Oct. 20, 1936. H. EDELMEIER 2,058,007

PRODUCTION OF PRELIMINARILY SHAPED ANNULAR BLANKS

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Fig.1

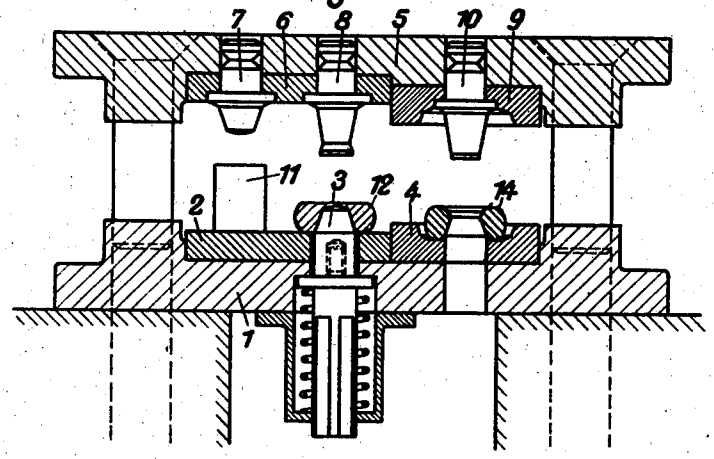


Fig.2

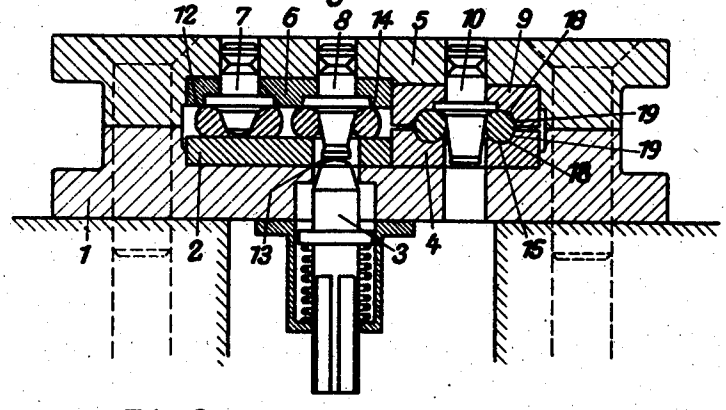


Fig.3

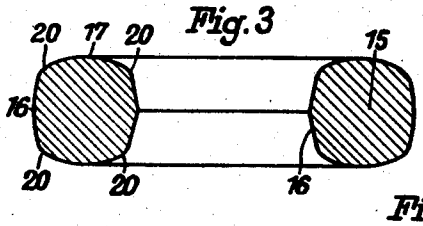


Fig.4

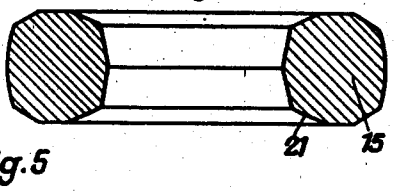
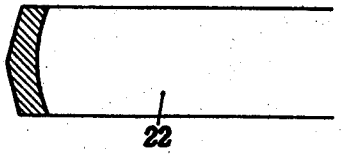


Fig.5



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his Att'y.

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2,058,007

PRODUCTION OF PRELIMINARILY SHAPED ANNULAR BLANKS

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Application September 21, 1934, Serial No. 744,907
In Germany December 9, 1932

4 Claims. (Cl. 29—156)

My invention relates to the production of preshaped annular blanks adapted to be rolled out for the manufacture of spring rings for the so-called ring springs described, for instance, in the United States Patents Nos. 1,501,220 and 1,515,346, or of rings having similar predetermined surfaces or cross-sections of a relatively great axial height and a relatively small radial thickness. Such preliminary annular blanks are usually produced from initial blank sections which are, for example, cut from bars or rolled billets by deforming or stamping and preliminary and final punching of blank sections in a press having a plurality of punches and dies. The rolling out of these preliminarily shaped annular blanks then usually takes place on a suitable ring rolling mill of well-known construction. Heretofore, the pressing of the said preliminary annular blanks has been performed so as to obtain preliminary blanks whose cross-sectional shape corresponds as much as possible to the desired cross-section of the finished spring rings or the like, i. e. having plane and cylindrical circumferential surfaces which are as flat as possible. The subsequent rolling out of such blanks necessitates a considerable amount of work during the rolling, and the rolls are subjected to very great strain, causing rapid wear of these expensive tools. In spite of this the product is frequently faulty.

A chief object of my invention is so to preshape the annular blank that the work required during rolling is reduced to a minimum, and only light rolling pressure is required, whereby the strain and, consequently, the wear on the rolls is considerably reduced.

According to my invention, the deforming or stamping and the preliminary and final punching of the initial blank section is so performed as to produce a preliminary annular blank having a cross-sectional shape which is overall or on all sides arched or polygonal or arched and polygonal. For instance, the outer and inner surfaces as well as the two end surfaces of the blank may be curved convexly and merge into one another by rounded portions. Such a preliminary annular form seems to be contrary to the requirements for the rolling out of the final cross-sectional shape of the rings, for example of rings for ring springs, because the corners or edges of the latter are sharp and its inner or outer circumferential surfaces, respectively, are plane or even differently, i. e., concavely curved. However, experience has proven that the above-mentioned advantages are in fact completely achieved during the rolling.

In performing my manufacturing process, I subject the initial blank section successively to a stamping or deforming operation and preliminary and final punching operation in a plurality of dies arranged in one or more suitable presses. In order to bring the punches into contact with the heated blank only for a short time, all punches are preferably arranged in the upper dies, whereby the placing of the annular blank in the lower dies of the press or, should there be no special dies, its centering on the lower plate of the pressing device with the aid of a stop, is materially facilitated. Owing to the arrangement of the punches in the upper dies, it is necessary that the blank should be turned through 180 degrees between each pressing operation.

The annular form of the blanks according to my invention offers the advantage that the desired shape of the blanks can be obtained during pressing without great pressure, because it is no longer necessary to press the material into sharp corners of the dies. Moreover, the formation of burrs is avoided if the hollow space of the dies be somewhat greater than the volume of the material to be deformed. The diameter of the punches is made as small as possible in order to make possible a high ratio of deformation in the rolling mill, whereby the grain in the rolled ring is given a tangential disposition which increases the durability of the material in spring rings. Owing to the short time required during which no appreciable consumption of heat occurs, to proceed directly with the rolling process, without any intermediate heating, or a heating furnace may be arranged between the press and the rolling mill if it is desired to complete the heating of the blanks before the rolling process.

The production of the preliminarily shaped annular blanks by the process according to the invention will hereinafter be more particularly described with reference to the accompanying drawing, which illustrates a constructional example of the pressing tools, and wherein

Fig. 1 shows in vertical longitudinal section a press for performing three working stages on the blank, prior to the performance of the pressing stroke,

Fig. 2 is a similar section showing the dies and blanks after termination of the pressing stroke,

Figs. 3 and 4 show, by way of example, two preliminarily shaped annular blanks in cross-section and on a larger scale, and

Fig. 5 shows, by way of example and in cross-

section, the finished ring of a ring spring produced from the preliminarily shaped blank.

In the lower or base part 1 of the press are arranged the pressure plate 2, the centering punch 3 and the lower die 4, for the three stages, with which are associated the upper pressure plate 6 with the punches 7 and 8, and the upper die 9 with the punch 10, all of which are secured in the upper or head part 5 of the press. As is well known in presses of this type, the base part 1 is stationary and the head part 5 is vertically guided and moved up and down with respect to the said stationary base part, by means of a suitable driving mechanism which is also well known and needs, therefore, no particular description or illustration for one skilled in this art.

The initial blank section 11 which has been severed in any well known manner from a rolled billet or a bar, for instance by a suitable saw or hot shears, and has then been duly heated in any suitable and well known furnace, is placed on the pressure plate 2. In the pressing operation, the punch 7 is impressed into the initial blank section 11 and forces it apart, and the section is at the same time upset or stamped by the cooperation of the lower plate 2 and the pressure plate 6 and thereby formed into the intermediate shape 12.

The blank 12 produced in this first working stage is, after being turned through 180 degrees, placed in the second working position upon the centering punch 3 so that the second working stage may be carried out. During the second pressing stroke, the bottom 13 is stamped out of the intermediate blank 12 by the punch 8 secured in the head 5. In order to facilitate this operation, the punch 8 is made cylindrical at the bottom, while, in all other respects, its form is conical, so that the hole in the blank 14 is widened in the known manner. In this second working stage, the blank is somewhat increased in its external diameter and further reduced in height until it assumes the form 14.

The blank is again turned through 180° between the second and third working stages. In this latter pressing operation, substantially only the circumferential surfaces of the blank are pressed, so that an annular blank 15 is produced, the outer and inner circumferential surfaces 16 of which are convexly curved, as shown in Figure 3. The end surfaces 17 of the blank 15 are also convexly curved by suitable formation of the bases 18 of the dies 4 and 9. Since the curved transitional portions 19 of the bases 18 of the dies 4 and 9 merge into the contour of the punch 10, the circumferential and end surfaces 16 and 17, respectively, of the annular blank 15 also gradually merge into one another by curved surfaces 20, as shown in Fig. 3. Instead of this shape of the blank 15 comprising curves, it may be polygonal as shown at 21 in Figure 4. The cross-sectional surface is limited by curved and broken lines. The preliminarily shaped annular blank 15 produced on the press is immediately rolled out in a suitable ring rolling mill, for example to form the inner ring 22 of a ring spring (see Fig. 5). Such ring rolling mills are well known in this art and no particular description and illustration are necessary.

It is obvious that various changes may be made in the shape of the preliminary annular blank shown and described, as well as in the process and device for producing the same, without departing from the spirit of my invention and the scope of the claims.

What I claim, is:—

1. The process of producing metallic rings of relatively large axial width and relatively small radial thickness, which consists in swaging and punching a solid metal blank into an annulus of a substantially square cross-section with all four faces bulged outwardly and with its inside and outside faces substantially parallel to the axis of the annulus, and then subjecting the annulus to the action of opposed rollers working upon the inside and outside faces of the annulus.

2. The process claimed in claim 1, in which the said swaging and punching operation includes the step of removing from the annulus the edges between adjacent bulging surfaces of said annulus, whereby the individual bulging surface of the annulus smoothly merges in the abutting bulging surfaces of the same.

3. The process claimed in claim 1, in which the said swaging and punching operation includes the step of subdividing and transforming each of said four bulging surfaces of the annulus into a plurality of plane peripheral surfaces disposed at an angle to one another, an edge being thus produced at the line of juncture of each pair of said plane surfaces, whereby each of said bulging surfaces of the annulus is given an angular outline.

4. The process claimed in claim 1, in which the said swaging and punching operation includes the step of subdividing and transforming each of said four bulging surfaces of the annulus into a plurality of curved peripheral surfaces disposed at an angle to one another, an edge being thus produced at the line of juncture of each pair of said curved surfaces, whereby each of said bulging surfaces of the annulus is given a curved and angular outline.

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