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(54) **A method apparatus for use in forming articles from rods or bars of metal**

(57) A method of forming a basket shaped article from a plurality of metal bars secured together in a parallel relationship comprises securing one end of the said plurality of metal bars in a fixed gripper ring and securing

the other end in a rotatable gripper ring. The rotatable gripper ring is rotated in one direction to impart a twist to the bars. It is then rotated the opposite direction to partially untwist the bars. The initial twist is greater than 360°.

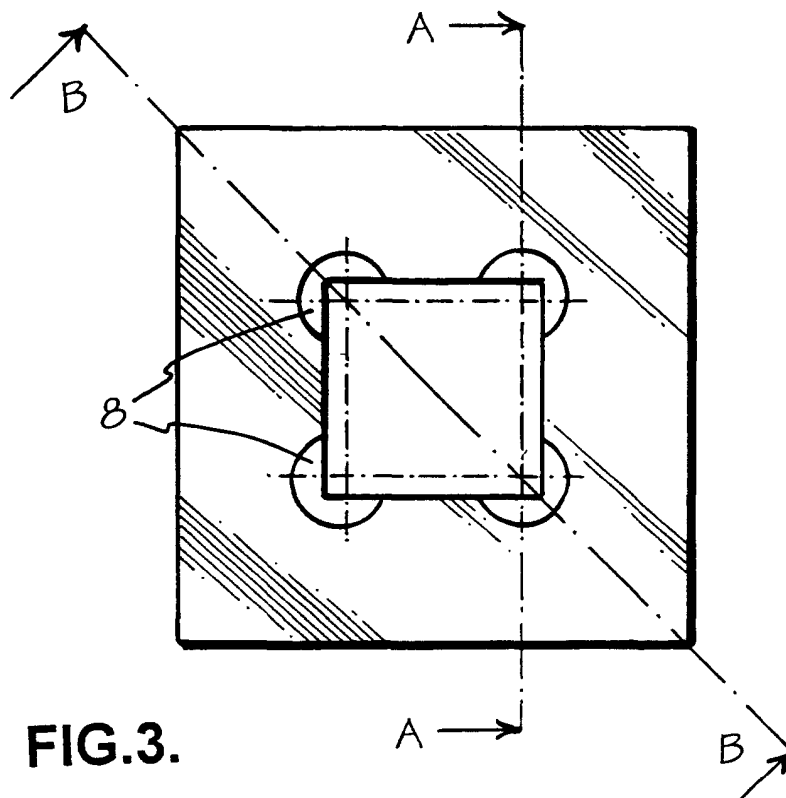


FIG.3.

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Description

[0001] The present invention relates to an apparatus for use in forming articles from rods or bars of metal by rotation of an element of the apparatus. More specifically, the present invention relates to an apparatus for forming from a plurality of metal bars secured together at each end a twisted and enlarged basket of bulbous shape, as illustrated in Figure 2 of the accompanying drawings. These basket shaped articles are commonly used as decorative features in wrought iron designs.

[0002] It is known to employ electro-hydraulically operated machines to twist and compress metal bars into the required shape. However, these machines are relatively expensive and require an appropriate power source to operate. Whilst they are well suited to mass production of the basket shaped articles, they are unsuited to small scale operations. In this regard, it must be understood that many craftsman working in wrought iron do so for a hobby and on a semi-professional basis. The use of complex and expensive machines is for them neither economically nor practicably justifiable.

[0003] Hand operated versions of the electro-hydraulic machines referred to above are known for use by craftsman. Generally, these comprise a fixed gripper ring or clamp for securing one end of the plurality of metal bars and a rotatable gripper ring or clamp for securing the other end of the plurality of metal bars. The rotatable end of clamp is caused to rotate by a large handle and power thread drives. The plurality of metal bars (usually 4 in number) is twisted through 360° and then the twist is reversed through 180° to create a slender basket. In more complex machines, during the reverse twist, the distance between the fixed and rotating clamps is reduced, thereby compressing the metal bars, causing them to bow out further and thereby increasing the size of the basket.

[0004] It is an object of the present invention to provide a method for forming metal bars which is capable of achieving the increased size of basket associated with shortening of the distance between the two clamped ends of the bars and increased compression thereof, without it actually being necessary to shorten the distance between the two clamped ends of the bars.

[0005] It is another object of the present invention to provide an improved design of gripper ring for securing the ends of a plurality of metal bars in a metal forming apparatus.

[0006] According to a first aspect of the present invention there is provided a method of forming a basket shaped article from a plurality of metal bars secured together in a parallel relationship wherein one end of the said plurality of metal bars is held in a fixed position in a gripper ring, whilst the other end is held in a rotatable gripper ring and is rotated in one direction to impart a twist thereto, and then the said other end is rotated in the opposite direction to partially untwist the bars, characterised in that the initial twist is greater than 360°.

[0007] Preferably the initial twist is between 540° to 720° and the partial untwist is of approximately 180°.

[0008] By imparting more twist to the said plurality of bars than is normally the case (no more than 360° of twist is applied in the conventional method) the bars are required to undergo more severe distortion or stretching. Surprisingly, the result of this is that when the plurality of bars are partially untwisted a larger basket is formed. This is so even when the partial untwist remains at 180° as it is in the conventional method.

[0009] The increased twist imparted to the plurality of bars in the method according to the first aspect of the present invention results in partial shearing of the outer corners of the bars at the point where they exit the gripper rings. This shearing is illustrated in Figure 7 of the drawings. This shearing results from the design of the known gripper rings.

[0010] According to a second aspect of the present invention there is provided an apparatus for forming a basket shaped article from a plurality of metal bars secured together in a parallel relationship, the apparatus comprising a fixed end for securing one end of the said plurality of metal bars and a rotatable end which is adapted to be connected to the other end of the said plurality of metal bars, wherein both the fixed end and the rotatable end each comprise a gripper ring defining a through hole of square section which is so dimensioned that it receives and tightly accommodates between the walls thereof an end of the said plurality of bars, characterised in that each corner of square sectioned through hole is partially relieved.

[0011] Preferably the relief created at each corner of the square section through hole in each gripping ring is that of a 90° cone whose centre is set in from the internal corner towards the theoretical centre of the through hole.

[0012] The effect of the relieved area at each corner of the through hole is to prevent distortion of the said plurality of bars at the outer corners thereof. Such distortion, which is, of course, more likely as the amount of twist imparted to the bars is increased, reduces the integrity and strength of the bars and can lead to shearing as they are partially untwisted.

[0013] An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows a cluster of four metal bars prior to twisting and untwisting to form a basket shaped article;

Figure 2 shows a typical basket shaped article formed from the cluster of four metal bars shown in Figure 1;

Figure 3 shows an end view of a fixed end clamp in accordance with the present invention for use in a metal forming apparatus;

Figure 4 is a sectional view of the fixed end clamp shown in Figure 3 along lines A-A;

Figure 5 is a sectional view of the fixed end clamp shown in Figure 3 along lines B-B;

Figure 6 is a view of the end of a cluster of metal bars held in a fixed ring in accordance with the present invention after they have been twisted through 540° to 720°; and

Figure 7 is a view of the end of a cluster of metal bars held in a conventional fixed ring after they have been twisted through 540° to 720°.

[0014] Referring firstly to Figure 1 there is shown four lengths of metal bar 4 which are held together in parallel positions with the ends joined together by welding or other means. By twisting the four metal bars 4 about their central longitudinal axis and then partially untwisting them a basket shaped article is formed as previously discussed and as shown in Figure 2.

[0015] In accordance with the method of the present invention significantly more twist is imparted to the metal bars 4 than the 360° which is the absolute maximum in the conventional method. Typically, the initial twist is between 540° to 720°. The effect of this is that the bars undergo more severe stretching. When the bars are then partially untwisted a larger basket is formed than is normally the case. Indeed, the size of the basket is comparable to that achieved with apparatus which simultaneously with the partial untwisting of the bars impart a degree of compression on the bars by shortening the distance between the fixed and rotating ends of the apparatus.

[0016] One consequence of the greatly increased twist imparted to the metal bars in the method according to the first aspect of the present invention is that the bars are subject to shearing forces at the point where they enter the fixed and rotatable gripping rings. The severity of this can lead to partial shearing of the outer corners of the bars thus preventing them from being able to deform correctly during the partial untwisting step. This partial shearing of the end of the metal bars at the point where they enter the gripping ring is shown in Figure 7.

[0017] Referring now to Figures 3, 4 and 5 there is shown a gripping ring in accordance with the present invention for use in a metal forming apparatus. This apparatus may be an electro-hydraulically operated machine, but more typically will be a hand operated apparatus.

[0018] The gripper ring in accordance with the present invention is used as a direct replacement of the conventional gripper rings of the metal forming apparatus. It is identical to the conventional gripper rings to the extent that it comprises a through hole of square section which is so dimensioned that it receives and tightly accommodates between its inner walls the ends of the metal bars. The gripper ring in accordance with the present invention differs from the conventional gripper ring by virtue of the enhanced relief 8 provided at each internal corner of the through hole adjacent to the point where the bars exit the gripper ring.

[0019] The relief allows the outer corners of the over-stretched bars to move by a limited amount without being subjected to a shear action thus avoiding damage and subsequent failure to support themselves during the reverse rotation as can be seen in Figure 6. (In a conventional gripper ring the actual edge of the aperture causes the bars to shear.)

[0020] The actual geometry of the relief created at each corner of the internal square profile of the gripping ring is that generally of a 90° cone whose centre is set in from the internal corner towards the theoretical centre of the square hole.

[0021] This relief will prevent the corners of the bars held within the gripping ring from being subjected to highly concentrated shear forces thus preserving the integrity and strength of these bars when they are being subjected at the same time to high tensile forces as they stretch due to the twisting action of the equipment within which they are the work pieces. This protection of the bars from shearing is essential in the forming of baskets by the method according to the first aspect of the invention because the secondary rotational action of this process needs the bars to have stretched in length by a greater degree than in any other process during the first rotation to guarantee a more bulbous effect of the basket.

Claims

1. A method of forming a basket shaped article from a plurality of metal bars secured together in a parallel relationship wherein one end of the said plurality of metal bars is held in a fixed position in a gripper ring, whilst the other end is held in a rotatable gripper ring and is rotated in one direction to impart a twist thereto, and then the said other end is rotated in the opposite direction to partially untwist the bars, characterised in that the initial twist is greater than 360°.
2. A method according to claim 1, characterised in that the initial twist is between 540° to 720° and the partial untwist is of approximately 180°.
3. Apparatus for forming a basket shaped article from a plurality of metal bars (4) secured together in a parallel relationship, the apparatus comprising a fixed end for securing one end of the said plurality of metal bars (4) and a rotatable end which is adapted to be connected to the other end of the said plurality of metal bars, wherein both the fixed end and the rotatable end each comprise a gripper ring defining a through hole of square section which is so dimensioned that it receives and tightly accommodates between the walls thereof an end of the said plurality of bars (4), characterised in that each corner (8) of square sectioned through hole is partially relieved.

4. Apparatus according to claim 3, characterised in that the relief created at each corner of the square section through hole in each gripping ring is that of a 90° cone whose centre is set in from the internal corner towards the theoretical centre of the through hole. 5

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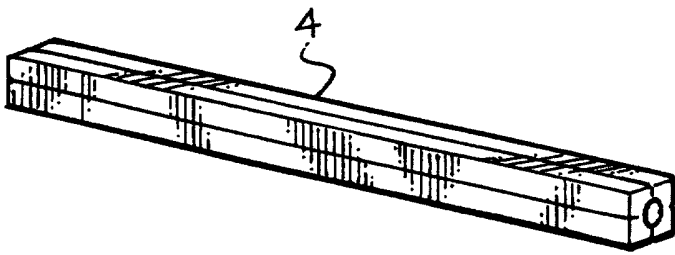


FIG.1.

FIG.2.

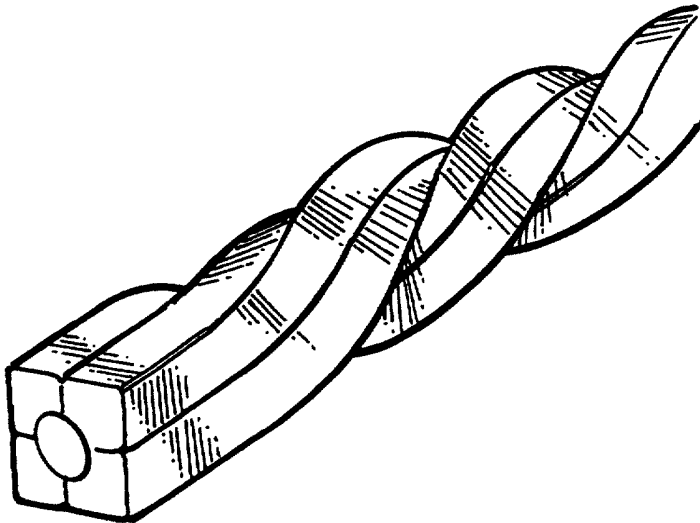
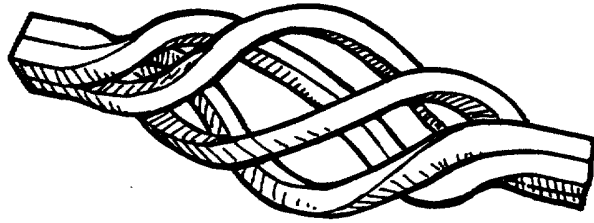


FIG.6.

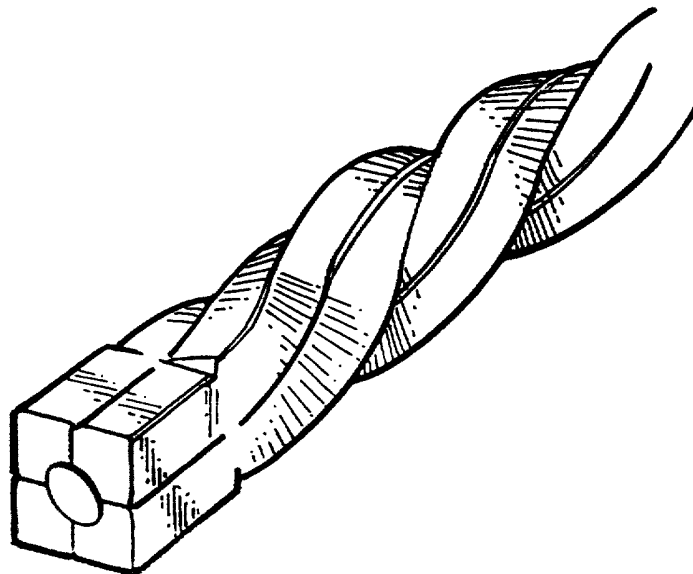


FIG.7.

