

April 23, 1929.

J. D. COWAN

1,709,933

COMPRESSION SPRING WASHER

Filed Jan. 16, 1928

FIG. 1.

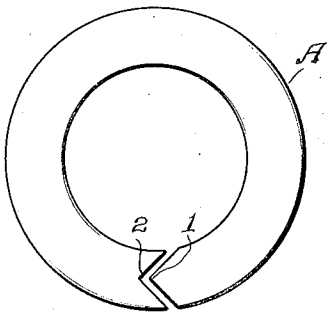


FIG. 3.

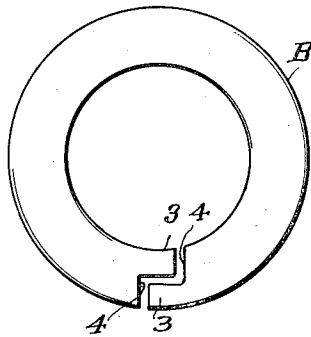


FIG. 5.

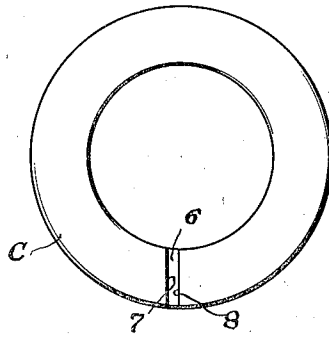


FIG. 2.

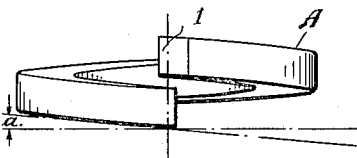


FIG. 4.

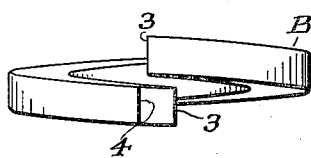


FIG. 6.

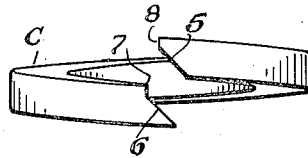


FIG. 7.

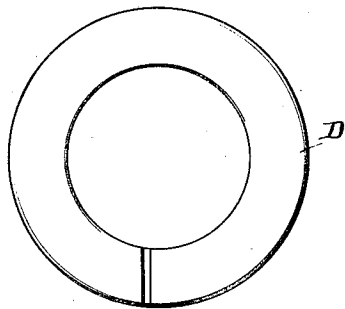


FIG. 10.

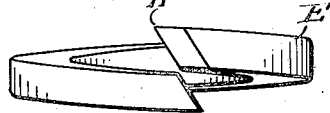


FIG. 12.



FIG. 8.

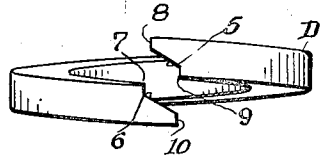


FIG. 9.

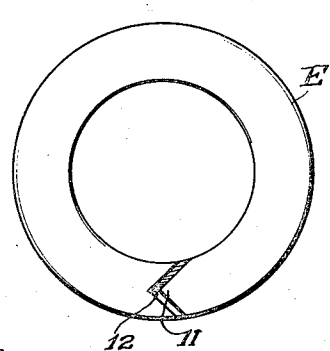


FIG. 11.

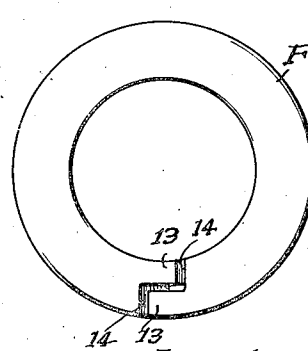


FIG. 13.

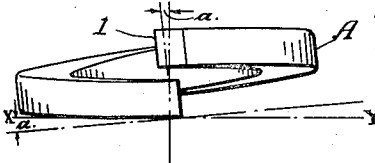
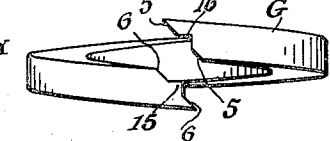


FIG. 14. James D. Cowan



by *James D. Cowan*
Attorney

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1,709,933

UNITED STATES PATENT OFFICE.

JAMES D. COWAN, OF SUMMIT, NEW JERSEY, ASSIGNOR TO THE NATIONAL LOCK WASHER COMPANY, OF NEWARK, NEW JERSEY, A CORPORATION OF NEW JERSEY.

COMPRESSION-SPRING WASHER.

Application filed January 16, 1928. Serial No. 247,171.

This invention relates to compression spring washers of the split ring type which are in the general form of a helical segment.

Washers of this sort have heretofore been made so that, when shipped in bulk, they would not interlink with each other, as is shown and described in U. S. Letters Patent, No. 1,655,018, issued January 3, 1928, to Cyrus H. Loutrel, but such patented washers had at their ends opposed faces making angles with the top and bottom of the washers, and to bring about this structure the ends were severed in unbroken planes that were angularly disposed with respect to the axis of the helical segment and these planes were therefore in overlapping relation.

The present invention consists in forming the severed ends of a washer with projecting and receding portions that are interrelated and overhang each other, in the sense that, when the washer is flattened by compression, its ends would be complementary one of the other, the segment being more than 360° in circumference, while the greatest distance between corresponding points in the planes of these complementary portions is less than the smallest dimension of the cross section of the washer stock.

In carrying out this invention the ends of the washer are preferably severed in planes that are parallel to the axis of the helical segment, and the planes of projecting portions are opposite and parallel with the planes of the receding portions, and, since the segment is more than 360° in circumference, if the washer were flattened these projecting portions would be more or less within the receding portions, and this is true whether the ends are severed in planes parallel or oblique to the axis of the segment, and it is a fact that some washers whose ends are severed in planes oblique to such axis would interlink unless formed with these projecting and receding portions, and therefore the invention is not limited except to the provision of these portions.

There are many ways of cutting the ends of the washers so as to form these overhanging projecting and receding portions, but the accompanying illustrations will be confined to only a few forms of the washer, since such forms will fully exemplify the gist of the invention.

In the drawings

Figures 1 and 2 are respectively plan and

elevation views of one form of this washer. Figures 3 and 4 are respectively plan and elevation views of another form of the washer.

Figures 5 and 6 are respectively plan and elevation views of still another form of the washer.

Figures 7 and 8 are respectively plan and elevation views of a form of washer made in accordance with this invention.

Figures 9 and 10 are respectively plan and elevation views of a washer similar to that illustrated at Figures 1 and 2, except that the ends of the washer in Figures 9 and 10 are severed in planes oblique to the axis of the helical segment.

Figures 11 and 12 are respectively plan and elevation views of a form of washer like that shown at Figures 3 and 4 except that the ends of the washer in these Figures 11 and 12 are severed in planes oblique to the axis of the helical segment.

Figure 13 shows the same washer as that illustrated at Figure 2 with the washer turned into a somewhat different position, and

Figure 14 is a side elevation of a washer similar to that shown at Figure 6, but in slightly modified form.

Similar numerals of reference denote like parts in the several figures of the drawing.

Compression spring washers can interlink in several ways to which reference will now be made.

If the shortest space between any parts of the ends of the washer is greater than the smallest cross-section dimension of the washer stock, then washers of this sort will interlink.

Also, if the washers are less than 360° in circumference, and two such washers are approached toward each other in parallel planes, so that the end faces of the segments are in approximate alinement, then such washers will interlink.

Again, if the shortest space between any parts of the ends of the washer is less than the smallest cross section diameter of the washer stock, and if such washer is more than 360° in circumference, and if two such washers in certain angular dispositions are approached toward each other so that the end faces of one washer will be opposed to the end faces of the other washer, such washers can interlink.

These are the three chief ways in which washers of this nature have heretofore become interlinked.

The first is obviated by making the shortest space between the ends of the washer less than the smallest cross section dimension of the washer stock.

The second manner of interlinking described can be prevented by making the helical segments more than 360° in circumference.

The third manner of interlinking can be prevented by decreasing the distance between the end faces of the washer, and this may be brought about by increasing the length of the segment.

The third manner of interlinking by approaching the washers at an angle to each other with the end faces disposed in a certain manner is less likely to be brought about accidentally than the other two manners of interlinking.

When washers are made in accordance with the present invention they cannot interlink by any of these three methods, because the washer segments are more than 360° in circumference, and the planes of the projecting portions are opposite and parallel with the planes of the receding portions so that if the washers were flattened under compression these projecting and receding portions would be complementary, and finally since the shortest distance between any portions of the opposed faces of the washers is less than any cross section dimension of the washer stock.

In order that one may readily understand the manner in which the circumferential area of the segment is determined, attention is called to Figures 2 and 13; the latter showing the washer turned from the position shown at Figure 2 wherein the axis of the helix is vertical. The washer should be turned through the angle α (see Figure 2) which angle is the pitch of the helix, into the position shown at Figure 13, and then the ends of the segment are projected on the line X-Y, and if the combined circumference of the top and bottom of the washer thus projected is greater than 360° , the washers will not interlink when approached toward each other in parallel planes so that the end faces of the segment are in approximate alinement. Therefore, when the length of the segment is specified as being more than 360° in circumference it is to be understood that the latter is determined with the washer in the position shown at Figure 13.

Figures 1, 2, 3, and 4, show washers made in accordance with this invention with the ends severed in a plane parallel with the axis of the segment.

Figure 1 shows a washer A in which one end is formed into an angular projection 1

while the opposite end is formed into a corresponding angular recessed portion 2, and it will be evident that the planes of the projection 1 are within the planes of the recess 2, so that if the washer was subjected to ultimate compression the angular portion 1 would nest within the receding portion 2, and this statement is true with respect to all the forms of washers illustrated and would be true of all washers having their ends formed with projecting and receding portions when the area of the segment is more than 360° as determined in the manner hereinbefore set forth.

Referring to the style of washer B shown at Figures 3 and 4, the ends are formed with rectangular projecting portions 3 and corresponding recessed portions 4, and these projecting portions will seat within the recessed portions when the washer is subjected to ultimate compression.

Figures 5, 6, 7, 8, 9, 10, 11, 12, 13 and 14, show washers made in accordance with this invention in which the ends are severed at an angle to the axis of the segment.

Referring to Figures 5 and 6, the ends of the washer C have angular cuts 5 and 6 which overhang each other and are like the angular cuts shown and described in the patent aforesaid, but these angular cuts are separated by a space greater than the smallest cross section dimension of the washer stock, and in applying the present invention to this form of washer a projection 7 is formed at the top of the lower angular cut 6, and the distance between this projection 7 and the nearest point of the opposite cut 5 is less than the smallest dimension of the cross section of the stock of the washer and this projection would prevent interlinking of washers of this style. The top of the angular cut 5 is sheared off as shown at 8 so that when the washer is subjected to great compression the projection 7 will nest against the sheared portion 8, and although this sheared portion is not exactly necessary it is nevertheless advisable since if the angular cut 5 was extended to the top of the washer, then when the washer was compressed the projection 7 would strike against the inclined face 5 and effect an expansion of the washer.

The washer D shown at Figures 7 and 8 is precisely like that shown at Figures 5 and 6 with the exception that the lower extremity of the angular cut 5 has a projecting portion 9 similar to the projection 7 while the lower end of the angular face 6 is sheared off as shown at 10 for precisely the same reason as that set forth with respect to the sheared off portion 8.

In this washer shown at Figures 7 and 8 the space between the inclines is greater than the smallest cross section dimension of the washer stock, but the distance between the

projections 7, 9, and the nearest opposite portions of the faces 5, 6, is in each instance less than the smallest cross section dimension of the washer stock. The only difference, therefore, between the style of washer shown at Figures 5 and 6 and the style shown at Figures 7 and 8, is that in the former interlinking is guarded against at one end of the space between the ends of the washer while in the latter such interlinking is guarded against at both ends.

Referring to the washer E shown at Figures 9 and 10, the projection at one end and the recess at the other end are precisely like the projection and recess shown at Figures 1 and 2, the only difference being that the projection and recess in the Figures 9 and 10 construction are effected by severing the ends at an angle to the axis of the segment, and in these figures 11 denotes the angular projection at one end of the washer and 12 the corresponding angular recess at the other end of the washer, and all the statements made with respect to the washer shown at Figures 1 and 2 are true in regard to the washer shown at Figures 9 and 10.

Referring to Figures 11 and 12, the washer F therein shown is precisely like that shown at Figures 3 and 4 with the exception that the projections and recesses are formed by shearing the ends at an angle to the axis of the segment, and in this form of washer 13 designates the projections at the ends and 14 the corresponding recesses, and here again it is a fact that all the statements made with respect to the washer shown at Figures 3 and 4 are true with respect to the washer shown at Figures 11 and 12.

The washer shown at Figure 14 is designated by G, and the ends are sheared at inclines 5, 6, just as in the washers shown at Figures 6 and 8, but the projecting and recessed portions instead of being located at the top or bottom of these inclines, are intermediate the ends of the latter, the projection 15 extending from the face 6 while the corresponding recess 16 is within the face 5.

In all the structures shown and hereinbefore described it will be noted that the projections and recessed portions are complementary one of the other and that the planes of the projecting portions are always within the planes of the recessed portions, and this is necessarily due to the fact that

the circumferential area of the washer segment is more than 360° as measured in the manner hereinbefore set forth.

It will be readily understood that there are many ways in which the ends of the washer may be severed in accordance with the present invention and interlinking thereby be prevented, but no attempt has been made to show more than a few examples of the ways in which these washers may be formed and further illustration is deemed to be unnecessary.

It will be noted that in the various constructions shown and described the projections and recessed portions are angular, but this is not a limiting feature since the angular portions may be rounded if desired without interfering with the efficiency of the washers, and in this connection it is thought proper to state that it is possible to equip the ends of a washer of this style with rounded projecting and corresponding receding surfaces that will roll together so as to effect interlinking, but such interlinking is only effected by special manipulation and is well nigh non-existent in ordinary handling and shipping of washers.

The pitch of the helical segments from which these washers are formed is quite immaterial so long as it is not too great, and the limit of pitch can easily be determined by experiment.

What is claimed is:—

1. A compression spring washer of the split ring type and comprising a helical segment more than 360° in circumference, the ends of the segment having opposed faces that are respectively formed with complementary projecting and receding portions, the planes of which latter intersect the inner and outer edges of the washer throughout their thickness, and the shortest distance between opposite points in said faces being less than the smallest dimension of the cross section of the stock of the segment.

2. A construction as in claim 1 further distinguished in that said projecting and receding portions overhang each other, whereby, at the ultimate compression of the washer said portions will be in nesting relation.

In testimony whereof I affix my signature hereto.

JAMES D. COWAN