Feb. 8, 1938. S. L. GOOKIN 2,107,375

EYELET

Filed July 19, 1935

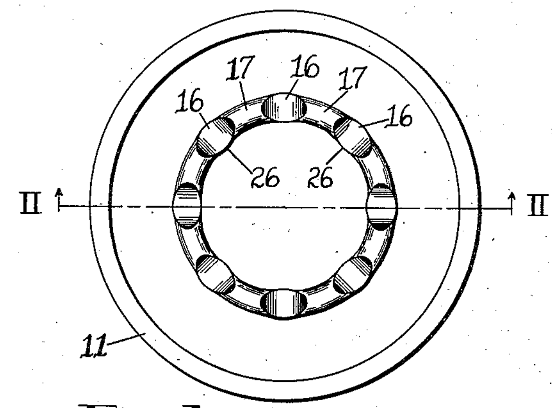

Fig.1.

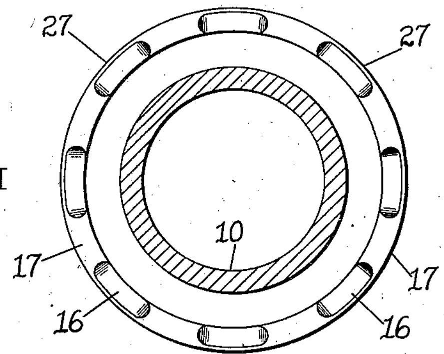

Fig.4.

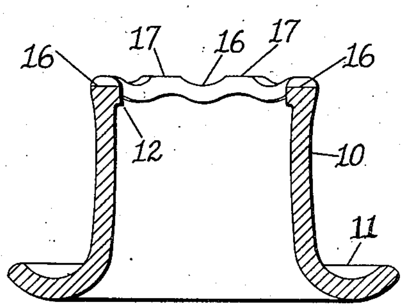

Fig.2.

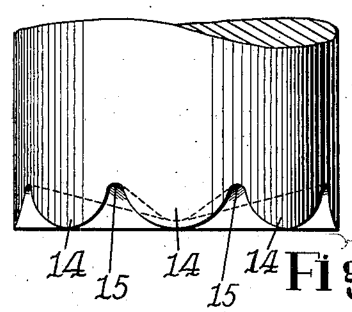

Fig.5.

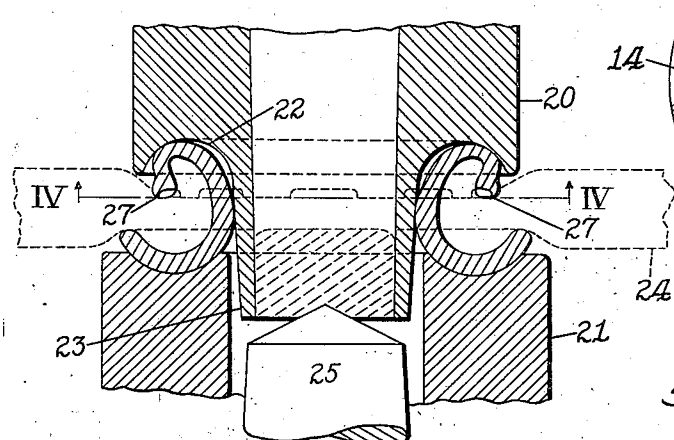

Fig.3.

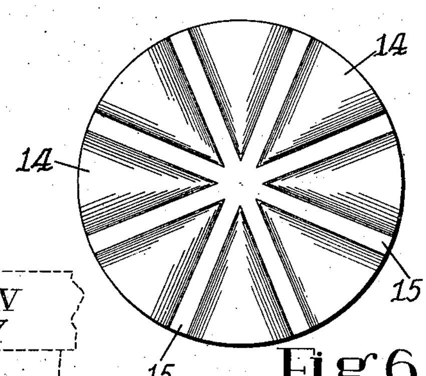

Fig.6.

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UNITED STATES PATENT OFFICE

2,107,375

EYELET

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Application July 19, 1935, Serial No. 32,305

12 Claims. (Cl. 24—141)

This invention relates to eyelets and methods of making them, and is particularly concerned with eyelets intended to be roll-clenched as distinguished from those intended to be split into prongs in the process of upsetting and clenching them.

One problem encountered in the manufacture of roll-clench eyelets is to make their clenching ends so that they will not be split in the upsetting and clenching process, and another is to provide for clenching them in soft eyelet-receiving materials such as shoe-leather and woven fabrics so securely that they will not be pulled out or loosened by laces pulled against them.

In consideration of these problems an object of the present invention is to provide an improved eyelet that may be roll-clenched without being split, and at the same time with a grip of greater holding power than that afforded by former types of corresponding size.

Accordingly, as herein illustrated, the invention is embodied in a ductile metal eyelet the barrel of which is provided with a blunt clenching end divided into alternate high and low segments by a series of arcuate indentations.

Preferably the eyelet is made by first forming the barrel thereof with a blunt clenching end without any indentation and thereafter forming the arcuate indentations in the clenching end with pressure lengthwise of the axis of the eyelet. This aspect of the method is not concerned with whether the clenching end is provided with an internal bead of supplemental metal, but the best results are insured by forming the clenching end of the barrel with such a bead before the indentations are formed, to the end that the indentations, when subsequently formed, will extend across the bead in addition to the rest of the clenching end.

When such an eyelet is roll-clenched the high segments become embedded in the eyelet-receiving material to a greater depth than the low segments, and this condition produces a considerable increase in the holding power of the eyelet. Moreover, in the process of upsetting and clenching the eyelet both the high segments and the low segments grow thinner and become attenuated circumferentially in consequence of being stretched, but the indentations, because of their form, do not cause the clenching end to burst or split. This non-splitting property may be, and presumably is, due to forming the indentations in such a way as to preserve approximate equality of strength of the metal around the clenching end, rather than weakening the metal at the points where it is indented.

Referring to the drawing which is magnified many diameters,

Fig. 1 is an end view of the clenching end of an unclenched eyelet embodying a preferred form of the invention;

Fig. 2 is a cross-section thereof in the plane of line II—II;

Fig. 3 is a cross-section of a roll-clenched eyelet developed from an unclenched eyelet of the type shown in Figs. 1 and 2, the view also including portions of cooperative tools for upsetting and clenching such an eyelet;

Fig. 4 is a cross-section of a portion of a clenched eyelet in the plane of line IV—IV, the clenched end thereof appearing in elevation; and

Figs. 5 and 6 are a side elevation and an end view of an indenting tool designed to form arcuate indentations in the clenchng end of an eyelet as shown in Figs. 1 and 2.

The eyelet illustrated in an unclenched condition in Figs. 1 and 2 and in a clenched condition in Figs. 3 and 4 is made of ductile metal drawn from a flat blank of sheet metal to form a barrel 10 and a flange 11 at one end thereof. As a result of drawing the barrel, the opposite end is initially closed or imperforate, but after all the necessary drawing has been accomplished this end is perforated by a punch the diameter of which is nearly but not quite as great as the internal diameter of the barrel, to the end that an integral internal bead 12 of unworked metal will be left to supply the demands of stretching when the eyelet is subsequently upset and clenched. When this end of the eyelet is punched out to form the bead the clenching end of the barrel is virtually flat and blunt as shown and described in my copending application, Serial No. 16,644, filed April 16, 1935, its thickness or radial dimension being augmented by the bead. Thereafter a wavy formation is imparted to the profile of the clenching end by impressing arcuate indentations therein with pressure applied lengthwise of the axis of the eyelet.

Figs. 5 and 6 illustrate an indenting tool suitable for this purpose. The operating end of the indenting tool is provided with a series of radial convex indenting ribs or segments 14 of arcuate cross-section separated from each other by grooves 15. The two dotted circles in Fig. 6 represent the inner and outer boundaries of the clenching end of an eyelet such as that above described, to illustrate the relation in which the eyelet and the indenting tool are brought one against the other to impart the desired wavy formation to the clenching end of the eyelet.

The indenting operation impresses the ribs 14 into the clenching end of the eyelet, thereby forming arcuate troughs or low segments 16 separated from each other by truncate crests or high segments 17 as developed in Figs. 1 and 2. The indenting ribs 14 also have a swaging effect upon the clenching end of the eyelet whereby the thickness of the low segments 16 is increased so that it exceeds the thickness of the high segments 17, the difference in thickness being apparent in Fig. 1. Moreover, because of the convexity of the ribs 14 the faces of the low segments are developed into oval configurations.

Since the bead 12 projects radially from the wall of the barrel 10 and is therefore unsupported except at its junction with the barrel it assumes a sinuous formation as shown in Fig. 2 in consequence of the pressure with which the ribs 14 are impressed into it. Still another change produced by the indenting operation is an increase in the circumferential length of the end face comprising the high segments 17 and the low segments 16. This increased length is of advantage when the clenching end of the eyelet is subsequently upset and clenched in that it gives up some of its sinuosity while the clenching end is being dilated, and to that extent it reduces the amount of stretching of the metal of the clenching end.

Fig. 3 illustrates a pair of cooperative setting tools 20 and 21 of well-known construction that are commonly used for upsetting and roll-clenching eyelets in a machine of the type illustrated and described in United States Letters Patent No. 1,228,768, granted June 5, 1917, on application of P. R. Glass.

The tool 20, sometimes termed a clenching tool, is provided with an annular concave operating surface 22 and with a slightly tapered pilot 23 projecting therefrom. The pilot is tubular, and in a machine of the type illustrated in said Letters Patent it cooperates first with an imperforate punch-block to punch an eyelet-receiving hole in an article of sheet material such as a shoe upper. In Fig. 3, dotted lines represent the eyelet-receiving material 24 such as a shoe-upper. The pilot 23, after punching a hole in the work 24, feeds the work in consequence of shifting the tool 20 laterally into register with the tool 21, and then the tool 20 remains in that relation while the tool 21 rises with an unclenched eyelet to insert the latter into the work and to clench it. The tool 21 is provided with a spring-pressed spindle 25 that normally projects therefrom to pick an eyelet from a raceway and to maintain the eyelet virtually in coaxial relation to the tool 21.

The smaller end of the pilot 23 is no larger than the hole in the bead 12 of an eyelet and is preferably slightly smaller than the hole to insure its entrance into the clenching end of the eyelet without fouling the latter. The larger end of the pilot where it joins the concave clenching surface 22 should be as large as the hole in the bead 12 and may be slightly larger than the initial size of the hole, the essential consideration being that it will fill the hole and thus centralize the clenching end before the latter encounters the clenching surface 22 to be upset and roll-clenched thereby.

The curvature or cross-sectional profile of the clenching surface 22 is such as to turn the clenching end of an eyelet inside out and clench it in the form illustrated in Fig. 3. In the process of turning the clenching end inside out the bulging portions 26 (Fig. 1) are rubbed with considerable pressure by the operating surface 22 and become swaged by that surface with the result that they develop into thin burrs or fins 27 that project from the low segments 16 toward the plane of the high segments 17. When the process of upsetting and roll-clenching the eyelet is completed as pictured in Fig. 3, both the high segments 17 and the low segments 16 are embedded in the work 24 but the high segments are embedded more deeply than the low segments and they increase the holding power of the eyelet. Moreover, the thin burrs or fins 27 become embedded in the work 24 nearly, if not quite, as deeply as the high segments, and they further augment the holding power of the clenched end.

In consequence of stretching the metal of the clenching end during the process of dilation, both the high segments 17 and the low segments 16 grow thinner as may be seen by comparing Figs. 1 and 4. Moreover, although the low segments 16 are initially thicker than the high segments 17, the difference in thickness is virtually dissipated as a result of the stretching process, the low segments giving up their initial bulging formations to supply the demand for metal as circumferential attenuation of the segments progresses.

Because of the differences in ductility of various metals, the extent to which the ductility is dissipated in certain portions during the manufacture of eyelets and because some roll-clenching tools provide for more spread of the clenching ends than others, it is not always possible to determine in advance exactly how many high segments and low segments the clenching end should have to avoid splitting, but it has been found in practice that eyelets having ten high segments and ten low segments formed as herein shown and described may be roll-clenched with a spread to the extent illustrated in Fig. 3 with a margin of safety to guard against splitting. A greater spread than that illustrated may be possible under certain conditions but a spread of the magnitude shown has proved to be satisfactory with regard not only to holding power but also to the avoidance of splitting.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A roll-clench eyelet of ductile metal the barrel of which has a blunt clenching end divided into alternate high and low segments by a series of arcuate indentations.

2. A roll-clench eyelet of ductile metal the barrel of which has a blunt clenching end thicker in cross-section than any other portion of the barrel and divided into alternate high and low segments by a series of arcuate indentations.

3. A roll-clench eyelet of ductile metal the barrel of which has a blunt clenching end thicker in cross-section than any other portion of the barrel and including an annular bead, said clenching end being divided into alternate high and low segments by a series of arcuate indentations.

4. A roll-clench eyelet of ductile metal the barrel of which has a blunt clenching end thicker in cross-section than any other portion of the barrel and including an internal annular bead, said clenching end being divided into alternate

high and low segments by a series of arcuate indentations.

5. A roll-clench eyelet of ductile metal the barrel of which has a blunt clenching end divided into alternate high and low segments by a series of arcuate indentations, the surfaces of said indentations having greater radial dimensions than the high segments.

6. A roll-clench eyelet of ductile metal the barrel of which has a blunt clenching end comprising alternate high and low segments, said low segments being thicker than the high segments and their end faces being arcuate in profile.

7. A roll-clench eyelet of ductile metal the barrel of which has a blunt clenching end comprising alternate high and low segments, said low segments being thicker than the high segments and their end faces being arcuate in profile and of oval configuration.

8. A roll-clench eyelet of ductile metal the barrel of which has a blunt clenching end including flat high segments and alternate low segments of arcuate profile.

9. A roll-clenched eyelet the clenched end of which is an annulus comprising alternate high and low segments arranged to be embedded to unequal depths in the material against which they are clenched.

10. A roll-clenched eyelet the clenched end of which is an annulus comprising alternate high and low segments arranged to be embedded to unequal depths in the material against which they are clenched, the outer perimeters of said low segments having relatively thin fins connecting said high segments.

11. A roll-clench eyelet comprising a barrel of ductile metal provided with a blunt annular clenching end having a series of arcuate indentations impressed into it.

12. A roll-clench eyelet comprising a barrel of ductile metal provided with a blunt annular clenching end including a radially projecting annular bead, said clenching end having a series of arcuate indentations impressed into it and into said bead.

SYLVESTER LEO GOOKIN.