A connector claw

Field of the Invention

This invention belongs to the field of connectors and connecting vertical, horizontal and /or diagonal members.

Background of the Invention and Prior art

The available connectors suffer from the disadvantages of containing plurality of individual components, wherein loose fittings or inadequate tightening of the components could result in instable assembled structures, multiple screws requiring tightening at a regular interval, or usage of rapidly corrodible material of connectors, or requirements of extensive fabrication methods or even limitations on the shape and size of structures assembled using them. Specialized tools are required for installing and dismantling the assembled structures. Further, there exist practical difficulties in replacing worn out components of the connectors and structures, and there are high maintenance and transportation costs involved. In addition, prescribed safety and building up standards for connectors vary with country – depending upon the local prescribed requirements issued by the local authorities. For example, a European standard may not be feasibly used in Asia and vice versa.

The present invention provides a robust connector along with a method for assembling and disassembling structures that overcomes the above-mentioned disadvantages of the prior art.

Summary of the Invention

The present invention provides a connector comprising a C-shaped holder (C-holder) attached to, preferably welded, on to the open mouth of horizontal and / or diagonal members. The fitted components of the connecting members eliminate requirements for

tightening several nut-bolts or screws that may loosen up with time and use and thereby render the structure unsafe for use. The material used in the invention is hot-dipped galvanized in order to reduce rate of corrosion. Erecting, dismantling, and replacing of worn out parts, storing of the scaffold members, etc can be done easily using basic tools that are normally available on construction or installing sites. The connecting means may be used by workers even with a very basic knowledge of assembling structures and no specialized training on aligning components, etc of the invention is required. The afore-mentioned user-friendly aspects of the invention make it considerably cost effective in terms of labour requirements and provide users with hassle free structures and a total ease of mind.

According to one aspect of the present invention, the invention provides a connector, comprising: a back portion, an upper arm extending from the top of the back portion, a lower arm extending from the bottom of the back portion, the top portion having a tongue with a notch, extending downwardly from its distal extent, and the connector with slots provided in its upper and lower arms to receive a wedge.

In a preferred embodiment, the invention provides a connector as disclosed above, wherein the width of the slots in the upper and lower arms correspond with the width of the wedge passing through them.

In an another preferred embodiment, the invention provides a connector as disclosed above, wherein the width of the slot in the upper arm is less than the width of the slot in the lower arm.

In a still another preferred embodiment, the invention provides a connector as disclosed above, wherein the slots extend from the back portion towards a downwardly protruding tongue in each of the upper and lower arms respectively.

In a further preferred embodiment, the invention provides a connector as disclosed above, wherein the tongue extending downwardly from the top portion includes a notch.

In a still further preferred embodiment, the invention provides a connector as disclosed above, wherein the back portion is adapted to support accessories such as lifeline.

In a yet further preferred embodiment, the invention provides a connector as disclosed above, wherein the accessories attached to the back portion are one or more hinge means.

In a further another preferred embodiment, the invention provides a connector as disclosed above, wherein the lower arm is having a tongue extending downwardly from its distal end.

In a still further preferred embodiment, the invention provides a connector as disclosed above, wherein the lower arm is broadened at its distal end or retained without broadening.

In a yet further preferred embodiment, the invention provides a connector as disclosed above wherein the upper arm of the connector is deformed on two opposite side edges thereof, with downwardly protruding tongue, which is assembled position, co-act with the outer surface of a support on vertical member.

In a still further preferred embodiment, the invention provides a connector as disclosed above wherein the downwardly protruding tongue extends into the support on a vertical member.

In a yet further preferred embodiment, the invention provides a connector as disclosed above is C-shaped.

In a still further preferred embodiment, the invention provides a connector as disclosed above is with a wedge passing through the slots in upper and lower arms.

In a yet further preferred embodiment, the invention provides a connector as disclosed above is attached onto the open mouth of a horizontal or substantially horizontal member.

According to a second aspect of the present invention, the invention provides a connector for connecting vertical, horizontal and/or diagonal members, comprising: a connector as disclosed above and a wedge, the wedge being shaped to have a first end which is larger than a corresponding dimension of the slot in the upper arm of the connector so that it cannot pass through it and an opposite end which is sized so as to freely pass through the slot in the lower arm of the connector whereby the wedge can be hammered into and out of position to retain the connector and wedge assembly against a support positioned between the wedge and back portion of the connector.

According to a preferred embodiment, the invention provides an assembly as disclosed in the above-mentioned paragraph, wherein the wedge is adapted to fit within upper slot and the notch provided in the upper arm of the connector, when it is not located within the tongue slot.

According to a further preferred embodiment, the invention provides an assembly as disclosed in the above-mentioned paragraphs, wherein the wedge tapers over at least part of its length.

According to a still further preferred embodiment, the invention provides an assembly as disclosed in the above-mentioned paragraphs, wherein the wedge is bent to have a lower part which forms a non-zero angle with an upper part.

According to a yet further preferred embodiment, the invention provides an assembly as disclosed in the above-mentioned paragraphs, wherein the wedge comprises an obstructing portion provided at or to its lower end preventing the wedge from being removed upwardly when inserted through the slot in the upper arm.

According to a still further preferred embodiment, the invention provides an assembly as disclosed in the above paragraph, the obstruction is an integral or a non-integral component.

According to yet further preferred embodiment, the invention provides a connector assembly as disclosed in the above-mentioned paragraphs, including one or more supports provided on at least one vertical or substantially vertical member for receiving the connector and wedge.

According to yet further another preferred embodiment, the invention provides an assembly as disclosed in the above-mentioned paragraph, wherein each support is a square or rectangular holder.

According to still further another preferred embodiment, the invention provides an assembly as disclosed in the above-mentioned paragraph, wherein each support is trapezoidal.

According to still further another preferred embodiment, the invention provides an assembly as disclosed in the above-mentioned paragraph, wherein the supports are provided on vertical or substantially vertical members and the connectors are affixed to the horizontal or substantially horizontal members.

According to yet further another preferred embodiment, the invention provides an assembly as claimed in the preceding claims, wherein the connectors on horizontal or substantially horizontal members and supports on vertical or substantially vertical members are engaged to achieve a connection of the horizontal or substantially horizontal members and the vertical or substantially vertical members.

According to yet further another preferred embodiment, the invention provides a structure achieved using assembly as disclosed in the above-mentioned paragraph.

The invention provides a robust connecting means comprising a C-holder, preferably welded, onto the open mouth of the horizontal and / or diagonal member, wherein the C-holder is slotted on its two arms for a wedge, that is slotted in the narrow slot of the upper arm and freely dangles around a pin, screw, bolt and or nut, pre-casted / forged or

any similar molded or pre-casted in-built obstruction allowing it to freely dangle from the upper arm, but preferably a rivet, fitted on its narrow distant end.

Further, the two arms of "C" are bent to provide a centrally disposed bifid or notched tongue from the upper arm and a short downward tongue from the lower arm. The corners of the upper arm around the tongue are deformed to provide a safe and easy fitting and alignment with the vertical members when connected. The slot on the upper arm cuts through the upper back portion of C just above the joint or welding of the back of "C" on the horizontal and / or diagonal member, including the entire width of the upper arm including upper part of the tongue. The lower arm of "C" provides slot that is wider than that on the upper arm and extends on the bent part of the tongue. The wide slot allows for unobstructed, easy and convenient movement and fall of wedge in the upper and lower slots even if there is slight deviation. The various dimensions of the C-holders are carefully determined such that it can withstand and distribute load and pressure on it evenly around the surface when in use and provide stability and rigidity to the structure.

The notch in the upper arm of C-holder allows a lot of space for the free movement of wedge in between the two slots in C-holders and replacement of the worn out wedge and components around it easily. Installation and dismantling of structure does not require sophisticated instruments for the purpose of assembling and disassembling structure. Further, bracing is provided to prevent connected members from swaying, bending in a particular direction and to assist in erecting upright structure.

Further, the notch may prevent occasional / accidental slip-offs during the positioning of a C-holder inside the cavities of a square holder by becoming stuck along the notch portion, which may, otherwise, cause injury to the hands and legs of the workers. The C-holder may also become stuck on the walls of the square-holder along the notch and prevent fall of heavy members with C-holders. Similarly, overshooting the C-holders may also cause the holder to become stuck with the engaging member along the notch portion. The holder with the notch therefore may act as an additional safety element. The

notch also cuts down the weight of the C-holder so that handling of the holders becomes easier.

The invention provides vertical members that are preferably welded on with two pairs of square-shaped holders (square-holders) with slightly tapering outer walls. The two members of each pair are welded in directions opposite to each other. The two pairs are set in alternate arrangement with respect to each other.

The invention provides that two pairs of square holders are set close to each other thereby forming a junction of four square-holders. A vertical member may contain plurality of such junctions. Distances between such two junctions are variable depending upon the requirements. Such an arrangement is useful in evenly distributing the load and pressure load on the members and securing a stable and rigid configuration.

The invention provides a wedge with a crooked or angular distal end. The distal end portion is fitted preferably with a rivet or similar obstructions facilitating locking of the wedge in the slots of C-holders and allowing it to remain in position until removal is desirable. The lower portion of the wedge is narrow and crooked while the upper portion is wide with a broad flat head facilitating locking of the wedge and limiting the total length of wedge going inside the two slots in the upper and lower arms of C-holders, and tightening of the wedge by hammer blows.

The invention provides that the connector and connecting members are hot-dipped galvanized material in order to prolong the life-span of material against corrosion.

The invention provides a connection of the horizontal, vertical and / or diagonal members that is achieved by erecting at least two vertical members with square-holders at required distances holding horizontal/diagonal member with C-holders, preferably welded, onto the two slots in between the two vertical members and moving the horizontal and / or diagonal member (with C-holders) upside down in order to free up the wedge so that it can fall freely in the wide slot of the lower arm, turning the horizontal member back into

the original position, placing upper arm of the C-holder into the upper broad end of the square-holder on the vertical members on either side of the horizontal and / or diagonal member, allowing the wedge to freely and automatically fall inside the square-holder of the vertical member and pass through the square-holder and lower slot on the C-holder. The wedge is then hammered tight into the two slots of the C-holders. Such coupling of holders involving vertical, horizontal and/or diagonal members provides the required grip on the components. Connection can be disconnected by hammering wedge upward.

The invention provides a connector for scaffold members or like that satisfies the prescribed standard requirements for scaffoldings in Singapore (SS280:2006 specification for modular metal scaffolding.)

The invention requires that the material is hot-dipped galvanized on the finished products, hence increases the life span of material and thereby makes the structure and work cost-effective.

The connector is versatile with a wide range of possibilities. The subject invention can be used in construction including construction of buildings, ships, reservoirs, supporting frameworks, bed-frames, racking systems, grand stand, amphibious sitting, false works, concert stage, temporary roofing, tower, temporary lighting, temporary safety barricading, light weight bridges or for assembling easily dismountable structures.

The invention provides a C-holder with its functional slots and wedge plate preferably welded onto the open mouth of horizontal and / or diagonal member, and its connection with the square-holders on vertical members.

Further scope of the applicability of the present invention will become apparent from the detailed description given hereafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the

art from this detailed description.

Brief Description of Drawings

The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limitive of the present invention, and wherein:

Figure 1: An elevational view of connecting means assembly in accordance with the invention.

Figure 2: A plan view of the square-shaped holders on a vertical member.

Figure 3: Different perspectives of a C-holder and accessories.

Figure 4: Three-dimensional perspectives of the wedge.

Figure 5: A close-up of C-holder, wedge on horizontal scaffold member and operation of the wedge.

Figure 6: A close-up of square-holders on a vertical scaffold member.

Figure 7: Positioning of several square-holders on vertical members.

Figure 8: Positioning of several C-holders on vertical members.

Figure 9: Photographs depicting the method of connecting a C-holder with a square holder.

Figure 10 depicts an alternative fixation of C-holders on horizontal pipe achieved using nut and bolts.

Figure 11: Application of the invention in constructing a grand stand.

Figure 12: Front view of the grand stand erected using the invention.

Detailed Description of Preferred Embodiments

The figures depict the various embodiments of the connecting means on horizontal / diagonal and vertical members.

Figure 1 depicts the connection assembly of the subject invention. More particularly, the figure shows two connected assemblies on a vertical member (14) involving a pair of square-holders (10), and a junction or cluster (12) of the square-holders attached to the vertical member (14), preferably by welding.

Figure 2 presents a cross-section view of a vertical member just above the junction (12) and along the line of marking indicated on the vertical member. The symmetrical arrangement of square-holders (10) around vertical member (14) on a junction evenly distribute load and pressure arising due to couplings of C- and square-holders.

C-shaper holders on horizontal and / or diagonal members

Figure 3 depicts different perspectives of the C-holder (100) along with some of the accessories. The figure depicts with two arms (50 and 52). Upper arm (50) has slot (54) in the center, running along its width for wedge (32) to pass through it, extending on the upper backside of "C" just above its joint, preferably by welding, on the open end on horizontal and / or diagonal member (20) and on the upper part of the centrally disposed tongue (40). Similarly, lower arm (52) has slot (56) for receiving wedge (32). The back (60) of the holder is attached to horizontal and / or diagonal member (20), preferably by welding.

Slot (56) in lower arm (52) is wider than slot (54) on the upper arm. This is to allow a

free fall of wedge (32) into the slots even when there is slight deviation on the path of the wedge while connecting.

Further, the two arms of "C" (50, 52) are bent to provide a centrally disposed bifid or notched tongue (40) from the upper arm and a short tongue (42) from the lower arm. The tongue is notched or bi-fid in center to provide a notch (90). The notch (90) is used to allow free movement of wedge (32) in the slots before it easily fall through the slots (54) and (56) of arms (50 and 52) and even when there is deviation on its path. The corners of the upper arm around the tongue (40) are deformed to provide easy fitting and close alignment with the periphery of vertical members (14) in connected position. The slot on the upper arm cuts through the upper back portion of “C” just above the joint or welding of the back (60) of "C" on the horizontal and / or diagonal member (20), including the entire width of the upper arm (50) including upper part of the tongue (40). The lower arm of "C" provides slot (56) that is wider than that (54) on the upper arm and extends on the upper bent part of the tongue (40). The wide slot (56) allows for unobstructed movement and fall of wedge in the upper and lower slot even if there is slight deviation. The various dimensions of the C-holders are carefully determined such that it can withstand and load and distribute pressure on it evenly around the surface when in use and provide stability and rigidity to the structure.

The lower arm (52) bends to provide a short tongue (42). In connected assemblies, tongue (42) is pressed against at substantially 90 degree, ie, perpendicular to vertical member (14) and helps in evenly distributing load and pressure, and provides basal support to the connected structure.

Figures 10 (a) and (b) depicts an alternative fixation of C-holders on horizontal and /or diagonal pipe achieved using other means of attachments, such as nut and bolts (400). A prefix of number “3” have been added to reference numerals in order to distinguish the alternative C-holder shown in this Figure from that of Figure 3.

The inner side of the back (60) of C-holders is provided with a raised area (200) which

comes in direct contact with the square holder when hammering the wedge (32) into the slots (54 and 56).

The outer side of the back portion may support accessories, such as lifeline (500) for extra safety or hinge means (501) for applications such as cantilever, truss, hoisting, barricades, gantry purposes, ropes and similar applications.

Square holders on vertical member

Two pairs of square-shaped holders (10), with members in a pair attached on the either and opposite sides, ie, such that they face each other, are attached to vertical members, preferably by welding. The incrementally expanding u-shaped cavities (16) of each member face that of the other member of the pair. The square holders (10) are placed and spaced symmetrically, around the periphery of the vertical member (14). Two such pairs are attached on each junction (12). Members of a pair are attached in alternate arrangement with respect of members of another pair. A vertical member (14) may contain plurality of such junctions (12). Depending upon the requirement, the distances between junctions (12) may be altered to provide versatile structures (Figure 5).

Each square-holder has three flat sidewalls (4, 5, 6). The outer sidewall (5) slightly and gradually slopes, but does not taper, towards the centre of vertical member (14). The slope descends from top to bottom. The tapering sidewall reduces the area of cavity (16) at the bottom. The dimensions of engaging sidewalls 4 and 6 are adjusted accordingly. The resultant holder provides stability and rigidity of grip when connected.

The above-described arrangement of square holders (10) on vertical members evenly distributes load and pressure on each holder and provides required stability and rigidity to the entire structure.

The Wedge

Figure 4 depicts a three-dimensional view of wedge (32) disclosed in the present invention. Length, width and thickness of wedge (32) are carefully adjusted such that it provides a rigid and stable fit with the mating components when in use.

The three-dimensional depiction of wedge in Figure 4 shows that wedge (32) is broad at its proximal end to form a flat widened head (38) which tapers down along inner side (83), and is angular at portion 57. The outer side (82) of the wedge is straight but is angular (57) of inner side (83). The flat and widened head (38) of wedge (32) does not completely pass through slot (54) in the upper arm (50) but sits above the upper arm (50) of C-holder. Head (38) is knocked with hammer blow to drive the wedge downwards so that tight fit of the entire structure is achieved. The connection can be undone by striking the distant head (34) of the wedge (32) with a hammer in an upward direction and thereby loosening up the connection, thereafter pulling the wedge outside of the slot.

The wedge (32) slightly curves (crooked or angular) in (57) just before its distal end (34). The distant end (34) is fitted, preferably with a rivet (36), which does not allow the wedge to fall out of the slot in the upper arm of C-holder, and provides a prefabricated holder for the purpose of connecting members.

An alternative embodiment of wedge is also shown in Figure 4. The top surface area of the wedge is wide (compared to the head of the other wedge, which is narrow at the top), stubbed, and flat. Such a shape provides wide surface area for hammer blows and does not become damaged easily and wider-surface for hammer strikes, while avoiding occasional slips.

Figure 5 (a-f) depicts the operation of wedge attached on the upper limb (50) of C-holder.

Figure 6 depicts a close-up of square holders on a vertical member (14) used in the

invention.

Figure 7 depicts positioning of several square-holders (10) on vertical members (14).
Figure 8 (a-e) depicts positioning of C-holders (100) on horizontal and / or diagonal members (20) of structure. The lengths of the horizontal and / or diagonal members can be changed as per the requirement. Figure 8 (f) shows steps (step 1 on left-hand-side and step 2 on the right-hand side for the purpose of members connecting assembly.

Method of connecting vertical and horizontal and / or diagonal members

Connection between a vertical (14) and horizontal/ diagonal members (20) is initiated by erecting the vertical members (14) with plurality of junctions (12) on a desired surface. The horizontal and / or diagonal member (20) fitted with C-holder (100) on its either open ends is moved upwards to free-up wedge (32) of any cumbrances and allowing it to fall in slots of C-holders, the holder (100) is brought near a square-shaped holder (10) on vertical member (14). Tongue (40) on arm (50) is placed inside cavity (16) of square-shaped holder of vertical member (14). The lower arm (52) is positioned itself below the end of the square-member. Wedge (32) is easily slided inside slots (54) and (56) in arms (50) and (52) of C-holder. The proximal end of wedge (32) or its head (38) is stricked with hammer blows so that wide end (38) of wedge (32), its curved end (57) and rivet (36) at its distal end move further through slots (54) and (56), and an firmly secured tight in place. Figures 9(a-e) depicts a serialized presentation of steps leading to achieving a connection of vertical (14) and horizontal and / or diagonal members (20).

Figure 11 depicts a side view of a grand stand created using connector claw of the present invention.

Figure 12 depicts a front view of the grand stand assembly using the connector claw.

Whereas the present invention has been described in particular relation to the drawings attached hereto, it should be understood that other and further modifications apart from

those shown or suggested herein may be made within the spirit and scope of this invention. It is understood that this invention is not restricted to the particular drawings shown herein but is to restricted and limited only by the claims and the full range of equivalency to which each element thereof be entitled to.

Claims

1. A connector, comprising:

a back portion,

an upper arm extending from the top of the back portion,

a lower arm extending from the bottom of the back portion,

the top portion having a tongue with a notch, extending downwardly from its distal extent, and

the connector with slots provided in its upper and lower arms to receive a wedge.

2. A connector as claimed in Claim 1, wherein the width of the slots in the upper and lower arms correspond with the width of the wedge passing through them.

3. A connector as claimed in Claim 1 or 2, wherein the width of the slot in the upper arm is less than the width of the slot in the lower arm.

4. A connector as claimed in any preceding claim, wherein the slots extend from the back portion towards a downwardly protruding tongue in each of the upper and lower arms respectively.

5. A connector as claimed in any preceding claim, wherein the tongue extending downwardly from the top portion includes a notch.

6. A connector as claimed in the preceding claims, wherein the back portion is adapted to support accessories such as lifeline.

7. A connector as claimed in claim 6, wherein the accessories attached to the back portion are one or more hinge means.

8. A connector as claimed in the preceding claims, wherein the lower arm is having a tongue extending downwardly from its distal end.

9. A connector as claimed in the preceding claims, wherein the lower arm is broadened at its distal end or retained without broadening.

10. A connector as claimed in any one of the preceding claims wherein the upper arm of the connector is deformed on two opposite side edges thereof, with downwardly protruding tongue, which is assembled position, co-act with the outer surface of a support on vertical member.

11. A connector as claimed in any one of the preceding claims wherein the downwardly protruding tongue extends into the support on a vertical member.

12. A connector as claimed in the preceding claims is C-shaped.

13. A connector as claimed in the preceding claims with a wedge passing through the slots in upper and lower arms.

14. A connector as claimed in the preceding claims attached onto the open mouth of a horizontal or substantially horizontal member.

15. A connector for connecting vertical, horizontal and/or diagonal members, comprising:
a connector as claimed in any of Claims 1 to 14 and
a wedge, the wedge being shaped to have a first end which is larger than a corresponding dimension of the slot in the upper arm of the connector so that it cannot pass through it and an opposite end which is sized so as to freely pass through the slot in the lower arm of the connector whereby the wedge can be hammered into and out of position to retain the connector and wedge assembly against a support positioned between the wedge and back portion of the connector.

16. An assembly as claimed in Claim 15, wherein the wedge is adapted to fit within upper slot and the notch provided in the upper arm of the connector, when it is not located within the tongue slot.

17. An assembly as claimed in Claim 15 or 16, wherein the wedge tapers over at least part of its length.

18. An assembly as claimed in Claims 15 to 17, wherein the wedge is bent to have a lower part which forms a non-zero angle with an upper part.

19. An assembly as claimed in any of Claims 15 to 18, wherein the wedge comprises an obstructing portion provided at or to its lower end preventing the wedge from being removed upwardly when inserted through the slot in the upper arm.

20. An assembly as claimed in Claim 19, the obstruction is an integral or a non-integral component.

21. A connector assembly as claimed in any of Claims 15 to 20, including one or more supports provided on at least one vertical or substantially vertical member for receiving the connector and wedge.

22. An assembly as claimed in Claim 21, wherein each support is a square or rectangular holder.

23. An assembly as claimed in Claim 22, wherein each support is trapezoidal.

24. An assembly as claimed in Claims 22 or 23, wherein the supports are provided on vertical or substantially vertical members and the connectors are affixed to the horizontal or substantially horizontal members.

25. An assembly as claimed in the preceding claims, wherein the connectors on horizontal or substantially horizontal members and supports on vertical or substantially vertical members are engaged to achieve a connection of the horizontal or substantially horizontal members and the vertical or substantially vertical members.

26. A structure achieved using assembly of claim 25.