July 8, 1958 F. J. MACHAC 2,842,181

SMALL EIGHT PRONG WASHERS CONNECTED IN STRIP FORM

Filed Dec. 19, 1955

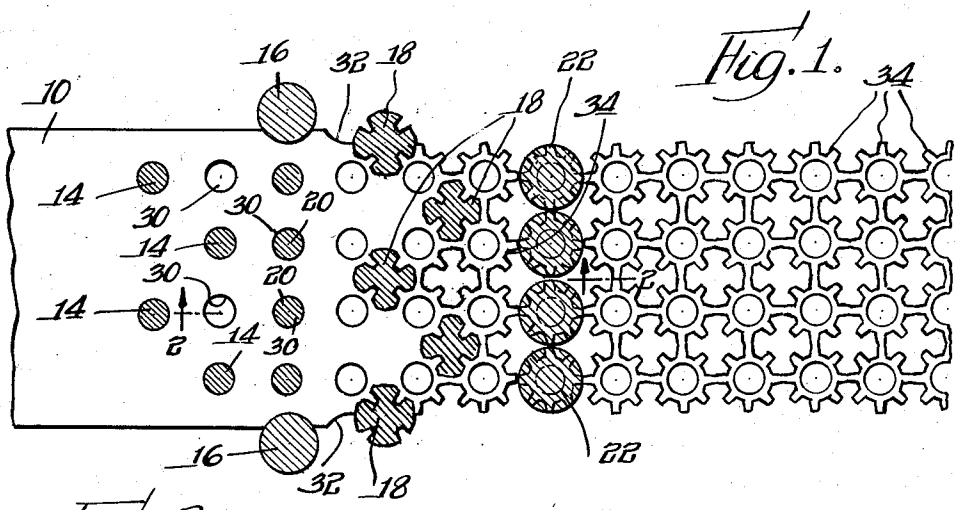


Fig. 1.

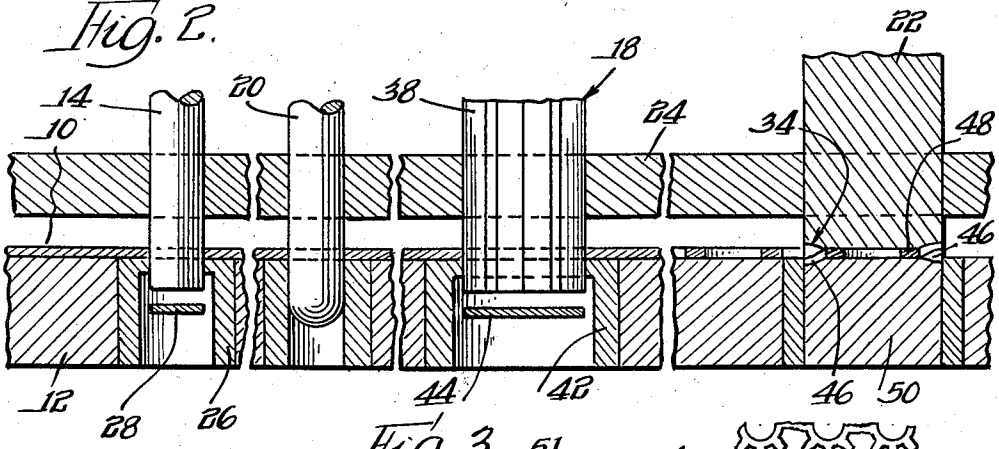


Fig. 2.

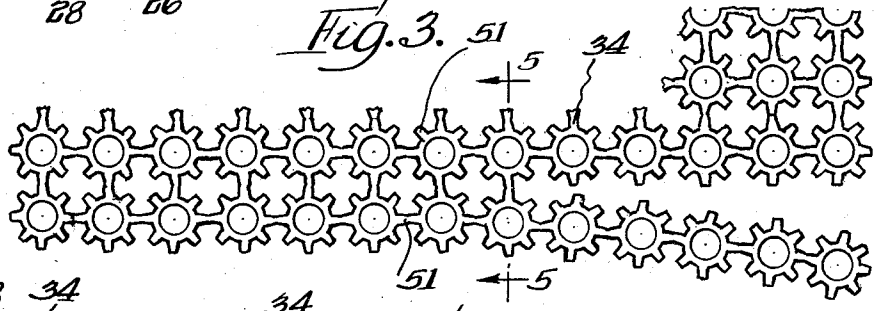


Fig. 3.

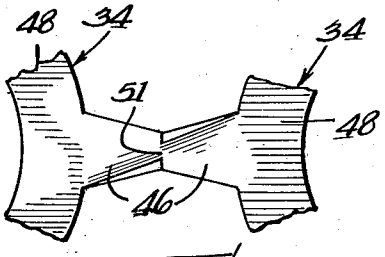


Fig. 4.

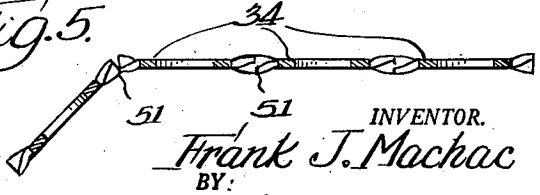


Fig. 5.

INVENTOR.
Frank J. Machac
BY:
Olson & Trexler
attys.

United States Patent Office

2,842,181

Patented July 8, 1958

2,842,181

SMALL EIGHT PRONG WASHERS CONNECTED IN STRIP FORM

Frank J. Machac, Park Ridge, Ill., assignor to Illinois Tool Works, Chicago, Ill., a corporation of Illinois

Application December 19, 1955, Serial No. 553,976

2 Claims. (Cl. 151—35)

This invention is concerned generally with the art of lock washers, and more particularly is concerned with an improved strip of lock washers and an apparatus for forming the same.

In Poupitch Patent No. 2,352,118 there is disclosed a washer strip and method and apparatus for producing the same which results in a minimum of waste, and which facilitates handling of the stock material. More specifically, the washer strip therein disclosed is a plural strip comprising a plurality of diagonally interconnected toothed lock washers. The plural strip subsequently is separated between the diagonally connected teeth to provide a plurality of single strips.

This invention is concerned generally with the same type of washer strip disclosed in the aforesaid Poupitch patent, and it is an object of this invention to provide a multiple strip of lock washers which is more easily fed and handled.

It is a further object of this invention to provide a plural washer strip which is separated into a plurality of single strips with the utmost of ease, and which can be separated readily while moving.

It is another object of this invention to provide a plural strip of toothed lock washers wherein all of the external toothed portions of the washers are made by punches of the same shape.

It is yet another object of this invention to provide an apparatus comprising a plurality of punches of identical design for producing a plural strip of toothed lock washers.

Other and further objects and advantages of the present invention will be apparent from the following description when taken in connection with the accompanying drawings wherein:

Fig. 1 is a plan view partly in section and illustrating an apparatus for forming a strip of washers according to the present invention;

Fig. 2 is a fragmentary view in vertical section as taken substantially along the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary view of a portion of the plural washer strip illustrating the separation thereof into single strips;

Fig. 4 is an enlarged fragmentary view of the connection between a pair of adjacent washers; and

Fig. 5 is a cross sectional view as taken along the line 5—5 of Fig. 3 showing the separation of the plural strip into separate strips.

Referring now more specifically to the drawing, there will be observed a blank or strip of stock **10** comprising a relatively wide band or sheet of metal. The strip of stock is fed intermittently by any suitable and appropriate mechanism (not shown) to a die block **12** supported upon the bed plate of a conventional punch press (not shown). As the strip **10** is fed intermittently over the die block it is operated upon by a plurality of sets of stamping dies **14**, **16** and **18**. The strip is positioned by a set of pilot plungers **20**, and further is acted upon

by a set of tooth twisting plungers **22**. The various stamping dies or plungers may be connected in any suitable manner to the head or ram of the punch press for simultaneous action thereby, and slidably extend through a plate **24** which serves to guide the various stamping dies or punches or plungers, and also serves as a stripper.

The first set of plungers **14** comprises plungers of circular cross section coacting wtih dies **26** of similar shape to stamp out circular sections **28** of scrap material to form the center holes **30** of prospective washers. In the illustrative example of the invention it will be observed that there are four such punches **14**, being arranged in laterally and longitudinally offset pairs. The plungers **14** are longitudinally offset to avoid undesirable effects on the strip **10**, and also to provide adequate room for attachment to the ram or head of the punch press.

As the strip progresses longitudinally, from left to right in Figs. 1 and 2, the plungers **20** engage in the previously formed apertures **30** for properly positioning the strip. At the same time that the pilot plungers **20** descend into the center holes **30**, the punches or plungers **16**, preferably of circular shape, engage the edges of the strip to form scallops **32** therein. The scallops are aligned laterally with the center holes **30**, and carry the edge of the strip in toward a perspective washer sufficiently closely to define the outer ends of teeth on the prospective washers. It is desirable not to make the entire strip sufficiently narrow for this purpose inasmuch as this might result in undesirable distortion of the strip adjacent the edges thereof during formation of the center holes **30**.

The punches or plungers **18** all are of an identical cruciform shape. It will be observed that the punches **18** preferably are arranged in laterally and longitudinally offset groups. Thus, in the illustrative example there first are three of the punches **18** which engage the center and edges of the strip, and then two punches **18** subsequently engage the strip intermediate the edges and center to form the outlines of the lock washers **34**. It will be observed that the cruciform shape of the punch **18** is such as to provide a relatively thick and strong central or shank portion **36** with the four ribs or projections **38** joined thereto at relatively thick roots **40**, thereby providing a strong punch which readily is fabricated, and which will not fail in use.

The punches **38** cooperate with dies **42** of complementary shape to stamp out cruciform scrap sections **44**. It will be apparent that the two outermost punches **18** would not need the ribs **38** on the outer edges, but this does not require the fabrication of a special punch, only eliminating the finishing of one part of the uniform punch.

The final punch or plunger **22** acting on the strip **10** serves to twist the teeth **46** of the washers **34** outwardly of the ring-like body portions **48** thereof. The punch **22** cooperates with a complementary punch or backup member **50** secured in the die block **12** as will be apparent.

In the enlarged fragmentary view of Fig. 4 it will be observed that the twisting of the teeth **46** produces a relatively easily fracturable line of severance **51** between adjacent washers. It will be understood that the strip generally is heat treated or otherwise treated, preferably after formation of the washers, to harden the washers so as to resist flattening of the teeth. Therefore, only a certain amount of flexing of the metal can be tolerated without fracture, and this is of particular importance with regard to the line of severance **51**.

Several important features will be noted with regard to the shape of the finished plural washer strip. Primarily, it will be observed that the teeth of adjacent

washers are connected longitudinally and laterally of the strip. There are no diagonal or oblique connections. Thus, the laterally connected teeth comprise cross bars which can be of considerable importance in feeding the plural strip. It will be understood that sprocket wheels or the like readily could engage these cross bars for feeding. The lateral alignment of the washers facilitates coiling of the strip for storage. It will be understood that the hardened washers, particularly in small sizes, are extremely resistant to bending. If the washers themselves had to bend, or if the washers were aligned other than laterally, it would be extremely difficult to coil the plural strip, except perhaps on a very large radius. However, in the present instance it is possible for the bending to occur between washers along the line of severance of the longitudinal interconnections. Such bending would not be sufficient to fracture the connections, but materially facilitates coiling of the strip for storage.

Separation of the plural strip into individual longitudinally connected strips of washers **34** is illustrated in Figs. 3 and 5. To separate the plural strips into individual strips, all that is necessary is to bend the laterally adjacent washers relative to one another through the lateral interconnections along the lines of severance **51**. Thus, as in Fig. 5 the leftmost washer is bent down relative to the adjacent washer, and a rather substantial bend readily results in fracture along the line of severance. Such fracturing or severance readily can be accomplished while the strip is in continuous motion, by means such as complementary rollers. One example of satisfactory apparatus for so separating a plural strip into individual strips, and also a practical use for such plural strips, is shown and described in the co-pending application of Moritz H. Nielsen, Method of and Apparatus for Assembling Nut and Washer Elements, Serial No. 277,-973, filed March 22, 1952, now Patent No. 2,730,732, issued Jan. 17, 1956.

The apparatus represents an improvement over strip forming apparatus as heretofore known in that all of the punches used in producing the form of the washer are of the same shape. Furthermore, this form is symmetrical so that the punch can be installed in any of a plurality of positions to attain proper results. Furthermore, the punch is "opened up," thereby providing a strong central or shank portion to which the ribs or projections are joined by relatively strong roots, the ribs being thicker outwardly of the roots than are the roots.

It is to be understood that the specific embodiments of the invention as herein shown and described are for exemplary purposes only. Various changes in structure will no doubt occur to those skilled in the art, and are to be understood as forming a part of the invention insofar as they fall within the spirit and scope of the appended claims.

The invention is claimed as follows:

1. An elongated metallic strip comprising a plurality of integrally joined small size lock washers, each washer consisting of an annular body portion and a total of eight prongs of uniform shape radially projecting outwardly from the outer margin of said annular body, and each prong being radially outwardly tapered throughout its length, a distance at least as great as the radial width of said body, said prongs being circumferentially spaced equally along said outer margin and similarly twisted about their radial axes so as to present a plurality of work engaging teeth at the outer extremities thereof projecting beyond opposite sides of said annular body, said washers being disposed in a plurality of rows longitudinally of said metallic strip and also disposed in a plurality of rows extending normal with respect to said longitudinal rows, radial prongs of each washer having integral limited end-to-end connection with a corresponding prong of the next adjacent washer, said connected prongs being disposed with the radial axes thereof in linear alignment along a line parallel with the longitudinal margin of said metallic strip, other prongs of each washer having integral limited end-to-end connection with a corresponding opposed prong of the next adjacent laterally positioned washer, said last-mentioned connected prongs being disposed with the radial axes thereof in linear alignment along a line extending normal to said longitudinal strip margin, the remaining four twisted prongs of said washers having their free extremities terminating within a struck-out area defining a four-leaf clover pattern with the minimum distance between corners of adjacent free prong extremities being at least as great as the maximum width of said prongs, the space between adjacent prongs of each washer presenting an area at least as great as the area occupied by each of said prongs, said last-mentioned space area combined with the space area bounded by the free extremities of adjacent washer prongs being of such size as to enable the use of a die punch having a cross sectional four-leaf clover shape complemental to the aforesaid combined space areas.

2. An elongated metallic strip comprising a plurality of integrally joined lock washers as claimed in claim 1 wherein alternate prongs are joined end-to-end and are oppositely twisted to provide a connection of limited cross section whereby to facilitate detachment of the washers from each other.

References Cited in the file of this patent

UNITED STATES PATENTS

2,352,118	Poupitch	June 20, 1944
2,675,844	Knohl	Apr. 20, 1954
2,716,247	Poupitch	Aug. 30, 1955
2,730,155	Knohl	Jan. 10, 1956