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Esser et al.

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[11] **3,913,374**

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[54] **APPARATUS FOR BEVELLING WIRE BLANKS**

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[30] **Foreign Application Priority Data**

Sept. 18, 1972 Germany 2245771

[52] **U.S. Cl.** **72/404;** 59/23; 225/96; 225/103

[51] **Int. Cl.**[2] **B21J 13/02**

[58] **Field of Search** 72/404, 324, 338; 83/519; 59/1, 18, 23, 35, 71, 75, 77; 225/103, 94, 96

[56] **References Cited**

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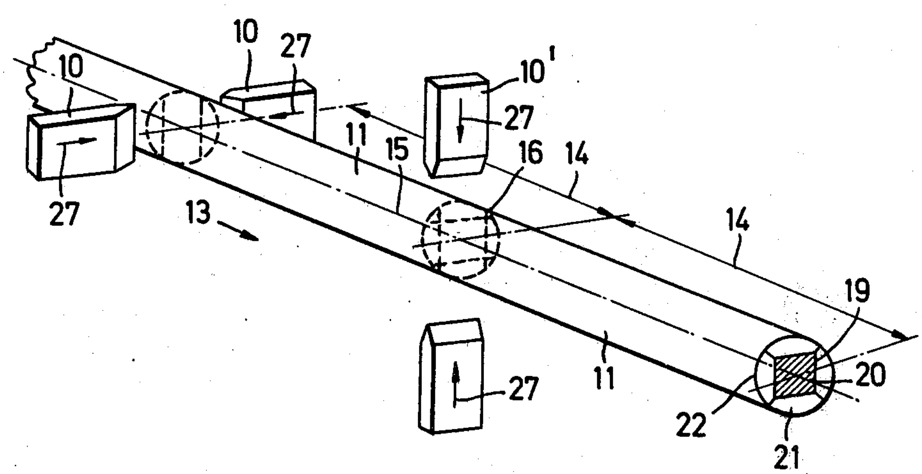
Assistant Examiner—Gene P. Crosby
Attorney, Agent, or Firm—Spencer & Kaye

[57] **ABSTRACT**

For providing an improved deformability of wire blanks (such as chain link blanks) during noncutting shaping, there is performed a bevelling step on the wire blank simultaneously from two opposite sides in the same blank zone, while leaving unaffected a flat cross-sectional portion adjacent the blank axis. This bevelling step is subsequently repeated at least once in the same zone in a direction set off not more than 90° with respect to the bevelling direction of the first bevelling step.

2 Claims, 6 Drawing Figures



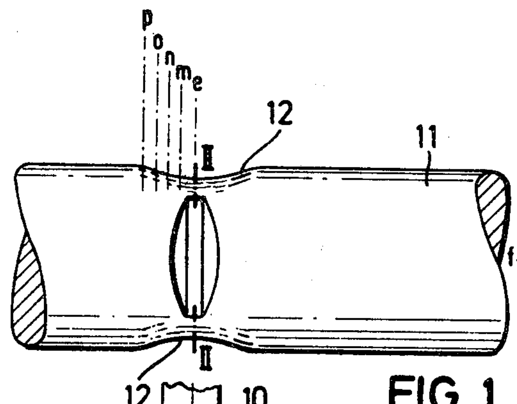


FIG. 1

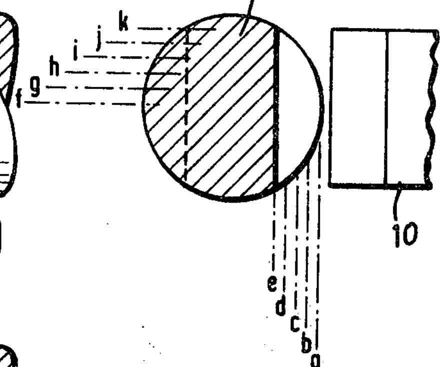


FIG. 2

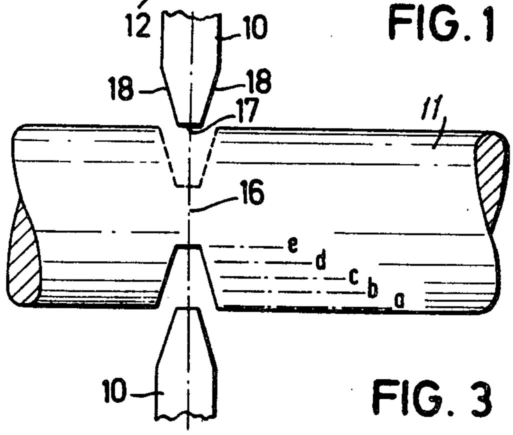


FIG. 3

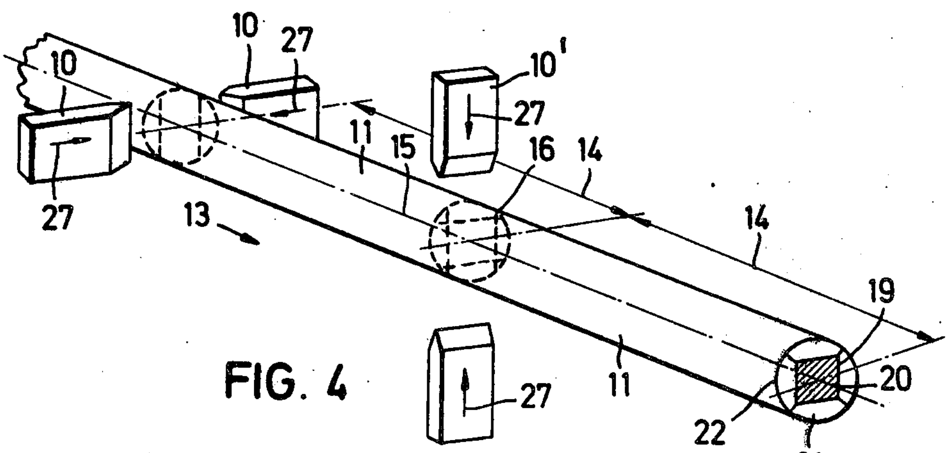


FIG. 4

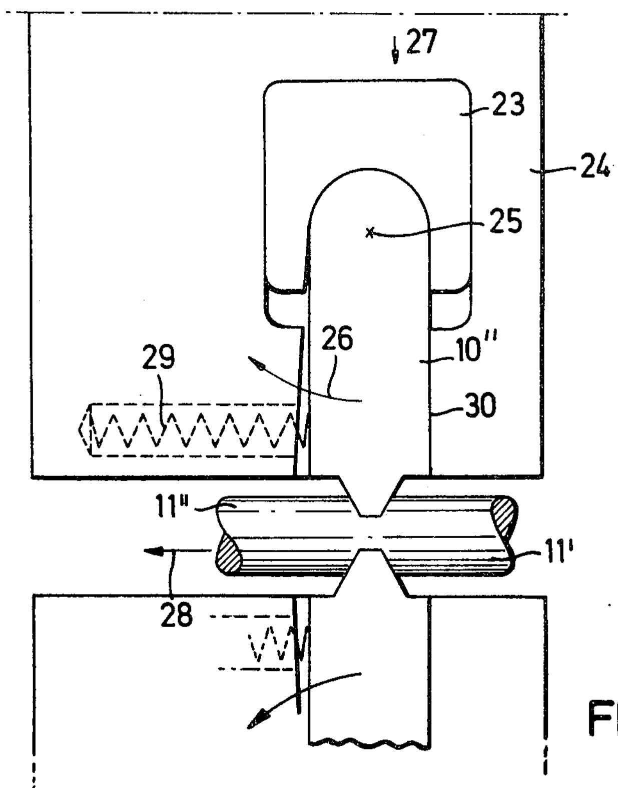


FIG. 5

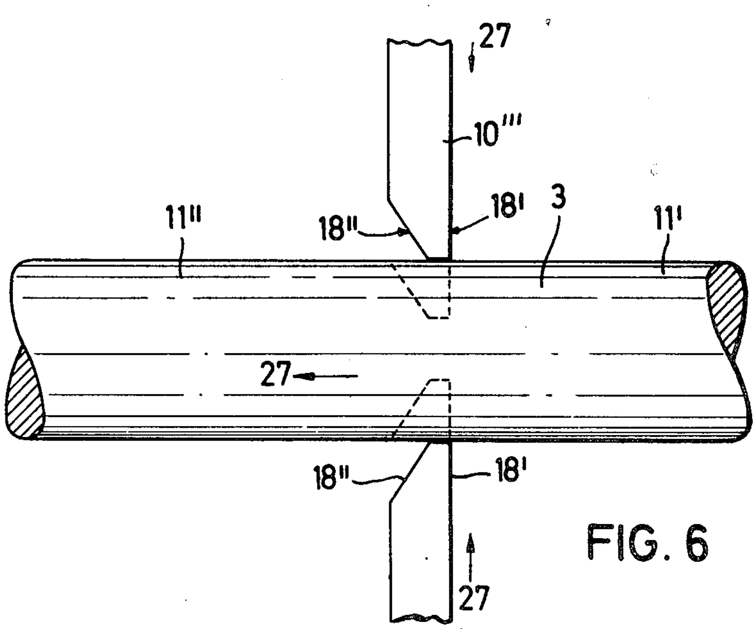


FIG. 6

APPARATUS FOR BEVELLING WIRE BLANKS

BACKGROUND OF THE INVENTION

This invention relates to apparatus for bevelling continuously fed wire blanks, particularly chain link blanks.

According to a known method, as disclosed, for example, in U.S. Pat. No. 2,025,557, the bevelling is performed in such a manner that each bevelled blank end has two bevelled surfaces arranged symmetrically to one another in a V-shape. These surfaces form identical angles with the axis of the blank and converge in a crest that intersects the blank axis. There is also known an apparatus for performing this method. Such apparatus, as disclosed, for example, in U.S. Pat. No. 1,994,794, comprises two cooperating V-shaped cutters which are advanced simultaneously and from opposite directions towards the blank. The purpose of bevelling the blank ends in the above manner is to ensure that during the welding together of the blank ends bent into a C-shape to form a chain link, the fusion proceeds from the adjoining, lengthwise contacting, cutter-shaped crests in an outward direction. In this manner impurities which may be formed by scaling, oxidation or the like during the welding process, are displaced outwardly into the weld during the welding operation and particularly during forging. Subsequently, the impurities are ground or filed away with the weld burr.

It has since been found to be more advantageous if the fusion occurs from the inside outwardly, not in the manner taught by the afore-mentioned prior art but by maintaining unaffected by the bevelling a residual cross-sectional portion which is symmetrical to the blank axis, so that during forging the expulsion of the flowing metal into the weld occurs not only in a direction perpendicular to the crests, but also uniformly in all radial directions (German Laid-Open Application No. 1,602,632). The apparatus for accomplishing such a result is, however, quite complex because it includes four bevelling tools arranged in a frame at 90° with respect to one another. These tools are advanced towards the axis of the blank one after the other in the plane of the blank cross section in radial directions disposed at 90° to one another. Not only is such an apparatus complex and its bevelling operation much too time consuming to be connected to a chain link bending machine of usual rhythm, but also, unsymmetrical deformations are very likely to occur.

There is further known a similar apparatus — as disclosed, for example, in German Gebrauchsmuster (utility patent) No. **1,920,278** — wherein two knives that cut notches in a blank are advanced in a common holder perpendicularly and symmetrically with respect to the blank axis. The frontal faces of the knives have a cutting edge and between the two cutting edges there is provided a play, so that an unaffected cross-sectional portion in the wire blank is maintained.

SUMMARY OF THE INVENTION

It is an object of the invention to provide an improved method and apparatus of the afore-outlined type which are free of the above-discussed disadvantages, whereby the bevelling process is performed on the wire blank symmetrically, very rapidly and by means of simple devices.

This object and others to become apparent as the specification progresses, are achieved by the invention according to which, briefly stated, a bevelling is first effected in a known manner simultaneously from two opposite sides in the same zone of the blank substantially perpendicularly to the blank axis, while maintaining unaffected a flat cross-sectional portion adjacent the blank axis, and subsequently, substantially in the plane of the same cross section, the same bevelling process is repeated at least once, in a direction shifted not more than 90° in the circumferential direction of the blank with respect to the direction of the preceding bevelling step.

The invention is based on the discovery that when working with the earlier discussed know apparatus which has two bevelling tools advanced from opposite directions perpendicularly to the blank axis, the material flows at the locus of working in a particular manner, as explained later in the specification.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevational view of a wire blank, such as a chain blank, taken in the direction of advance of one of the bevelling tools and showing the locus of working.

FIG. **2** is a sectional view taken along line II—II of FIG. **1**.

FIG. **3** is a top plan view of the blank shown in FIG. **1**, with both bevelling tools visible.

FIG. **4** is a perspective schematic view of a preferred embodiment of the invention.

FIG. **5** is a schematic side elevational view of another preferred embodiment of the invention.

FIG. **6** is a schematic side elevational view of still another preferred embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Turing now to FIGS. **1, 2** and **3,** there are shown bevelling tools **10** which, as they are advanced towards the longitudinal axis of the blank **11** through positions *a-b-c-d-e*, cause material particles of the planes *f, g, h, i, j, k* of the blank **11** to be compressed in succession. By virtue of the volume constant and the reaction of the volume elements of the planes *f-k* with respect to one another, the material flows in the axial direction from the middle of the blank cross section. At the same time, the cross sections *l-m-n-o-p* tend to move away from one another. The first still missing compression in the planes *k-j-i* prevents the parallel shift of the planes *l-m-n-o-p* in the vicinity of the outer surface of the blank. Thus, in this zone there is generated a tension in the axial direction with a volume shift in the same direction, whereby in this zone, by virtue of the volume constant, material flows inwardly from the outer surface of the blank. The consequence of the above-described occurence is the appearance of the constrictions **12** of the blank cross section. These oppositely lying constrictions **12** are oriented 90° with respect to the operational direction of the bevelling tools. These constrictions which may be clearly observed during operation, have heretofore not been given any attention.

The invention utilizes this phenomenon by providing a second bevelling step during which the bevelling tools engage the blank in the zones of these constrictions. As the bevelling tools are advanced in the course of this second bevelling step, they first eliminate the tensional stress present and subsequently generate a compression stress with axial displacement of material. In this manner there are achieved an additional flow-readiness of the material and an expansion of the bevelling process for a greater cross section and/or a greater strength.

Accordingly, the process according to the invention is particularly adapated for the bevelling of wire blanks made of high carbon-containing and high-alloyed materials which, because of their hardness and brittleness, make noncutting metal shaping particularly difficult.

The process according to the invention may undergo several modifications. Thus, it is not critical whether the bevelling tools are advanced exactly in the cross-sectional plane of the blank or at a small angle thereto. Further, it is also not critical to operate along the cross-sectional plane of the blank merely with two pairs of work tools staggered at 90° in a radial direction; often it is necessary to make bevelled faces that have more than four frustopyramidal bevels. Thus, it is only exemplary to perform the bevelling process twice: the bevelling steps – each time with a change of direction — may be performed four times. A three-step operation is also possible but is probably less practical.

In certain cases the method according to the invention may be so modified that instead of providing two knife pairs which in succession work on the stationary blank at the same location, the knife pairs are arranged spaced from one another along the length of the blank and operate simultaneously. It is true that in this manner the structural length of the apparatus is increased but at the same time the operating time is substantially decreased and also, the structure of the apparatus is simplified. Such a device for performing the method according to the invention is illustrated schematically in FIG. **4** and will now be described in detail.

The blank **11** is advanced intermittently in the direction of arrow **13.** The first bevelling step is performed thereon by the first bevelling tools **10,** whereas the second bevelling step is performed thereon by the second bevelling tools **10′** spaced from the first bevelling tools **10** along the blank axis at a distance **14** which corresponds to the length of one blank. The tool pair **10′** which works in the cross-sectional plane **16** perpendicularly to the blank axis **15** is set off by 90° with respect to the tool pair **10.** Since each tool, as shown in FIG. **3,** has a leading edge face **17** and two lateral faces **18** arranged symmetrically to one another in a V-shape, there is eventually obtained a bevel **19** having a quadratic frustopyramidal surface **20,** four frustoconical surfaces **21** and a circular base surface **22.** Since the bevelling operation according to the invention may be effected in such a manner that the leading blank **11** snaps off as a result of the second bevelling step, the frustopyramidal surface **20** is not always completely smooth, but has an uneven character and may even have a slightly prismatic form. Such a phenomenon is not necessarily disadvantageous for initiating the fusion process from the inside outwardly. Nevertheless, it is possible without difficulty to design the edge face **17** at each tool to be more or less wide or to so design the cutting tool that the lateral faces **18** converge into a cutting edge.

Turning now to FIG. **5,** there is shown a particular design of the tools according to the invention, concerning in particular the support of the bevelling tools. Each bevelling tool **10″** is supported in a tool carrier **23** which forms part of a tool holder **24** and which is pivotal about an axis **25** in the direction of the arrow **26.** The advance of the tool holder **24** is effected exclusively in the direction of the arrow **27** while the blank **11′** is held stationary. By virtue of the support of the tools **10″** in their pivoting carriers **23** according to the invention, the displacement of the material in the blank occurs, during the noncutting shaping, advantageously in the direction of the arrow **28** in which the blank **11″** should have a freedom of motion. In this manner it is possible to avoid radial material shifts.

The resetting of the bevelling tools **10″** is effected by a reset spring **29** so that in the withdrawn position of the tool support **24** the bevelling tools **10″** abut a stop face **30** forming part of the work tool holder **24.**

Another embodiment of the invention is schematically illustrated in FIG. **6.** In this embodiment, the bevelling tools **10‴** can be advanced exclusively in the direction of the arrow **27.** The bevelling tools **10‴** have a lateral surface **18′** which extends perpendicularly to the blank axis and a lateral face **18″** which forms an angle with the surface **18′.** In this case also, the material of the blank flows exclusively in the direction of the arrow **27** and radial material shifts in the direction of arrow **28** are avoided if the blank **11′** is held stationary and a freedom of motion is ensured for the blank **11″.** The avoidance of such radial material shifts in the direction of the arrow **28** is of particular significance for accomplishing that the constrictions **12** which are generated in the course of the first bevelling operation are fully developed as described earlier to thus achieve, according to the invention, the substantial deformability even of materials which otherwise are difficult to shape.

It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptations and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

We claim:

1. An apparatus for bevelling a wire blank simultaneously at diametrically opposite sides from successively different directions, comprising at least two pairs of bevelling tools; the bevelling tools of each pair being arranged to move simultaneously and in opposite directions to one another into engagement with said wire blank; the direction of advance of each tool towards said blank being normal to the longitudinal axis of the blank; cutting faces provided on each tool, said cutting faces being arranged symmetrically with respect to any cross-sectional plane of said blank; a separate tool holder associated with each bevelling tool for carrying the same, each tool holder being movable towards and away from said axis in a direction normal thereto; means for pivotally securing each bevelling tool to its associated holder for a pivotal motion of the bevelling tool about an axis that is normal to and spaced from the axis of said blank; an abutment provided on each tool holder and cooperating with the tool to determine therefor a position of rest; and spring means engaging each tool holder and the associated tool for urging the tool against said abutment.

2. An apparatus for bevelling a wire blank simultaneous at diametrically opposite sides from successively different directions, comprising at least two pairs of bevelling tools: the bevelling tools of each pair being arranged to move simultaneously and in opposite directions to one another into engagement with said wire blank; the direction of advance of each tool towards said blank being normal to the longitudinal axis of the blank; each bevelling tool has a first cutting face extending normal to said axis and a second cutting face arranged at an angle with respect to said first face; a separate tool holder associated with each bevelling tool for carrying the same, each tool holder being movable towards and away from said axis in a direction normal thereto; means for pivotally securing each bevelling tool to its associated holder for a pivotal motion of the bevelling tool about an axis that is normal to and spaced from the axis of said blank; an abutment provided on each tool holder and cooperating with the tool to determine therefor a position of rest; and spring means engaging each tool holder and the associated tool for urging the tool against said abutment.

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