Feb. 25, 1964 A. R. DRAGUNAS 3,121,933

ERECTION AND STRIPPING OF CONCRETE FORMS

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FIG. 1

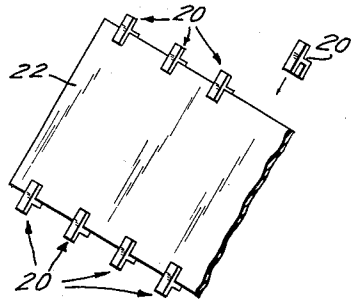


FIG. 2

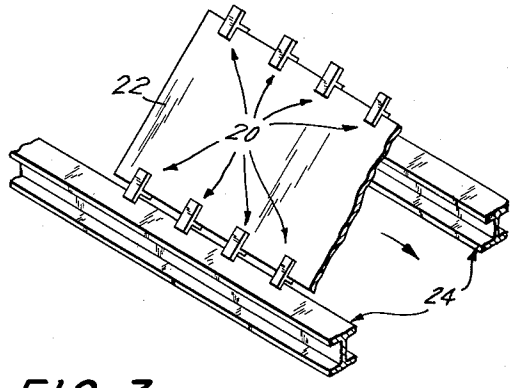


FIG. 3

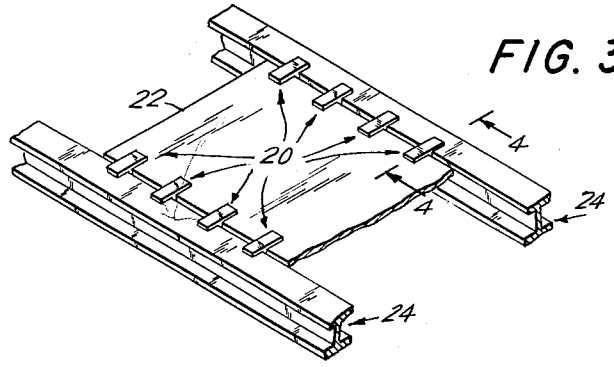


FIG. 4

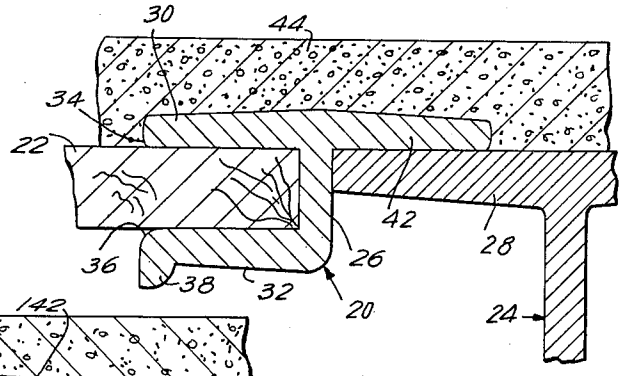
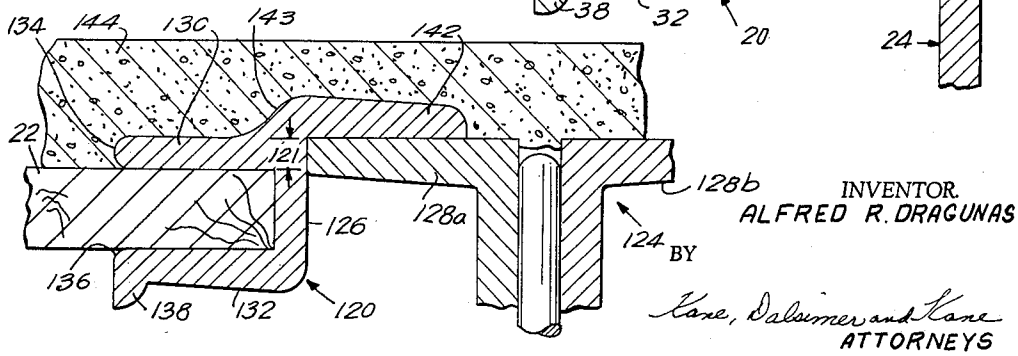


FIG. 5



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FIG. 6

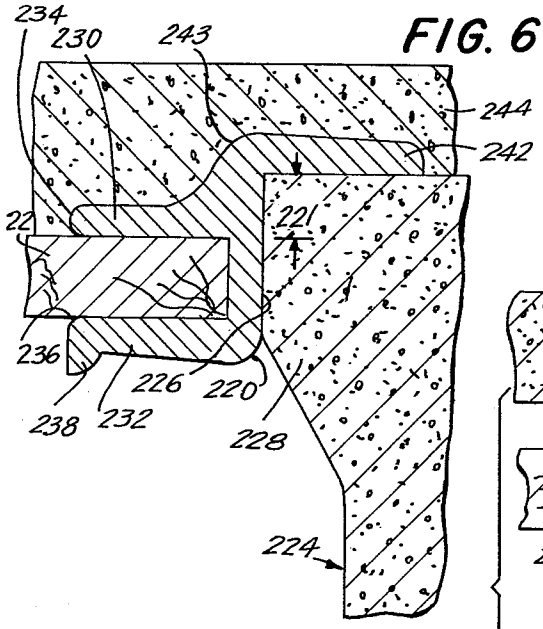


FIG. 7

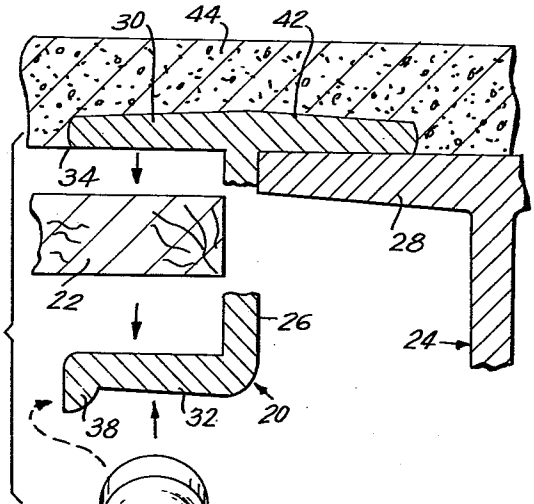


FIG. 8

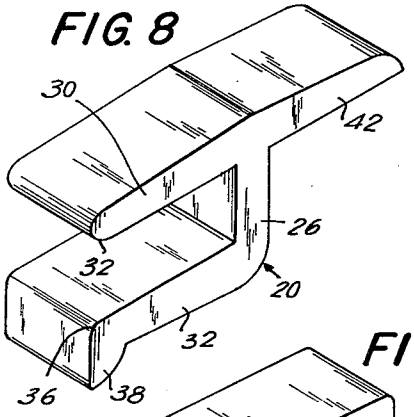


FIG. 9

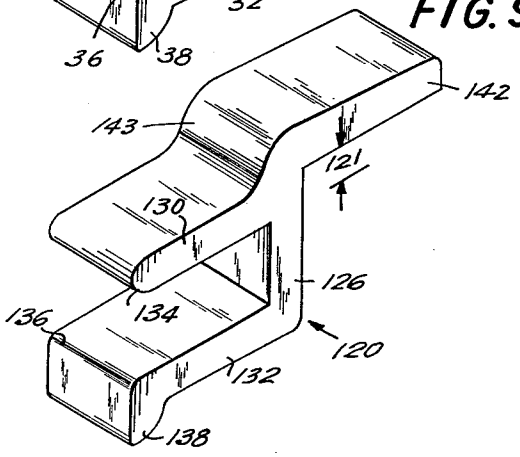
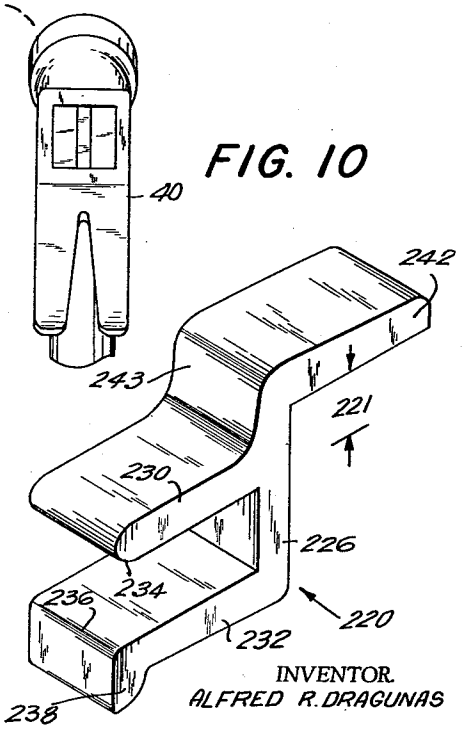


FIG. 10



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ERECTION AND STRIPPING OF CONCRETE FORMS

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3 Claims. (Cl. 25—131.5)

The present invention relates to an improved system for the erection and stripping of concrete forms, particularly for the building industry, and, in addition, to a structurally and functionally improved clip for facilitating the adaptation and application of the system.

In the construction of concrete floors, decks or ceilings, the "wet" cementitious mix is ordinarily poured onto and supported by forms on which setting and hardening takes place. A contributing factor with respect to cost is the reusability of the forms and the ease with which the framework is erected. A builder's profit is certainly influenced by the required concrete work. Profits are both lost and gained by this aspect of construction. The framework in the past has varied from the elaborate to the simplest, the costly to the inexpensive not only in fabrication but erection as well.

The dictates of each building project will, in most instances, determine the system of formwork to be employed. For example, the forms may be custom made by fabricating and erecting them at the building site from lumber suited for such purposes. The selected formwork may ultimately constitute an integral part of the building as is the case with commonly employed corrugated steel decking. Conventionally dimensioned plywood, suitably suspended intermediate beams and joists has proved somewhat successful particularly in light of the reusability factor. A number of methods of suspending the plywood formwork have been devised. One entails the use of bent wire straps which would eventually require cutting to permit removal of the plywood sheets, once the concrete has set. Another has proposed the use of clips for fastening to the beam or joist and on which the plywood sheets rest.

With respect to the latter, the supporting clips are hooked to the top flanges of members whether they be I-beams, Jones and Laughlin junior beams or other rolled sections, open web joists, or precast concrete joists Plywood panels are then placed between the flanges and conveniently rested on the shelves provided by the hooked clips.

After steel rod or wire mesh reinforcing has been properly placed, the concrete is poured. It is permitted to set, at which time that portion of the clips exposed below is subjected to deliberate impact by a well placed blow causing its fracture and severance. The plywood panels may now be easily and quickly stripped for reuse.

However, the dimensioning of beams and joists of substantially the same load bearing capacity, unfortunately, differs as between manufacturers and sources.

Similarly, the clip dimensions must also vary with practically each size supporting member. In this connection, the clips are designed to hook onto the member's upper flange with little or no "play"; otherwise the forms may not be adequately supported and, consequently, there may be substantial seepage or total loss of the poured wet mix.

It is, therefore, an object of the present invention to provide an improved system and clip for supporting reusable concrete forms on beams and joists.

Another object is to provide an improved clip for concrete forms having standardized dimensioning independent of the size of beam or joist.

Still another object is to provide an improved system of suspending concrete formwork from beams and joists

by clips capable of being coupled with the form sheets and then supported on the beams and joists together with the sheets as a composite unit.

Other objects and advantages will become apparent from the following detailed description to be taken in conjunction with the accompanying drawing illustrating several preferred embodiments of the invention and in which:

FIG. 1 is a perspective view of a plywood sheet having placed thereon clips in accordance with the present invention;

FIG. 2 is a similar view showing the placement of the clip supporting sheet between a pair of beams;

FIG. 3 depicts the sheet now being suspended from the beams by the clips;

FIG. 4 is an enlarged fragmentary sectional view taken along the line 4—4 of FIG. 3 showing the manner in which a clip of this invention supports formwork on which concrete has been poured;

FIG. 5 is a similar view illustrating another embodiment of clip supported in this instance by an open web joist;

FIG. 6 is another similar view of still another embodiment of clip shown associated with a pre-cast concrete joist;

FIG. 7 illustrates the construction of FIG. 4 following severance of the lower retaining lip of the clip whereby the forms are readily removed;

FIG. 8 is a perspective view of the clip of FIG. 4;

FIG. 9 is a perspective view of the clip of FIG. 5; and

FIG. 10 is a perspective view of the clip of FIG. 6.

Reference is now made to the embodiment of the invention illustrated in FIGS. 1 to 4 and 7 to 8 . Thus, a series of strategically located clips 20 incorporating the teachings of the present invention are initially secured to a form 22 for cementitious material such as concrete to be placed between spaced beams, joists or other structural steel or concrete members pursuant to the particular plans and specifications. In the embodiment under discussion, the supporting member may be considered a standard and commercial rolled section 24 as, for example, an I-beam or Jones and Laughlin junior beam. The form 22 is ordinarily of plywood or similar material and, in the case of thin concrete floor slab construction to be supported by lightweight structural members ordinarily little over two feet between flanges, the plywood in most instances will be of 5/8" stock and approximately two feet wide. It has been found that the clips 20 should be spaced approximately two feet six inches on center for satisfactory results. In this connection, in the field there will be a slight sagging of the form 22 between clips 20 such that there will be a structural interconnection with the spaced beams by the concrete slab thereby providing a rigid floor construction and the desired stress distribution.

When the selected number of clips 20 have been placed on the particular sheet of plywood 22 as will be described in detail shortly, the formwork is then positioned between the top flanges of the spaced beams 24 such that the clips bear on the external surfaces of the beams as shown.

Reinforcing mesh or the like is generally rolled out after the formwork has been installed. During the pouring operations, the mesh is generally pulled up as the concrete is being placed to insure proper location of the reinforcing as well as to avoid having the mesh show or be exposed on the bottom of the slab after the forms are stripped. After the concrete has set, the present invention contemplates the stripping of the plywood forms 22 for reuse. This is accomplished by fracturing the clips 20 by the application of a light blow in order to remove the exposed portion of the clip supporting the form 22. The light blow need not be applied by any special tool which could assume the form of an ordinary hammer or other makeshift type of implement. After the clip has been

broken, the form 22 may simply be pulled downwardly by the employment of a pinch bar if need be. Oiling of the forms will tend to eliminate or minimize adhesion and add to the life of the plywood 22.

In actual practice, satisfactory results are achieved by placing the clips no more than four inches from the plywood panel ends. In the case of standard eight foot plywood panels as well as lengths longer than 6 feet 8 inches, four equally spaced clips should be employed along each side of the panel. For lengths of 2 feet to 3 feet 8 inches, two clips on each side will adequately serve whereas for lengths of 3 feet 8 inches to 6 feet 8 inches, three clips should ordinarily be employed on each side. Generally, if the clips are spaced approximately 2 feet 6 inches on center, little or no difficulty will be experienced in adequately supporting the formwork on the horizontal beams.

The clips 20 are preferably fabricated from cast metal or suitable plastic material sufficiently strong to sustain the necessary loads yet possessing a relatively low resistance to shock. Accordingly, the clips 20 may be manufactured from cast iron capable of taking a dead load of approximately 1500 lbs. Such clips, however, are designed to fracture on the impact of a direct blow so that once the concrete has set the exposed portions of the clips are readily broken off by the hammer blow permitting the plywood forms to be easily removed for reuse. The remainder of the clips 20 stay imbedded in the concrete.

It should be understood that the foregoing generally applies to all of the contemplated forms and embodiments of clip as well as applications thereof.

Turning now to the details of the clip 20, it will be readily apparent that a vertically extending web 26 is adapted to be conveniently disposed between the side of the associated plywood form 22 and edge of the top flange 28 of the beam 24. The clip 20 includes a jaw extending laterally from the web 26 for securely gripping the plywood 22 across its thickness. The jaw includes a pair of opposed lips 30 and 32 providing a space therebetween having a width approximating the thickness of the selected plywood panel 22. In this connection, the panels may assume either a thickness of 5/8" or 3/4", with the former thickness ordinarily being employed, the latter generally when the only material available. As stated, the clips 20 are initially secured to the panel 22 and, in this connection, should be capable of frictionally gripping the panel so that there is no detectable or discernable play between these parts whereby the clip will, in effect, serve as an extension of the plywood form 22. The free ends of each of the lips 30 and 32 may be provided with a somewhat tapered or rounded edge 34 and 36, respectively, for facilitating the insertion of the plywood panel 22 between the lips of the jaw. The lower lip 32 is additionally provided with an impact surface in the form of an enlarged downwardly extending projection 38 designed to receive the impact of the stated direct blow of a hammer or like implement 40. Also extending from the web 26 in an opposed direction is a bearing 42 adapted to rest on the external surfaces of the associated beam 24. In the illustrated application of the clip 20, the bearing 42 rests on the top face of the flange 28.

As explained in the above, following the placement of the plywood form 22 with extending clips 20 on the spaced beams 24, the wet concrete is poured after the placement of reinforcing, if necessary or if dictated by the particular construction contemplated. The weight of the wet mix will ordinarily result in a slight sagging of the form between clips thereby assuring continuous contact between the slab when set and cured and the tops of the supporting members or beams 24. Under such circumstances, there will be bearing of the slab 44 against the sides of the top flanges 28. This bearing will be more pronounced in the embodiments of the clip to be considered in the following.

Following the setting of the concrete 44 and formation of a cured slab, the clips 20 remain imbedded in the slab thereby serving to further rigidifying the structure. Thus, interaction between the supporting members and the concrete slab is created as well as positive and continuous bracing of the top flanges of the supporting beams. Experience has proven that vibration and balance in the construction are virtually eliminated or at least minimized to a substantial extent.

As illustrated in FIG. 7, following the setting of the concrete 44, a well placed blow as, for example, by hammer 40 is applied to the lower lip 32 and particularly against the enlarged impact portion 38. The impact of the blow will cause clip fracture and breakage, in all probability, where indicated in this figure. The form 22 may now be removed with little or no difficulty. In this connection, the form may be easily and quickly stripped with the use of a pinch bar (not shown).

Referring now to the form of clip illustrated in FIGS. 5 and 9, it should be understood that the sequence of operations represented by FIGS. 1 to 3 and 7 apply equally to this embodiment. This clip is shown associated with the plywood panel 22 and a commercially available open web joist 124 having the usual web separated companion angles 128*a* and 128*b*. The clip 120 is, in most respects, similar in construction to clip 20 and, in addition, includes a drop designated by numeral 121 which, as will become apparent shortly, assures positive interlocking and interaction between the supporting members and the concrete slab 144. Thus, the clip 120 will include a web 126 from which laterally extends a jaw defined by lips 130 and 132 defining a space adapted to neatly receive the plywood panel 22, the ends of these lips are somewhat tapered as at 134 and 136, respectively, for such purpose. Lip 132 will include the somewhat enlarged impact receiving portion 138 capable of directly receiving the impact of the selected tool or implement as, for example, hammer 40. A bearing 142 also extends laterally from the web 126 and defines with the upper lip 130 a haunch 143. The bearing 142 conveniently rests on the top face of the supporting member and, in the exemplary illustration, the top face of the angle 128*a*.

Following the placement of reinforcing if employed and the setting of the concrete slab 144, the panel 22 is removed for possible reuse by breaking off exposed portions of the clip 120. In this connection, the blow is applied to the enlarged portion 138 thereby relieving the gripping of the clip jaws along a line of fracture defined by the cooperative interaction of the jaw and the clip web.

In FIG. 8 and FIG. 10, still another embodiment of clip is disclosed having somewhat more of a drop 221 than the clip 120 to assure more positive T-beam action particularly when used in conjunction with precast concrete joist 224. Such a joist will include the somewhat enlarged flanges 228 as shown. The clip 220 is similarly adapted to grip the panel 22 of the selected formwork whereby the concrete slab 244 may be poured in the manner suggested by the descriptive matter accompanying FIGS. 1, 2 and 3. The clip 220, under such circumstances, will include the web 226 from which extends laterally the gripping jaw of the panel defined by lips 230 and 232. The tapered jaw entrance for the panel 22 was provided by the tapered or bevelled lip surfaces 234 and 236 respectively. The enlarged portion 238 on lower lip 232 serves as the impact receiving surface for the blow applied by the implement such as a hammer 40. The bearing 242 is adapted to advantageously rest on the top face of the flange 228 and similarly defines with the upper lip 230 a haunch 243. Obviously, due to the enlarged drop 221, increased bearing and interaction is provided between the slab 244 and joist 224 creating what is known in the trade as T-beam action. The panels 22 may be stripped in a simi-

lar fashion as that disclosed in connection with the previous embodiments.

Thus, it will be readily apparent that a more sophisticated clip and system of formwork for the pouring and setting of concrete on support members is provided by this invention. Forming materials are not left in place, the selected forms as, for example, plywood may be reused time and time again and as much as twenty or more times. Because of the minimization of undesirable sagging of formwork, there is little or no waste of concrete. Most important is the decreased time and effort required to lay or install the formwork system and relative ease required in stripping the forms for reuse. In this connection, assembly and installation of the formwork is expedited by the fact that the clips serve as extensions of the form panels. As stated, a more rigid floor construction is obtained particularly in cconection with the formation of thin concrete floor slabs to be supported by lightweight structural members. The clips and the proposed system herein produce speedy, accurate and economical concrete forming. No special tools or scaffolding, welding or attachments, anchoring, bridging or the like are required. Very little concrete waste, if any, is present by the application of the invention. It is of further importance that the many variables created by the particular structural members utilized in the particular construction under consideration do not in any way effect the parameters or design of the clips of this invention. Since it is customary practice to utilize ⅝" thick plywood or other suitable sheet material, the jaws of the clip may also assume standardized proportions. The clips themselves are relatively light in weight, readily molded or cast, small in size and relatively inexpensive to manufacture by such techniques.

Thus, the aforenoted objects and advantages, among others, are most effectively attained. Although somewhat preferred embodiments have been disclosed herein, it should be understood that this invention is in no sense limited thereby and its scope is to be determined by that of the appended claims.

I claim:

1. In combination with spaced structural beams and concrete molding forms supported thereby, a plurality of discrete clips engaging opposite sides of said forms and resting on said beams, each of said clips comprising a web, a jaw extending laterally in one direction from said web in gripping relationship with the associated form to serve as an extension of such form, and a bearing extending laterally in the other direction from said web in bearing relationship with an external part of the associated beam.

2. The invention in accordance with claim 1 wherein the clips are of a brittle material having substantial load-bearing capacity, said web and said jaw defining a zone of weakness such that fracture will occur thereat by a hammer-blow to release the grip of the molding forms.

3. The invention in accordance with claim 1 wherein said bearing includes a substantially flat portion, and said jaw includes a pair of opposed substantially flat form-gripping lips both of which are substantially parallel to said flat portion, and both lips are disposed in planes spaced from the plane of said flat portion to provide a drop between the top of the gripped form and the top of the supporting beam.

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