

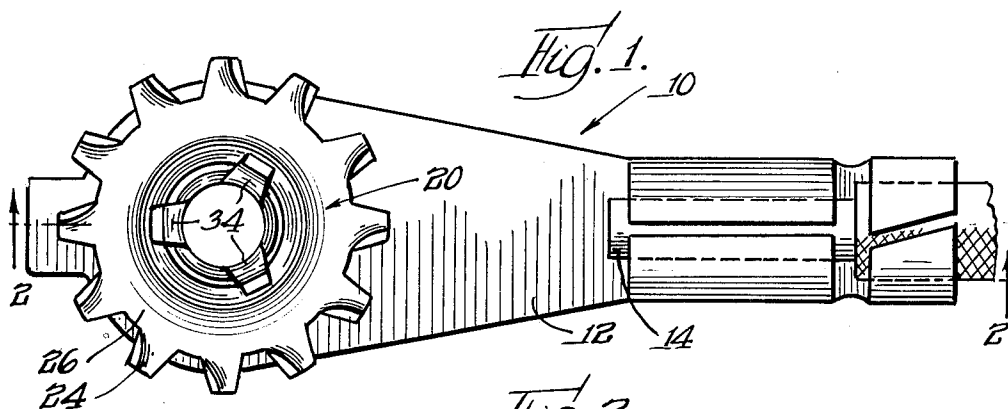
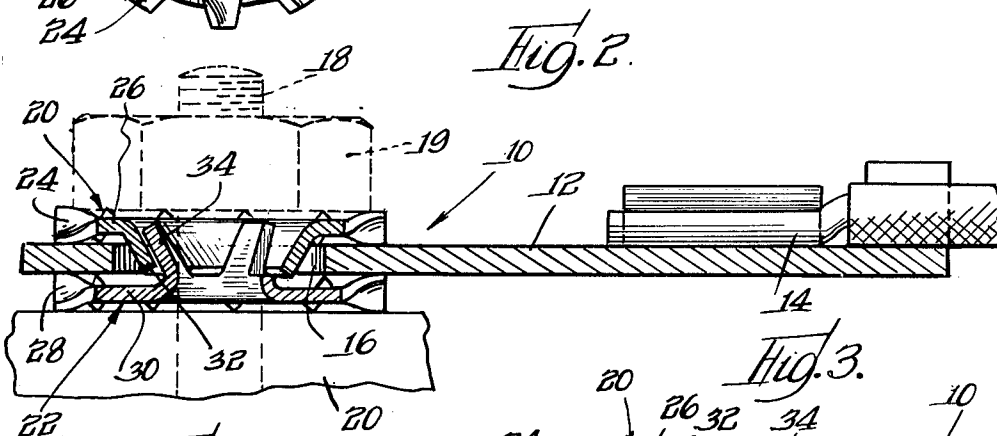
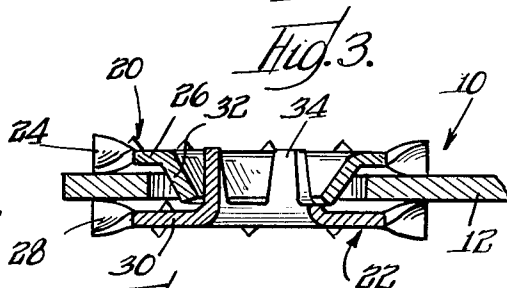
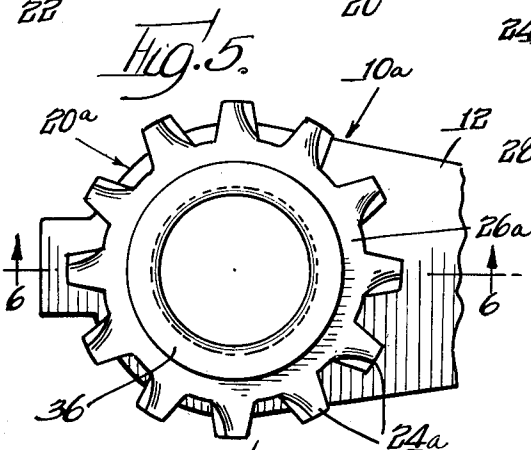
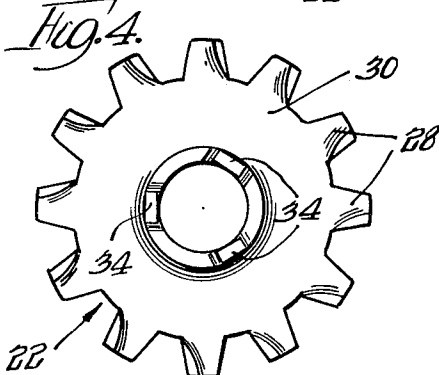
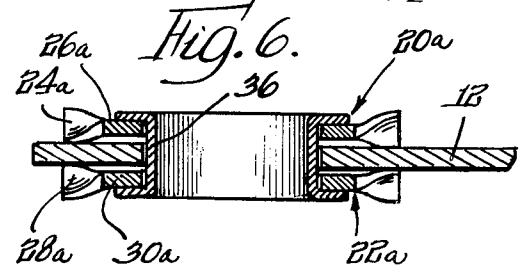
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3,190,333

DUAL WASHER LOCKING DEVICE

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3,190,333

DUAL WASHER LOCKING DEVICE

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4 Claims. (Cl. 151—35)

This invention relates generally to locking devices and more particularly to locking devices in the nature of lockwashers for securing an apertured workpiece interposed between a pair of lockwashers.

Certain problems have heretofore been experienced in securing apertured workpieces in place, as for example, electric terminals of the sheet metal type which are apertured at one extremity to accommodate a binding post or screw. It has not been uncommon, after a conventional terminal has been telescopically associated with a terminal post or screw and a nut tightening thereagainst, for the terminal member to be thereby subjected to rotation due to the frictional engagement of the under side of the nut with the adjacent surface of the terminal. This often results in causing the conductor secured to the opposite or free extremity of the terminal to become dislodged. In fact, in most instances it is very desirable to prevent the terminal from rotating when the nut on the binding post or screw is tightened thereagainst. It is therefore one of the primary objects of the present invention to provide means for securing an apertured workpiece such as an electric terminal in position by a clamping member or nut without subjecting the terminal to objectionable rotation. To this end the present invention contemplates the use of a pair of locking members positioned on opposite sides of a workpiece such as an electric terminal in such a manner as to assure good electrical contact without imparting rotation to the terminal.

More specifically, the present invention contemplates a locking device as set forth above wherein positive locking against unwarranted loosening of a threaded clamping member such as a nut is assured without simultaneously subjecting the workpiece associated therewith to forces tending to impart rotation thereto.

Still more specifically it is the object of the present invention to not only increase locking effectiveness in clampingly securing an electric terminal in position upon a binding post or screw, but also materially to increase electrical contact between the terminal member and the source of electric power.

It is a further object of the present invention to accomplish the above mentioned advantages with minimum cost of manufacture and with a minimum number of telescopically associated terminal parts and to this end the invention contemplates the use of a pair of locking members having teeth adapted to lockingly impinge opposite sides of a terminal member when a conventional terminal nut is clamped thereagainst, said locking members being freely relatively rotatable until finally locked in position.

The foregoing and other objects and advantages will be apparent from the following detailed description when considered in connection with the accompanying drawing, wherein:

FIG. 1 is a plan view of an electric terminal member associated with lockwasher members in accordance with the teachings of the present invention;

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FIG. 2 is a vertical central sectional view taken substantially along the line 2—2 of FIG. 1;

FIG. 3 is a fragmentary sectional view similar to the left portion of FIG. 2 disclosing the position of the washer coupling means prior to swaging of one of the circumferentially disposed sections;

FIG. 4 is a plan view of the lower washer of FIG. 3 with the upper washer and terminal member separated therefrom;

FIG. 5 is a fragmentary plan view of a locking device of modified form; and

FIG. 6 is a central transverse sectional view taken substantially along the line 6—6 of FIG. 5.

Referring now to the drawings more in detail, where like numerals have been employed to discuss similar parts throughout the various figures, it will be seen that one embodiment of the invention is disclosed in FIGS. 1—4, inclusive. The invention is shown as being incorporated in an electrical connecting unit or fixture designated generally by the numeral 10. This electrical connector unit includes a conventional flat type terminal 12 which at its free extremity is designed to accommodate an electrical conductor 14 and at its opposite fixed extremity is provided with an aperture 16.

Terminals of the type just referred to are commonly used in association with threaded terminal posts or screws 18 projecting outwardly from a suitable supporting member 20. A clamping screw member such as a nut 19 is usually clamped against the terminal member 12 to complete an electrical connection. As previously pointed out, one of the problems incident to the use of terminal fastenings of this type is the tendency for the terminal member 12 to be subjected to rotation as an incident to the rotary clamping action of the nut 19.

The present invention contemplates the solution of the above mentioned problem by providing a pair of lockwashers designated generally by the numeral 20 and 22. The lockwasher 20 includes an annular body portion 26 having locking prongs extending radially outwardly therefrom so as to provide locking teeth positioned axially beyond the body portion 26. As will be seen from FIG. 2 the upper teeth provided by the prongs 24 are designed to lockingly engage the clamping side of the nut 19 and the lower teeth of these prongs are adapted to impinge or lockingly engage the upper surface of the terminal member 12. In the disclosed embodiment these prongs 24 are twisted from their roots to their outer extremities so as to present the locking teeth just referred to. The other lockwasher 22 also includes a plurality of prongs 28 formed integral with and extending radially outwardly from a body portion 30. These teeth 28 are similar in structure to the prongs 24 and thus provide teeth extending axially beyond the body portion 30 so as to engage the under side of the terminal member or workpiece 12 as well as the surface of the member or mounting 20.

To assure coaxial positioning of the lockwashers 20 and 22 within the workpiece or terminal member 12, and also to effect coupling of the lockwashers with the workpiece, coupling means is provided in the vicinity of the inner body margin of each washer. In FIGS. 1—4, inclusive, this coupling means includes a generally axially projecting circumferential portion or skirt 32 which is inclined downwardly from the washer body 26 as viewed in FIGS. 2

and 3. The other or complementary portion of the coupling means includes a circumferentially disposed portion consisting of a plurality of laterally swageable members 34 in FIG. 2. In FIG. 2 these members 34 are shown as being swaged or deflected laterally so as to overlie the adjacent surface of the skirt 32. In FIGS. 3 and 4 these swageable members 34 circumferentially disposed along the inner body margin 30 are shown before swaging takes place. In this position the members 34 are adapted to be telescopically associated with the complementary coupling skirt 32 formed integral with and extending from the inner margin of the washer body 26. After the parts have been thus telescopically associated, the coupling members 34 may be deflected or swaged laterally so as to occupy the coupling position shown in FIG. 2.

In effecting the coupling of the lockwashers 20 and 22, as above described, it is preferable to permit free relative rotation of the lockwashers 20 and 22 with respect to the workpiece or terminal member 12. In other words, some play is permitted between the adjacent superimposed surfaces of the axially extending skirt 32 and members 34. In this position the lockwashers and terminal member are secured together as a unit with the lockwashers held in coaxial relation and the lockwashed teeth disposed in proper locking or impinging association with the complementary surfaces of the workpiece positioned therebetween. When this unit consisting of the coupled lockwashers and terminal member are telescopically associated with the binding post or screw 18 and the nut member 19 tightened in position as shown in FIG. 2, the terminal is secured firmly in proper position and the washer teeth become imbedded in the nut terminal and mounting block so as to assure good electric contact. It will be noted from the disposition of the lockwashers in FIGS. 2 and 3 that pressure exerted by the nut 19 is resisted by an effective strut consisting of the material of the terminal member 12 and the locking teeth inner prongs 24 and 28 located on opposite sides thereof. The inherent resiliency of the lockwasher prongs causes them to yieldably resist the clamping action of the nut 19, thus continually maintaining effective contact between the surfaces clamped against the washer teeth. Any forces tending to cause retrograde rotation of the binding post nut 19 are effectively resisted by the combined resilient locking action of the upper and lower axially aligned washer prongs 24 and 28, respectively. Also, with this arrangement the tendency for the terminal member 12 to experience rotation about the axis of its aperture 16 is reduced to a minimum.

In FIGS. 5 and 6 a modified locking arrangement is shown. The locking elements are designated by numerals corresponding with the numerals employed in describing FIGS. 1-4, inclusive, and bearing the suffix (a). Thus the lockwashers of FIGS. 5 and 6 are designated generally by the numerals 20a and 22a and the locking prongs thereof are designated by the numerals 24a and 28a respectively. Each of the lockwashers 20a and 22a have an annular body portion 26a and 30a respectively. The significant difference between the coupling means for the lockwashers 20a and 22a over the coupling means described in connection with the lockwashers 20 and 22, resides in the provision of a grommet or sleeve 36 which extends through the central apertures of the washers 20a and 22a as well as through the aperture provided in the terminal member 12. The opposite extremities of the grommet overlie the outer surfaces of the washer bodies 26a and 30a. The grommet 36 is applied in such a manner as to permit freedom of rotation of the washers 26a and 30a with respect to the workpiece or terminal member 12 prior to the tightening of the combined unit in position upon a terminal post or screw.

From the foregoing it will be apparent that the present invention contemplates a very simple and practical solution to the problem of properly securing workpieces such as electrical terminals in position. The novel arrangement of the coupling means contemplated by the present

invention serves to assure coaxial positioning of the washers as well as to secure the parts against unauthorized separation. The functioning of the lockwashers is such as to reduce to a very minimum tendencies for the terminal member to experience rotation when the clamping nut is initially clamped against the superimposed washer teeth. Also, a very good electrical connection is established due to the impingement of the washer teeth against the work surface as previously described.

While certain details of construction have been disclosed and described herein, it is to be understood that structural modifications and changes are contemplated which will fall within the scope of the appended claims.

The invention is claimed as follows:

1. In combination with an apertured workpiece, a locking device including a pair of sheet metal lockwashers with said apertured workpiece positioned therebetween, each washer having an annular body portion, yieldable locking teeth formed integral with and projecting axially and oppositely beyond the bounding planes of each of said body portions, and washer coupling means associated with the inner margins of said body portions and extending into the aperture of said workpiece for securing said washers against separation and for maintaining said washers in coaxial and relatively rotatable relation, said washer coupling means including a circumferentially disposed swageable section along at least one inner body margin overlying a complementary circumferential section along the other inner marginal sections, the teeth projecting from one side of one lockwasher positioned in operative association with an adjacent surface of the workpiece and the teeth projecting from one side of the other lockwasher positioned in operative association with the opposite adjacent surface of said workpiece whereby said lockwashers and said workpiece are secured against unauthorized separation with the lockwashers freely rotatable with respect to said workpiece, the teeth projecting from the other side of each lockwasher positioned to lockingly impinge opposed surfaces when clamped thereagainst.

2. The combination as set forth in claim 1, wherein the swageable section is interrupted to provide a plurality of circumferentially spaced portions.

3. In combination with an apertured workpiece, a locking device including a pair of sheet metal lockwashers with said apertured workpiece positioned therebetween, each washer having an annular body portion, yieldable locking teeth formed integral with and projecting axially and oppositely beyond the bounding planes of each of said body portions, and washer coupling means for securing said washers against separation for maintaining said washers in coaxial and relatively rotatable relation, said washer coupling means including a grommet extending through the apertures of said workpiece and lockwashers with the outer extremities thereof overlying the opposed outer surfaces of said body portions, the teeth projecting from one side of one lockwasher positioned in operative association with an adjacent surface of the workpiece and the teeth projecting from one side of the other lockwasher positioned in operative association with the opposite adjacent surface of said workpiece whereby said lockwashers and said workpiece are secured against unauthorized separation with the lockwashers freely rotatable with respect to said workpiece, the teeth projecting from the other side of each lockwasher positioned to lockingly impinge opposed surfaces when clamped thereagainst.

4. In combination with an apertured workpiece, a locking device including a pair of sheet metal lockwashers with said apertured workpiece positioned therebetween, each washer having an annular body portion, yieldable locking teeth formed integrally with and projecting axially and oppositely beyond the bounding planes of each of said body portions, the inner margin of one body portion presenting a continuous section inclined in

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one direction relative to the plane of the said one body portion and the inner margin of the other body portion presenting circumferentially spaced projections complementally inclined oppositely to the inclination of the said continuous section and juxtaposed therewith for coupling together the washers in coaxial and relatively 5 rotatable relation, the teeth projecting from one side of one lockwasher positioned in operative association with an adjacent surface of the workpiece and the teeth projecting from one side of the other lockwasher positioned 10 in operative association with the opposite adjacent surface of said workpiece whereby said lockwashers and said workpiece are secured against unauthorized separation with the lockwashers freely rotatable with respect to said workpiece, the teeth projecting from the other

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side of each lockwasher positioned to lockingly impinge opposed surfaces when clamped thereagainst.

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