

July 1, 1941.

C. C. WASHER

2,247,981

METHOD OF FORMING LOCK WASHERS

Filed Feb. 2, 1940

2 Sheets-Sheet 1

Fig. 1.

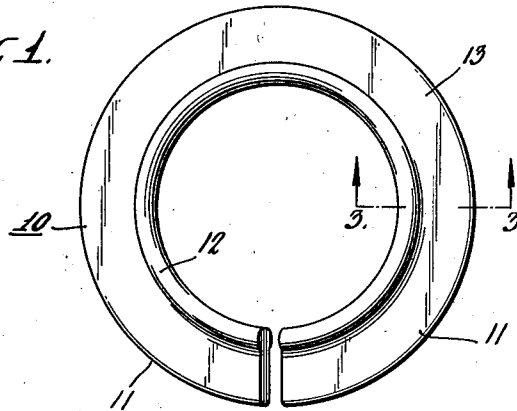


Fig. 2.

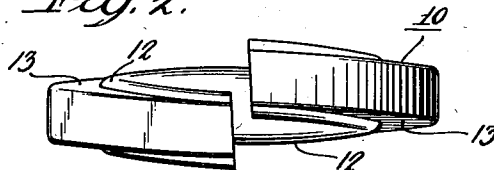


Fig. 4.

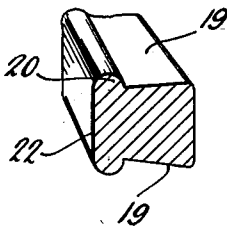


Fig. 3.

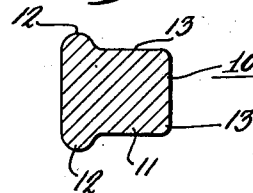
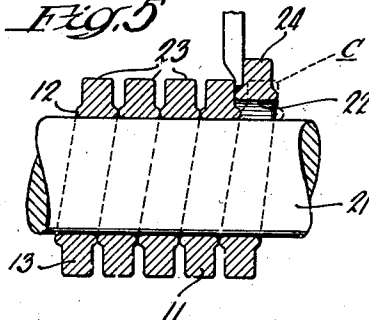


Fig. 5.



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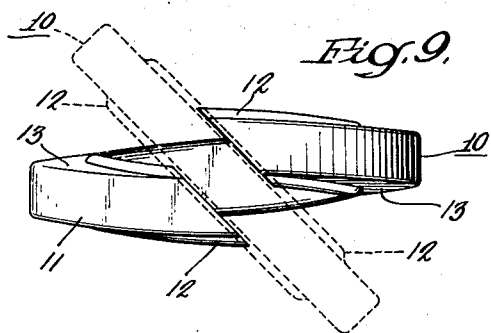
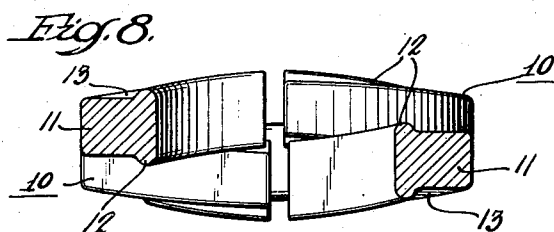
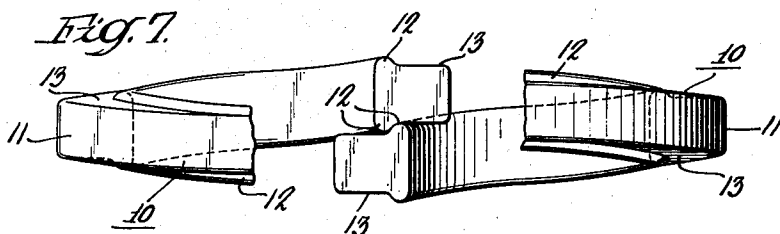
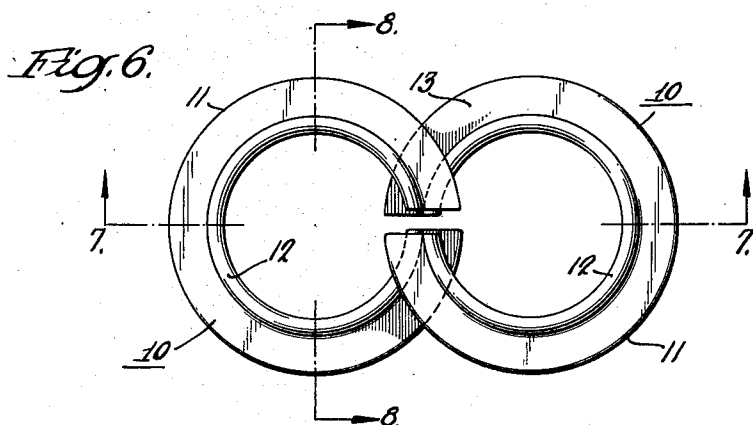
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METHOD OF FORMING LOCK WASHERS

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2 Sheets-Sheet 2



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METHOD OF FORMING LOCK WASHERS

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Application February 2, 1940, Serial No. 317,015

4 Claims. (Cl. 10—86)

This invention relates to a method of producing non-entangling lock washers and, more particularly, to producing such washers in the form shown in my copending application Serial No. 263,524, filed March 22, 1939, for "Lock washer."

An important object of the invention is the production of a method of producing such lock washers which will render the same non-entangling in a normal method of formation thereof.

A more particular object of the invention is the production of washers of this type by a method in which the materials themselves serve to pre-tension the helical coil from which the washers are formed so that upon separation of the individual washers the ends of the washer will spring toward one another to an extent such that interlinking of the washers is prevented provided the gap between the ends thereof is not made excessive.

A still further object of the invention is the production of a method of this character which will enable considerably more latitude for mechanical errors in construction insofar as the length of the helix is concerned, thus materially reducing the number of washers which are failures due to the fact that their ends do not come into proper relation.

These and other objects I attain by the construction shown in the accompanying drawings wherein, for the purpose of illustration, I have shown a preferred embodiment of my invention and wherein:

Fig. 1 is a plan view of a lock washer produced in accordance with my invention;

Fig. 2 is a side elevation thereof;

Fig. 3 is a sectional view through the washer on line 3—3 of Fig. 1;

Fig. 4 is a perspective view of a fragment of the wire employed in constructing the washer;

Fig. 5 is a sectional view illustrating the method of forming the coil from which the washers are subsequently severed;

Fig. 6 is a plan view illustrating the manner in which the washers engage when an attempt is made to interlink the same;

Fig. 7 is a section on line 7—7 of Fig. 6;

Fig. 8 is a section on line 8—8 of Fig. 6; and

Fig. 9 is a view showing the increased gap permissible when the washer is formed with angularly cut ends.

Referring now more particularly to the drawings, the washer comprises a helical coil 10 of substantially 360 degrees, such coil being composed of material having a body portion 11 substantially rectangular in cross section and de-

fined at the inner edges of the transaxial faces thereof by axially shallow and radially narrow ribs 12. The transaxial surfaces 13 outwardly of the ribs 12 are preferably parallel and disposed at right angles to the axis of the helix and the outer surfaces of the ribs themselves are preferably made arcuate and smooth with the surfaces 13 either corrugated or plain as desired.

In constructing such washers I employ a wire of cross section such as shown in Fig. 4; that is to say, a wire of keystone cross section the edges of the converging faces 19 of which are defined at the narrow edge of the section by outstanding ribs 20 which subsequently produce the ribs 12 of the finished washer.

A wire of this cross section is wound about a round mandrel 21 with the narrow edge 22 of the keystone facing the mandrel. This coiling will, of course, tend to stretch the wider end of the keystone and compress the narrow inner edge thereof with the result that the faces 19 come into parallelism as shown in Fig. 7. The ribs 20 are slightly rounded and filleted at their connection with the faces on which they are formed, and in coiling the wire the pitch of the helix 23 formed about the mandrel is made such that the last wound coil 24 is spaced from the next adjacent previously wound coil a distance approximating the width of one rib. The ribs winding upon one another wedge the finally wound coil to one side as shown by the dotted lines at C in Fig. 5, thus placing the coil under axial tension. Accordingly, when the convolutions of the coil are severed by the usual severing means the axial tension of the coil results in movement of the severed ends axially so that the rib portions thereof will overlap. The helix thus resulting will, as regards its major cross section, have less axial pitch than the axial cross section of the butt portion. The rib portions, however, will axially overlap with the result that when a deliberate effort is made to engage two of these washers with one another such attempt must fail because of abutment of the ribs unless the gap has been made excessively wide.

It has been found in practice that the gap usable with such washers can far exceed that of the ordinary washer of similar cross sectional area and may be as much as 30 per cent of the smallest axial thickness of the washer section, when the angle cut of the washer is parallel to the axis of the helix. This gap may be increased as the angle of cut is increased until at a 45 degree angle it may be made slightly less than 100 per cent of the major depth of the washer section, such major depth including the depth of the ribs.

Obviously, the ability to form a gap so wide as compared to the washer cross sectional area results in a considerable saving of material, both by reason of the fact that less wire is necessary to the formation of the washer and that the number of rejections as a result of malformed washers occurring in normal manufacture may be reduced. This is important for, despite the accuracy of the present-day machines employed in the construction of lock washers, errors occur as a result of uncoiling movement of the helix prior to severing. Accordingly, if only a 15 per cent gap is possible even a slight error resulting from such axial movement or from wear or other causes might cause the washer to either be of the linking type or to have its ends so closely related that it could not flatten properly.

As the method hereinbefore set forth is capable of some modification without departing from the spirit of my invention, I do not wish to be understood as limiting myself thereto except as hereinafter claimed.

I claim:

1. The method of producing lock washers comprising providing a wire of keystone section the narrow end of which is defined at each of the converging faces by a rib projecting from said face and helically coiling the wire about a mandrel with the narrow end of the keystone juxtaposed to the mandrel while maintaining the pitch of the helix at an angle such that the rib of each newly laid coil bears against the rib of the previously laid coil to an extent such that the newly laid coil is moved axially by engagement of its rib with that of the previously laid coil prior to engagement of the inner surface of the wire with the mandrel and finally severing the individual coils to produce washers.

2. The method of producing lock washers comprising providing a wire of keystone section the narrow end of which is defined at each of the converging faces by a rounded rib projecting

from said face and helically coiling the wire about a mandrel with the narrow end of the keystone juxtaposed to the mandrel while maintaining the pitch of the helix at an angle such that the rib of each newly laid coil bears against the rib of the previously laid coil to an extent such that the newly laid coil is moved axially by engagement of its rib with that of the previously laid coil prior to engagement of the inner surface of the wire with the mandrel and finally severing the individual coils to produce washers.

3. The method of producing lock washers comprising providing a flattened wire opposite faces of which are defined at corresponding edges by ribs projecting from said faces and helically coiling the wire about a mandrel with the ribbed edges juxtaposed to the mandrel while maintaining the pitch of the helix at an angle such that the rib of each newly laid coil bears against the rib of the previously laid coil to an extent such that the newly laid coil is moved axially by engagement of its rib with that of the previously laid coil prior to engagement of the inner surface of the wire with the mandrel and finally severing the individual coils to produce washers.

4. The method of producing lock washers comprising providing a flattened wire opposite faces of which are defined at corresponding edges by rounded ribs projecting from said faces and helically coiling the wire about a mandrel with the ribbed edges juxtaposed to the mandrel while maintaining the pitch of the helix at an angle such that the rib of each newly laid coil bears against the rib of the previously laid coil to an extent such that the newly laid coil is moved axially by engagement of its rib with that of the previously laid coil prior to engagement of the inner surface of the wire with the mandrel and finally severing the individual coils to produce washers.

CHANDLER C. WASHER.