April 7, 1953 F. J. SURENDA 2,634,079

CLAMP COMPRISING TWO ELEMENTS JAMMED ON A RAIL

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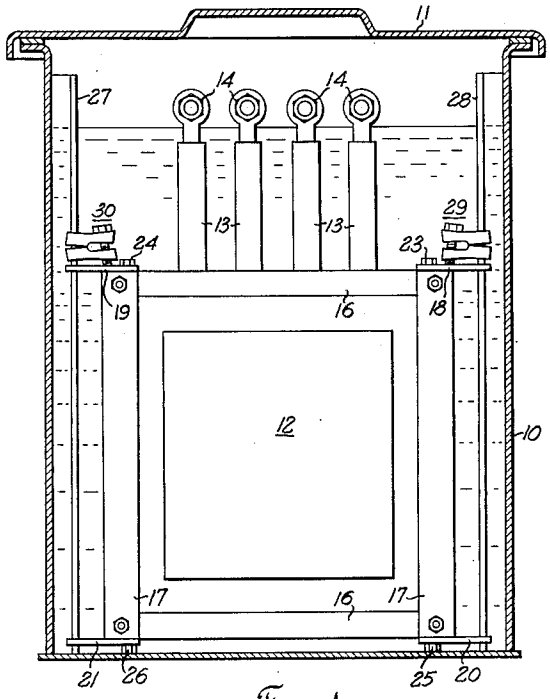


Fig. 1

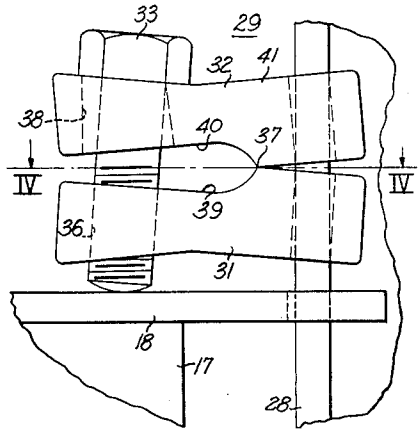


Fig. 2

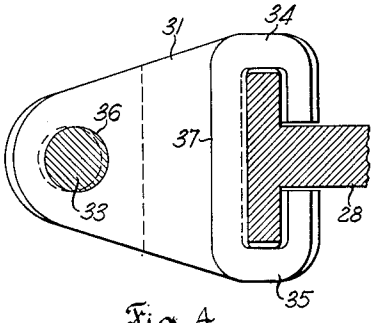


Fig. 4

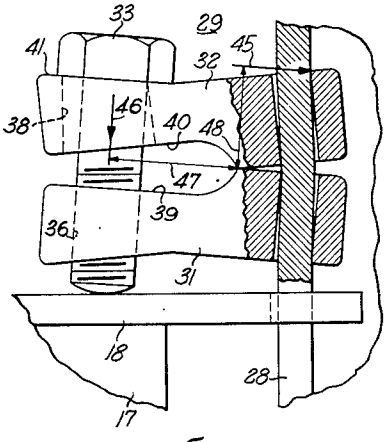


Fig. 3

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CLAMP COMPRISING TWO ELEMENTS JAMMED ON A RAIL

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3 Claims. (Cl. 248—361)

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This invention relates to clamping devices and has particular application to clamping objects against movement in either of two directions and where the space for providing the clamping structure is very limited. The clamping device claimed has application, for example, inside of casings for holding in position transformers or transformer accessories which are spaced therefrom inside of the casing, such as terminal boards.

Various arrangements have been utilized to clamp or hold transformers or other apparatus in place inside of casings. It has been usual practice to use clamping members bolted to fixed structural parts of the casing and bolted to or acting against the transformer to hold the transformer or other apparatus in place. There are, however, several disadvantages to the usual arrangements of clamping devices. Their primary disadvantages are the difficulty of alignment of bolts or clamps with holes or notches in the fixed structure of the casing and with the frame enclosing the transformer, the necessity for the use of both ordinary and locking nuts, the inability to exactly adjust the position of the clamping device to compensate for the variances in size of apparatus being clamped, and the inability of some clamping devices to firmly lock against movement of the apparatus in either of two directions.

It is an object of this invention to provide an improved clamping device which avoids the above mentioned disadvantages.

Other objects of this invention are to provide a clamping device which is a simple, compact, inexpensive structure; is easily adjustable to any desired position; is easily locked and unlocked in position even in very confined spaces; and cannot be inadvertently moved from the locked position.

Objects and advantages other than those above set forth will be apparent in the following description when read in connection with the accompanying drawing in which:

Fig. 1 is a side view of a transformer with its casing broken away to show an embodiment of an invention;

Fig. 2 is an enlarged side view of the clamping device shown in Fig. 1 in the clamped position;

Fig. 3 shows the clamping device partly in section and in the same position as in Fig. 2;

Fig. 4 is a section view taken on the line IV—IV of Fig. 2.

The apparatus shown in Fig. 1 is provided with a casing 10 and a cover 11 which is usually adapted to be attached to the flanged upper edge

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of the casing by bolts or clamps (not shown). A transformer coil and core assembly 12 is located inside the casing and is provided with conductor cables 13 which are connected to bushing terminal members 14 of any suitable type. The core of the transformer is clamped by means of horizontal angle irons 16 and vertical angle irons 17 which are held in place by bolts. Guide members 18 and 19 may be attached to the angle irons at the top of the coil and core assembly by means of bolts 23, 24, respectively, and guide members 20, 21 are attached to the bottom of the assembly by bolts 25, 26. A pair of T-shaped resilient guide rails 27, 28 are welded to the side walls of the casing at diametrically opposite vertically extending positions. The guide members 18, 19, 20 and 21 are grooved to cooperate with the guide rails so that the coil and core assembly may be lowered into the casing with the guide members sliding upon the guide rails. The bolts 25, 26 abut the bottom of the casing to support and prevent downward movement of the assembly from its position inside the casing. The coil and core assembly is held in place against upward movement in the casing by means of clamping devices 29 and 30.

The clamping device generally indicated at 29 includes two similarly shaped resilient clamping elements 31, 32 and a clamping bolt 33. Clamping element 31 has at one end thereof a pair of arms 34 and 35 which define a T-shaped slot. The dimensions of the slot are slightly larger than the cross sectional dimensions of the T-shaped guide rail so as to permit the clamping device to slide easily upon the guide rail. The opposite end of clamping element 31 has a tapped hole 36 to receive the clamping bolt 33. The outline of element 31 shown in elevation in Fig. 2 defines a first portion of about one-third the length of the element of substantially constant width extending from the slotted end thereof to a point only a slight distance from the end of the slot. From that point, defined as the fulcrum line 37, to the other end of the element the upper edge of element 31 is cut away an amount equal to approximately one-third the thickness of the first mentioned portion.

The other of the two clamping elements 32 has the same general shape as element 31 and also has the same shape and size of T-shaped slot to slide easily upon the guide rail. However, the end of element 32 opposite to the slotted end, instead of being tapped, has a round opening 38 therethrough of a size slightly larger than the size of the shank of bolt 33. The vertical cross sectional

shape of the two clamping elements is the same.

As shown in Fig. 2, the top edge surface 41 of element 32 is not flat but is defined by two planar surfaces which intersect at an obtuse angle approximately at the midpoint of the lengthwise dimension of the element.

After the coil and core assembly has been lowered into the casing, elements 31 and 32 are slid down the rail 28 with their adjacent similar surfaces 39 and 40, respectively, abutting against each other at the fulcrum line 37. Clamping bolt 33 is inserted through opening 38 of element 32 and is screwed into tapped hole 36 of element 31 until the bottom of the bolt makes contact with guide member 18 and the head of the bolt makes contact with the flat surface 41 of element 32. The bolt 33 is then screwed farther into element 31 causing elements 31 and 32 to rotate slightly about fulcrum line 37 until they engage the guide rail along the upper and lower edges of their T-shaped slot openings. At that position the opening 38 of element 32 bears against the shank of the bolt and the head of the bolt is in contact with the flat upper surface 41 of element 32. The resiliency of the cooperating two elements acting about the fulcrum line and the resiliency of the guide rail cause the edge surface 41 to exert a force on the head of the bolt preventing the bolt from accidentally working loose.

A simple three piece clamping device is thus provided which very effectively locks itself against the rail preventing its movement in either the upward or downward direction as viewed in Fig. 2 by the utilization of the coacting bolt and clamping elements which pivot about a fulcrum line relatively close to the guide rail against which they exert a force. The clamps thus prevent any upward movement of the coil and core assembly and hold the assembly down against the bottom of the casing.

By the illustration of Fig. 3 it is particularly intended to more clearly show the action of the clamping elements against the guide rail. When the clamping device is in its locked position there is a slight bending of the guide rail. The force 45 which can be exerted through the jamming action of the clamp against the guide rail is greatly increased over the force 46 the bolt exerts on the clamping element. The comparison of the length of the relatively long lever arm 47 from the bolt to the fulcrum line with the length of the relatively shorter lever arm 48 from the fulcrum line to the remotest point of contact of the T-shaped slot edges with the guide rail represents the great increase of force exerted against the rail. Also the coaction of the two clamping elements tending to rotate about the fulcrum point provides two closely adjacent points of application of pressure against the guide rail to prevent movement of the clamping device in either the upward or downward direction. The coaction between the clamping elements and the bolt also provides force applying means in contact with the core and coil assembly and locking means for the bolt to prevent accidental or inadvertent loosening thereof.

Although but one embodiment of the present invention has been illustrated and described, it will be apparent to those skilled in the art that changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

It is claimed and desired to secure by Letters Patent:

1. A clamping device for restraining an object against movement comprising the combination of a fixed guide rail and means including a bolt, a first clamping element, and a second clamping element, each of said elements having first and second ends and a contact surface, one of said elements having its said contact surface formed intermediate its said ends to define a fulcrum line engageable with the said contact surface of the other of said elements for relative pivoting of said elements, said rail and said elements consisting of resilient material, the first end of each of said elements closely surrounding said rail, said elements abutting intermediate their ends at said contact surfaces, said bolt passing through an opening in the second end of said first element and threadedly received into the second end of said second element, said means being movable along said rail so that said bolt can make contact with said object, said bolt being adjustable with respect to said elements to move said second ends of said elements toward each other with the head of said bolt engaging a thrust surface of said first element, thereby relatively pivoting said elements about said fulcrum line until said first ends of said elements jam against said rail, said bolt then abutting said object and when adjusted coacting through said elements with said rail so that the resilience of said elements and of said rail causes a thrust on said object and prevents loosening of said means with respect to said rail.

2. A clamping device for restraining an object from moving comprising a fixed guide rail having a T-shaped cross section, force applying means, a first clamping element, and a second clamping element, said rail and said elements consisting of resilient material, each of said elements having first and second ends and a contact surface, one of said elements having its said contact surface formed intermediate its said ends to define a fulcrum line engaging the said contact surface of the other of said elements for relative pivoting of said elements, the first end of each of said elements having a T-shaped slot slightly larger than the cross section of said rail, said rail received in the slots of said elements with said elements movable along said rail, said means connected to the second ends of said elements and being engageable with said object, said means coacting with said elements and adjustable with respect to said elements to force said second ends toward each other for relatively pivoting said elements about said fulcrum line to thereby jam said first ends on said rail, said means abutting said object and when adjusted coacting through said elements with said rail so that the resilience of said elements and of said rail causes a thrust on said object.

3. A clamping device for restraining an object against movement, said device comprising a fixed guide rail, an adjustable force applying means, and a pair of clamping elements having first and second ends, said rail and said elements consisting of resilient material, said first ends of said elements substantially enclosing said rail, each of said elements having first and second ends and a contact surface, one of said elements having its said contact surface formed to define a fulcrum line engageable with said contact surface of the other of said elements, said force applying means adjusted to act on said second ends to bring them toward each other, said elements in contact with each other along said fulcrum line intermediate said force applying means and said rail, said force

applying means causing said elements to relatively pivot about said fulcrum line until said first ends of said elements forcibly engage said rail, said force applying means abutting said object and coacting through said elements with said rail so that the resilience of said elements on said rail causes a thrust on said object and prevents loosening of said force applying means.

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