ADJUSTABLE CLAMP FOR ELONGATED ARTICLES

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ABSTRACT OF THE DISCLOSURE

A releasable clamp for securing elongated articles to a supporting structure. A substantially rigid base member, a substantially rigid inverted J-shaped locking member extending upwardly from the base member and a deformable tab which may be flexible extending upwardly from the base member. Cooperating locking means on the locking member and flexible tab adapted to inter-engage and releasably lock the clamp. The cooperating locking means are adapted to lock in different positions in order to secure articles of different sizes. The base member may be substantially rectangular in plan, with the locking member and flexible tab secured to opposed sides thereof.

The locking means may have a transversely disposed projection on the locking member adapted to engage a similar projection on the flexible tab. The tab may have a number of such projections in order to provide for adjustment of clamp size. Each projection may be generally triangular in cross-section and have a vertical locking shoulder and an adjacent inclined face. The inclined face of the locking member projection is adapted to cooperate with like inclined faces of the flexible tab projections in order to permit relative sliding movement between said faces. The locking shoulder of the locking member is adapted to be releasably secured in locking engagement with a corresponding shoulder on the flexible tab.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to adjustable clamps for releasably securing elongated articles to supporting structures. More specifically, it relates to adjustable clamps which have opposed portions provided with both operating projections for effecting releasable locking of the clamp.

Description of the prior art

There are numerous known clamps and holders for securing elongated articles to a supporting structure such as a wall or ceiling. The problems encountered with clamps of this type are generally the same regardless of whether the article to be secured is part of an electrical conductor system such as a wire, cable or conduit or is part of a plumbing system such as a clamp for holding piping. In the instance where the clamp is intended for electrical use, it is generally desirable that the clamp possess electrical insulating properties.

Such clamps must generally effectively secure the elongated article to the wall or ceiling structure in a rigid fashion. In addition, the size must be such that the article being secured is not provided with any meaningful freedom of movement. Among other pertinent considerations are the cost of the clamp, the ease with which the clamp may be secured to the supporting structure, the suitability of the clamp for holding various sizes and shapes of articles and the ease with which the clamp may be released. For some installations, it is also important that the clamp possess corrosion resistant properties as well as electrical insulating properties. It may also be desirable in some instances, to provide a clamp having thermal insulating properties.

Clamps adapted for use with one side of the cable or pipe have been known for some time. Typical of such clamps is that shown in United States Patent 1,963,908.

That disclosure relates to a clamp having two separate body members adapted to be placed around the pipe to be supported and fastened to a wall member. Tightening of the clamp about the pipe is effected through the tightening of a nut and bolt assembly which passes through the clamp end furthest from the wall structure. One of the obvious disadvantages of such a system is the need to carry a rather substantial inventory of clamps of various sizes in order to be able to secure all sizes of pipes and cables. Another disadvantage of such a clamp resides in the need to tighten the clamp by means of the nut and bolt assembly with the resultant expenditure of time inherent in such a tightening mechanism. Also, as this type of clamp is generally metallic, properties of thermal as well as electrical insulation and corrosion resistance were not necessarily present.

It has also been known to the art to make a clamp or holder for bundles of electrical wire or cable from non-corrosive, non-electrically conductive materials. Such a clamp is disclosed in United States Patent 3,149,808 wherein an elongated nylon strap having an enlarged head with an opening therethrough is provided. In using this clamp, a tapered end of the clamp is passed through the enlarged aperture in the head which is disposed on the other end of the resilient strap. Teeth on the strap adjacent the tapered end are engaged with teeth within the aperture of the enlarged head and the wires or cables are enclosed in the loop thus defined. In addition, in order to secure the clamp in that position, a wedge-shaped member is driven into the head opening after the tapered end has been inserted, thus retaining the clamp in locked position. One of the disadvantages of such a clamping system is the need to provide an independent member through which locking is effected. Another disadvantage is the resultant inability to release the clamp without destruction of the clamp structure. Also, there is provided no convenient means of securing the clamp to a supporting structure. Another disadvantage of such a structure, is the time consumed in placing the clamp in position for locking and subsequently inserting the independent wedge-shaped member in order to effect locking. The clamp disclosed in United States Patent 2,979,794 is similar in that it also provides an elongated flexible strap having an enlarged head with an opening therein adapted to receive the opposed end of the strap which has teeth adapted for engagement with serrations contained within the enlarged head. The serrations are said to prevent movement in one direction but permit it in another. This clamp is said to be releasable. It is noted that with this clamp, it is necessary to thread one end of the flexible strap through an aperture in the opposed end. This is undesirable as, with one or more cables in position, and the member secured in some fashion, to a structural support, it is somewhat awkward to thread the serrated strap end through the aperture. A similar structure is disclosed in United States Patent 2,936,980 wherein a strap end having protruberances is inserted into a slot having an edge adapted to engage the protuberances.

As an alternative to providing a flexible strap having an integral opening adapted to receive the opposed end of the strap with some sort of protuberance provided for locking engagement, it has also been known to provide an independent locking member adapted to secure the two overlapped ends of a strap in the desired position. One such a clamp is illustrated in United States Patent 3,305,319 wherein the ends of an adjustable ring-shaped clamp are
overlapped and an operating member is provided. The overlapped ends of the clamp pass through an opening in the operating member. Situated within the operating member is a rotating member which, upon rotation, adjustably moves from the clamp body thereby altering the size of the opening. This sort of clamp not only requires the use of a separate locking member, but also manual manipulation during installation is required in order to effect adjustment of the clamp size.

SUMMARY OF THE INVENTION

This invention provides an adjustable clamp which is adapted to be readily secured to a supporting structure. The clamp has a base member which is substantially rigid and an upstanding generally inverted, J-shaped, rigid locking member which is adapted to cooperate with a deformable tab member which may be flexible also secured to the base member. Cooperating, inter-engaging locking means on the J-shaped locking member and deformable tab are adapted to provide adjustable, releasable locking of the clamp member. Locking and release may be effected by a simple, single movement. The locking means has inter-engaging protruberances provided on the locking member and the deformable strap. These protruberances have an integral locking shoulder and an inclined sliding face. The inclined faces are adapted to have relative sliding movement upon contact with each other and the locking shoulders are adapted to provide locking engagement with each other.

The above discussed problems have been solved by the clamp of this invention. The clamp may be of unit construction and is preferably molded as a unitary member, from a plastic material which may be resilient. The portions of the clamp connecting the locking member and the flexible tab with the base member are preferably of reduced thickness in order to provide an integral hinge for rotation of these members with respect to the base member. The base member is preferably provided with means to secure the base to a supporting structure such as an aperture through which a fastener may be passed. The base may also be provided with one or more upstanding bosses which assist in rigid retention of the elongated article secured within the clamp. In order to effect release of the clamp, all that is required is that a suitably directed force be applied to establish relative sliding movement between the locking shoulders until one shoulder is free from the other.

It is an object of this invention to provide a releasable clamp for elongated articles such as electrical wires, cables and the like which clamp possesses adjustability, ease of locking and unlocking, and is composed of an electrically and thermally insulating material.

It is another object of this invention to provide a clamp composed of resilient material having rigid and deformable elongate cooperating locking members secured to a base member with each of the members having integral locking means.

It is a further object of this invention to provide an adjustable clamp which is economical to manufacture and adapted for effective, releasable locking over a wide range of sizes.

It is a still further object of this invention to provide an adjustable clamp composed of a resilient material adapted to be molded as a unit.

Other objects and advantages of the invention will be apparent from the following description of the invention, on reference to the illustrations appended hereto.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIGURE 1 is a front elevation of a type of clamp contemplated by this invention illustrated in the open position.

FIGURE 2 is a side elevation of the clamp of FIGURE 1 taken along II—II of FIGURE 1.

FIGURE 3 is a sectional view of the clamp of FIGURE 1 taken through III—III.

FIGURE 4 illustrates the clamp in locked position securing a singular elongated article.

FIGURE 5 illustrates the clamp in closed position securing a relatively large tubular elongated article.

FIGURE 6 illustrates the clamp immediately after the initiation of release, with a number of elongated members having been secured within the clamp.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings in greater detail, attention is directed to FIGURES 1 and 2. In the form of clamp illustrated in these figures, the clamp has a base member 2, a substantially inverted J-shaped locking member 4 and a deformable tab 6. The locking member 4 extends upwardly from one edge of the base member 2, and the flexible tab 6 extends generally upwardly from an opposed edge of base member 2. In the form selected for illustration in these figures, the clamp has been integrally formed as a unit by molding of resilient material. The base member 2 and locking member 4 are of sufficient thickness that they are substantially rigid as compared with the deformable tab 6 which is in the form shown, flexible. The connection between locking member 4 and base member 2 is of reduced thickness with respect to the remainder of locking member 4 in order to provide an integral hinge 8 which facilitates rotation of locking member 4 about base member 2. The flexible tab 6 is connected with base member 2 by means of a portion of reduced thickness which defines integral hinge 10 in order to permit rotation of flexible tab 6 about base member 2.

The locking member 4 extends generally upwardly and terminates in a free end 20. Flexible tab 6 extends generally upwardly and terminates in a free end 22. In the form shown, the tab 6 has a surface curved about a horizontal axis with a concave inner surface. The locking member 4 has an inside surface 24 and an outside surface 26. The flexible tab 6 has an inside surface 28 and an outside surface 30.

A locking member projection 32 is disposed on the inside surface 24 of locking member 4 relatively close to free end 20. A number of flexible tab locking projections 34 are disposed on the outside surface 30 of flexible tab 6 intermediate hinge 10 and free end 22.

The locking member 4 and the flexible tab 6 each have a central longitudinal axis 36, 38 respectively which are generally vertically disposed. As is shown in FIGURE 2, the projections 34, 32 are elongated and generally transversely disposed with respect to said central longitudinal axis.

The projections illustrated are shown to have a substantially triangular cross-section. The projection disposed on locking member 4 has a shoulder portion 40 defined by a surface substantially perpendicular to the locking member 4. It also has an inclined face 42 which is disposed closer to the free end 20 than shoulder portion 40. Similarly, the projections on flexible tab 6 each have a flexible tab locking shoulder portion 44 and an inclined face 46. The inclined face 42 of locking member 4 is adapted for relative sliding movement over the inclined faces 46 of flexible tab 6. The locking shoulder 40 is adapted for locking engagement with the flexible tab locking shoulders 44. In effecting locking engagement between the locking member and flexible tab, inclined face 42 is moved across the outer surface of flexible tab 6 until the desired size of clamp opening is obtained. During this movement, inclined face 42 will slide in cammed fashion over inclined faces 46.

When the point at which locking engagement is desired has been reached, locking member shoulder 40 will be permitted to engage one of the flexible tab shoulders 44, thereby preventing removal of locking member 4 from flexible tab 6. As is seen in FIGURE 5, a tubular elongate
article 48 has been secured within clamp 50. Locking member 4 has been rotated in a generally clockwise direction with respect to the position shown in FIGURE 1. Flexible tab 6 has been rotated in a generally counter-clockwise direction with respect to the position shown in FIGURE 1. Locking shoulder 40 of locking member 4 has engaged flexible tab shoulder 44 in order to secure the clamp in locked position.

Had the elongated article been of a substantially smaller size, the clamp would have assumed the position shown in FIGURE 6. As shown in FIGURE 5, 48 has been secured within clamp 50. The degree of rotation of both locking member 4 and flexible tab 6 has increased substantially with respect to the positions illustrated in FIGURE 5. It will be appreciated that this rotational movement is facilitated by the presence of hinges 8, 10, respectively.

In locked position, the inner surface 28 of flexible tab 6 is caused to bear against the elongated article. The locking member shoulder portion 40 bears against the flexible tab shoulder portion 44 in order to establish inter-engagement between the two members and thereby lock the elongated article 48 in the desired position.

Should it be desired to release the clamping member, all that is required is to manually release the inter-engagement between locking member shoulder portion 40 and flexible tab shoulder portion 44. This may be readily accomplished by releasing the locking member 4 and flexible tab 6. Thus, in effect, as is shown in FIGURE 6, either the locking member 4 is rotated generally counter-clockwise, or the flexible tab 6 is rotated generally clockwise. Once the inter-engagement between locking member shoulder portion 40 and flexible tab shoulder portion 44 have been released, the locking member and flexible tab may be rotated to their original position, thereby freeing the secured elongated articles.

Referring now to FIGURES 1 and 3, it is seen that the base member 2 which is preferably rectangular in plan, is provided with an opening 52 through which a fastener for securing the clamp to a supporting wall or structure may pass is provided. In FIGURE 5, a fastener 54 which may conveniently be a nail or screw, is shown extending through hole 52 and securing the clamp to supporting structure 56. The clamp is thereby effectively and simply anchored to the desired supporting structure 56. In order to facilitate such anchoring, the bottom surface 58 of the base member 2 is preferably of similar shape to the surface of the supporting structure 56. Should it be desired, other conventional fastening means such as adhesives, for example, may be employed. In the form illustrated, the base member 2 has a substantially flat bottom surface 58.

As is shown in FIGURES 1 and 3, the upper surface 60 of base member 2 has a pair of upstanding bosses 62. These bosses, which are preferably integrally formed and of generally hemispheric configuration, serve to assist in positioning and retaining of the elongated article. As is shown in FIGURE 5, bosses 62 bear on a portion of the elongated article 48 substantially diametrically opposed to the contact position between the elongated article 48 and the flexible tab 6. It is also noted that in FIGURE 6 wherein a number of elongated articles 48 are secured within the clamp 50, bosses 62 also serve to assist in restraining the articles against a transverse movement.

It is noted that as is shown in FIGURE 2, the base member 2 may be of greater width than the locking member 4 or flexible tab 6. The portions 64, 66, which extend outwardly beyond the locking member 4 and flexible tab 6 serve to provide a more stable foundation, but are by no means essential.

The clamp may be made from any suitable material adapted to provide a substantially rigid base member 2, a substantially rigid inverted J-shaped member 4 and a tab 6 which is either permanently or resiliently deformable. The material is preferably, at least partially, a moldable resilient material. The material, if contemplated for use with electrical wires, conduits or cable should be preferably, electrically insulating. The material also should be corrosion resistant and possess some thermal insulating properties. A material such as polypropylene for example, has been found to be suitable for this purpose. The use of such materials facilitates economical manufacture of these clamps by enabling the manufacture of the clamp as a unit by molding.

It will be appreciated, therefore, that the clamp of this invention is adapted for simple installation and economical manufacture. By means of the suitably placed projections on the substantially rigid locking member 4 and flexible tab 6, the clamp may be releasably locked in a number of positions in order to adjust its size to accommodate the elongated article 48 which is to be secured therein. The base member is preferably substantially rectangular in plan and is provided with a hole 52 through which a fastener may pass and upstanding integral bosses 62 which aid in restraint in positioning of the elongated article 48. The cooperating projections 32, 34 provide in essence, a ratchet effect which facilitates closing and locking movement of the clamp at the appropriate, desired position. Releasing of the clamp may be readily accomplished by freeing the interlocking shoulders 40, 44. In the preferred form, the combination of the resiliency of the material, permits the tab 6 to be flexible and the integral hinges 10 permit free rotation of locking member 4 and tab 6 about base member 2, as well as flexing of tab 6.

It will be further appreciated that the preferred, substantially triangular cross-sectional configurations of projections 32, 34 contribute to the functioning of this clamp structure. As the projections 32, 34 are preferably elongated, a substantial area of bearing contact between interlocking shoulders 40, 44 is provided. While for purposes of illustration, the locking member 4 has been illustrated as having a single projection 32, it will be appreciated that additional projections may be provided on locking member 4, if desired, and the flexible tab may be provided with a single projection 34, should this arrangement be desired. It is preferred, however, that the single projection be placed on the locking member 4 and the plurality of projections 34 which provide for the adjustability feature of the clamp 50, be placed on flexible tab 6.

Whereas, particular embodiments of this invention have been described above for purposes of illustration, it will be apparent to those skilled in the arts, that numerous variations of the details may be made without departing from the appended claims.

1. A releasable clamp for securing elongated articles to a supporting structure comprising, a substantially rigid base member, a substantially rigid generally inverted J-shaped locking member extending upwardly from said base member terminating in a free end, a deformable tab extending upwardly from said base member and terminating in a free end, cooperating locking means disposed on said locking member and said flexible tab adapted to inter-engage to releasably lock said clamp, and said inter-engaging locking means adjustable to secure articles of different sizes.

2. The clamp of claim 1 wherein, said base member is substantially rectangular in plan, said locking member is connected to said base member adjacent one edge of said base member, said deformable tab is connected to said base member adjacent the opposed edge of said base member.

3. The clamp of claim 1 wherein, said deformable tab is flexible, said cooperating locking means has a locking member projection disposed on the inner surface of said locking member adjacent the free end thereof and a plurality of flexible tab projections on the outer surface of said flexible tab, and
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said flexible tab projections adapted to releasably engage said locking member projection.

4. The clamp of claim 3 wherein, said clamp is composed of a resilient material, said clamp has a unitary molded structure and is composed of an electrically insulating material, the connection between said locking member and said base member is of reduced thickness with respect to the remainder of said locking member to provide an integral hinge for rotational movement of said locking member about said base member, and the connection between said flexible tab and said base member is of reduced thickness with respect to the remainder of said flexible tab to provide an integral hinge for rotational movement of said flexible tab with respect to said base member.

5. The clamp of claim 3 wherein, said base member has means for facilitating securing said base member to a supporting member, and said base member has at least two integral upstanding bosses adapted to bear against said elongated articles.

6. The clamp of claim 3 wherein, said locking member has a longitudinal central axis which extends generally from said base member to said free end of said locking member, said flexible tab has a longitudinal central axis which extends generally from said base member to said free end of said flexible tab, and said locking member projection is elongated and disposed generally transversely on said locking member and said flexible tab projections are elongated and disposed generally transversely on said flexible tab.

7. The clamp of claim 4 wherein, said electrically insulating material is polypropylene.

8. The clamp of claim 6 wherein, said locking member projection is elongated and has a substantially triangular cross-section with a locking shoulder defined by a face disposed substantially perpendicular to said flexible tab and having another face inclined with respect to said flexible tab, said inclined face of each of said flexible tab projections disposed closer to said free end of said flexible tab than said locking shoulder, said inclined faces of said flexible tab projections adapted to have sliding contact with said inclined face of said locking member projections, and said tab shoulders of said flexible tab projections adapted to releasably engage said locking member shoulder of said locking member projection in order to lock said clamp.

9. The clamp of claim 8 wherein, said flexible tab is curved about a horizontal axis and has a concave inner surface.

10. The clamp of claim 8 wherein, said base member has an opening through which a fastener may be passed, said clamp is secured to a rigid supporting structure by means of a fastener which passes through said opening in said base member, said locking member shoulder is engaged with a locking member shoulder of one of said flexible tab projections, and an electrical wire is secured within said clamp.

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