Sept. 20, 1932. C. G. OLSON 1,878,425

LOCK WASHER

Filed July 17, 1930

Fig. 1.

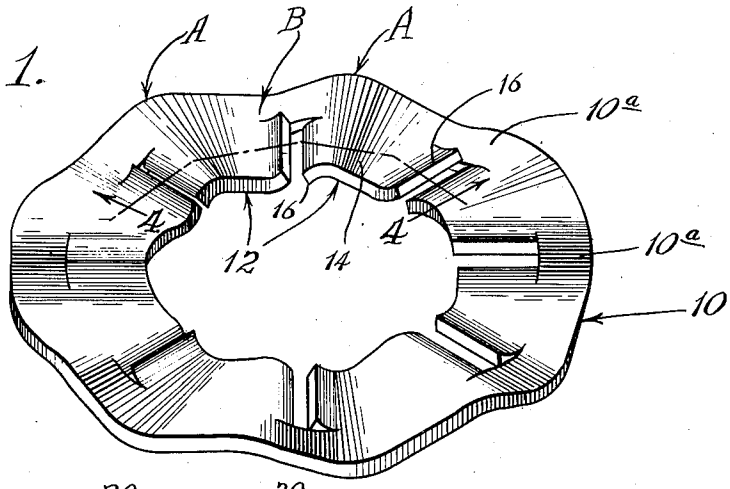


Fig. 4.

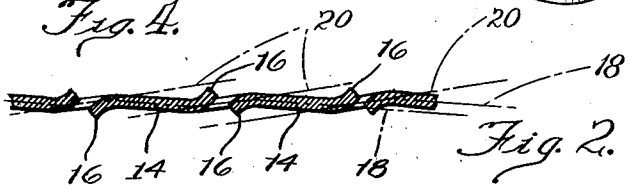


Fig. 2.

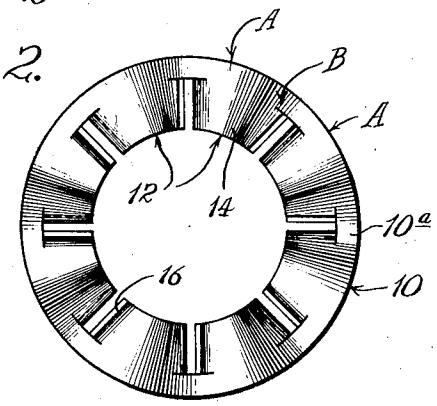
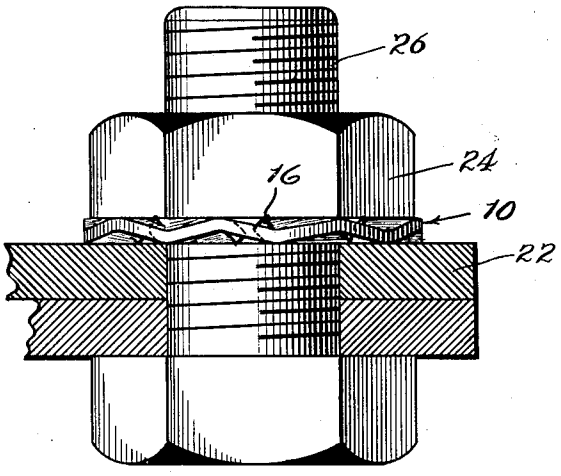


Fig. 3.



Inventor:
Carl G. Olson

By Cleaver, Cox & Morse
Attys.

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UNITED STATES PATENT OFFICE

CARL G. OLSON, OF CHICAGO, ILLINOIS, ASSIGNOR TO SHAKEPROOF LOCK WASHER COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE

LOCK WASHER

Application filed July 17, 1930. Serial No. 468,486.

My invention relates generally to lock washers and more particularly to lock washers of the annular type, having a plurality of marginal work engaging teeth.

One of the primary objects of my present invention is to provide a lock washer of improved practical design having a tooth and body construction which makes for increased locking efficiency.

More specifically my invention contemplates the provision of lock washers adapted to be formed from flat spring stock which are equipped with radial warped prongs, and which are provided with annular body portions corrugated in accordance with the warping of the prongs.

Still more specifically my invention contemplates the provision of an annular type lock washer in which a plurality of marginal prongs are provided, said prongs having a body portion inclined with respect to the plane of the washer and having oppositely disposed work engaging teeth projecting on opposite sides of the washer, an annular body portion of the washer being bent or corrugated so that when the washer is clamped between the work said corrugated or undulated portions will serve to prevent the complete dislodgment of the washer teeth from the work.

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

Figure 1 discloses a perspective view of a lock washer which is representative of one embodiment of my invention;

Figure 2 is a reduced plan view of the structure shown in Figure 1;

Figure 3 describes the washers of Figures 1 and 2 clamped against a work piece; and

Figure 4 is an unfolded sectional view taken substantially along the line 4—4 of Figure 1 to more clearly disclose the relative positions occupied by the washer prongs.

Referring now to the drawing more in detail, wherein similar numerals have been applied to corresponding parts of the various figures, it will be seen that one embodiment of my invention comprises a lock washer which includes an annular body portion designated generally by the numeral 10, and a plurality of internal radial prongs 12 formed integral with said body portion. Each of the prongs 12 includes a body portion or section 14 and work engaging edges or teeth, 16, disposed on opposite sides of the washer.

Particular attention is directed to the manner in which my improved washer is waved or undulated. In this case it is to be noted that the crest of each wave or undulation as it appears in Figure 1 is designated by the letter "A", and the trough of said waves by the letter "B". It will also be seen that these undulations extend from the inner margin to the outer margin of the washer. Thus the body portion 14 of each prong is inclined with respect to the plane of the washer proper, and this inclination corresponds to the wave form with which the washer is provided. It might be stated that the inclination of the body portion 14 of each prong corresponds to the inclination of the side of each undulation which extends downwardly from each crest A, when a clockwise movement from said crests is considered. Likewise it might be stated that the tooth portions 16 of each prong are positioned in the wave section extending downwardly from each crest when a counter-clockwise movement from said crests is considered.

The teeth 16 of each prong are warped or deflected out of the plane of the washer stock to such an extent as to place said teeth in a position to lockingly engage a work piece.

In order more clearly to understand the foregoing description, reference is made to Figure 4, wherein the inclination of the body portions of the prongs 12 are designated by dot-and-dash lines 18, while the inclination of connecting sections 10—A of the body portion 10 are designated by dot-and-dash lines 20. It will be seen that by having the connecting sections 10—A inclined as described, the annular body portion 10 of the washer presents a resilient abutment when the washer is secured against a work piece. This will be more clearly understood by referring to Figure 3 wherein I have shown the

lock washer clamped between a work piece 22 and a nut 24, which is screwed upon a bolt 26. In this figure the teeth 16 of the washer prongs are imbedded within the work piece, and the nut and the undulated body portion present a resilient abutment so as to prevent the nut from being tightened against the washer to an extent which would cause said teeth to become dislodged. In other words, the waves or undulations serve to increase the carrying capacity of the washer.

From the foregoing it will be apparent that my invention contemplates the provision of lock washers equipped with prongs or segments formed integral with an undulated ring or body portion. These prongs are provided with work engaging edges projecting out of the plane of the washer and the body portion of the prong or segment, inclined similarly to one side of a corresponding wave in the body portion.

One of the novel and improved features of my lock washer resides in the provision of the crests A which extend radially across the washer stock. When the nut 24 is clamped tightly against the washer, said nut will bear against these crests. In other words, the entire load is not sustained by the section of the crest included in the body portion 10, but a portion of the load is sustained by the section of the crest which is included within the body portion of the prong.

Reference is made to my co-pending application, Serial Number 454,848, filed May 23, 1930, wherein I have disclosed a lock washer having radial corrugations. The present invention, however, differs from the structure shown in said co-pending application. Thus in the present instance the tooth construction is different, inasmuch as the work engaging edges of the prongs lie in substantially horizontal planes. Likewise the body portion of each tooth is inclined in accordance with the undulations, and said body portion is provided along each edge with an outwardly disposed work engaging tooth or edge. It is also to be noted that in the structure of the co-pending application all of the load is sustained by the body portion, because the crests of the undulations do not extend completely across the washer stock as in the present instance. Also the structure in this application presents teeth which taper from their roots to their outer extremities, said roots being slit sufficiently to permit the tapered edges of the teeth to be bent out of the plane of the washer as described above.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A lock washer including an annular undulated body portion, and a plurality of prongs extending along the inner margin of said body portion, each prong being wider at the root than at the free end thereof and including a body section inclined with respect to the bounding planes of the washer and having oppositely disposed work engaging teeth provided on opposite sides thereof, which project out of the said bounding planes of the washer, the inclination of the body section of said prong corresponding to the inclination of a companion side of one of the undulations in the body portion.

2. A lock washer including an undulated annular body portion of flat stock and a plurality of marginal prongs extending from said body portion, said prongs being narrower at their outer extremities than at their roots, each prong including a body portion inclined with respect to the bounding planes of the washer in accordance with the undulations in the body portion, and having oppositely disposed work engaging teeth projecting out of the said bounding planes of the washer.

3. A lock washer including an undulated annular body portion of flat stock, and a plurality of work engaging prongs extending from said body portion and formed integral therewith, said prongs being narrower at their outer ends than at their roots, and connected with said body portion at the down wave side of two successive undulations, said prongs having substantially radial edges deflected oppositely, and projecting out of the bounding planes of the washer to lockingly engage a work piece.

4. In a lock washer of the class described, including an annular body portion of flat stock, and a plurality of spaced locking prongs extending inwardly from and formed integral with said annular body portion, the portion of the body adjacent the space between the prongs being inclined with respect to the bounding planes of the washer to present a resilient abutment when said washer is clamped between the work, the body portion of each prong being inclined in a direction opposite to the inclination of the portion adjacent the spaces and having work engaging teeth projecting on opposite sides of the washer.

5. In a lock washer of the class described, an annular undulated body portion of flat stock, and a plurality of spaced work engaging teeth positioned along the inner margin of said body portion, each prong including a body portion having work engaging edges disposed on opposite sides of the bounding planes of the washer, said prongs being arranged with respect to the undulations in the body portion so that each prong will extend over a greater portion of the distance between the crests of adjacent undulations.

6. In a lock washer of the class described, an annular undulated body portion of flat stock, and a plurality of work engaging

prongs positioned along and extending radially of the inner margin of said body portion, each prong including a body portion and flanges positioned along the opposite margins thereof and deflected out of the bounding planes of the washer to present oppositely disposed work engaging edges, the body portion of each prong forming a continuation of the immediate section of the annular washer body, the roots of said prongs being provided with slits to facilitate the deflection of the flanges out of the plane of the washer stock.

7. In a lock washer of the class described, an annular body portion having radial crests and troughs, and a plurality of work engaging prongs positioned along and extending inwardly from the inner margin of said body portion, each prong including a medial body and flanges along the radial margins thereof warped in opposite directions so as to present locking edges projecting beyond the surface of said prong body and out of planes coincident with the crests of said annular body portion, the roots of said prongs being relieved to facilitate the flexing of said flanges.

8. In a lock washer of the class described, an annular body portion having radial crests and troughs, and a plurality of work engaging prongs positioned along and extending inwardly from the inner margin of said body portion, each prong including a medial body and flanges along the radial margins thereof warped in opposite directions so as to present locking edges projecting beyond the surface of said prong body and out of planes coincident with the crests of said annular body portion, said locking edges over substantially their entire length being positioned in planes parallel with and spaced from the planes coincident with said crests, the roots of said prongs being relieved to facilitate the flexing of said flanges.

In witness whereof, I have hereunto subscribed my name.

CARL G. OLSON.