Jan. 28, 1964 J. M. DEALY ETAL 3,119,635

H-BEAM PILE CONNECTORS

Filed Jan. 23, 1962

Fig. 1

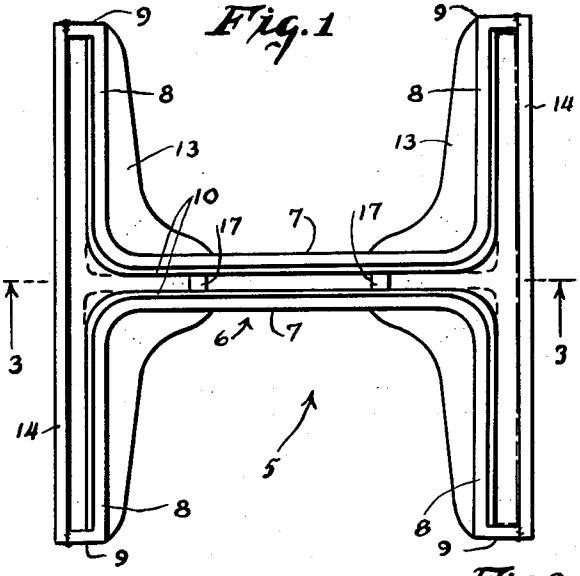


Fig. 2

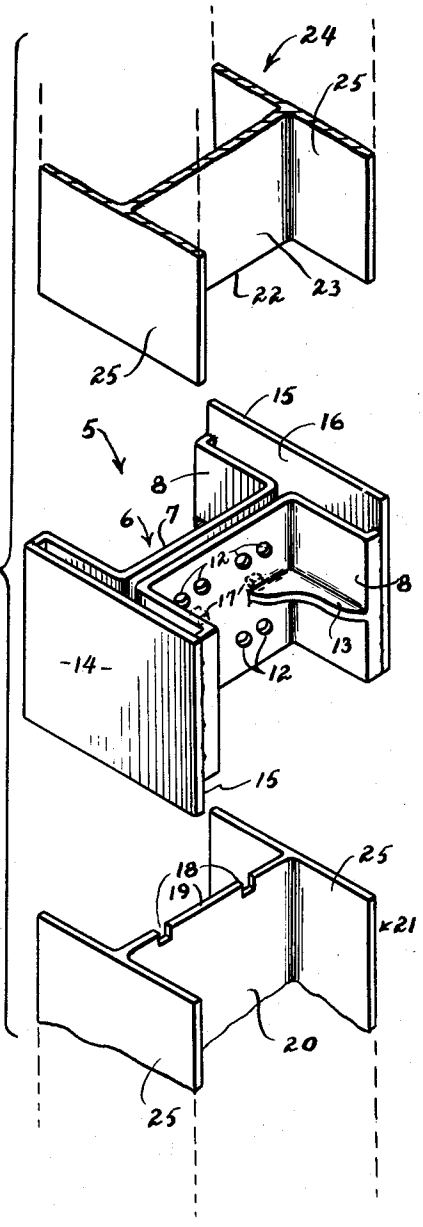


Fig. 3

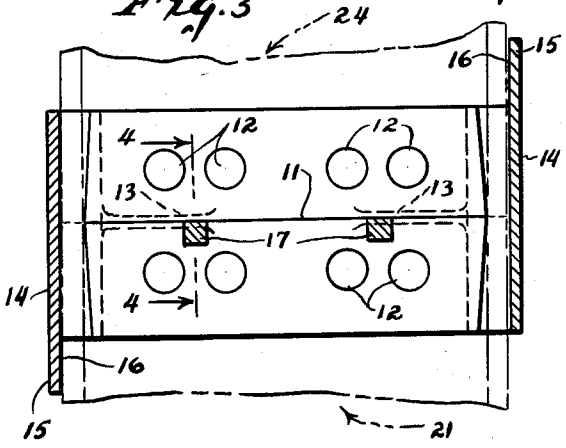
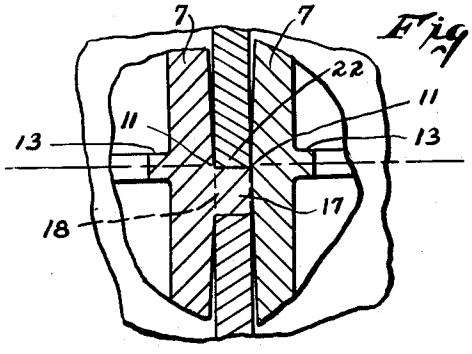


Fig. 4



INVENTORS
ARTHUR A. GREEN
JOHN M. DEALY

BY Edward G. Rose

ATTORNEY

United States Patent Office 3,119,635 Patented Jan. 28, 1964

3,119,635

H-BEAM PILE CONNECTORS

John M. Dealy, Port Washington, and Arthur A. Green, Scarsdale, N.Y., assignors to Albert Pipe Supply Co., Inc., Brooklyn, N.Y., a corporation of New York

Filed Jan. 23, 1962, Ser. No. 168,050
5 Claims. (Cl. 287—108)

Generally the invention relates to structural foundations and specifically it comprehends a connection or splice for H-beams used as bearing piles.

Many types of piles are employed in construction work depending on the material which is met while driving the sections of pile. Some of these are:

(1) Stepped tapered pile
(2) Tapered fluted piles
(3) Cased concrete pile
(4) H-section steel pile

Our invention pertains to the last mentioned kind of pile, known as H-beam because of its cross section, and it is employed where penetration in certain material is required. The H-beams may be of as much as sixty feet (60') in length and when they are driven to about ground level, another length must be put in the leads of the pile driver, positioned over the section that has been driven and spliced to the driven section in end-to-end relationship by welding or other means. Welding has the disadvantage of requiring one or more full-time welders on the job, and the splice made in this fashion is time consuming and expensive in labor costs.

We have invented an H-beam connector or sleeve which splices the driven and to be driven H-beams in the matter of a few seconds without welding and in which the sections are coupled to form a homogenous bearing pile, with the beam ends butting together to transmit the driving force of the pile driver directly from one beam to the other with no intermediate member interposed or involved.

Some of the advantageous results achieved by our H-beam connector or coupling are:

(1) End-to-end bearing of the sections of H-beams, the ends butting together with the top of one H-beam contiguous with the bottom of another within the H-beam connector.
(2) A continuous column of the same metal material in the resulting foundation pile.
(3) Continuous alignment of the H-beam webs and flanges accompanied by the peripheral sleeve and interference fit of the H-beam connector.
(4) The butt ends of the H-beam can be coupled without the expensive welding operation and in minimum time.

These and other manifest advantages will be apparent.

Briefly described our H-beam connector comprises a peripheral sleeve which encompasses all the web and flanges of the adjacent ends of the sections of the bearing pile. There are provided two integral lead extensions on one of the upper and lower edges of the connector to facilitate the operator's guiding of the butt ends of the H-beam sections into the sleeve. The usual procedure, though not necessarily the one which every operator will follow, is: as soon as the lower H-beam section has been driven into the ground he will position the H-beam connector on top of the driven beam, then pick up the next section of pile in the leads and place lower end into the top of the connector; with the first few blows of the hammer the adjacent ends of the H-beams are positioned in end-to-end relationship to form a homogeneous length of pile without the interpositioning of any metal of different specification between the pile lengths. In driving H-beam

pile the sleeving ends of the H-beams may not and often do not identically match, there may be misalignment, skewing, and to correct this condition of the butting ends we have produced in the connector what we entitle "interference fit" which is in conjunction with the continuous peripheral sleeve around the adjacent ends of the pile sections, achieves continuous alignment of the webs and flanges of the H-beams without distortion of the sleeve. There is also virtually a complete void through the connector except for a pair of lugs or ledges in the central section of the lower half of the sleeve to prevent it sliding up or down the column, and one end of each H-beam has a pair of slots to receive said lugs.

Our H-beam has been rigidly tested by a leading test laboratory and authenticated to be superior to non-welding pipe sleeve currently employed in foundation pile and that it is feasible to use our H-beam sleeve for joining the H-beams instead of the welding process currently employed.

In the drawings:

FIG. 1 is a top elevation of our H-beam connector.

FIG. 2, an exploded perspective view of the connector together with the top of one H-beam and the bottom of another which are to be coupled during the pile driving.

FIG. 3, a section taken through line 3—3 of FIG. 1.

FIG. 4, a fragmentary sectional view taken on line 4—4 of FIG. 3.

It is understood that like numbers denote like parts and the invention may be variously referred to as a connector, sleeve or splice.

The connector 5 includes a pair of similarly dimensioned U-shaped channeled frames 6, arranged in back to back spaced relationship and having bases or webs 7, laterally extending flanges 8, with abruptly and outwardly angled flanges 9. The inner facing walls 10 of webs 7 are tapered small to bottom, that is constrained inwardly toward the midsection 11 of connector 5 from the top and bottom of the webs 7 as depicted in FIGS. 1 and 4, while the outer surfaces of the flanges are similarly tapered—see FIGS. 1 and 3.

A plurality of pairs of cylindrical openings or uplift holes 12 are formed in the upper and lower medial regions of the web 7. As best shown in FIGS. 1 and 2, integral bracings 13 are formed in opposite corners of each of the U-shaped frames 6 at the midsections thereof, extend across the flanges 8 and partially across the webs 7. These braces 13 are designed to raise the section modulus of the H-beam connector sufficiently high enough to cause the flanges of the mating H-beam to be cold formed into alignment with each other. Bracings 13 also minimize the distortion due to the high welding heats required in assembling the H-beam sleeve.

Our H-beam connectors frames 6 may be fabricated of steel castings or equivalent material and in assembling a pair of plates 14 are welded or otherwise secured to the outer ends of flanges 9 and said plates have integral extensions 15 extending above and below the connector 5 whose inner faces 16 are adapted to initially assist in guiding as lead edges the end of the to-be-driven H-beam into the connector. The whole assembly forms an integral peripheral sleeve adapted to encompass the web and flanges of the butting ends of H-beams.

Integral with the inner face 10 of one of the webs 7 are formed a pair of transversely extending lugs 17, welded to the adjacent face of the companion web 7 with the top of the lugs 17 coinciding with the center of the connector 5.

To receive the lugs 17 a pair of notches or slots 18 are formed in the top 19 of one end of the web 20 of the H-beam section 21 while the lower end 22 of web 23 of H-beam section 24 is not notched, and each of these H-beam sections have flanges 25.

In practicing our invention, the connector 5 is fitted over the driven H-beam 21 with the bottom of the to-be-driven beam 24 guided into the sleeve initially assisted by the lead edges or faces 16 of extension 15. With the walls of the frame constrained inwardly from the opposite outer ends toward the center of the connector, a compression or "interference" fit is provided and with the first few blows of the hammer on the to be driven pile section the ends of the pile butt together as illustrated in FIG. 3 and are seated within and encompassed by the sleeve, with the lugs or ledges 17 fitting in notches 18 preventing the connector from sliding down the column.

With the walls of the frames encompassing both the webs and flanges of the butting ends of the pile sections oppositely tapered toward the center, misalignment and reasonable differences in commercial tolerances of the H-beams are corrected and the pile sections aligned upon the application of pressure and force to the beam section last inserted into the sleeve. The diameter of the openings at the opposite ends ofthe sleeve are greater than the opening or chamber in the center or midsection II with all surfaces in the walls of the chamber bearing tightly against the corresponding surface of the butting ends of the H-beams as illustrated in FIGS. 3 and 4.

One outstanding feature of our invention, to repeat, is that the pile sections which are usually fabricated of steel, are coupled together in the connector with the ends butting together within the peripheral sleeve, thus transmitting the driving force of the pile driver directly from one beam to the other with no intermediate member or material involved. A continuous column of inherent strength and rigidity is formed and the coupling is produced without welding. The pile connector was tested under the most rigid conditions and found eminently satisfactory as a non-welding coupling for joining the pile sections eliminating the costly and time consuming welding conventionally practiced for H-beam pile construction. And the compression or "interference" fit accomplishes continuous alignment of the pile sections, with the lead edges of the the plates facilitating guiding the H-beam butt ends into the connector chambers. The "interference" fit which will align the two H-beam sections and not distort the sleeve is insured by giving the sleeve section an appreciably higher section modulus than the H-beam; this is accomplished principally by bracing 13.

Under certain conditions it may be advisable to utilize the openings or uplift holes 12 and insert bolts through these and holes fired through the webs of the H-beams to lock the butt ends together.

While but two H-beams and one connector are illustrated in the drawing, additional units can be employed during the driving operation.

It is understood that modifications may be made in the fabricating, material proportions and arrangement without departing from the scope of the invention, as defined by the claims.

We claim:

1. In combination with two superimposed metal H-beams in end-to-end relationship, a connector comprising an H-shaped sleeve with a continuous periphery, having integral braced web and flange sections enclosing the H-beam webs and flanges of the adjacent butt ends of the H-beams, said sleeve having a continuous channel therethrough with the sleeve converging inwardly from the opposite outer ends toward the center of the connector, forming a restricted section in the central portion of the sleeve, providing a close fitting between the sleeve and the end portions of the webs and flanges of the butting H-beams, one of the flange sections of the connector having an upwardly extending outside integral extension, the other flange section having an outside downwardly extending integral extension, said extensions for guiding the butt ends of the pile sections into the sleeve, means between and integral with the webs in the channel of the connector and extending downwardly from the mid-section

thereof engageable by the lower H-beam to prevent the connector from sliding down the lower H-beam during the driving operation and to ensure the H-beams butt together in the restricted section, the continuous channel through the sleeve providing end-to-end bearing of the sections of the H-beams, the ends thereof butting together with the top of one H-beam contiguous with the bottom of another H-beam within the H-beam connector, forming a continuous column of the same metal material in the resulting foundation pile.

2. In a foundation pile the combination of two superimposed metal H-beams in end-to-end relationship including a connector comprising

(*a*) an H-shaped sleeve with a continuous periphery having integral centrally braced web and flange sections enclosing the H-beam webs and flanges of the adjacent butt ends of the H-beams,

(*b*) said sleeve having a continuous channel therethrough with the sleeve converging inwardly from its opposite ends toward the center of the connector forming a restricted section in the central portion of the sleeve providing a close fitting between the sleeve and the butting H-beams,

(*c*) one of the flange sections having an upwardly extending outside integral extension,

(*d*) the other flange section having a downwardly extending outside integral extension,

(*e*) said extensions for guiding the butt ends of the pile sections into the sleeve,

(*f*) a plurality of ledges across the channel of the sleeve,

(*g*) notches in one of the webs of the butting H-beams for receiving the ledges of the sleeve,

(*h*) the butting ends of the superimposed H-beams being contiguous with each other in the sleeve forming a continuous column of the same metal material in the foundation pile,

(*i*) the butting ends of the H-beams joined in end-to-end relationship within the sleeve.

3. In a foundation pile, an H-shaped sleeve with a continuous periphery for joining the butt ends of driven and to be driven metal H-beam pile sections including:

(*a*) a pair of U-shaped channeled frames each having a web and a pair of integral flanges respectively, a pair of abruptly angled flanges at the outer ends of said flanges,

(*b*) the channeled frames arranged back-to-back, with the channels facing away from each other,

(*c*) a pair of plates, each welded to and across the free ends of and joined to a respective pair of the angled flanges,

(*d*) one of the pair of plates having an integral extension extending above the plane of the upper edge of the flange and the other of the pair of plates having an integral extension extending below the plane of lower edge of the flange,

(*e*) a pair of ledges between the webs of the channeled frames below the centerline of the sleeve,

defining a continuous channel through the connector between the webs and flanges with a convergent exteriorily braced section in the center of the connector to receive the webs and flanges of the butt ends of the pile sections with the ledges acting as a stop for one of the butt ends, the pile sections joined within the sleeve forming a continuous column of foundation pile of the same metal material.

4. An H-shaped connector for joining the butt ends of H-beam pile sections including

(*a*) a pair of U-shaped channeled frames each having a web and a pair of integral flanges, an abruptly angled flange on the outer end of each of said flanges,

(*b*) the channeled frames arranged back-to-back with the channels facing away from each other,

(*c*) a pair of plates, each welded to and across the free ends of and joined to a respective pair of the angled flanges,

(*d*) one of the plates having an integral outer extension extending above the upper ends of the webs and flanges and the other plate having an integral outer extension extending below the lower ends of the webs and flanges.

(*e*) a pair of ledges between the inside walls of the webs,

the connector defining a central opening therethrough with a narrowed section in the center of the connector to receive, enclose and join the webs and flanges of the adjacent butt ends of the superimposed pile sections, one of the webs of the butting ends having slots to receive the ledges of the connector.

5. A connector as defined in claim 4 wherein the facing walls of the webs of the channeled frames are tapered from the opposite ends toward the central portion of the connector and the outer walls of the flanges of the frames are similarly tapered to define two openings within the connector providing an interference fit for the H-beam webs and flanges of the abutting sections.

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