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BEAM FORM KICKER TIE

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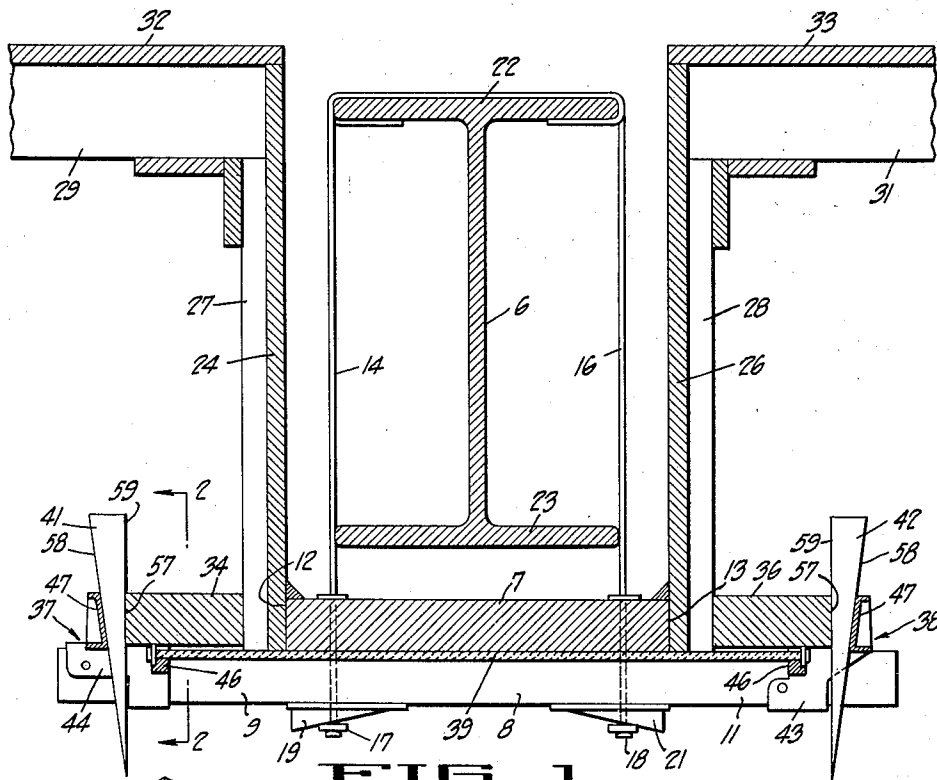


FIG. 1

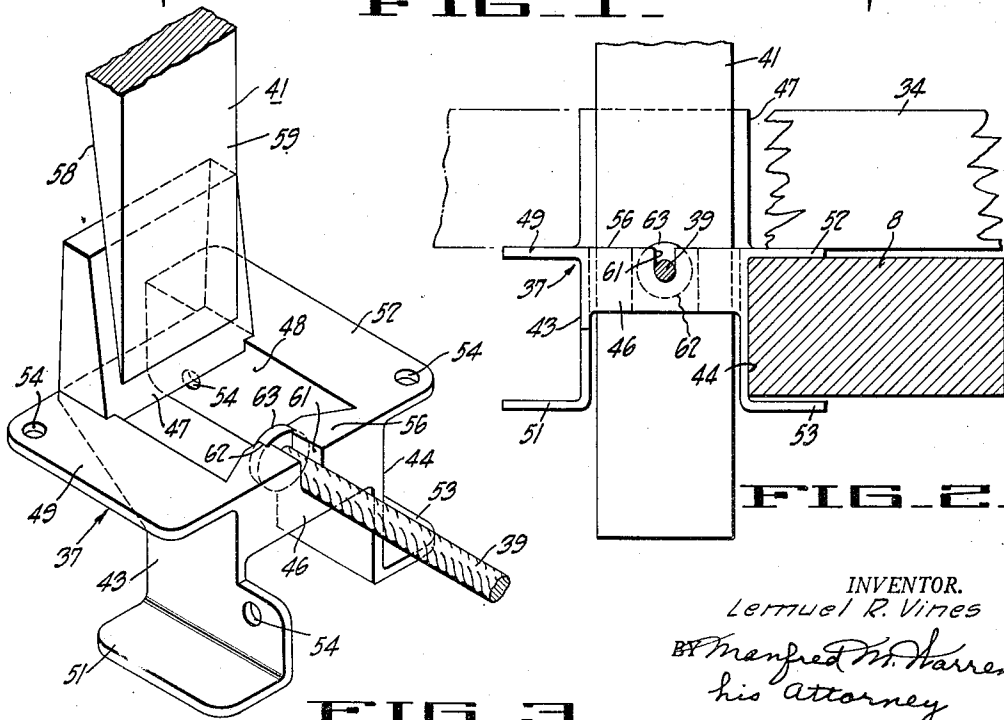


FIG. 2

FIG. 3

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BEAM FORM KICKER TIE

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The invention relates to tie means for forms used in concrete construction and more particularly to such means as are used for assembling and holding forms in spaced relation around steel beams in structural steel or reinforced concrete-steel types of building construction.

As will be understood, construction of the types noted is used in relatively large multi-story buildings and in the construction to which the present invention most specifically relates a plurality of steel beams, usually I beams, are erected and supported in horizontal position just below the finished floor lines of the building. The form work for the concrete is then applied around these beams so that upon pouring of the concrete the steel beams are encased in concrete beams which are integral with and directly support a superimposed concrete floor slab. The customary procedure in applying the concrete form is first to suspend from each of the horizontal steel beams, as by means of so-called hanging wires, a soffit composed of one or more lengths of form lumber and which runs longitudinally of the beam in underlying spaced relation so as to define the bottom of the concrete beam to be formed. The soffit is reinforced by a plurality of soffit carriers or cleats, usually relatively short lengths of 2" x 4"'s, secured to the under side of the soffit in more or less regularly spaced relation along its length, and which extend transversely, i. e., widthwise, of the soffit so that the grain of the carriers is at right angles to the grain of the soffit. Also, the carriers project from the opposite side edges of the soffit for support of the bottom edges of the side walls of the form. Usually the hanging wires above mentioned pass through the soffit and are secured at their lower ends to the carriers. One of the advantages of this type of construction is that the soffits may be cut to desired length and width, nailed to the underlying carriers, and the hanging wires applied, all as a bench operation. The unit thus bench-assembled may then be elevated into place under a steel beam and the hanging wire bent around the beam to support the unit as well as the balance of the form to be added. The form side walls may be similarly bench-assembled from suitable lengths of form lumber which are connected and reinforced by transverse cleats, preferably positioned along such side walls at longitudinal intervals corresponding to the longitudinal spacing of the soffit carriers. A pair of these pre-assembled side walls may then be elevated to a soffit unit above described and positioned in spaced vertical planes on opposites sides

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of the soffit and on opposite sides of the beam to be enclosed, with the lower ends of the vertical side wall cleats resting upon the opposite end portions of the soffit carrier. The side walls are then supported against transverse separation by means of kickers, commonly composed of lengths of 2" x 4"'s, positioned on the opposite ends of the soffit carriers and running lengthwise of the soffit and lying against the lower ends of the side wall cleats. These kickers are customarily nailed to the underlying soffit carriers and thus serve as stops to the outward movement or spreading of the side walls when under load of the concrete poured into the form. After setting of the concrete, the forms are stripped and the portions of the form salvaged in good order may be reused in the upper floors as the construction of the building progresses skyward.

The above described construction has many proven advantages. The form is constructed of common and readily obtainable form lumber which may be easily cut to length and size by workmen on the job, and thus is completely adaptable to the conditions of use. Also, portions of the form, such as the soffit unit and the form side wall units as above described, may be bench-assembled and then elevated as units into position in the building construction, thus saving considerable time in the form work.

The principal disadvantages of the above described construction arise out of the requirement for nailing of the kickers to the soffit carriers. The nails so used are subjected to a shearing pressure in the direction of the length of the grain of the soffit carriers, and frequently these nails will move lengthwise of the carrier, particularly when the form is overloaded or where soft grain is encountered in the carrier. Such relative movement of the kickers on the carriers, of course, permits an opening of the form and the discharge of concrete therefrom. Also, in the stripping of the forms the kickers and the nails must be removed, and in so doing much of the lumber is split up and rendered non-usable for subsequent work. Additionally, as will be clear, the original nailing and the subsequent stripping are time-consuming operations and must be accomplished in the air, sometimes high in the upper stories of a building, where working conditions are hazardous and operations are slowed by reason thereof.

In accordance with the present invention and as a principal object thereof, all of the essential parts of the above-described form are retained, but the nailing of the kickers to the soffit car-

riers is completely eliminated and tie means is supplied for rapidly and easily affixing the kickers in place and with equal speed and facility effecting their removal and the stripping of the form.

Another object of the invention is to provide a means of the character described which will support much greater load pressures with larger factors of safety than heretofore obtained.

A further object of the invention is to provide a tie means for a form of the character described in which all of the form parts are kept fully intact and unmutilated in the stripping of the form, thereby permitting the immediate re-use of the form parts in the form construction for subsequent stories as the building progresses skyward.

Still another object of the invention is to provide a tie means of the character above which will effect a substantial saving in use of cost of material such as nails and lumber recovered, and in labor in effecting the assembly and disassembly of the forms.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawing accompanying and forming part of the specification. It is understood, however, that variations in the showing made by said drawing and description may be adopted within the scope of the invention as set forth in the claim.

Referring to said drawing:

Figure 1 is a vertical cross-sectional view of an assembled form embodying my improved tie means.

Figure 2 is a cross-sectional view taken substantially on the plane of line 2—2 of Figure 1.

Figure 3 is a perspective view of a portion of the tie means.

In Figure 1 of the drawing there is shown the complete form portion suspended from and surrounding a structural steel I beam 6 such as used at the floor level of a structural steel-concrete building. The form parts include a soffit 7, which may consist of one or more lengths of form lumber supported upon and reinforced by underlying soffit carriers or cleats 8, set in longitudinally spaced relation along the line of the soffit and extending widthwise thereof with the opposite end portions 9 and 11 of the carriers projecting beyond the side edges 12 and 13 of the soffit. Customarily, the carriers 8 are composed of 2" x 4" lumber and support the soffit against bending or cracking by reason of the cross grain mounting of the carriers with respect to the soffit. Means for supporting the soffit 7 and its carriers 8 from the I beam here include a plurality of hanging wires 14 and 16 which are secured at their lower extremities 17 and 18 to metal wedges 19 and 21 underlying and positioned against a soffit carrier 8, and pass up through registering openings in the soffit and carrier and are secured at their upper extremities by wrapping around the top flange 22 of the I beam. In this manner the soffit is supported as shown in Figure 1 in spaced relation to and directly underlying the bottom flange 23 of the I beam.

The side walls 24 and 26 of the form are likewise composed of one or more lengths of form lumber, supported and reinforced by a plurality of vertically extending cleats 27 and 28 which are set in longitudinally-spaced relation along the side walls 24 and 26 so as preferably to register with the soffit carriers 8, upon which the side

walls are supported, whereby the bases of the cleats 27 and 28 rest directly upon the carriers 8. The cleats 27 and 28 customarily support at their upper ends floor joists 29 and 31, which support form lumber 32 and 33, onto which the slab floor of a building may be poured, the entire arrangement providing, as illustrated in Figure 1, for the integral pouring of the concrete floor slab with a concrete beam surrounding the I beam 6.

As will be understood, the weight of the concrete-formed beam within the side walls 24 and 26 and upon the soffit 7 is considerable, and adequate means must be provided for firmly holding the side walls in their abutted position against the sides 12 and 13 of the soffit. This means here includes kickers 34 and 36, commonly composed of lengths of 2" x 4" lumber which are supported upon the outer end portions 9 and 11 of the carriers 8, against the cleats 27 and 28 of the side walls. Heretofore, it has been the practice to nail these kickers 34 and 36 directly to the underlying ends 9 and 11 of the carriers 8. As will be noted, such nailing has to hold in the endwise grain of the carriers and, as hereinabove stated, is frequently insecure, thus permitting the side walls to move outwardly and to open the form. Additionally, the nailing has the other disadvantages hereinabove referred to.

In accordance with the present invention, there is provided on each of the carriers 8 a tie means which releasably engages the kickers 34 and 36 and which in assembled and operating position provides a firm anchorage for the kickers and the bottom of the form, thereby positively preventing the separation of the form walls and the opening of the form. This tie means consists of a pair of metal brackets 37 and 38 which are mounted upon the opposite end portions 9 and 11 of each of the carriers 8 and are firmly secured against separation by means of a connecting tie wire 39, and are additionally formed to receive wedges 41 and 42 which bear against and support the kickers 34 and 36. The brackets 37 and 38 are desirably of identical construction and are each composed of a box-like body section, including spaced side walls 43 and 44 and spaced, transversely extending inner and outer end walls 46 and 47 defining within the enclosure of the walls a centrally arranged rectangular opening 48 adapted to receive one of the wedges 41—42. The body is preferably provided with side channels at both of sides 43 and 44, arranged for mounting upon the side of the soffit carrier at one of its ends 9—11, the double side channel arrangement permitting of left-hand or right-hand mounting, as may be convenient. The channel at side 43 is defined by upper and lower flanges 49 and 51 projecting outwardly from the side 43, and the channel at side 44 is similarly defined by upper and lower flanges 52 and 53, likewise projecting outwardly from the side 44. The depth of the channel, that is, the dimension between the upper and lower flange, is, in the present showing, approximately 2", so as to fit over the side edge portion of a 2" x 4" carrier 8, as illustrated in Figure 2 of the drawing, it being noted from this figure that the bracket 37 is secured to the carrier by the channel at side 44 but that the opposite channel, at side 43, is of similar construction and might be so attached to the carrier opposite in mounting of the bracket to the carrier. Preferably, certain of the flanges and sides are perforated as indicated at 54 so that the bracket may be conveniently secured in place on the carriers by nailing, it being noted, however, that

such nailing is used only to effect convenient location and not to carry any of the applied load, and therefore only small locating nails need be used.

With reference to the drawing, it will be noted that the top flanges 49 and 52 of the bracket are generally aligned in a horizontal plane with the upper end 58 of the inner end wall 46. Thereby such plane defines the top plane of the opening 48 and in mounted position this plane is substantially flush with the top of the carrier 8. As will be seen from Figures 1 and 2, the kickers 34 and 36 are thus positioned directly upon the top flanges 49 and 52 of the brackets and lie directly against the top plane of the opening 48. The outer end wall 47 of the bracket is extended upwardly from the plane of the top flanges 49 and 52 so as to lie in opposed position to the outer face 57 of the kickers, and is sloped upwardly and outwardly as shown in Figures 1 and 3 so as to engage and support one of the tapered sides 58 of the wedges 41 and 42 and position the opposite tapered side 59 of each of the wedges in a substantially vertical plane directly abutting the outer face 57 of the kicker. In this manner, upon driving of the wedges downwardly into the openings 48 of the brackets, the tapered side 59 of the wedges will be advanced inwardly against the kickers 34 to thereby force the latter inwardly against the form side walls and the soffit.

Any suitable means may be used for connecting the tie wire 39 to the brackets 37 and 38. As here shown, the upper end 56 of the inner end wall 46 of each of the brackets is relieved to provide a notch 61 for the end of the wire 39 and a socket 62 for a button 63 fastened to each end of the wire. In the present showing, the socket 62 is of circular form corresponding to a disc-shaped button 63 which is fitted into the socket, and the majority of the periphery of the socket is located below the top 56 of the end wall, so that the button is firmly locked into the socket against vertical displacement when under load. Also desirably, the attachment of the wire to the bracket is effected in general alignment with the opening 48 and the wedge, so that the wire will be subjected to a straight longitudinal tension when placed under load.

As will be understood, the addition of the tie means of the present invention to the carrier is solely to take up the spreading load of the side walls, normally applied to the soffit carriers as a tension stress, and to relieve the carriers of this tension stress. The conventional 2" x 4" carrier and its rigidity to bending deformation is retained, and the tie means co-acts therewith in throwing the full spreading force onto the tie wire 39 as a purely tensional strain. In this manner, the strength and rigidity of the usual carrier to bending or beam action is fully retained, together with the other inherent advantages of the presently described type of form construction, and the tie means of the present invention overcomes the weaknesses heretofore present, as well as supplies the various advantages of ease and facility of assembly and disassembly above noted.

In operation, the soffit 7, its carriers 8, the hanging wires 14 and 16, the brackets 37 and 38, and tie wire 39 may be bench-assembled and elevated into position under a structural steel beam to be concreted. The pre-assembled side walls 24 and 26 and the kickers 34 and 36 may then be elevated into position at the opposite sides of the soffit and onto the opposite ends of

the soffit carriers, as illustrated in Figure 1 of the drawing. The workman then only needs to drop the wedges 41 and 42 into the bracket wedge-receiving openings 48 and drive the wedges home, as shown in Figure 1, in order to complete the assembly. The form thus constructed and supported is positively locked together against separation, and will take a very great load of concrete with a large factor of safety. After setting of the concrete, the form may be rapidly and easily stripped by merely knocking out the wedges 41 and 42 and removing the various form sides as a unit, and without in any mutilating the lumber therein. These form sides are then immediately available for re-use in the upper stories of the building as construction progresses skyward.

I claim:

1. A beam form kicker tie comprising, a pair of metal brackets formed for attachment to the opposite ends of a soffit cleat, a tie wire secured to and connecting said brackets against separation, each of said brackets being formed with a wedge receiving slot, and wedges mounted for movement in said slots, said brackets being formed with means to support one side of said wedges with the opposite side of said wedges presented for bearing against form kickers on said soffit cleats.

2. A beam form kicker tie comprising, a pair of metal brackets each defining a channel for fitting over and under and against a side of a soffit carrier with the top of said bracket substantially flush with the top of said carrier for support of a kicker in substantially the plane of a soffit on said carrier, a tie wire secured at its opposite ends to said brackets, and extending parallel to the longitudinal axis of said channel for supporting said brackets against separation on said carrier, and wedge receiving and supporting portions formed on said bracket substantially aligned with said wire and each constructed to present a wedge for bearing support against the kicker mounted on the top of said bracket.

3. A beam form kicker tie comprising, a pair of metal brackets having top and bottom flanges spaced to define a channel to embrace the sides of a 2" x 4" soffit cleat adjacent the opposite ends thereof and each being formed with a vertical opening therein for receipt and displacement of a wedge with the tapered faces of the wedge being substantially vertically arranged and in planes substantially perpendicular to the longitudinal axis of said channel, and a tie wire secured at its opposite ends to said brackets independent of said wedges for supporting the latter against separation on said soffit cleat.

4. A beam form kicker tie comprising, a pair of metal brackets each formed with a box-like central opening having an outer inclined side for receipt and support of one side of a wedge and each formed with a side channel having a longitudinal axis perpendicular to said inclined side embracing the sides of a soffit cleat adjacent one end thereof, and a tie wire connected at its end to said brackets in substantial alignment with said inclined side for securing said brackets against separation on said soffit cleat, said inclined side being arranged to present a relatively tapered side to a wedge for adjustable pressing against a kicker mounted on the top of said bracket at said opening.

5. A beam form kicker tie comprising, a pair of metal brackets each composed of a body of box-like section formed with spaced side walls

and spaced transversely extending inner and outer end walls defining a vertical opening therebetween for receipt and vertical displacement therein of a wedge having tapered sides opposed to said end walls, the outer of said end walls extending above the top plane of said opening and sloping upwardly and outwardly with respect thereto for support of the outer of said tapered sides of said wedge, one of said side walls being formed with vertically spaced flanges for engagement with the sides of a soffit cleat adjacent one end thereof, and a tie wire secured at its opposite ends to said inner end walls of said brackets for securing said brackets against separation on said cleat.

6. A beam form kicker tie comprising, a pair of metal brackets each formed with spaced side walls and spaced transversely extending inner and outer end walls defining a vertical wedge-receiving opening therebetween, upper and lower transversely extending flanges on one of said side walls formed to embrace the sides of a soffit cleat adjacent one end thereof, the upper of said flanges being substantially aligned with the top plane of said opening, the outer of said end walls extending above said plane and sloping upwardly and outwardly with respect to said opening for supporting a tapered side of a wedge mounted in said opening, the inner of said end walls being formed with a socket, and a tie wire having the opposite ends thereof engaged and secured in said sockets and supporting said brackets against separation on said soffit cleat.

7. In a form construction for a concrete beam, a wooden soffit of elongated form, a plurality of elongated wooden soffit carriers secured to the under side of said soffit and extending transversely thereof with the opposite ends of said carriers projecting from the opposite sides of said soffit, the grain of said carriers running substantially lengthwise thereof, form side walls mounted on said carriers on the opposite sides of said soffit and extending lengthwise thereof, metal brackets mounted on the opposite ends of said carriers, kickers mounted on said carriers between said side walls and said brackets, a tie wire connecting the brackets on each carrier against separation lengthwise of said carrier, and wedges engageable between said brackets and kickers for supporting said side walls against the sides of said soffit.

8. In a form construction for concrete encasement of a structural steel beam, a wooden soffit of elongated form adapted to underlie said beam in spaced relation, a plurality of elongated wooden soffit carriers secured to the under side of said soffit in longitudinally spaced relation and extending transversely of said soffit and arranged with the opposite ends of said carriers projecting from the opposite sides of said soffit, form walls mounted on said carriers at the opposite sides of said soffit and extending lengthwise thereof, a plurality of metal brackets each formed with side flanges adapted to engage a side of one of said carriers adjacent an end thereof, kickers mounted on said carriers between said side walls and said brackets, a tie wire connecting the brackets on each carrier against separation lengthwise of

said carrier, and wedges engageable between said brackets and kickers.

9. For use in holding in assembled relation a form for a concrete beam having a soffit forming the bottom of and extending lengthwise of the form and soffit carriers secured to the under side of and extending transversely of the soffit and form side walls mounted on the carriers on the opposite sides of the soffit and kickers mounted on the carriers on opposite sides of the side walls for retaining the bases of the side walls against the opposite longitudinal sides of the soffit, metal bracket means formed for detachable mounting on a carrier outside of the kickers and having portions adapted to interlock with the carrier to prevent relative rotative displacement in the plane of the length of the carrier, tie means connecting said bracket means against separation longitudinally of the carrier, said tie means being so positioned with relation to said bracket means as to lie below said soffit when assembled, and manually adjustable means carried by one of said bracket means and adapted to engage with a kicker for urging the latter against a form side wall to forcibly clamp the form side walls and the kickers against the opposite longitudinal sides of the soffit.

10. For use in holding in assembled relation a form for a concrete beam having a soffit forming the bottom of and extending lengthwise of the form and soffit carriers secured to the under side of and extending transversely of the soffit and form side walls mounted on the carriers on the opposite sides of the soffit and kickers mounted on the carriers on opposite sides of the side walls for retaining the bases of the side walls against the opposite longitudinal sides of the soffit, metal bracket means formed for detachable mounting on a carrier outside of the kickers and having portions adapted to interlock with the carrier to prevent relative rotative displacement in the plane of the length of the carrier, tie means connecting said bracket means against separation longitudinally of the carrier, said tie means being so positioned with relation to said bracket means as to lie below said soffit when assembled, one of said bracket means being formed with a wedge supporting face adapted to be positioned in spaced opposed relation to the outer face of a kicker for the insertion and driving therebetween of a wedge for forcibly clamping the form side walls between the kickers and the opposite longitudinal sides of the soffit.

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