United States Patent [19]

Haines

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[54] **CLAMP STRUCTURE**

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[51] **Int. Cl.** **F16b 2/20**; F16b 3/04

[58] **Field of Search** 403/388, 390, 391, 400, 403/408, 396-397, 399

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[57] **ABSTRACT**

A one-piece preformed wire or rod is employed to hold component assembly parts in alignment and clamps the parts firmly into an assembled unit, the clamp being readily releasably engageable for quick disassembly of the parts. The preformed wire or rod clamp may also be employed to assemble pipes into an array or network in one embodiment of the invention which also includes a saddle structure to aid in positively locating and aligning the pipes.

23 Claims, 6 Drawing Figures

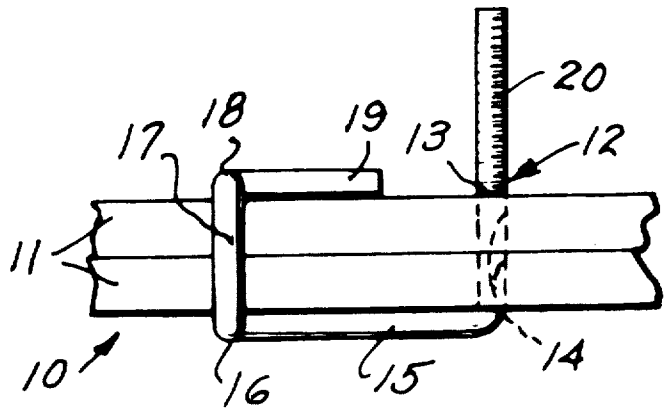


Fig. 1

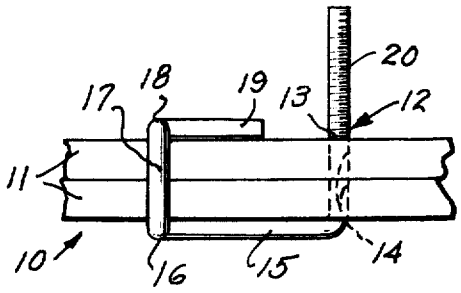


Fig. 2

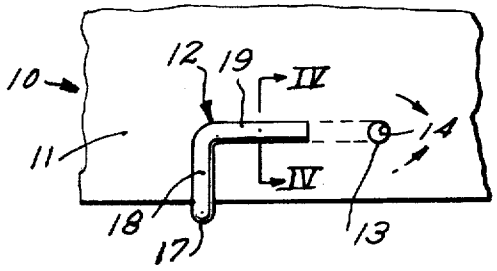


Fig. 3

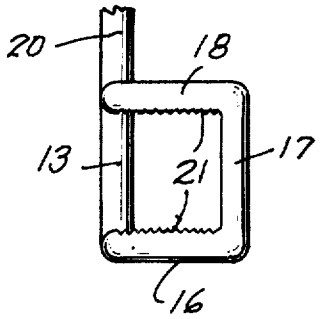


Fig. 4

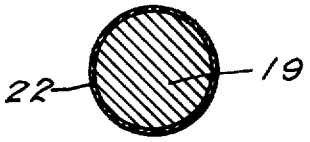


Fig. 5

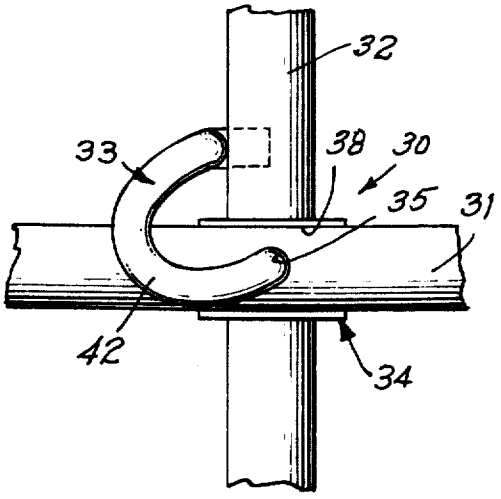
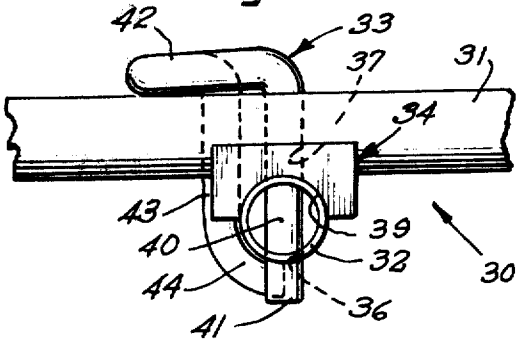


Fig. 6



CLAMP STRUCTURE

DESCRIPTION

This invention relates to clamp structures and is particularly concerned with clamp structures for aligning and clamping parts of an assembly firmly together in releasable relationship for a quick disconnect function to provide ease of disassembly of the parts.

It is the usual practice to assemble parts by means of riveting and spot welding, and by means of bolts, nuts and washers or the like. The latter type of connection is predominantly employed in all manufactured assemblies which are capable of being serviced, for example, in products such as electric motors and centrifugal pumps, or wherever a capability for disassembly is desired. Nearly every major appliance, as well as many minor ones, has components which can be disassembled or detached for repair or replacement.

Most major appliances, such as washers, dryers, large models of humidifiers and air conditioners, etc., in addition to items such as replacement motors for vehicles, are usually bolted to a wooden frame for shipping. Here, disassembly, as well as assembly, and the labor involved in applying and removing standard bolt structures, is quite evident. In addition to the cost of these fixation devices, the time involved in applying and removing them during crating and installation adds substantially to the overhead of the manufacturer and to the overhead of the service company.

It is therefore highly desirable to have and a primary object of the present invention to provide a simple clamp structure which may be utilized to align and clamp parts firmly in place with the capability of quick release for disassembly.

Another object of the invention is to provide a clamp structure having a simple configuration and which therefore requires extremely simple fabrication procedures.

Another object of the invention is to provide a clamp assembly of simple structure which obviates the necessity for stocking bolts, nuts and washers or the like for applications where such a clamp would be desirable and further obviates the necessity for stocking the clamp itself in that the structure of the clamp lends itself to in-house production. An attendant object in this respect is to provide a clamp structure which may be easily fabricated on location in extraterrestrial applications.

Inasmuch as a clamp fulfills the function most often assigned to a bolt, washer and nut, it is a further object of the invention to provide a clamp structure having the following unique combination of features: lower parts cost than the bolt, washer and nut; less labor time requirement for assembly or disassembly of parts; utilization (assembly and disassembly) without tools; extremely good vibration-proof characteristics; economically competitive with other assembly techniques such as riveting and spotwelding in which disassembly is impractical; and of simple structure which is readily adapted to on-the-spot fabrication.

The foregoing objectives are realized, according to the invention, through the provision of a single formed wire or rod having one part which comprises a straight portion of sufficient length to pin the parts to be assembled into the desired position and another part which comprises a pair of L-shaped portions aligned with one another and held in parallel planes by an intermediate

connecting straight portion of sufficient length to assure a friction fit when pressed onto the layers of material to be joined. One end of one L-shaped portion is joined to the above-mentioned straight portion which serves as an alignment pin so that the pin is at right angles to the planes of the L-shaped portions and points toward the other L-shaped portion. The corresponding leg of the other L-shaped portion which, if extended, would contact the alignment pin is shorter than the leg connected to the alignment pin by an amount slightly greater than the distance from a hole for receiving the alignment pin and the edge of the materials to be joined. The clamp may be fabricated from a variety of materials as it needs to have only slightly elastic qualities, such as that of cold rolled steel. The clamp is utilized by inserting the straight pinning portion through the alignment holes in the parts to be joined, and then pivoting the clamp about the pin portion and pressing it onto the edges of the materials to be joined so that the L-shaped portions tightly embrace the materials. Of course, the clamp structure can be configured for either a clockwise or counterclockwise pivotal motion as application thereof dictates.

The clamp structure may be provided with a nonmarring coating, such as nylon, in order to prevent scratching.

The clamp structure may be provided with additional gripping power through the provision of serrations such as those found on paper clips, or by the application of a coating cement thereon such as is customary for cement coated nails.

Additional gripping power along with the nonmarring feature may be provided through a combination of the two last-mentioned features so that, for example, in fastening appliances to the wooden frame for shipping the portion of the clamp structure which contacts the appliance may be provided with a nonmarring coating while the portion of the clamp structure which contacts the wooden frame is provided with serrations or a cement coating.

Threaded extensions may also be provided on the clamp to facilitate the addition of a threaded extension as an assembly line option or for dealer use in installing appliance accessories.

The clamp structure may also be made into a captive clamp by the addition of a speed nut so that with the use of a slot instead of a hole in the detachable portion of an assembly, disassembly, or partial disassembly, may be accomplished without the danger of dropping or losing the clamps.

According to a particularly useful embodiment of the invention, the formed rod clamp structure is configured to receive curved surfaces and cooperates with a simple saddle structure to join pipes, rods or the like. Pipe rack systems may thus be quickly and inexpensively constructed to support scaffolding or storage shelves, provide support for concrete floor sections during curing, or assemble pipe fences and ladders. This feature is also quite advantageous in extraterrestrial work for the assembly of space platforms and stations in free space, on the moon, or on other planets and is highly practical for this purpose since no tools are required.

Other objects, features and advantages of the invention, its organization, construction and operation will best be understood from the following detailed description of some preferred embodiments thereof taken in

conjunction with the accompanying drawings, in which:

FIG. 1 is an elevational view of a clamp structure constructed in accordance with the principles of the present invention and shown clamping layers together;

FIG. 2 is a top plan view of the apparatus illustrated in FIG. 1;

FIG. 3 is an end view of a portion of the apparatus illustrated in FIG. 1 showing the provision of serrations for additional gripping power;

FIG. 4 is a sectional view of a portion of the clamp illustrated in FIGS. 1 and 2 taken generally along the line IV—IV of FIG. 2;

FIG. 5 is a top plan view of a pair of pipes joined at right angles with a clamp structure and saddle combination according to the principles of the present invention; and

FIG. 6 is an elevational view of the apparatus shown in FIG. 5 to better illustrate the relationship between the clamp structure and the joined pipes.

Referring to FIGS. 1 and 2, a joined assembly 10 is illustrated as utilizing the novel clamp structure 12 of the present invention to clamp together layers of material 11. The clamp structure 12 comprises an alignment pin 13 which extends through a bore 14 in each of the layers 11 as a means for indexing and aligning the layers 11. As will be appreciated from the discussion below, the alignment pin 13 also serves as a pivot in the bore 14 for effecting the clamping operation.

Extending at a substantially right angle and along the lowermost surface of the bottom layer 11 is an L-shaped clamp member comprising a portion 15 connected to the alignment pin 13 and a portion 16 connected to and extending at right angles to the portion 15. A clamp portion 17 abuts the outer edges of the layers 11 and extends from the portion 16 to another L-shaped section having portions 18 and 19 which are generally parallel to the portions 16, 15 respectively, and which embrace the upper surface of the uppermost layer 11.

During assembly, the layers 11 are disposed adjacent one another with their bores 14 aligned to receive the alignment pin 13. The alignment pin 13 is then inserted fully through the bores 14 and the clamp structure is pivoted about the pin 13 in the direction indicated by the solid arrow in FIG. 2. For disassembly, the reverse operation takes place wherein the clamp structure is pivoted about the pin 13 as indicated by the broken arrow in FIG. 2, the pin 13 is withdrawn from the bores 14 and the layers 11 are then separated.

The clamp structure may include means for adapting the clamp structure for additional use once the structure has been pivoted to its operable position. In FIG. 1, this means is illustrated by the provision of an extended threaded portion 20. A spline or notched configuration may also be advantageously employed for this purpose and the showing of a thread in the drawing is for purpose of illustration only.

Referring to FIG. 3, means are provided for increasing the gripping power of the clamp structure through the provision of serrations 21 which are formed at least on some of the surfaces which face the layers 11, such as illustrated for the portions 16 and 18 in FIG. 3. It is to be understood, however, that the serrations may also be provided on the corresponding surfaces of the portions 15 and 19.

FIG. 4 illustrates the provision of an additional layer of material 22 about the clamp structure. This additional layer 22 may be in the form of a cement to improve the friction or gripping power of the clamp, or it may be a non-marring material, such as nylon, to prevent scratching of the facing surfaces of the layers 11. As previously indicated, any combination of serrations, cement layer, or non-marring layer may be advantageously utilized for a combination of increased gripping power and scratch prevention.

Referring to FIGS. 5 and 6, an embodiment of the invention is illustrated wherein pipes may be joined to one another as in the assembly of children's playground equipment. In this illustrative embodiment, a pipe 31 is joined to a pipe 32 by means of a clamp structure 33 and a saddle 34. The clamp structure 33 includes an alignment pin 40 which extends through respective bores 35, 36 of the pipes 31, 32.

Disposed between the pipes 31, 32 is a saddle 34 which includes a bore 37 for receiving the alignment pin 40 and a pair of surfaces 38, 39 which are shaped to conform to the surfaces of the pipes 31, 32, respectively. It should be noted that the joined structures are not necessarily pipes, but may be solid rod type structures or even structures having irregular surfaces so long as the surfaces 38, 39 of the saddle conform thereto. The saddle 34 makes contact with about one-half of each pipe, but still allows the pipes to contact or nearly contact each other. This produces a remarkably firm yet simple joint. In order to avoid the use of an additional part to handle during assembly, the saddle 34 can be bonded, i.e., precemented or soldered, to one of the pipes.

The clamp 33 includes, in addition to the pin 41, a loop portion 42 which extends over one of the pipes 31 and a portion 44 which extends about and embraces the other of the pipes 32, and an intermediate portion 43 which joins the portions 42 and 44.

During assembly, the pipes 31, 32 are seated in the saddle 34 and the bores 35, 36, 37 are aligned to receive the alignment pin 40. The alignment pin 40 is then inserted and the clamp structure is pivoted so that the portions 42 and 44 embrace and clamp the pipes 31, 32.

The foregoing has described clamp structures which can be fabricated in mass for sale or fabricated in accordance with a manufacturer's particular specifications, in house and under his control, utilizing simple bending jigs. The invention in its simpler forms, replaces bolts which require heating and threading, nuts which require forming and threading and washers which require punching with the attendant waste of material. Bolts, nuts and washers must be purchased and stocked in sizes for anticipated or planned use; the clamp structure of the present invention requires only that wire be stocked. Inasmuch as the clamp structure of the present invention can be produced on very simple equipment from wire stock, and the clamped assembly can be produced without tools, the invention lends itself to products produced in less industrialized areas and/or by workers having no technical skill. This same feature, as mentioned above, also makes the invention attractive for extraterrestrial applications.

Although I have described my invention by reference to specific illustrative embodiments thereof, many changes and modifications may readily become apparent to those skilled in the art without departing from

the spirit and scope of the invention. I therefore intend to include within the patent warranted hereon all such changes and modifications as may reasonably and properly be included within the scope of my contribution to the art.

I claim:

1. Clamp apparatus for clamping together objects having alignment holes spaced from an edge of each object, comprising a wire structure including a pin portion for insertion through the alignment holes, first and second object gripping sections spaced apart a distance approximately equal to the thickness of the objects and being disposed in parallel relation to one another and also to the edges of the objects being joined, and a third section connecting said first and second sections and acting as a stop as said wire is pivoted about said pin portion so that said first and second sections frictionally embrace said objects and said third section abuts at least one of said objects.

2. Clamp apparatus according to claim 1, wherein each of said first and second sections are L-shaped and lie in spaced planes.

3. Clamp apparatus according to claim 1, comprising a non-marring coating on at least one portion of said first section to prevent defacing of the object contacted thereby.

4. Clamp apparatus according to claim 1, comprising a cement coating on at least a portion of said first section to increase the gripping power of said clamp means.

5. Clamp apparatus according to claim 1, wherein at lea least a portion of said first section comprises serrations for increasing the gripping power of said clamp means.

6. Clamp apparatus according to claim 1, wherein said pin portion includes means for attaching at least one other object thereto.

7. Clamp apparatus according to claim 6, wherein said means for attaching includes a threaded end of said pin portion.

8. Clamp apparatus according to claim 1, comprising a non-marring coating on said first section to prevent defacing of the object contacted thereby, and means on said second section for increasing the gripping power of said clamp apparatus.

9. Clamp apparatus according to claim 8, wherein the last-mentioned means comprises a cement coating.

10. Clamp apparatus according to claim 8, wherein the last-mentioned means comprises serrations.

11. Clamp apparatus according to claim 1, wherein said first section is connected to said pin portion and said second section is spaced from said pin portion by a distance at least as great as the distance between an alignment hole and the edge of the corresponding object to provide clearance for insertion of said pin portion.

12. Clamp apparatus for clamping together objects each having a curved surface and an alignment hole therethrough, comprising: a saddle structure including a pair of surfaces for receiving respective objects and shaped in conformity with the surfaces of the respective objects, and means defining an alignment hole in said saddle; and a wire structure including a pin portion for insertion through the holes in said saddle and the objects to be joined, first and second object gripping section spaced apart a distance approximately equal to the distance through the objects when disposed in said saddle, and a third section for abutting the outside of the objects to be clamped connecting said first and second sections, said third section acting as a stop when said wire structure is pivoted about said pin portion the pin portion and the third section being disposed in parallel relation, the first object gripping section being generally U-shaped and joining the parallel pin portion and third section, the third section having the U-shaped first object gripping section at one end and the second section being disposed at an effective angle of 90° at its opposite end whereby upon insertion of the pin portion through the objects and upon rotation of the wire structure, the second section will move under one of the objects to effectively clamp same together.

13. Clamp apparatus according to claim 12, wherein said shaped surfaces of said saddle structure are shaped and disposed relative each other to define the angular disposition of the joined objects.

14. Clamp apparatus according to claim 12, wherein said shaped surfaces of said saddle structure are shaped and disposed relative each other to define a 90° angular relationship between the joined objects.

15. A clamped joint comprising:

a pair of objects to be joined each having a hole therethrough spaced from a defining surface of the object; and

means for releasably securing said objects including a formed wire structure comprising a pin section for extending through said holes and to form a pivot,

a pair of spaced connected sections connected to said pin section and spaced apart a distance approximately the combined thickness of said objects and being disposed in parallel relation to one another and also to the edges of the objects being joined, said pair of spaced connected sections connected to said pin section and pivotal therewith to frictionally embrace said objects.

16. A clamped joint as set forth in claim 15, wherein said pair of spaced sections lie in planes perpendicular to said pin section, one of said pair of sections is connected to said pin section and the other of said sections is connected to said pin section via said one section and spaced from said pin section to permit clearance for insertion of said pin section through said holes.

17. A clamped joint as set forth in claim 15, wherein said objects have circular cross sections and said joint comprises a saddle including a pair of shaped surfaces for at least partially embracing respective ones of said objects and a hole for receiving said pin section.

18. A clamped joint as set forth in claim 15, wherein each of said pair of sections is L-shaped.

19. A clamped joint as set forth in claim 15, wherein at least one of said pair of sections includes means for preventing marring of the object contacted thereby.

20. A clamped joint as set forth in claim 15, wherein at least one of said pair of sections includes means for increasing the grip of said formed wire structure.

21. A clamped joint as set forth in claim 20, wherein the last-mentioned means includes a cement coating on said one section.

22. A clamped joint as set forth in claim 20, wherein the last-mentioned means includes serrations on said one section.

23. Clamp apparatus for clamping together objects having alignment holes spaced from an edge of each object, comprising a wire structure including a pin por-

tion for insertion through the alignment holes, first and second object gripping sections spaced apart a distance approximately equal to the thickness of the objects and being disposed in parallel relation to one another and with the pin portion and the stop being disposed in parallel relation generally at right angles to the planes of the first and second object gripping sections, and a third section connecting said first and second sections and acting as a stop as said wire is pivoted about said pin portion so that said first and second sections frictionally embrace said objects and said third section abuts at least one of said objects.

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