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TRANSFORMER COVER LOCKING DEVICE

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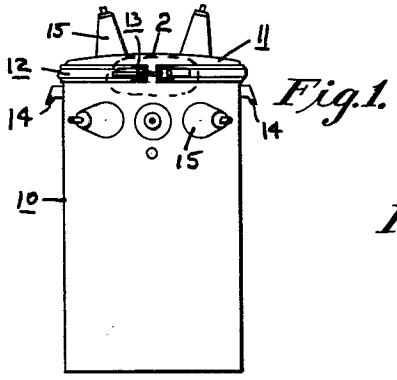


Fig.1.

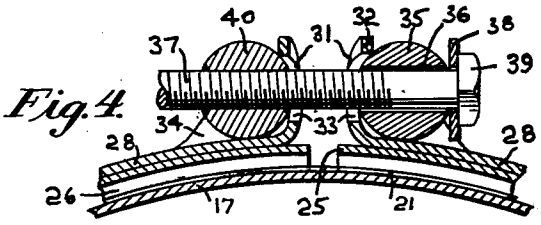


Fig.4.

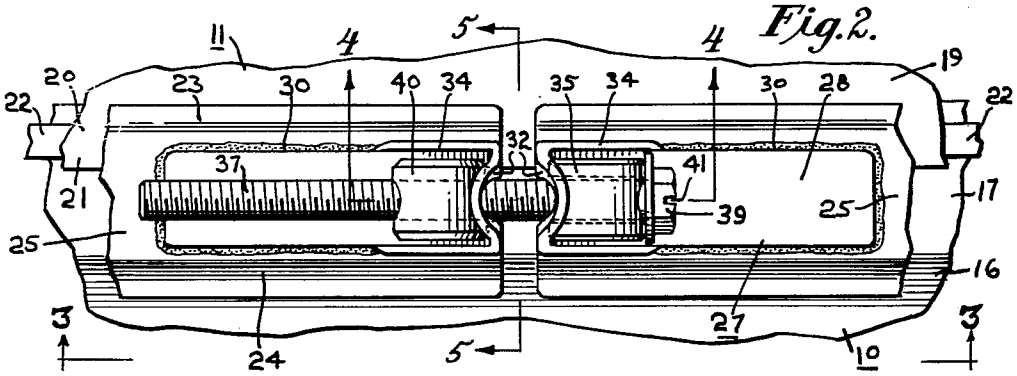


Fig.2.

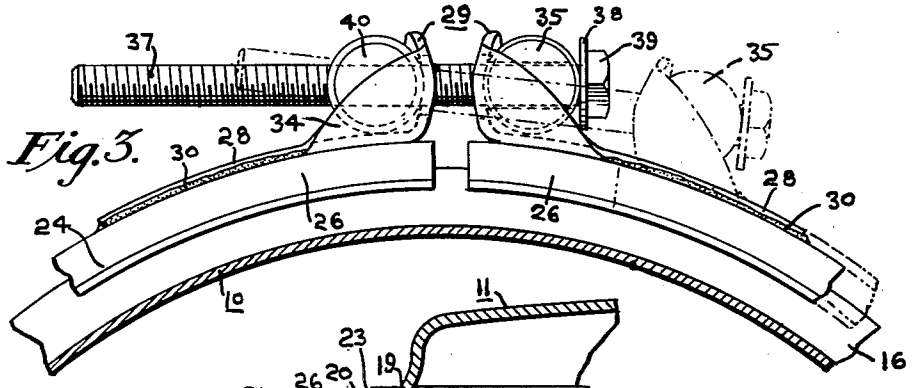


Fig.3.

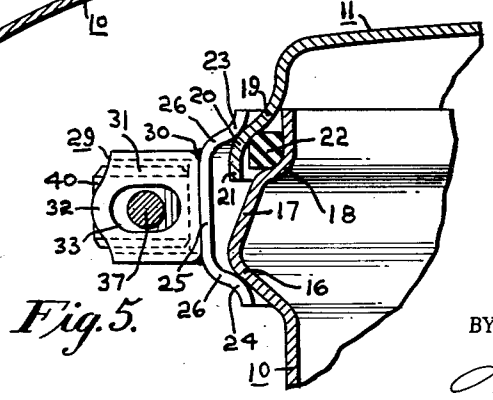


Fig.5.

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TRANSFORMER COVER LOCKING DEVICE

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1 Claim. (Cl. 24—279)

This invention relates generally to transformer cover locking devices, and more particularly relates to locking devices of the compression band type used to lock the cover structure to the tank casing of power distribution transformers.

Compression band cover locks are not per se new, many forms of such locking devices being known and used. In general, the known types of locking band devices are so constructed that when placed in use and tightened to provide the desired locking action they become physically distorted so that removal thereafter is extremely difficult.

It is therefore a primary object of this invention to provide a novel transformer cover locking device which may be quickly and easily installed to secure a transformer cover to its associated tank, and which may be subsequently just as readily removed when it is necessary thereafter to have access to the interior of the transformer tank.

Another object of the invention is to provide a novel transformer cover locking device of the compression band type which utilizes a draw-up bolt together with novel anchoring means therefore which prevent bending distortions of the bolt and thereby maintain the bolt in a physical state permitting its subsequent easy loosening for purposes of removing the compression band.

The foregoing and other objects of the invention will become clear from a reading of the following specification in conjunction with an examination of the appended drawings, wherein:

FIGURE 1 shows in front elevation a typical tank type of transformer having the transformer cover secured down upon the tank by means of the novel transformer cover locking device according to the invention;

FIGURE 2 is an enlarged showing of the locking device region of the compression band cover locking device shown in the phantom outline on FIGURE 1, portions of the transformer cover and tank being fragmentarily illustrated;

FIGURE 3 is a bottom view of the novel locking structure as would be seen when viewed along the line 3—3 of FIGURE 2;

FIGURE 4 is a longitudinal sectional view through the novel locking device as would be seen when viewed along the line 4—4; and

FIGURE 5 is a cross-sectional view through the takeup bolt of the locking device according to the invention as would be seen when viewed along the line 5—5 of FIGURE 2.

In the several figures, like elements are denoted by like reference characters.

Turning now to the figures, and considering first the showing of FIGURE 1, there will be seen a transformer having a tank portion 10 fitted with a cover 11 secured upon the tank by means of the compression band 12 pulled up tight by means of locking device 13. The tank is provided with lifting handles 14 and tank and cover are fitted with terminal bushings 15.

As best seen in FIGURE 5, the upper section of the tank 10 in the region where it is clamped by the compression band 12 is turned radially outward and upward to form a flared lip 16 which turns radially back inward to form the sloping face 17, the face 17 itself terminating at inwardly offset shoulder 18 from the inner edge of

which the tank turns upward for a short distance to its terminating open top edge. The cover 11 turns downward from its top surface outer edge and then slopes radially outward and downward to form the sloping face 19 which turns vertically downward to form a shoulder 20 terminating in skirt 21. Seated upon the shoulder 18 of the tank 10 is an annular gasket 22 which is placed in compression by shoulder 20 of cover 11 when the cover is seated upon the tank to close the same. The cover 11 may be forced downward upon the tank 10 to compress the gasket 22 until the sloping face 19 of the cover 11 engages the upper edge of the tank 10, after which no further gasket compression occurs.

The gasket compression is effected by shortening the circumference of compression band 12 by means of the locking device 13 to force the curved skirts 23 and 24 of the compression band respectively inward over shoulder 20 of cover 11 and inward under tank lip 16, the compression band curved skirts 23 and 24 constituting the side edge terminations of the compression band 12 which latter is generally of U-shape in transverse section having a flat base portion 25 and sidewalls 26. The tank curved lip 16, cover curved shoulder 20 and compression band curved skirts 23 and 24 are observed to comprise a group of camming surfaces which force the tank cover 11 downward to compress the gasket 22 when the compression band 12 is circumferentially shortened by the locking device 13.

The structural aspects of the locking device 13 are most clearly seen in FIGURES 3, 4 and 5 which shows a pair of anchors designated generally as 27 each of which has a generally flat base plate portion 28 longitudinally arced and provided at one end with a cradle structure 29. The base plates 28 are seated flat-wise upon the outer surface of the compression band flat base 25 and welded thereto, as at 30, so that the cradle structures 29 are in face to face relation when the compression band 12 is formed into a loop. Each of the cradles 29 has an upstanding front wall 31 indented as at 32 and turned back into overlying relationship relative to the base plate 28 proximate the front wall top, the front wall 31 being centrally apertured in vertically elongated fashion as at 33. Extending rearward and downward from the side edges of front wall 31 to the side edges of base plate 28 are anchor side walls 34 shown as integrally formed with the front wall 31 and the base plate 28.

Disposed within one of the cradle structures 29 is a cylindrical piece 35 of diameter sufficiently small to allow the cylindrical surface to engage the rear face of front wall 31 and top face of base plate 28 while underlying the indented region 32 of the cradle structure. The height of the cylindrical piece 35 between its parallel bases is somewhat less than the clear distance between the inside faces of the opposite side walls of the cradle structure so that while the cylindrical piece 35 is readily disposed between the side walls 34 it is restrained from any appreciable rotation except about an axis substantially perpendicular to the side walls. The cylindrical piece 35 is transversely bored completely therethrough along a diameter as at 36 so that the shank 37 of a bolt may pass freely therethrough until stopped by abutment of washer 38 with cylindrical piece 35 to thereby stop bolt head 39. As best seen in FIGURES 4 and 5, the diameter of bolt shank 37 is considerably smaller than the elongated aperture 33 so that the bolt shank 37 is freely movable within the cradle apertures. Disposed within the remaining cradle structure 29 is a cylindrical piece 40 of the same shape and dimensions as the cylindrical piece 35 previously described but which is not provided with a bore 36 to allow free passage of the bolt shank 37 therethrough, being instead bored and tapped with threads

complemental to those of the bolt shank 37 to thereby in effect form a nut therefor.

From the showing of FIGURE 4 which clearly illustrates the ability of the cylindrical pieces 35 and 40 to roll about their cylindrical surfaces relative to the anchor cradle structures together with the fact that the bolt shank 37 is sufficiently smaller than the elongated apertures 33 to prevent binding therein under conditions of relative motion between cylindrical pieces 35 and 40 on the one hand and cradle structure 29 on the other hand. It is fundamentally this structure which prevents binding of the bolt as the latter is drawn up to seal the cover 11 to the tank 10 by pulling the ends of the compression band 12 toward one another.

The operation is most clearly seen in FIGURE 3 wherein a loose condition of compression band 12 may be considered to exist when the cylindrical piece 35 and its associated anchor are in the position designated in phantom outline while the cylindrical piece 40 remains in the position designated by the solid line showing. Under this condition, it is observed that the bolt shank 37 illustrated is inclined at an angle to the position of the bolt shank illustrated in solid line when the compression band has been pulled up tight. Similarly, it will be recognized that under such condition the cylindrical piece 40 must of necessity occupy a somewhat clockwise rotated position in order that its threaded bore be in alignment with the bolt shank 37 which is threaded therethrough. Thus, as the bolt head 39 is turned to move the cradle structures 29 toward one another from the solid and phantom outline position to that designated by both completely solid line showings, it is understood that the cradle 29 of cylindrical piece 40 rotates relatively counter-clockwise while the cradle 29 of cylindrical piece 35 rotates relatively clockwise.

As the tightening procedure progresses, the bolt shank 37 also moves somewhat downward in the elongated apertures 33. With the cradles of the cylindrical pieces 35 and 40 being free to rotate relatively as aforedescribed and with the bolt shank 37 being free to move within the elongated apertures 33 there are no bending forces ever developed transversely to the axis of the bolt shank 37. If however, the cradle of cylindrical piece 40 were not free to rotate in a counter-clockwise direction relative to the piece 40 but were rigidly fixed thereto, it will be now apparent that the bolt shank 37 must of necessity undergo axial bending strains as it is advanced through the securing nut structure. A binding condition is therefore created which becomes successively more aggravated with continued take-up action of the bolt shank. The cylindrical piece 35, in addition to its rotational function as part of the strain relieving device for the bolt, also acts as a spacer which moves the bolt head 39 rearward beyond the anchor side walls 34 so that it is readily accessible to a wrenching tool. If desired, the bolt head 39 may also be cross-slotted as at 41 so as to be turnable by a screwdriver type of tool.

Having now described our invention in connection with a particularly illustrated embodiment thereof, it will be appreciated that variations and modifications of the same may now occur from time to time to those persons normally skilled in the art without departing from the essential scope or spirit of our invention, and accordingly it is intended to claim the same broadly as well as specifically as indicated by the appended claim.

What is claimed as new and useful is:

In a compression loop clamping band assembly for locking together a pair of members encompassed thereby by drawing the ends of the looped band toward one another to reduce the circumference of the band and thereby exert compression on the members, a clamping band locking device comprising, in combination, a pair of anchors each of which has a base plate portion provided at one end thereof with an upstanding cradle structure, said base plate portions being fixedly secured to the outer surface of the clamping band at opposite ends thereof so that the cradle structures are disposed in facing relation when the band is in loop form, each of said cradle structures having an upstanding substantially centrally apertured front wall having a portion proximate the top thereof indented into overlying relationship relative to its base plate portion and a pair of sidewalls extending rearward from and rigidly interconnecting the side edges of the front wall to the base plate, a pair of cylindrical pieces disposed respectively within different ones of said cradle structures with their axes parallel to one another and extending transversely of said cradle structures, each of said cylindrical pieces being of diameter sufficiently small so that the cylindrical surface thereof simultaneously engages the rear face of the cradle front wall and the top face of the base plate while at least partially underlying the indented top portion of the front wall, the axial length of each of the cylindrical pieces being somewhat less than the clear distance between the inside faces of said cradle sidewalls to thereby restrain said cylindrical piece from appreciable rotation except about its axis, said cylindrical pieces being each provided with a bore extending diametrically completely therethrough with one of said bores being threaded to receive the threads of a bolt and the other of said bores being smooth-walled and of larger diameter than that of the threaded bore, and a headed bolt having a threaded shank projected freely through the smooth-walled bore cylindrical piece and the facing apertured front walls of said cradle structure and threaded through the threaded bore cylindrical piece, the diameter of said bolt shank being substantially smaller than the aperture in said cradle structures front walls in a top to bottom direction, the arrangement being such that when said bolt is turned to move the anchor front walls toward each other to reduce the circumference of the band, said cylindrical pieces are respectively confined by said indented portions of the front walls of said cradles against upward movement therein and so are free to counter-rotate about parallel axes fixed relatively to their respective cradles, thereby permitting the bolt shank to freely move through the apertures in said cradle front walls without inducing any bending stresses in the bolt shank.

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