

RETAINING TOOL

BACKGROUND OF INVENTION

5 In fabrication or manufacturing, objects often need temporary fixing to a structure so that a more permanent fixture of the object can be achieved to the structure. Such temporary fixing may be difficult or time consuming to achieve. For example a flange may need to be welded to a steel wall or bulkhead but no or little space exists on the side opposite to where the component is to be secured. Such absence of space reduces any convenient access to the other side of the structural member and may make it difficult to obtain a temporary fixing of the component to the structural wall whilst more permanent fixture is worked on. Whilst it will be possible to use a G clamp to clamp a component to the structural member, if a welding of the component is required then normally at least two clamps need to be utilised to ensure that all portions of the component remain in an appropriate condition relative to the structural member providing two or more clamps takes time. Should one clamp be used between one portion of the structural member and the component then heat shrinking resultant from the welding may displace the component relative to the structural member whilst the component is being affixed thereto.

15 The space behind the structure may also be limited in the sense that obstructions may exist on the rear surface which prevent a G clamp from being securely positioned with the rear surface of the structure. Accordingly a single G clamp may not be able to provide many of the instances where retention of an object is required to a structure where the structures or objects are of a varying nature.

20 Accordingly the object of the present invention is to provides a means for a retaining tool which will at least provide the public with a useful choice.

BRIEF DESCRIPTION OF THE INVENTION

In a broad aspect the present invention consists in a retaining tool to retain an object to a structural member having opposite front and rear surfaces and a hole passing therethrough said retaining tool comprising

5 an axial shaft having a thread extending from a first end along at least part of said shaft

at least two arms pivotably movable relative to said shaft between a retracted position and expanded position relative to said axial shaft, each arm including rear surface contactable regions for engagement to the rear surface of said structural member

10 means to move said arms between said retracted position and said expanded position comprising (a) an actuator slidably engaged to said axial shaft and (b) linkage arms for each arm, pivotably connected at a first pivot to a respective arm and at another pivot to said actuator, said linkage arms including at least one articulation pivot intermediate of said first and second pivot

15 a fastening means to prevent movement of the actuator to said shaft

wherein said arms are insertable into said hole when said held in a retracted position by said means to move and wherein following insertion of said arms said actuator is moved along said shaft to move said arms to an expanded position to allow 20 the rear surface contactable region of each arm to locate against the rear surface of said structural member and when in said expanded position said fastening means is able to prevent movement of said actuator to said shaft

a threaded member to move axially along said thread

25 a bracket axially displaceable along said shaft by said threaded member to thereby force the bracket in an axial direction towards said arms and to press against the object and exert an axial holding force on said object captured between said front surface of said structural member and said bracket.

and wherein said expanded position is defined in on of two modes

30 a first mode wherein each said linkage arm provides the articulation axis in a first condition to said first and second pivots

a second mode wherein each said linkage arm provides the articulation axis in a second condition to said first and second pivots.

Preferably each said linkage arm comprised of two legs joined to each other at said articulation axis.

5 Preferably in the first mode said articulation axis and said first and second pivot axes when viewed in their axial directions are in line.

Preferably in the second mode said articulation axis and said first and second pivot axes when viewed in their axial directions are in a triangular formation with the articulation axis more proximate to said shaft than when in said first condition.

10 Preferably in the first mode the legs of said linkage arms are in are coaxially aligned.

Preferably in the second mode the first of the two legs of each linkage arm extending between the articulation axis and the second pivot is restrained from pivoting to said shaft by a retention means.

15 Preferably said retention means is provided to be encompassed about said first of the two legs of each of said linkage arms.

Preferably said first of said two legs of each linkage arm is retained by said retention means against said shaft.

20 Preferably in the first mode said articulation axis of each linkage arm is braced by a bracing means to hold said linkage arms in a rigid condition.

Preferably said bracing means is a sleeve which is slidably engaged over said linkage arm and is movable from a bracing condition to hold said linkage arms in a rigid condition to a non bracing condition wherein the articulation axis can be moved relative to said first and second pivot axis.

25 Preferably said actuator is a sleeve in slidable engagement onto said shaft.

Preferably said at least two arms are disposed from said shaft between said threaded end and the other end of said shaft.

Preferably there are three arms pivotably moveable relative to said shaft.

30 Preferably at least two brackets are provided to be separately selectable and engageable to said shaft for use with the retaining tool of the present invention which

provides its object engaging regions, in use, axially less advanced towards the at least two arms, and the at least one other bracket.

Preferably the first bracket is a substantially planar shaped bracket

This invention may also be said broadly to consist in the parts, elements and features referred to or indicated in the specification of the application, individually or collectively, and any or all combinations of any two or more of said parts, elements or features, and where specific integers are mentioned herein which have known equivalents in the art to which this invention relates, such known equivalents are deemed to be incorporated herein as if individually set forth.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a sectional view through a retaining tool used in a configuration for securing a component to a structural wall,

Figure 2 shows the retaining tool in use clamping a larger component to the structural wall,

Figure 3 is a perspective view of a first selectable bracket,

Figure 4 is an example of another selectable bracket,

Figure 5 is a close up side view of the arms and linkage arms, and

Figure 6 is a plan view of the crown to which the deployable members are pivotably engaged.

Figure 7 is a side view of the actuator of the present invention,

Figure 8 is a side view of the retaining tool of the present invention in a first mode wherein the arms are in the expanded position,

Figure 9 is a side view of the retaining tool of the present invention in a second condition wherein the arms are in an expanded position.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 illustrates the retaining tool of the present invention in an expanded position wherein the arms 1 are in a radially expanded condition relative to the axial shaft 2. The arms 1 are pivotable relative to the axial shaft about pivots 3 which are

provided at or disposed from the axial shaft 2. A crown 4 is preferably provided at a distal end of the shaft which provides the pivots about which the arms 1 are able to rotate relative to the shaft 2. The crown 4 may however be provided at any location along the shaft away from the other distal end 5 of the shaft 2. A thread 6 preferably extends along the shaft 2 from the distal end 5 and a threaded member such as a wing nut 7 is able to move axially along the thread of the shaft.

The arms 1 are movable between an expanded position as shown in figures 1 and 2, and a retracted position wherein the ends 8 of the arms 1 are more proximate to the shaft 2. Preferably a means to move the arms consists of an actuator 9 which is slideable in an axial direction along the shaft 2, and linkage arms 10 for each arm 1. The actuator 9 is slidable along the shaft 2 in an axial direction and preferably is a sleeve provided about the shaft 2. The sleeve is able to slide along the shaft and is actuatable by a hand of the user to displace along the shaft and to thereby move the linkage arms 10. The linkage arms 10 are pivoted about pivots 11 relative to the actuator 9, and about pivots 12 relative to the arms 1. An axial displacement of the pivots 11 relative to the pivots 12 changes the triangular formation between pivots 11-12 and as a result radially displaces the arms 1 relative to said shaft 2 about the pivots 12. A person can operate the retaining tool of the present invention by holding the shaft 1 at the threaded end and move the actuator 9 along the shaft to thereby set the appropriate radial displacement of the ends 8 of the arms 1 relative to the shaft 2. In use, the retaining tool of the present invention is most appropriately used in situations where an object 13 needs to be secured to a structural member 14 such as a wall or the like. A wall will be provided with a hole through which the arms are able to be moved when in a retracted position. After insertion the actuator 9 can be displaced along the shaft to move the arms to an expanded position such that the distal ends 8 of the arms can each engage with the rear surface 15 of the structural member 14.

In the most preferred form the retaining tool provides three arms extending from the shaft 2 however at least two arms may be sufficient and indeed four or more arms may also be provided. Each arm 1 has a linkage arm 10 connected thereto and extends between the arms 1 and the actuator 9.

Once the arms are appropriately positioned in the expanded position a fastening means 17 can be operated to fasten the actuator 9 to the shaft 2. Such a fastening means may for example be a wing nut threadingly engaged to the actuator 9 and able to press against the shaft 2 to thereby lock relative movement between the shaft 2 and the actuator 9. This then locks the expanded position of the arms relative to the shaft 2.

The object 13 is able to be clamped to the front surface 16 of the structural member 14 by a bracket 18. The bracket 18 is able to be advanced along the shaft 2 and can be forced towards the arms 1 by the use of the threaded member 7 such as for example the wing nut which is able to travel along the thread 6 of the shaft 2. The bracket 18 in a first example is shown in figure 3, includes a hole 19 through which the shaft 2 is able to extend. The shaft 2 is preferably of a length sufficient to allow varying shapes and particularly thicknesses of objects 13 to be retained against the structural member 14. For example in figure 1, a relatively thin object such as a flange is shown to be retained against the structural member 14 by the retaining tool of the present invention. In figure 2 a flanged pipe is for example shown to be engaged to the structural member 14 by the retaining tool of the present invention and the pipe is of a larger thickness (in the axial direction of the shaft). The threaded section 6 of the shaft is preferably provided to be sufficiently far (in the axial direction) from the arms such that brackets 18 of different shapes such as for example shown in figures 3 and 4 can be used whereby the position of the threaded member 7 along the thread can remain within a certain range along the shaft and wherein the different thicknesses of objects are accommodated by the different shaped brackets 18. The bracket as shown for example in figure 3 includes an end 20 against which the wing nut 7 is able to press and an end 21 (axially more proximate to the arms) which applies the force generated by the wing nut along the shaft against the object 13. A second example of a bracket 18 is for example shown in figure 4, for clamping thicker objects to the structural member 14 wherein the bracket is substantially of a planar shape. The interchangeable brackets 18 provide the retaining tool of the present invention with the flexibility of

allowing, in combination with a sufficiently long shaft, for thicker and thinner objects 13 to be retained against the structural member 14.

The retaining tool of the present invention can also be provided in a configuration of two different conditions of the arms in the expanded position. In the first condition as for example shown in figure 8, the linkage arms 10 are provided in a fully expanded relationship between the actuator 9 and the arms 1. In a second condition as shown in figure 9, the linkage arms 10 are provided in a partially collapsed condition wherein the linkage arms 10, of an articulatable nature have been partly collapsed against the shaft 2. In the second condition, the pivot point of the linkage arms 10 are moved from pivot points 11 to 11A. The linkage arms 10 then extend from the actuator 9, to be located against the shaft 2, to the arms 1 as for example shown in figure 9. That portion of the linkage arms 10A which are collapsed, are preferably retained in a collapsed condition by for example the use of an O-ring 22. By collapsing part of the linkage arms 10, a smaller radial displacement of the ends of the arms from the shaft 2 can be achieved without adjustment of the displacement of the actuator 9 to be made axially along the shaft 2. This allows for the retaining tool of the present invention to be utilised in the expanded condition where the hole through the structural member 14 is smaller and where for example obstructions 26 may exist on the rear surface 15 of the structural member 14 to prevent expansion of the arms to the full expanded condition as shown in figure 8. A reduced expanded condition can be assumed by the retaining tool without significantly having to remove the actuator 9 towards the end 5 of the shaft 2. Articulation of the linkage arms 10 is preferably achieved by removing a brace 23 away from the pivot 11A wherein such a brace then allows for a pivoting to occur about the pivot 11A of the linkage arms 10. The brace is preferably a rigid brace which can be slidably engaged over the pivot 11A to thereby create a rigid linkage arm as for example shown in figure 8.

When in the articulated condition as shown in figure 9, the O-ring 22 can be moved from a passive position as shown in figure 8, within a rebate of a portion of the actuator 9, to a position to be surrounding the collapsed portions 10A of the linkage arms 10.

The tool in this second expanded position is able to allow the arms 1 to engage with the rear surface of the structure at a more radially inward location to that as in the first expanded position without the actuator 9 having to move along the shaft to displace the arms to this radially inward location. This then still leaves sufficient length of thread on the shaft to accommodate any necessary axial displacement of the threaded member 7 to allow it to clamp an object via a bracket (not shown in figures 8, 9) to the structure. Such positioning of the arms may be necessary if for example an obstruction 26 exists at the rear of the structure.



CLAIMS

1. A retaining tool to retain an object to a structural member having opposite front and rear surfaces and a hole passing therethrough said retaining tool comprising

5 an axial shaft having a thread extending from a first end along at least part of said shaft

at least two arms pivotably movable relative to said shaft between a retracted position and expanded position relative to said axial shaft, each arm including rear surface contactable regions for engagement to the rear surface of said structural member

10 means to move said arms between said retracted position and said expanded position comprising (a) an actuator slidably engaged to said axial shaft and (b) linkage arms for each arm, pivotably connected at a first pivot to a respective arm and at another pivot to said actuator, said linkage arms including at least one articulation pivot

15 a fastening means to prevent movement of the actuator to said shaft

wherein said arms are insertable into said hole when said held in a retracted position by said means to move and wherein following insertion of said arms said actuator is moved along said shaft to move said arms to an expanded position to allow the rear surface contactable region of each arm to locate against the rear surface of said structural member and when in said expanded position said fastening means is able to prevent movement of said actuator to said shaft

20 a threaded member to move axially along said thread

25 a bracket axially displaceable along said shaft by said threaded member to thereby force the bracket in an axial direction towards said arms and to press against the object and exert an axial holding force on said object captured between said front surface of said structural member and said bracket.

and wherein said expanded position is defined in on of two modes

30 a first mode wherein each said linkage arm provides the articulation axis in a first condition to said first and second pivots and



a second mode wherein each said linkage arm provides the articulation axis in a second condition to said first and second pivots which places said arms radially more inwardly than in said first mode.

2. A retaining tool as claimed in claim 1 wherein each said linkage arm comprised of two legs joined to each other at said articulation axis.

3. A retaining tool as claimed in claims 1 or 2 wherein in the first mode said articulation axis and said first and second pivot axes when viewed in their axial directions are in line.

4. A retaining tool as claimed in any one of claims 1 to 3 wherein in the second mode said articulation axis and said first and second pivot axes when viewed in their axial directions are in a triangular formation with the articulation axis more proximate to said shaft than when in said first condition.

5. A retaining tool as claimed in any one of claims 2 to 4 wherein in the first mode the legs of said linkage arms are in are coaxially aligned.

6. A retaining tool as claimed in any one of claims 2 to 5 wherein in the second mode the first of the two legs of each linkage arm extending between the articulation axis and the second pivot is restrained from pivoting to said shaft by a retention means.

7. A retaining tool as claimed in claim 6 wherein said retention means is provided to be encompassed about said first of the two legs of each of said linkage arms.

8. A retaining tool as claimed in claims 6 or 7 wherein said first of said two legs of each linkage arm is retained by said retention means against said shaft.

9. A retaining tool as claimed in any one of claims 1 to 8 wherein in the first mode said articulation axis of each linkage arm is braced by a bracing means to hold said linkage arms in a rigid condition.

10. A retaining tool as claimed in claim 9 wherein said bracing means is a sleeve which is slidably engaged over said linkage arm and is movable from a bracing condition to hold said linkage arms in a rigid condition to a non bracing condition wherein the articulation axis can be moved relative to said first and second pivot axis.