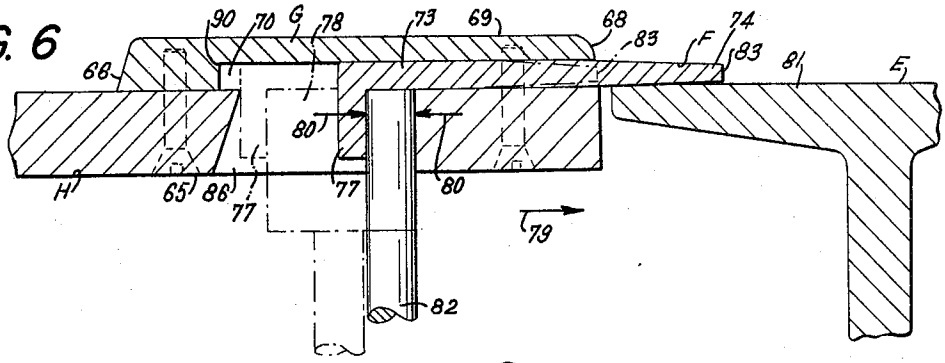


FIG. 9

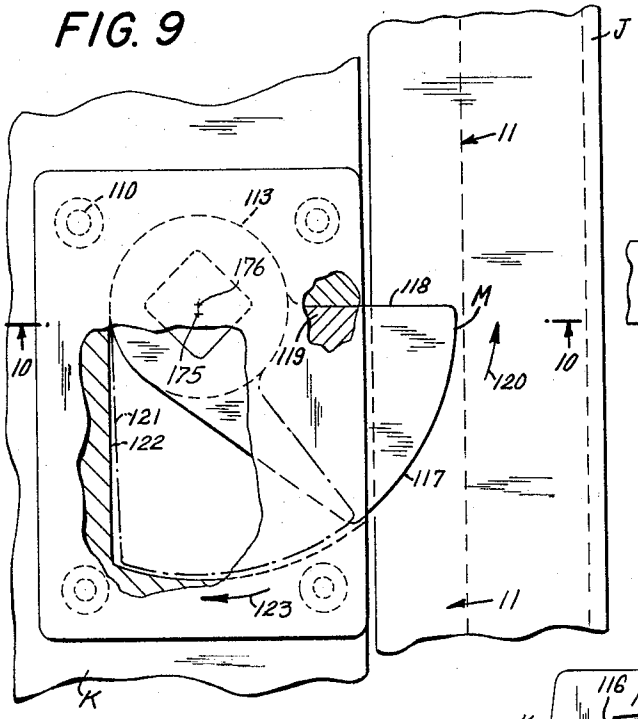


FIG. 7

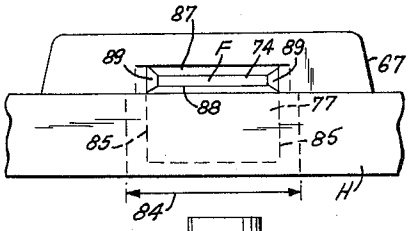


FIG. 8

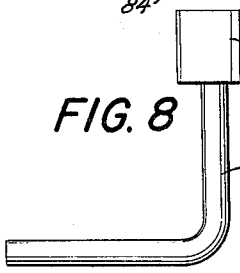


FIG. 11

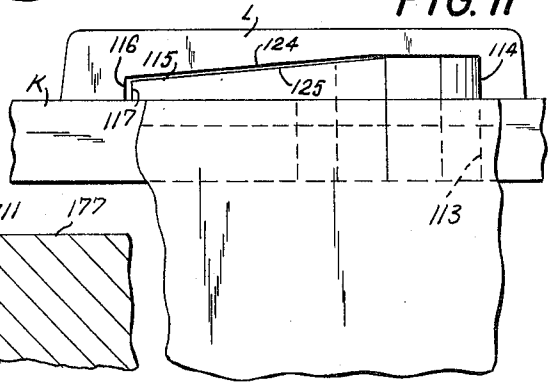
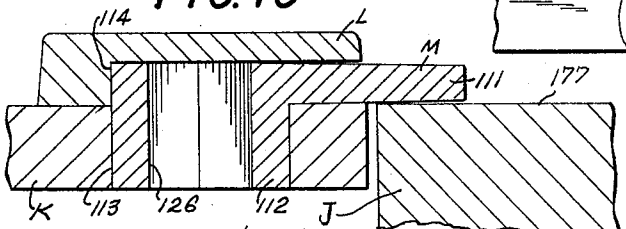


FIG. 10



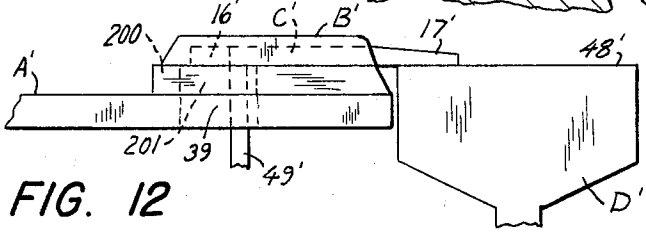


FIG. 12

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Patented Oct. 18, 1966

3,279,738

CONCRETE FORMING SYSTEM

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Filed Mar. 18, 1963, Ser. No. 265,698
15 Claims. (Cl. 249—25)

The present invention relates to a concrete forming system, and, although not restricted thereto, it will be particularly described in connection with its application to concrete erection and stripping system for the building industry.

Although not limited thereto, the present invention will be particularly described in connection with concrete floor and roof constructions in which the form and supports for the concrete may be readily supported and removed on completion of the work.

It is among the objects of the present invention to provide a convenient, readily effected system for constructing concrete floors and roofs with the use of panel members which may be readily removed after the concrete slab has been poured and which will effect great saving in time, labor and material over conventional concrete floor and roofing construction systems.

Another object is to provide a novel concrete floor construction system in which it would be readily possible to provide a conveniently installed and removed panel construction which will be universally applicable to I beams, open web joists, and also precast concrete joists, without special design or construction.

In conventional constructions it has been customary to use cast iron clips, which may have to be of a variety of sizes and shapes to accommodate various types of beam and joist constructions and in which the clips remain in position and must be broken away in part to release the panels after the concrete has been poured, involving wastage of material and extra labor costs.

It is among the further objects of the present invention to provide a novel system in which the same plywood or other forms may be readily installed, utilized and removed without breakage or permanent imbedding of cast iron clips and with assurance that the panels may be readily removed and thereafter re-used as desired.

Still further objects and advantages will appear in the more detailed description set forth below, it being understood, however, that this more detailed description is given by way of illustration and explanation only and not by way of limitation, since various changes therein may be made by those skilled in the art without departing from the scope and spirit of the present invention.

In accomplishing the above objects it has been found most satisfactory, according to one embodiment of the present invention, to provide a panel construction or form construction in which the engagement elements or supporting members to be attached to the structural beams may be unitarily associated with such panels or forms.

The panel members may consist of plywood panels or other panel constructions in the periphery of which are provided a series of spaced engagement members which may be readily extended for engagement with the various types of joists or beam constructions.

After pouring or casting of the concrete, these engagement members may be readily withdrawn or moved out of position so that the forms or panels can be removed and then re-used.

Desirably, the panels are of such size and shape as to extend between and occupy the space between the various types of beams or joists that may be employed and be positioned approximately at the same level as the top of the joist or beam, as the case may be.

If desired, however, the panel members may be positioned at a lower level, using an offset engagement member construction.

Desirably, on the upper side of the panels adjacents the periphery thereof, there to be attached to the joists or beams as the case may be, there are provided compact small flat guide members having a recess therein which will carry the sliding or movable engagement member and into which and from which the engagement may be withdrawn and/or projected.

Either the engagement member may be projected approximately outwardly from the holder or carrier or it may be rotated out of or into the holder or carrier respectively to engage or disengage the top of the beam or joist, as the case may be.

Although a wide variety of sizes of panels may be employed, it has been found most satisfactory to utilize panel sizes which will accommodate themselves to 2 foot spacings, as in customary with prefabricated concrete joists or steel beams.

These panels may vary from 2 by 8 feet in width and length, with plywood sheets of the order of about 5/8 of an inch in thickness. The engagement members may be spaced between 2 to 3 feet along the sides of the plywood sheets, with a preferred spacing of about 2½ feet.

It is, of course, obvious that a wide variety of other shapes, sizes and spaces may also be employed.

With the foregoing and other objects in view, the invention consists of the novel construction, combination and arrangement of parts as hereinafter more specifically described, and illustrated in the accompanying drawings, wherein is shown an embodiment of the invention, but it is to be understood that changes, variations and modifications can be resorted to which fall within the scope of the claims hereunto appended.

In the drawings wherein like reference characters denote corresponding parts throughout the several views:

FIG. 1 is a top plan view of one form of the invention, showing the engagements arranged alongside of the panel member.

FIG. 2 is a fragmentary top plan view upon an enlarged scale, as compared to FIG. 1, showing one of the engagement members extended from its slide or guide block in the panel, as shown in FIG. 1.

FIG. 3 is a transverse sectional view taken upon the line **3—3** of FIG. 2, showing the engagement member as it may engage a beam or joist.

FIG. 4 is an end elevational view taken from the line **4—4** of FIG. 2.

FIG. 5 is a top plan view of an alternative embodiment similar to FIG. 2; of a different shape of holder and engagement, provided with an intermediate stop.

FIG. 6 is a transverse sectional view taken upon the line **6—6** of FIG. 5.

FIG. 7 is an end elevational view of the clip and panel construction of FIG. 5.

FIG. 8 is a side elevational view of a key construction which may be utilized in connection with the engagement member of FIGS. 5 to 7.

FIG. 9 is a top plan view similar to FIGS. 1 and 5, of still another embodiment.

FIG. 10 is a transverse sectional view taken upon the line **10—10** of FIG. 9.

FIG. 11 is an end elevational view of the engagement member of FIG. 9, taken from the line **11—11** of FIG. 9.

FIG. 12 is an alternative arrangement similar to FIG. 10.

Referring to FIG. 1, there is shown a plywood panel A having a plurality of retainers or slide blocks B on the top face thereof, each of which receive a retractable and extendible engagement member C.

These panels may be of various sizes and shapes and a typical panel is one having a size of 2 by 8 feet, with the engagement members C spaced between 2 and 3 feet apart, with a preferred spacing of approximately 2½ feet apart.

Referring to FIGS. 2 to 4, the panel members A may consist of plywood or other sheet materials, for example of 5/8 inch in thickness, and these plywood members carry the slide or guide blocks B of steel, which are held in position by means of the screws or bolts **10**, desirably positioned at the forward corners **11** thereof, as well as the inside corners **12**.

The steel guide or slide blocks desirably have the sloping rear back faces **13** and side faces **14** and front face **15** so that they may be readily withdrawn from the concrete after it has been poured or laid on top of the panel construction and the interior of the slide block is desirably provided with a recess **16**, which acts as a guideway for the upper tongue or horizontal engagement element **17** of the angular engagement C.

The upper tongue **17** has the sloping side edges **18** and the top sloping portion **19**, which will extend over the beam member D, as indicated in FIG. 3. The beam member D is shown as having a horizontal flange **20** and a vertical flange **21** and it takes the form of an angle, forming part of an open web joist, but of course it may also take the form of J and L junior beams and I beams, channels or precast concrete joists.

The taper indicated at **13**, **14** and **15** on the sides of the guide block, as well as the taper at **18** and **19** on the sides and top of the engagement tongue element **17**, will permit ready withdrawing of the steel slide or guide block B, as well as the tongue **17** from the concrete after it has been cast.

The slot **16**, as shown in FIGS. 1 to 3, will have side walls as indicated at **22**, which will closely bear against the straight sides **23** of the tongue elements **19** to the rear of the tapers **18** and **19**, so that the tongue will be correctly guided transversely as it moves in and out of the slot **16**.

The inside straight portion **35** of the tongue element **17** will also closely contact the top surface **36** of the guideway or slideway **16**, with the other face closely contacting the top surface **37** of the plywood or other panel A (see FIG. 3).

The vertical portion **38** of the engagement element C will extend down through a rectangular or circular opening **39** in the plywood panel A, the sides **40** of which will be spaced so as to leave substantial clearance in respect to the sides of the downwardly extending portion **38**, as indicated at **41**.

The downwardly extending elements **38** or the engagement C will move between the stop faces **43** and **44** of the opening **39**.

The stop face **43** will limit the projection of the tongue **17**, as indicated in FIG. 3, whereas the stop face **34** will limit the retraction of the tongue **17**, so that it will clear the edge **45** of the panel A when withdrawn with its edge **46** retracted within the recess **16** in the position indicated in FIG. 3.

The engagement member C is shown as having a horizontal upper tongue portion **17** and a vertical extension **38** projecting downwardly from the slot or guide opening **16** through the opening **39** in the plywood form or panel A, but by increasing the size of the recess **16** it would also be possible to offset the tongue **17** so that the top face **47** of the guide or slide block would have the same level as the top face **48** of the angle member B.

The downwardly projecting portion **49** of the engagement member C should have such length as to conveniently be acted upon by a tool or hammer, which can move it in the direction **50** to engage the top face **48** of the angle member D, or in the direction **51** to be withdrawn after the concrete has been poured, with the end **46** of the tongue being withdrawn into the slide or guideway **16**.

The friction between the sides and top of the straight portion **35** of the tongue **17** and the faces **36** and **22** of the guideway **16** and the face **37** of the plywood panel A should be sufficient to hold it in either extended position

shown in solid lines in FIG. 3 or in different and retracted position as shown in dot and dash lines in FIG. 3.

In usage, the width **52** of the panel A, as indicated in FIG. 1, should be such that its side edge **45** will be spaced very closely to the edges **53** of the horizontal flange **20** of the angle member D, leaving a minimum space or crevice through which the concrete will not enter (see FIG. 3).

The length of the panel indicated by the dimension **54** in FIG. 1 will vary, depending upon the number of panels that it is desired to use and the number of engagements C that are to be positioned alongside of the edges **45** thereof.

In operation, the tongues **17** will normally all be extended as indicated in FIGS. 1 to 3, with the right angular extensions **38** stopped against the face **43** over the opening **39** in the plywood.

The panels A with the extended tongues may be dropped in position so that these tongues will lie on top of the horizontal flanges **20** of the angle members D or over the top flanges of an I beam or top surface of a concrete joist.

The concrete than may be poured on top of the panels and on top of the beam members D and permitted to harden. After the concrete has been poured and hardened to form the suitable slab thickness, the extensions **49** of the vertical members **38** of the engagement element C may then be moved in the direction **51** by a blow of a hammer or other suitable tool.

The slab, as indicated at **13**, **14** and **15**, on the sides of the guide or slide block B and the taper at **18** and **19** on the tongue **17** will permit ready removal thereof from the concrete and the panels with the result that their attached engagement elements C may then be withdrawn and reused.

In the alternative embodiment shown in FIGS. 5 to 7, the I beams E will support the engagement tongues F sliding inside of the guide or slide blocks G.

The slide or guide blocks G will be held in position on the plywood panels H by means of the corner screws **65** and will also have the sloping back faces **66**, side faces **67** and front face **68**, as well as the flat top face **69**.

The slideway or guideway **70** will have the straight sides indicated at **71** to frictionally engage the side **72** of the rear portion **73** of the tongue **74**, forming part of the engagement element F.

The sides of the slot, however, differ from the slot in FIGS. 1 to 4 in that the outer portion of the slot is tapered, as indicated at **75**, to act as a stop against the taper sides **76** of the tongue **74** of the engagement member.

The down-turned vertical portion **77** will not extend out of the recess **78** in the side portions of the plywood panel H.

The down-turned flanges **77** will then be stopped in their movement in the direction **79** by contact between the oblique side face **76** and the tongue F of the oblique side face **75** of the slot or guideway **70** so that there will be a space indicated by the arrows **80** in FIG. 6 when the tongue F is extended to be positioned on the top face **81** of the I beam E.

The panel in the plywood, as indicated at **84** in FIG. 7, will give sufficient spacing on each of the sides **85** of the depending tongue **77**.

The tongue elements **74** may be conveniently extended by insertion of a tool or other member in the recess **86**, which may be formed at the side of the plywood opening or recess **78**.

In the arrangement shown in FIGS. 5 to 7, desirably the top and bottom faces **87** and **88**, as well as the side faces **89** of the projecting tongue are tapered (see particularly FIG. 7) and a movement of 3/4 of an inch of the tongue **74** may be conveniently accomplished to achieve projection thereof for the purpose of positioning on the top surface **81** of the I beam E.

Desirably the friction between the top and sides of the rear portion **73** of the engagement F will hold the en-

gagement member F in position when it has been extended or retracted.

The advantage of the structure shown in FIGS. 5 to 7 is that it enables the tongue F to be readily withdrawn by rotation of the tool, wrench or key, as indicated in FIG. 8, when the necessity of hammering on the down-turned portion **77** of the engagement member F arises.

The plywood bars are set up as already indicated in connection with FIG. 1 with the tongues F extended as indicated in FIGS. 5 to 7 when the panels are placed in position, and then the concrete is poured on the top of these plywood bars H, with the extended tongue F and the top of the I beams E.

Where it is desired to use the tool, both to extend the tongue F as well as to retract the tongue F, the rear end **90** of the slot or guideway **70** might be positioned in advance of the rear side of the opening **78** in the plywood.

In this instance, by providing a spacing **80** at both sides, the key of FIG. 8 may be used both for extension of the tongue F as well as retraction of the tongue F.

In the embodiment of FIGS. 9 to 11 there is shown a concrete joist J, on which may be mounted the panel K having the slide or guide block L with the rotating engagement M.

The block as shown in FIG. 9 has the screw attachments **110** at the corners thereof to the plywood panel K and the engagement element M has an outstanding tongue **111** which is mounted upon a rotary bearing member **112** closely fitting in the circular opening **113** in the plywood panel and extending upwardly into a corresponding circular opening **114** in the base of the guide block L.

The block L has the arcuate slideway **115**, with the end face **116**, which will clear the arcuate edge **117** of the tongue M.

The tongue member M has the straight radial sides **118**, which will stop against the face **119** of the recess **115** in the block L to limit the movement in the direction **120**.

The other side **121** of the tongue will be stopped against the other wall **122** of the recess **115**, limiting the movement in the direction **123** of the tongue M.

The frictional engagement is achieved by the closed fitting between the oblique inside face **124** of the recess **115** and the oblique or angular face **125** of the swinging tongue member M, as best shown in FIG. 11, so as to hold the tongue M either in extended position, as indicated by the arrow **120**, or in retracted position, as indicated by the arrow **123**.

The hub portion **112** is provided with a square or other polygonal opening **126**, which may receive a tool or wrench having the same shape as the polygonal opening **126** to turn it either in the direction **120** when the panel is to be placed upon the concrete joist J or when it is to be retracted and removed from the concrete joist when moved in the direction **123**.

These panels, as shown in FIGS. 1 to 11, may be conveniently mounted in position by projection of the tongues C, F and M, and after the concrete is poured on top of the panels A, H and K, and on top of the angle members D forming part of an open joist structure or the I beams E or the concrete joists J.

In the embodiment of FIGS. 1 to 4, a hammer blow may be readily applied to withdraw the projecting tongue engagement C, whereas in the embodiments of FIGS. 5 to 8 and 9 to 11, a tool may be employed to withdraw the reciprocatory tongue F or the rotary tongue M and permit the panels to be released.

The radius point of the edge **117**, as indicated at **175**, should be spaced below or away from the center point **176** of the hub portion **112** which fits into the circular opening **113** in the plywood panel K and the circular opening **114** in the block L.

As a result of this feature, the circular edge **117** will move in the direction of the arrow **123** without scraping upon the concrete when withdrawn inwardly in the direction **123**.

In the preferred arrangement, the distance between the center points **175** and **176** may be approximately 1/16 of an inch.

In the alternative embodiment of FIG. 12 , a shim **200** is employed in connection with the use of this device upon a pre-cast concrete joist.

Similarly functioning parts are indicated by the same numerals and letters as in FIG. 3, which, however, are primed.

The pre-cast joints D' has a top surface **48'**, which receives the projecting tongue **17'**, which slides within the block B'. The angular engagement member C' has a depending tongue **49'** which can move backwardly and forwardly within the opening **39'**, which opening is also present at **201** in the shim **200**.

The plywood panel A' may be attached to the plywood panel by means of screws or bolts **10'**, as already shown in connection with FIGS. 1 to 3.

The opening **201**, if desired, may be somewhat larger than slot **16'** in the guide block B'.

The applicant has thus provided a combined unitary panel or form arrangement with clips or engagements associated therewith, which may be readily mounted upon concrete joists and channel beams and upon web joist constructions without change in the shape, side or form of the particular engagements employed, with assurance that engagement will be had without wiring or special fitting operations.

The panels may be readily spaced in position and may be readily withdrawn, and the arrangements shown will permit a most economical system for constructing and setting up lightweight rigid thin or thick slab floor or roof constructions of concrete.

The entire panels, together with the clips, are removed, with nothing left in position, and it is most convenient to have the concrete flooring or roofing in position directly on top of and above the I beams, concrete joists or open web joists, as the case may be.

As many changes could be made in the above concrete forming system, and many widely different embodiments of this invention could be made without departure from the scope of the claims, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

Having now particularly described and ascertained the nature of the invention, and in what manner the same is to be performed, what is claimed is:

1. A concrete erection and stripping system for engagement with spaced structural beams, web joists and concrete joists, said beams and joists having top horizontal faces, a plurality of removable panels of elongated rectangular shape having a top horizontal surface flush with said top faces and a bottom parallel horizontal surface below said top face and vertical side edges closely adjacent the sides of said beams and joists having a plurality of spaced recesses along the sides thereof adjacent the beams and joists enabling pouring and supporting of the concrete in forming floor and roof slabs, a plurality of extendible and retractable engagements having outwardly convergent beveled faces to engage the top faces of said beams and joists, mounted to extend above and below said surfaces and vertically through said recesses of said panels, and a plurality of recessed guide blocks mounted on said top surface and extending over and covering the spaced recesses of said panels into which said engagements may be retracted after pouring of the concrete, enabling removal of the panels and from which the engagements may be projected upon placement of the panels upon the beams and joists.

2. A concrete erection and stripping system for engagement with spaced structural beams, web joists and concrete joists, said beams and joists having top horizontal faces, a plurality of removable panels of elongated rectangular shape having a top horizontal surface flush with said top faces and a bottom parallel horizontal sur-

face below said top face and vertical side edges closely adjacent the sides of said beams and joists having a plurality of spaced recesses along the sides thereof adjacent the beams and joists enabling pouring and supporting of the concrete in forming floor and roof slabs, a plurality of extendible and retractable engagements having outwardly convergent beveled faces to engage the top faces of said beams and joists, mounted to extend above and below said surfaces and vertically through said recesses of said panels, and a plurality of recessed guide blocks mounted on said top surface and extending over and covering the spaced recesses of said panels into which said engagements may be retracted after pouring of the concrete, enabling removal of the panels and from which the engagements may be projected upon placement of the panels upon the beams and joists, said guide blocks consisting of sloping side flat members, mounting means to mount said blocks on the tops of the panels and having guide recessed openings therein on the sides against panels and said engagements having elongated projectable and retractable tongues movable out of and into said recessed openings.

3. A removable engagement panel for a concrete erection and stripping system for engagement with spaced structural beams, web joists and concrete joists, said beams and joists having top horizontal faces, comprising a rectangular plywood panel of elongated rectangular shape having a top horizontal surface flush with said top faces and a bottom parallel horizontal surface below said top face and vertical side edges closely adjacent the sides of said beams and joists having a plurality of spaced recesses along the sides thereof adjacent the beams and joists, a plurality of recessed guide blocks mounted on the top surface of the panel and extending over and covering said recesses and along the sides of said panel and a plurality of projectable and retractable engagement elements having outwardly convergent beveled faces in said blocks for engagement with the beams and joists upon pouring of the concrete and for retraction after pouring of the concrete to permit removal of the panels and engagement elements.

4. A removable engagement panel for a concrete erection and stripping system for engagement with spaced structural beams, web joists and concrete joists, said beams and joists having top horizontal faces, comprising a rectangular plywood panel of elongated rectangular shape having a top horizontal surface flush with said top faces and a bottom parallel horizontal surface below said top face and vertical side edges closely adjacent the sides of said beams and joists having a plurality of spaced recesses along the sides thereof adjacent the beams and joists, a plurality of recessed guide blocks mounted on the top surface of the panel and extending over and covering said recesses and along the sides of said panel and a plurality of projectable and retractable engagement elements having outwardly convergent beveled faces in said blocks for engagement with the beams and joists upon pouring of the concrete and for retraction after pouring of the concrete to permit removal of the panels and engagement elements, each of said elements including a right angular structure with horizontal tongues and depending transverse structures to permit said tongues to be projected and retracted and openings in said panels for access to said transverse structures from below said panels.

5. A removable engagement panel for a concrete erection and stripping system for engagement with spaced structural beams, web joists and concrete joists, said beams and joists having top horizontal faces, comprising a rectangular plywood panel of elongated rectangular shape having a top horizontal surface flush with said top faces and a bottom parallel horizontal surface below said top face and vertical side edges closely adjacent the sides of said beams and joists having a plurality of spaced recesses along the sides thereof adjacent the beams and joists, a plurailty of recessed guide blocks mounted on the top surface of the panel and extending over and covering said recesses and along the sides of said panel and a plurality of projectable and retractable engagement elements having outwardly convergent beveled faces in said blocks for engagement with the beams and joists upon pouring of the concrete and for retraction after pouring of the concrete to permit removal of the panels and engagement elements, each of said inside blocks having a guideway recess therein to receive and guide said engagement elements and said panels having openings to said guideway recess through the panel to the bottom of the blocks to give access and enable actuation and reciprocation of said engagement elements.

6. A removable panel for engagement with structural beams and joists having a rectangular base to extend between the beams and joists and support the concrete poured thereinto, a plurality of guide blocks having recessed guideways on the bottom faces of the blocks mounted on the sides of the upper faces of the panel and a plurality of projectable retractable beam engagement tongue members having outwardly converged beveled faces in said blocks and frictionally fitting said guideways, said panels having openings permitting access to said tongue members to actuate the same, said panel having a plurality of spaced recesses along the sides thereof and said blocks being mounted over and covering said recesses.

7. A concrete forming system for concrete erection and stripping in connection with cast concrete horizontal floor and roof constructions having a plurality of parallel spaced beams and joists with top horizontal faces and elongated rectangular concrete supporting removable panels having top and bottom horizontal surfaces extending between and filling the space between said beams and joists and having side edges in close proximity to top portions of the sides of said beams and joists, said panels having a plurality of spaced vertical recesses along the sides of the panels adjacent the vertical edges thereof, a plurality of recessed guide blocks having horizontal recesses forming slideways mounted upon said panels adjacent and extending to said vertical side edges and covering said panel recesses and a plurality of retractable and projectable tongue members having horizontal portions mounted to move in said blocks and vertical portions mounted to move in said panel recesses.

8. The system of claim 7, said guide blocks having horizontal recesses with open ends toward the panel edges and closed on the top, sides and away from the panel edges by the block bodies and closed on the bottoms by the outer portions of the panel and said block recesses also opening into said vertical panel recesses away from said panel recesses.

9. The system of claim 7, said tongue members being of angular shape with horizontal portions extending through the block recesses and vertical portions extending through the panel recesses.

10. The system of claim 7, said tongue members including arcuate sector portions lodged in the box recesses and hub portions extending into the vertical recesses, said hub portions having central openings to enable engagement with a rotatable actuator.

11. The system of claim 7, said tongue member consisting of L-shaped reciprocable members, movable transversely to the edges of the panels and having flat rectangular cross section horizontal and vertical arms respectively received in the box and panel recesses.

12. The system of claim 7, said panels being of plywood and said blocks being rectangular and mounting members at the corners thereof attaching the blocks to the panels and extending through the panels.

13. The system of claim 7, said tongue members having horizontally projecting portions with flat horizontal lower faces sliding upon the outer upper surfaces of the panels and top faces of the beams and joists and with

downwardly and outwardly sloping top faces to enable ready release from the cast concrete.

14. The system of claim **7**, said panel recesses being adjacent but spaced from the panel edges and said blocks having flat top faces and oblique side edges.

15. The system of claim **7**, said tongue members consisting of arcuate sectors and having off-center turning axes to cause more ready withdrawal from the cast concrete.

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