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[54] **CLAMP WITH PREDETERMINED CLAMPING FORCE**
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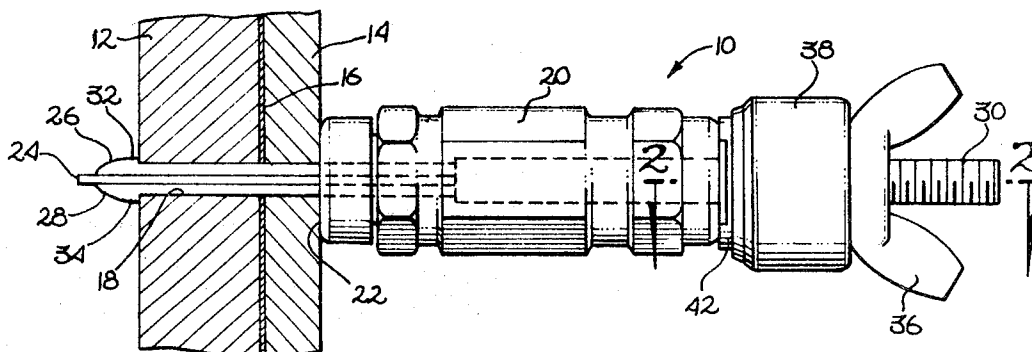
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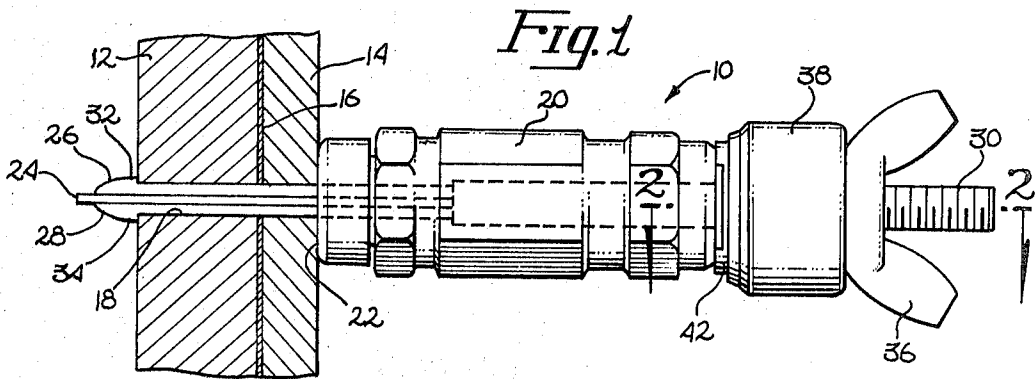
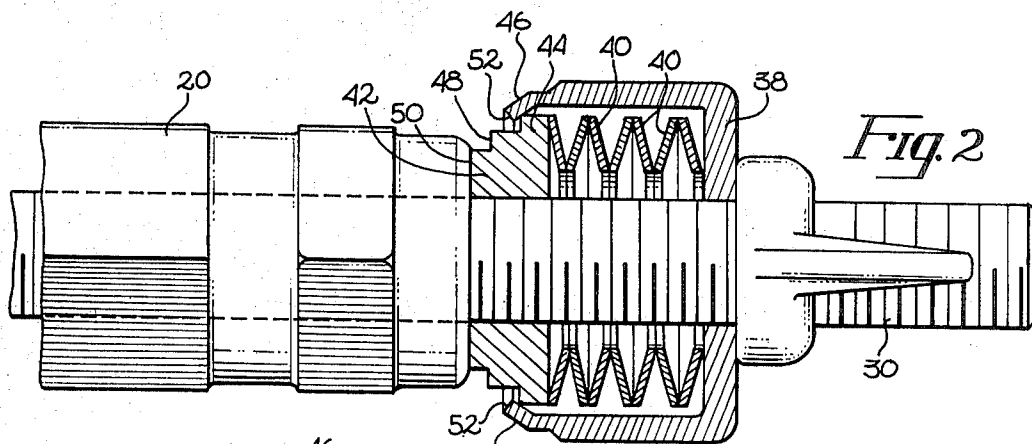
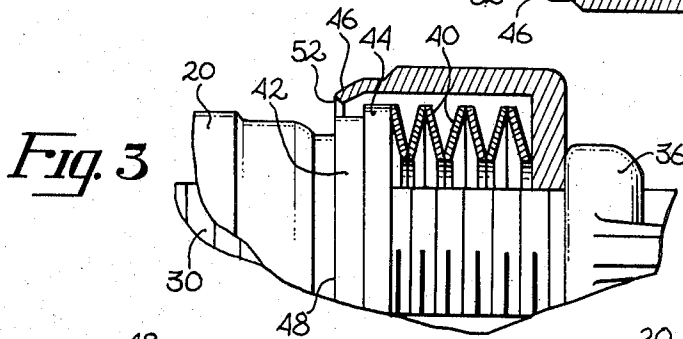
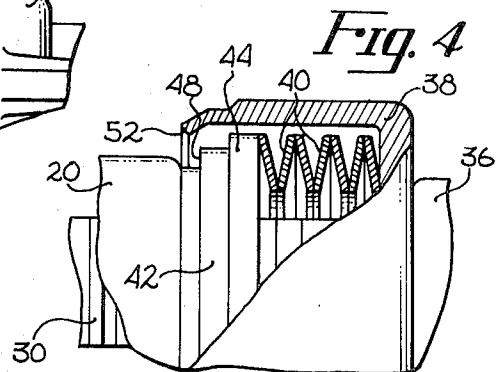
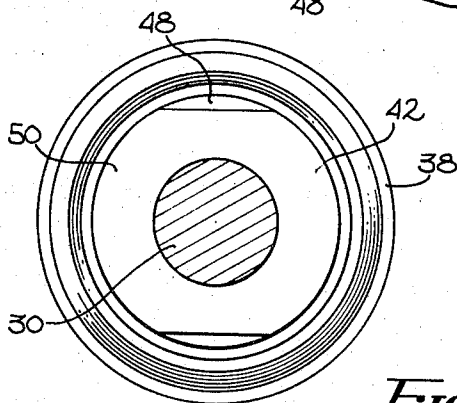
[50] Field of Search..... 269/47, 49,
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ABSTRACT: The clamp with predetermined clamping force disclosed herein is provided with first and second opposed wires having hooks thereon for engagement through aligned holes in sheet material intended to be clamped. A tee is extendable relatively to the wires between the wires to engage the hooks at the edges of the holes. The clamp body engages the sheets opposite to the hooks so that the force by which the hooks are pulled into the body is the sheet clamping force. This force is created by stressing springs, and the amount of spring stress or deflection is indicated by the position of the spring housing body with respect to the main clamp body so that when they are moved to a predetermined position, a predetermined amount of clamping force is obtained.





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CLAMP WITH PREDETERMINED CLAMPING FORCE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is directed to a novel clamp which is arranged to clamp with a predetermined amount of clamping force. The clamp includes a tee to spread the wires into engagement with the far side of the sheets to be clamped, and a spring stressed to a predetermined position to provide the known clamping force.

2. Brief Description of the Prior Art

In many cases, it is desirable to clamp sheets of material together. In view of the flexibility of fairly thin sheets, they cannot be clamped only at the edge, but must be clamped throughout their area. The convenient way to accomplish this clamping is to provide substantially aligned holes in the sheets lying against each other and pass a device through the holes which can be expanded on the far side to provide engagement on both sides of the sheets lying together. In such cases wires having hook edges are passed through the aligned holes and are wedged apart by a tee positioned between the wires. This wedging apart causes the hooks on the wires to engage on the far side of the sheet. Thus, both sides of such large areas of sheet can be engaged in this clamp. However, in many cases, it is desirable to clamp such sheets together with a known, resilient force. Such cases occur when the sheets are being bonded together by adhesive. In such a case, a known force is essential to proper adhesive bonding as is a resiliently applied force which maintains a bending force while the adhesive spreads or dries. In other cases, it is desirable to use a temporary clamp which is employed to maintain a predetermined clamping force on such sheets, while other securing devices are being permanently installed.

SUMMARY OF THE INVENTION

In order to aid in the understanding of this invention, it can be stated in essentially summary form that it is directed to a clamp with predetermined clamping force. The clamp includes first and second wires having hooks thereon, which wires with their hooks are arranged to pass through aligned holes in sheets to be clamped. Thereupon, a tee positioned between the wires is moved with respect to the wires to engage the wire hooks over the edges of the holes in the aligned sheets. The main body of the clamp on the opposite side from the wire hooks is engaged against the sheets so that the force between the wires and the main body of the clamp is the clamping force. This force is controlled by a spring stress to a predetermined force. Predetermination of the spring stress force is preferably made by indication of relative position between a spring housing body and the main clamp body.

Accordingly, it is an object of this invention to provide a clamp with predetermined clamping force, which clamp is especially arranged for clamping sheets of material together by extending through holes in the sheets and clamping on both surfaces of the sheets adjacent to the holes. It is another object to provide a clamp which includes first and second hook carrying wires which extend through holes in sheets to be clamped and which are separated by a tee for engagement on the sheets, together with a body supporting the wires and engaging on the other sides of the sheets so that the force of the wires and the body against the sheets is the clamping force.

It is a further object to provide a known resilient clamping force by providing resiliently deflectable springs which are positioned between the clamping wires and the main clamp body so that spring deflection force provides the clamping force. It is still another object to provide means for predetermining the clamping force provided by clamping springs, which predetermination is accomplished by determination of spring deflection. It is still another object to provide a spring housing body positioned with respect to one end of the spring and a main clamp body positioned with respect to the other end of the spring, so that the relative position of the spring housing body and the main clamp body is an indication of the

spring deflection and the clamping force. It is still another object to provide truncated hollow conical springs arranged in series so that a substantial clamping force can be accomplished with minimum deflection.

Other objects and advantages of this invention will become apparent from a study of the following portion of the specification, the claims and the attached drawing.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The present invention, both as to its operation and manner of organization, together with further objects and advantages therein, may best be understood by reference to the following description, taken in connection with the accompanying drawings, in which:

FIG. 1 is a side elevational view of the clamp with predetermined clamping force of this invention, shown in conjunction with sheets of material being clamped together;

FIG. 2 is an enlarged partial section taken generally along the line 2-2 of FIG. 1 showing the clamp unstressed;

FIG. 3 is a partial view similar to FIG. 2, showing the clamp stressed to a first predetermined force;

FIG. 4 is a section similar to FIG. 3, showing the clamp stressed to a second predetermined clamping force; and

FIG. 5 is a section taken toward the front face of the novel force control washer employed within this invention.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring to the drawings, the clamp with predetermined clamping force of this invention is generally indicated at 10. Clamp 10 is adapted to clamp together first and second sheets of material 12 and 14 which may have an adhesive, separator or other sheet 16 therebetween. The sheets have a generally aligned hole 18 therethrough through which the clamp 10 engages.

Clamp 10 includes body 20 which has a front clamping face 22 which is adapted to engage against the sheets to be clamped adjacent and around hole 18. Body 20 is the main body of clamp 10 and supports the remaining structure. Tee 24 is an elongated member which has its head irrotatably secured within clamp body 20 and is of such length that it extends through the sheets to be clamped when in clamped position. Elongated members in the form of 26 and 28 are positioned on opposite sides of tee 24. Wires 26 and 28 are secured to clamp screw 30 and are arranged so that hooks 32 and 34 respectively positioned adjacent the ends of wires 26 and 28 are beyond the end of tee 24 when clamp screw 30 is at its fully extended, leftmost position in the drawings. In this way, wires 26 and 28 can lie together at their outer ends so that the distance across hooks 32 and 34 is such that they can pass through hole 18. However, as clamp screw 30 is drawn to the right, tee 24 extends between the hook portions of the wires and spreads the hooks to engage around the left side of the sheets. In this way, the wires are able to pass through the hole and be wedged outward into position to lock on the far side of the sheets.

Wingnut 36 is threadably engaged on clamp screw 30 and engages against the face of spring housing body 38. A plurality of truncated hollow conical springs 40, commonly known as Belleville Springs, are positioned within spring housing 38 and arranged in series fashion so each adjacent spring opposes the next. The first spring engages the face of spring housing, on the opposite side from wingnut 36, so that the wingnut force is directly applied to the stack of springs 40. The last spring engages against force control washer 42. Force control washer 42 in turn engages against body 20. Thus, as wingnut 36 is tightened, clamp screw 30 and wires 26 and 28 carried thereon are stressed to the right with respect to body 20. As wingnut 36 is tightened, spring housing 38 is moved to the left with respect to body 20 as springs 40 are compressed.

Force control washer 42 has an enlarged shoulder 44 thereon around which spring housing 38 is crimped at 46 in order to retain the spring housing 38, springs 40 and force control washer 42 is a unitary assembly. However, force control washer 42 also has step 48 thereon as well as face 50. As the springs 40 are compressed by a tightening of wingnut 36, lip 52 on the spring housing body is moved to the left with respect to force control washer 42. When lip 52 comes into line with step 48, as is shown in FIG. 3, springs 40 are compressed to a first predetermined clamping force, which force is applied to clamp the sheets 12 and 14, as previously described. Alignment of lip 52 with step 48 indicates that this first predetermined clamping force has been reached. However, further tightening of wingnut 36 compresses springs 40 still further, so that when lip 52 is lined up with face 50, the second and higher predetermined clamping force is reached.

Accordingly, the clamp with predetermined clamping force of this invention can be engaged through substantially aligned holes in sheets of material to engage on both sides of the sheets of material, and to provide selected predetermined clamping force for clamping the sheets of material together.

This invention having been described in its preferred embodiment, it is clear that it is susceptible to numerous modifications and embodiments within the ability of those skilled in the art without the exercise of the inventive faculty. Accordingly, the scope of this invention is defined by the scope of the following claims.

I claim:

1. A clamp arranged to apply several predetermined clamping forces at several definite marked locations, said clamp comprising:

a clamp body, said clamp body having a face adapted to be in a contactual relationship with a first side of material to be clamped;

first and second elongated members each having a hook thereon, said hooks on said elongated members facing away from each other with a spreader member positionable between said elongated members adjacent said hooks,

said elongated members extending into said clamp body; a clamp screw, said elongated members being secured to said clamp screw;

a nut on said clamp screw, the improvement comprising:

a spring housing positioned around said clamp screw and engaged by said nut, said spring housing being movable with respect to said clamp body; and

a spring member within said spring housing, said spring member engaging said spring housing and thrusting against said clamp body so that by tightening said nut said spring member is deflected to exert a force between said clamp body and said clamp screw, the amount of deflection of said spring member is a function of the clamping force on the material engaged by said clamp body and said hooks.

2. The clamp of claim 1 wherein said spring housing has a lip thereon, and a mark is positioned with respect to said clamp body so that when said spring is deflected so that said spring housing lip is aligned with said mark, said clamp applies a predetermined force upon the member being clamped.

3. The clamp of claim 2 wherein a force control washer is interposed between said clamp and said body and said mark is on said force control washer.

4. The clamp of claim 3 where said force control washer has first and second marks thereon, said first and second marks representing first and second predetermined clamping forces applicable by said clamp on the member to be clamped.

5. The clamp of claim 3 wherein said force control washer has a shoulder thereon and said spring housing is crimped around said shoulder to retain said force control washer with respect to said spring housing to retain said spring member within said spring housing.

6. The clamp of claim 3 wherein said spring member comprises at least one truncated hollow conical spring.

7. The clamp of claim 6 wherein said spring member comprises a plurality of truncated hollow conical springs arranged in series interposed between said spring housing and said force control washer.