July 4, 1933. C. G. OLSON 1,916,525

LOCK WASHER

Filed July 31, 1930

Fig. 1.

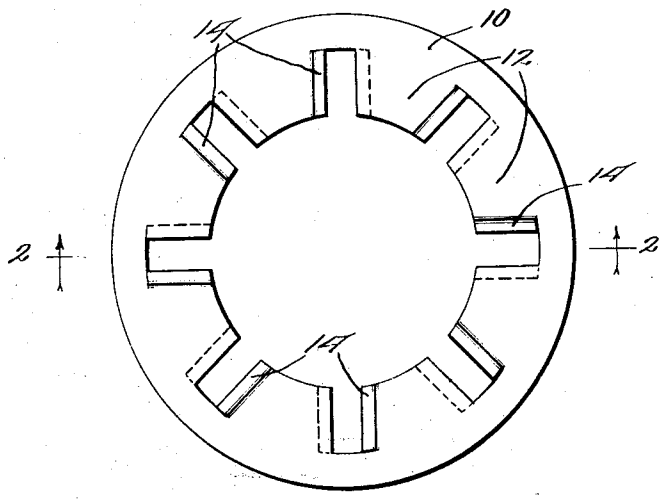


Fig. 2.

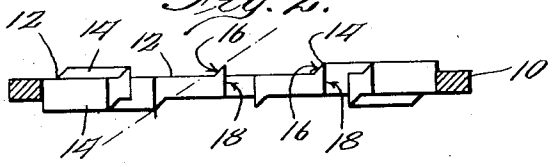
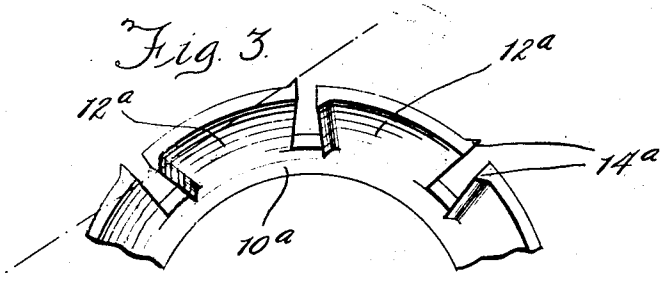


Fig. 3.



Inventor:
Carl G. Olson
By Cleaves, Cox & Moore
Attys.

Patented July 4, 1933 1,916,525

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 31, 1930. Serial No. 471,972.

My invention relates generally to lock washers, and more particularly to lock washers of the annular type provided with a plurality of radial prongs.

I am aware that numerous types of lock washers have been in use and are now being used, which are annular in form and which are provided with a plurality of radial prongs which are adapted to lockingly engage a work piece. However, my present invention presents certain distinct improvements in structural characteristics over the above mentioned conventional types of pronged washers.

It is an object of my present invention to provide a distinct improvement in the structure of locking prongs in washers of the annular type, and to this end I propose to eliminate the necessity of bending the radial edges of said prongs in the conventional manner, in order to project a portion thereof out of the plane of the washer body so as to present a locking tooth.

More specifically, my invention contemplates the provision of a plurality of prongs disposed along and formed integral with an annular body portion, said prongs having their radial edges upset in a novel manner so as to force a portion of the stock, which would otherwise be adjacently positioned with respect to the next prong, out of the plane of the washer body so as to provide a work engaging tooth.

A further object of my invention is to provide a lock washer of the prong type, in which radial prongs are provided with edges forming locking spurs on opposite sides of the washer, said spurs being included between a pair of converging sides, one of said sides being substantially parallel to the axis of the washer body so as to present a rigid support.

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

Figure 1 is a plan view of a washer constructed in accordance with the teachings of my invention;

Figure 2 is a transverse sectional view thereof taken substantially along the line 2—2 of Figure 1; and

Figure 3 is a fragmentary plan view of a conical lock washer provided with spurs or locking teeth embodying features of my present invention.

Referring to the drawing, it will be seen that one embodiment of my invention includes a lock washer having an annular body portion 10, and formed integral with and extending inwardly therefrom is a plurality of prongs 12.

These prongs are spaced along the inner margin of the body portion 10, and it will be seen that the side edges of each prong taper toward each other and are substantially radial with respect to the center of the washer. It will be noted that I provide on each prong oppositely disposed locking teeth or spurs 14, and particular attention is directed to the manner in which these spurs are formed upon said prongs. Each of the spurs 14 has a side surface 16 which is inclined with respect to the plane of the washer body and a companion surface 18 converging therewith, which extends substantially parallel with the axis of the washer. In other words, the surface 18 is disposed at substantially right angles with respect to the plane of the washer.

These locking spurs or teeth 14 are formed by upsetting the radial edges or sides of each of the prongs and this is to be clearly distinguished from the usual practice of bending oppositely disposed edges of washer teeth out of the plane thereof. By employing my improved prong construction, I provide a backing for the spurs 14 when said spurs are clamped between work pieces. In other words, instead of bending the entire section of the stock of each prong outwardly, as has been the practice heretofore, I merely upset the edges of the prong so as to force a portion of the stock out of the plane of the washer to present the locking spur or tooth. In this manner the stock which is positioned at the root of the spur 14 provides a very rigid backing therefor to counteract the tendency for said spur to be forced inwardly when the washer is clamped in position.

In making lock washers of my improved design, it is only necessary to radially sever the inner margin of the washer stock and then upset the adjacently positioned portions of the stock of each prong in opposite directions so as to present the work engaging teeth or spurs 14. In this manner the stock between each pair of prongs is employed in the upsetting operation to provide the locking spurs.

Washers of the type described may be made by practicing conventional machine shop operations, such as stamping and forming operations, and therefore said device may be very economically produced. The spurs, in combination with the reinforced portion of the prong adjacent thereto, present a very rigid locking element and thus render the washer adaptable for heavy duty.

Referring to Figure 3, it will be noted that I have shown a conical type of lock washer which is equipped with my improved spur or tooth construction. This washer includes a body portion 10*a* and a plurality of marginal prongs 12*a*. Opposite edges of said prongs are upset so as to present work engaging and locking spurs 14*a* which correspond to the spurs 14 hereinbefore described. I have merely shown the conical type of washer in Figure 3 in order to show that my invention is in no sense limited to a flat type washer or to a washer having inwardly extending prongs. In other words, my invention is capable of application to various types of pronged lock washers.

It will be apparent from the drawing that, by upsetting or warping the prongs in the manner shown, sufficient space is presented between said prongs so as to positively prevent any overlapping of teeth when the washer is clamped between work pieces. That is to say, my invention contemplates the provision of a washer having a plurality of radial prongs spaced along one margin of flat spring stock having oppositely disposed acute work engaging edges, the margins of adjacent prongs being sufficiently spaced by radial slots so as to positively prevent any overlapping of teeth when the washer is subjected to a clamping force.

It should be noted that the oppositely disposed teeth in each prong cooperate with the pronged body to produce a strutting action along the dot-and-dash line shown in Figures 2 and 3. This strutting action is particularly significant in Figure 2. When a work-piece is tightened against the washer, forces acting along the line of strut indicated by the dot-and-dash line set up a firm resistance to any force tending to loosen the nut. While the prongs of my improved washer are of exceptionally rigid construction, it will be apparent that they are sufficiently resilient to enable them to yield when the washer is clamped in place. In this manner the prongs function to effectively and yieldingly secure a work-piece and nut against relative rotation.

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 body formed from resilient material, and a plurality of resilient prongs provided along at least one of the margins of said body, each prong having an acute work engaging tooth along one margin thereof and projecting out of the plane of the body in a given axial direction and a corresponding acute work engaging tooth on the other margin and projecting in an opposite direction out of the plane of the body, a portion at least of the transverse marginal surfaces of each prong extending substantially parallel with the axis of the washer and merging with the work engaging corner of a companion tooth, said teeth being adapted to set up a strutting action when the washer is tightened between clamping surfaces.

2. A lock washer including an annular body formed from resilient material, and a plurality of resilient prongs provided along at least one of the margins of said body, each prong having an acute work engaging tooth along one margin thereof and projecting out of the plane of the body in a given axial direction and a corresponding acute work engaging tooth on the other margin and projecting in an opposite direction out of the plane of the body, a portion at least of the transverse marginal surfaces of each prong extending substantially parallel with the axis of the washer and merging with the work engaging corner of a companion tooth, said teeth being adapted to set up a strutting action when the washer is tightened between clamping surfaces, the teeth being disposed with respect to the body of the washer so as to permit the projection of teeth on both sides of the washer beyond the bounding planes of the body when said washer is firmly clamped in position.

3. A lock washer including an annular body formed from resilient material, and a plurality of resilient prongs provided along at least one of the margins of said body, a space being provided between adjacent prongs, each prong having an acute work engaging tooth along one margin thereof and projecting out of the plane of the body in a given axial direction and a corresponding acute work engaging tooth on the other margin and projecting in an opposite direction out of the plane of the body, a portion at least of the transverse marginal surfaces of each prong extending substantially parallel with the axis of the washer and merging with the work engaging corner of a companion tooth, said teeth being adapted to set up a strutting

action when the washer is tightened between clamping surfaces.

4. A lock washer including an annular body formed from resilient material, and a plurality of resilient prongs provided along at least one of the margins of said body, each prong having an acute work engaging tooth along one margin thereof and projecting out of the plane of the body in a given axial direction and a corresponding acute work engaging tooth on the other margin and projecting in an opposite direction out of the plane of the body, a portion at least of the transverse marginal surfaces of each prong extending substantially parallel with the axis of the washer and merging with the work engaging corner of a companion tooth, said teeth being adapted to set up a strutting action when the washer is tightened between clamping surfaces, the axial thickness of the prongs at each margin thereof being greater than the thickness of the washer body.

5. A lock washer including an annular body formed from resilient material, and a plurality of resilient prongs provided along at least one of the margins of said body, each prong having an acute work engaging tooth along one margin thereof and projecting out of the plane of the body in a given axial direction and a corresponding acute work engaging tooth on the other margin and projecting in an opposite direction out of the plane of the body, a portion at least of the transverse marginal surfaces of each prong extending substantially parallel with the axis of the washer and merging with the work engaging corner of a companion tooth, said teeth being adapted to set up a strutting action when the washer is tightened between clamping surfaces, said transverse marginal surfaces of each prong converging with the body of the prong at a point oppositely disposed from a companion tooth so as to present a supporting structure for said tooth.

In witness whereof, I have hereunto subscribed my name.

CARL G. OLSON.