A. MOORE.

MACHINE FOR MAKING LOCK WASHERS.

APPLICATION FILED JULY 3, 1919.

1,404,994. Patented Jan. 31, 1922.

2 SHEETS—SHEET 1.

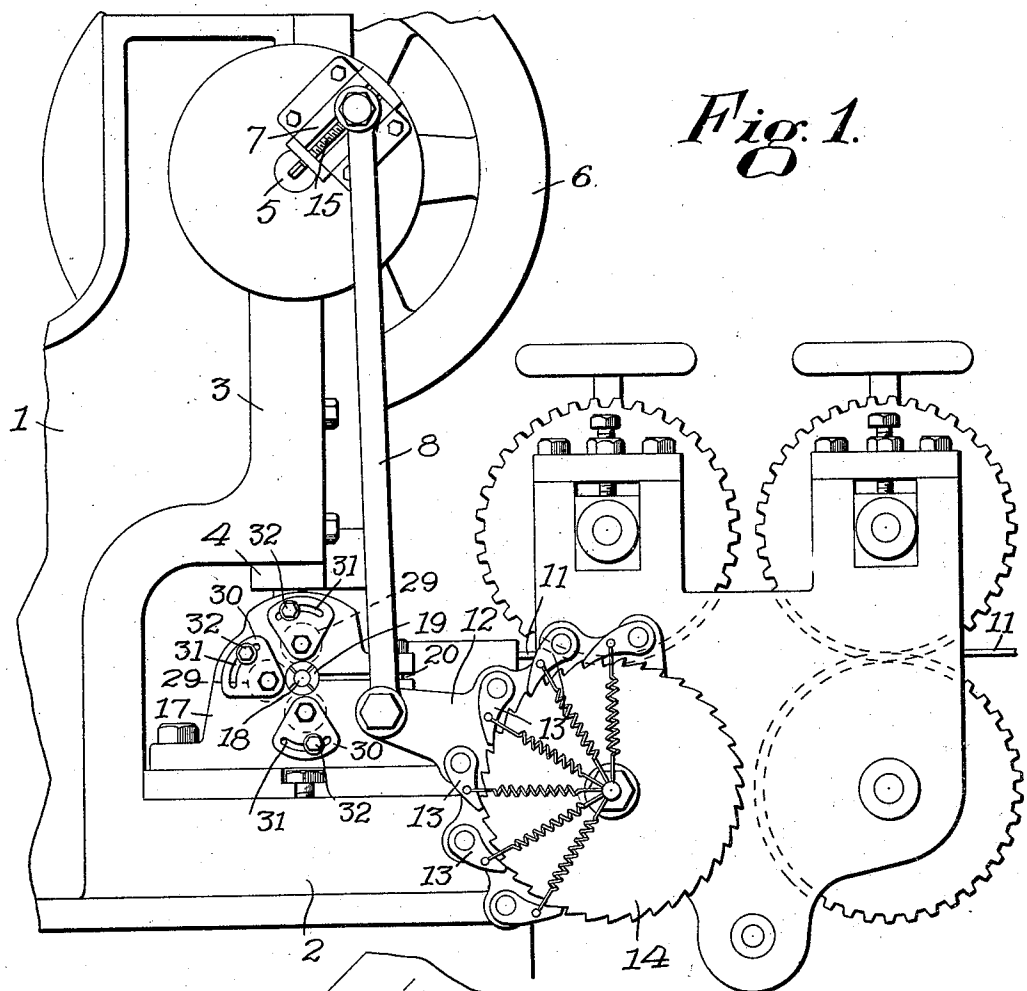


Fig. 1.

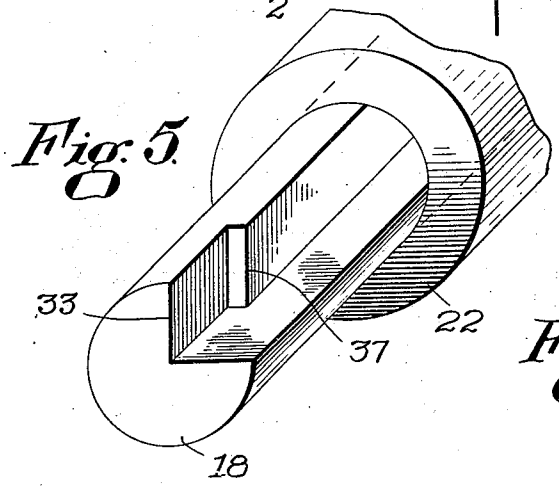


Fig. 5.

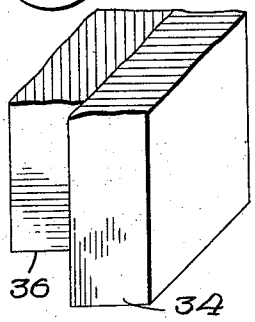


Fig. 6.

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MACHINE FOR MAKING LOCK WASHERS.

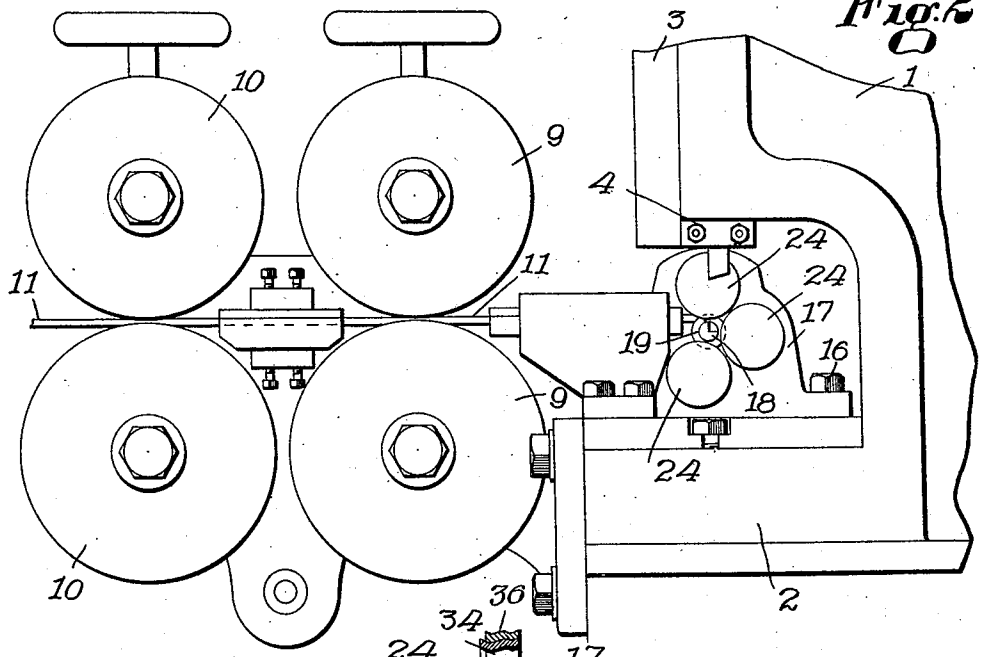
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2 SHEETS—SHEET 2.

Fig. 2



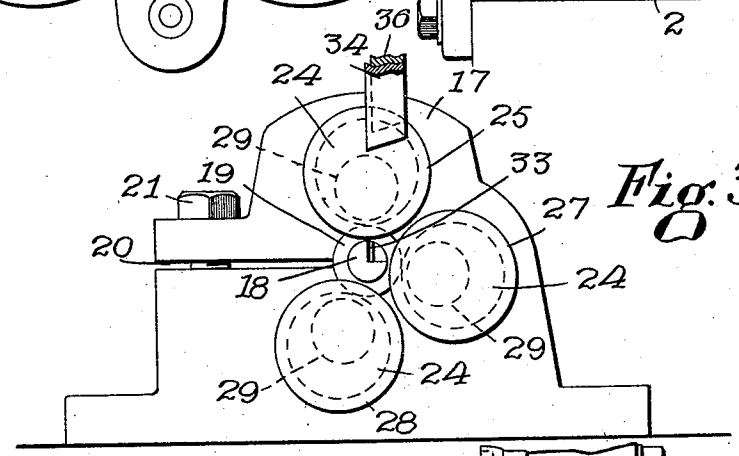


Fig. 3.

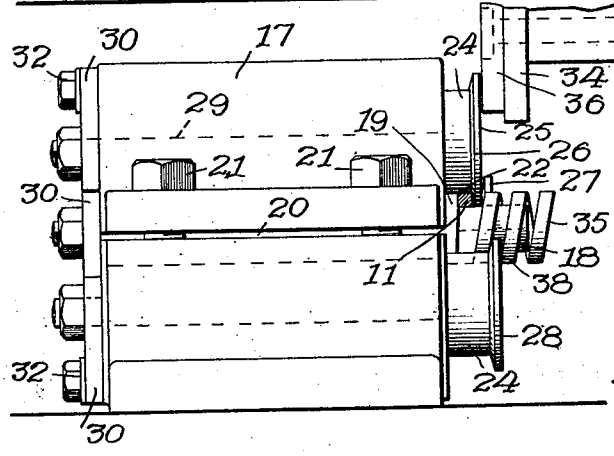


Fig. 4.

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UNITED STATES PATENT OFFICE.

ARLINGTON MOORE, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO HOBBS MANUFACTURING COMPANY, OF WORCESTER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

MACHINE FOR MAKING LOCK WASHERS.

1,404,994. Specification of Letters Patent. Patented Jan. 31, 1922.

Application filed July 3, 1919. Serial No. 308,522.

To all whom it may concern:

Be it known that I, ARLINGTON MOORE, a citizen of the United States, residing at Worcester, in the county of Worcester and Commonwealth of Massachusetts, have invented a new and useful Improvement in a Machine for Making Lock Washers, of which the following, together with the accompanying drawings, is a specification.

The present invention relates to a machine for making lock washers, by the continuous coiling of a strip in spiral form, and the successive severance of the convolutions thus coiled. More particularly, the machine of the present invention contemplates improvements in construction and operation over existing machines of this class, whereby the production of lock washers is greatly increased, the friction incident to the spiral coiling of the material greatly reduced, and the machine made adjustable, over a wide range, to accommodate its operation to various sizes of washers and various sections of washer material.

The above, and other objects, are attained by the construction, combination and arrangement of parts hereinafter set forth in detail, reference being had to the accompanying drawings, wherein—

Fig. 1 is a view in side elevation illustrating a machine constructed in accordance with the invention.

Fig. 2 is a similar view showing the operating parts as they appear from the other side of the machine.

Fig. 3 is an enlarged detail view of the coiling and cutting mechanisms of the machine.

Fig. 4 is a view of the same parts as they appear in a plane at right angles to Fig. 3.

Figs. 5 and 6 are perspective views illustrating more clearly the washer cutting instrumentalities.

Like reference characters refer to like parts in the different figures.

The machine herein shown comprises a suitable stationary supporting structure 1, with a base or anvil portion 2 and, spaced above the latter, guideways 3 for the vertical reciprocation of a cutting head 4. The latter is caused to travel up and down in the guideways 3 by its connection to a crank on a shaft 5, carrying a pulley or flywheel 6, to which rotation is continuously imparted by a belt, not shown, connected with any suitable source of power.

In common with existing machines of this class, the rotation of shaft 5 is transmitted by a crank 7 and connecting link 8 to procure the intermittent operation of suitable feed rolls 9, 9 and 10, 10, which serve to advance, on each up stroke of the head 4, a predetermined length of washer material 11, which is supplied from a continuous strip by a suitable supply reel or coil, not shown. To this end, any desired form of intermittent feed may be provided, as for instance, that shown in Fig. 1, where the link 8 is connected to a swinging arm 12 carrying a plurality of spring held pawls 13 for cooperation with a ratchet wheel 14 on the shaft of one of the feed rolls 9, the latter being geared together to operate in unison. To control the amount or length of stock that is thus fed intermittently in each cycle of operations of the machine, the throw of arm 12 may be varied by adjusting the length of crank 7, a screw 15, or other equivalent device, being provided for this purpose.

At each intermittent operation of the feeding mechanism above described, the material 11, at its free or advancing end, is caused to assume a spiral or helical formation, by the action of coiling instrumentalities which will presently be described; thereupon, and before the next operation of the feeding mechanism, the head 4 descends, for the purpose of bringing suitable cutting devices which it carries into forcible contact with the coiled material, so as to sever, at one operation, a plurality of the individual convolutions previously formed. The construction and operation of the novel coiling and cutting mechanisms that form the subject matter of the invention are as follows:—

Secured firmly to the base or table 2 of the frame, by means of bolts 16 or the like, is a block 17, having a transverse bore adapted to receive a coiling mandrel 18, the end of which projects from said block in a position to lie directly beneath the vertically reciprocating head 4. Within the block 17 the mandrel 18 is surrounded by a bushing 19, preferably made in two or more parts, the outside diameter thereof corresponding

to the transverse bore through the block 17. A number of such bushings 19 are provided with each block 17, all of said bushings being of the same outside diameter, so as to fit interchangeably in the block, the latter being split as at 20, whereby the loosening of bolts 21 will permit the removal of one bushing and the substitution of another of the set. The bushings 19 vary as to their inside diameters, thus allowing the use of mandrels 18 of different sizes so as to vary the diameter of the coil that is formed on the mandrel. As shown clearly in the drawings, the end of the bushing 19 that projects from the block 17 has a helical or spiral edge surface 22, for the purpose of imparting an initial helical twist to the material 11 as the latter is fed against the same.

The direction of feed of the material 11 is substantially tangential to the upper surface of mandrel 18 and across the face of bushing 19, as shown in Fig. 2. Any suitable means, such as straightening rolls, not shown, may be with advantage employed to maintain the material in the proper alinement as it approaches the coiling mandrel, but as such straightening devices form of themselves no part of the present invention, a detailed reference thereof is unnecessary. For the purpose of causing the material to wrap around the mandrel 18, the block 17 is provided with a set of coil confining or pressing rolls 24, 24, here shown as three in number, one above and one below the mandrel 18, and the other on the opposite side of said mandrel from the feed of material 11. Each roll 24 is adapted to be rotated freely about its own axis by the friction of the material 11 as the latter is fed, the rolls being so arranged that their peripheral surfaces will tend to crowd the material inwardly on the mandrel 18 and cause said material to be wound in spiral form thereon. The upper roll 24, or that one which is first in the path of the material, projects slightly beyond the helical edge 22 of bushing 19 and at its end has a flange 25 with a bevelled inner surface 26, that confines the material between it and the surface 22.

The roll 24 which next makes contact with the material as the latter winds about the mandrel, is the one directly opposite to the line of feed, and this roll 24 projects a greater distance outwardly from the block 17 than the first roll, so that its bevelled flange 27 will hold the coiled material 11 in proper position on the mandrel 18, at a point beyond the contact therewith of the first roll. The final roll 24 has a still greater overhang, as shown clearly in Fig. 4, thus disposing its bevelled guiding flange 28 against the coiled material at a point which is approximately one-half of a convolution distant from the point of contact of the first roll.

The three rolls 24 rotate freely about their own centers on the ends of eccentric shafts or necks 29, 29 that extend transversely through the block 17. On the opposite side of said block these eccentric shafts 29 are equipped with segmental adjusting arms 30, 30, having elongated slots 31, 31 therein for the passage of bolts 32 that are let into the rear of block 17. By loosening the bolts 32, the arms 30 may be swung in either direction to turn the shafts 29 in the block; this will throw the rolls 24 either inwardly or outwardly with respect to the mandrel 18. In this way, the rolls are adjustable for varying thickness of material 11, being thrown outwardly from the mandrel as the thickness of the material increases, and vice versa, being set up close to the mandrel when thin material is being coiled.

As shown in Fig. 5, the mandrel 18 at its end is cut away for approximately one-quarter of its circumference to provide a substantially vertical cutting edge 33. Corresponding to this edge, the reciprocating head 4 carries a cutter 34, which, on the descent of the head, cooperates with the edge 33 and procures the severance of the single convolution 35 of coiled material that partly overhangs the end of the mandrel, on the free end of the coiled strip. Inwardly of the cutter 34, the head 4 carries a second cutter 36 that cooperates with another vertical cutting edge 37 of the mandrel for the severance of the next innermost convolution 38 of the coiled strip. Both cutting operations take place on the same descent of the head 4; the first, resulting in the severance of the convolution 35, takes place slightly in advance of the second by reason of the fact that the cutter 34 is longer than the cutter 36 and hence strikes the coil a little earlier. This delay in the severance of the second convolution is necessary in order that the first convolution may be adequately supported while it is being cut.

The feed of the material 11 is so adjusted as to bring the free end of the coil on mandrel 18 almost but not quite opposite the point of first severance. This results in the production of a correctly formed spiral lock washer, with just enough circumferential gap between its ends to permit the straightening out of the material under compression. To obtain a similar result with the second or any subsequent washers cut at the same operation of head 4, the cutting edge 37 is slightly offset from the edge 33, as shown in Fig. 5, and the edge of cutter 36 is correspondingly disposed slightly at the rear of the corresponding edge of cutter

34. The machine of my invention has been described in connection with the production of two washers at a single operation of the cutting devices, but obviously the invention is applicable to the simultaneous production of a greater number than this, simply by the adjustment of the feed devices to provide at each stroke a coil of greater length, and by the provision of additional stepped cutting devices on the head 4 and mandrel 18.

I claim,

1. In a machine of the class described, means for spirally coiling a continuous strip of material, and means operable at a plurality of points to sever simultaneously, a plurality of the individual convolutions thus formed.

2. In a machine of the class described, means for coiling a plurality of spiral convolutions in the end of a continuous strip of material, and means for severing said coiled portion at a plurality of points.

3. In a machine of the class described, means for producing a coil, and means for severing said coil, at one operation, at a plurality of points.

4. In a machine of the class described, means for supporting the coiled end of a continuous strip of material, and means cooperating with said supporting means to sever said coiled end in a plurality of places at one operation.

5. In a machine of the class described, means for supporting the coiled end of a continuous strip of material, and means cooperating with said supporting means to sever said coiled end in a plurality of places at one operation.

6. In a machine of the class described, means for supporting the coiled end of a continuous strip of material, and means cooperating with said supporting means to sever said coiled end in a plurality of places at one operation, and at successive times.

7. In a machine of the class described, means for severing in a plurality of places, at one operation, a plurality of individual convolutions of a coil with a lapse of time between successive severances.

8. In a machine of the class described, means for cutting the coiled end of a strip of material in a plurality of places at one operation, with the cuts taken consecutively from the outer toward the inner portion of the coil.

9. In a machine of the class described, means for severing consecutively, at one operation, a plurality of the individual convolutions of the coiled end of a strip of material, with each convolution, at the time of its severance, supported by the next adjacent one.

10. In a machine of the class described, a coil supporting arbor and a plurality of cutting devices cooperating with said arbor and movable in unison to sever the coil at a plurality of places, said devices being unequally spaced from the arbor, whereby to produce a lapse of time between their operations.

11. In a machine of the class described, a coil supporting arbor and a plurality of cutting devices for cooperation with said arbor to sever at one operation a plurality of the individual convolutions of the coil, said devices being out of alinement, whereby to produce a circumferential gap between the ends of each severed convolution.

Dated this 23rd day of June, 1919.

ARLINGTON MOORE.

Witnesses:

NELLIE WHALEN,

PENELOPE COMBERBACH.