April 17, 1962 C. L. SPORCK 3,029,764

METAL WORKING ROLLER

Filed Oct. 18, 1954

Fig. 1.

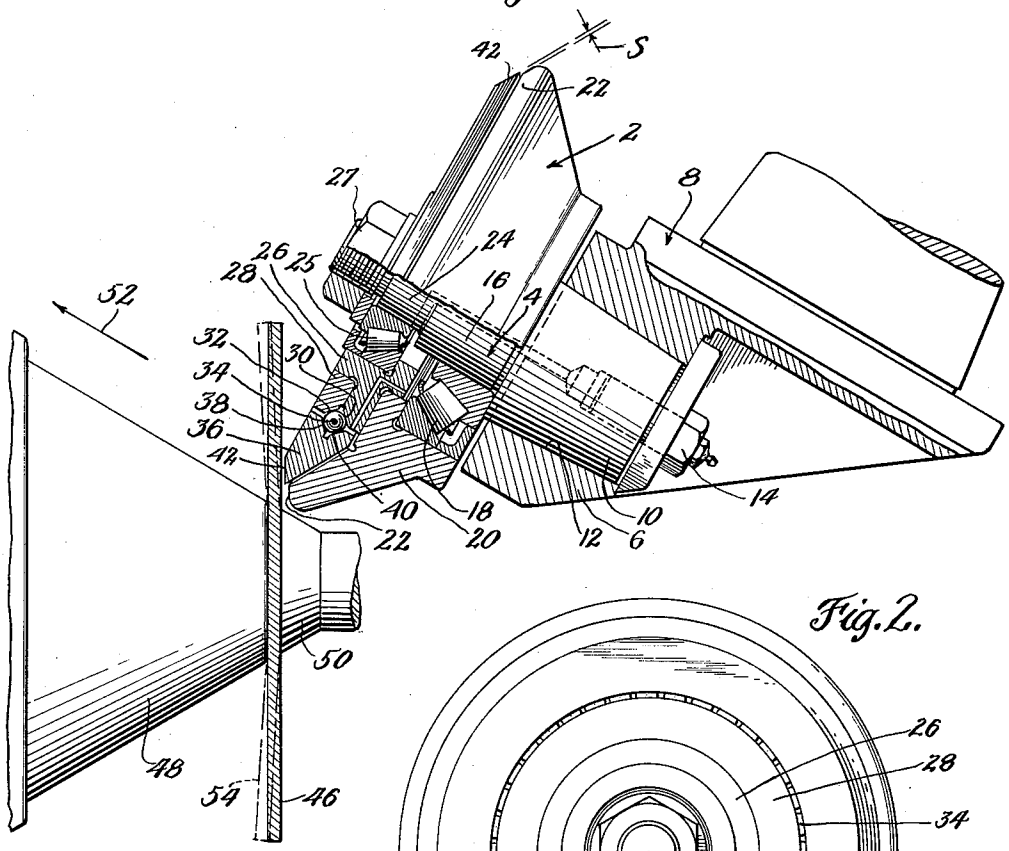


Fig. 2.

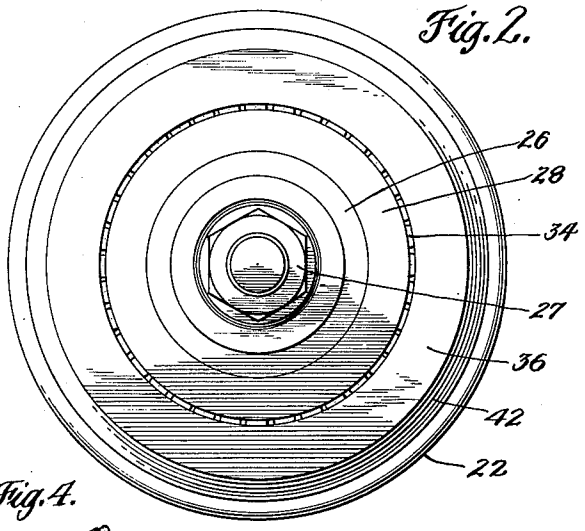


Fig. 3.

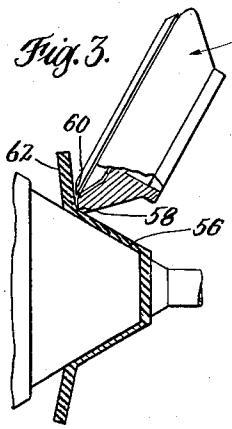
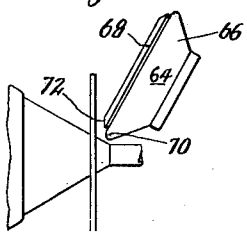


Fig. 4.



INVENTOR
Claus L. Sporck
Synnestvedt & Lechner
ATTORNEYS

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METAL WORKING ROLLER

Claus L. Sporck, Cincinnati, Ohio, assignor to The Lodge & Shipley Company, Cincinnati, Ohio, a corporation of Ohio

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2 Claims. (Cl. 113—52)

This invention relates to apparatus for the working of sheet metal and, in particular, relates to a roller for making hollow frusto-conical-shaped objects from sheet metal blanks.

Equipment with which the roller of the invention is particularly suitable comprises in general a head stock which carries and rotates a mandrel having the shape of the desired part. A blank to be worked, which is preferably flat, is clamped on the mandrel by a rotatable tail stock. The roller is adapted to engage the blank and move along the surface of the mandrel to progressively axially displace the walls of the blank whereby to reduce the thickness and lengthen the same to the desired amounts. The roller is mounted on a support or rest which, in turn, is mounted on a carriage adapted to move on a track or bed for the required motion of the roller along the surface of the mandrel.

Typical methods for which the roller of the present invention is applicable are disclosed in my copending application, Serial No. 407,010, filed January 29, 1954, and entitled Methods for Working Sheet Metal, now abandoned, and in the Lindgren Patent No. 1,939,356.

In making frusto-conical-shaped objects, I have used rollers of a generally known type. Such rollers are provided with a working or reducing surface adapted to engage and displace the material of the blank. When such a roller was used to work a blank, particularly a flat blank, I found that upon initial contact with the blank, the roller tended to pick up metal so that the blank became scored or scarred. The foregoing, of course, is very undesirable because it is conducive to a very high rejection rate of finished objects.

The principal object of the present invention is to provide a roller which will eliminate the above referred to pick-up.

According to the invention, the roller comprises a main body portion which is rotatably mounted on a shaft secured to a roller rest or support. The main body portion of the roller has an annular working or reducing surface which, in cross section, is generally arcuate in shape. Also rotatably mounted on the shaft is a ring-like member which also has a working surface. The working surface of the ring is disposed adjacent the reducing surface of the roller and in a manner such that when the roller is brought up to a flat blank, the working surface of the ring first contacts the blank. The working surface of the ring exerts pressure on the blank and hence, with further axial movement of the roller, the blank is deflected or bent into slightly dished form. With further axial movement of the roller, the reducing surface contacts the blank and starts to displace the metal in the usual manner.

In effect, the roller of the invention is provided with two working surfaces which are offset from one another, the first being a deflecting surface which initially contacts the blank and bends the same into dished form, the effect of which is to so condition the blank that when contacted by the second or reducing surface, there will be no pick-up or scarring of the metal.

The details of the manner in which the roller is constructed will be apparent from the following description and drawings wherein:

FIGURE 1 is an elevational view partly in section of a roller constructed in accordance with the invention, the roller being shown in association with a blank to be worked;

FIGURE 2 is a face view of the roller;

FIGURE 3 is a fragmentary view showing a roller working a blank and, in particular, illustrating the relationship between the reducing surface and the deflecting surface at this stage of the operation; and

FIGURE 4 is a fragmentary view showing another embodiment of the invention.

In FIGURE 1 a roller is designated generally by the numeral 2 and is mounted on a shaft 4, which is disposed in the wedge-shaped portion 6 of a roller rest generally designated by the numeral 8. (A roller rest on which the roller 2 may be mounted is disclosed in copending application, Serial No. 462,695, filed October 18, 1954, and entitled Metal Working, now abandoned.) The shaft 4 has a generally tapered surface 10, which mates with a correspondingly tapered surface 12 in the wedge-shaped member 6. The shaft is held in fixed position by the clamp and nut assembly generally designated by the numeral 14.

The shaft has a shoulder 16 on which is mounted the thrust bearing 18 carrying the main body portion 20 of the roller. The main body portion has a generally arcuate reducing surface designated by the numeral 22.

The shoulder 24 of the shaft carries thrust bearing 25, which mounts ring-like member 26. The member 26 carries another ring-like member 28, which is secured thereto by bolts (not shown). The bearing 25 and the members 26 and 28 are held on the roller shaft by the nut and washer assembly 27. The members 26 and 28 have respectively tapered surfaces 30 and 32, which cooperate with one another to form a race for a plurality of ball bearings 34. A deflector ring 36 is mounted on the rollers 34, the tapered surfaces 38 and 40 of which provide an outer race for the ball bearings 34. The deflector ring 36 has a preferably flat annular working or deflecting surface designated by the numeral 42.

The spacing S between the surfaces 22 and 42 is somewhat exaggerated in FIGURE 1. This has been done for purposes of illustration. In a roller having an O.D. of ten inches the spacing may be about .020 inch.

FIGURE 1 shows at flat, disk-like blank 46 supported between a mandrel 48 and a tail stock designated by 50 Ordinarily, the mandrel is power-driven and since the tail stock is rotatably mounted, rotation of the mandrel causes rotation of the blank.

As will be apparent from FIGURE 1, as the roller is moved in the direction shown by the arrow 52, the deflector ring working surface 42 will first contact the blank. The ring begins to rotate with the blank and the pressure exerted by the movement of the roller in the direction of the arrow causes the blank to deflect or bend into slightly dished form. The deflection, of course, is relatively small, for example, in the order of that shown by the dotted lines designated by the numeral 54. As the roller is further moved, the roller reducing surface 22 contacts the blank and begins to displace metal.

As the roller travels along the surface of the mandrel to displace the metal, the rolling pressure is adjusted so that the unworked portion of the blank remains normal to the rotational axis of the mandrel or is adjusted so that the unworked portion is slightly deflected in a forward direction. An article being formed under conditions wherein the unworked portion of the blank is coned forwardly is shown in FIGURE 3, where a partially worked blank is engaged by the reducing surface 58 of the roller and the deflecting surface 60 is spaced from the wall 62 of the blank.

The above-described arrangement whereby the blank to be worked is initially deflected has eliminated the pick-up and resulted in the production of articles free from

scars. I believe that the elimination of pick-up is due to the fact that when the blank is initially deflected, the portion to be first contacted by the reducing surface is put under tension. While I have used the terms "deflecting" and "reducing" as applied to the above-described roller, it will be understood that these terms are for descriptive purposes only. It is contemplated that the deflecting surface may have some reducing effect, for example, in the sense that the surface operates to strain a certain portion of the blank.

Another feature of the invention is in the arrangement of the races for the ball bearings 34. The surfaces 30 and 32 may be so ground that when the rings 26 and 28 are assembled, the balls 38 will be preloaded with respect to the ring 36. This is of particular advantage because essentially all of the play can be taken out of the ring 36, even though the ring is rotatable.

While I have shown the preferred embodiment of the invention to comprise two members which have surfaces rotatable with respect to one another, the invention may take other forms, for example, such as an embodiment shown in FIGURE 4. Here the roller 64 has a main portion 66 and an auxiliary portion 68, the two portions being integral with one another. The main portion 66 has a working surface 70, while the auxiliary portion 68 has a flat working surface 72. The working surface 70 operates in a manner similar to that of working surface 22 of roller 2 described above. The working surface 72 operates to initially deflect the blank in a manner similar to that described in connection with the deflector ring surface 42.

As will be apparent, the main difference between this roller 2 and the roller 66 is that the surface 72 is not rotatable relative to the surface 70. In using this type of roller, it is preferable to adjust the rolling pressure such that the unworked portion of the blank is coned forwardly in order to space the deflecting surface 72 away from the blank.

In this embodiment the roller may be rotatably mounted with respect to a shaft carried by a roller rest or alternatively, the roller may be secured to a shaft, the shaft then being rotatably supported by the roller rest.

I claim:

1. A roller for working a blank comprising: a shaft; bearing means mounted on said shaft; a first member mounted for rotation on said bearing means and having an annular working surface for engaging and performing a working operation on a blank; and a second member mounted for rotation on said bearing means and having an annular working surface for engaging and deflecting a blank disposed adjacent to but offset from first said surface in the direction of travel of the roller during a working operation the offset of last said working surface providing for the deflection of the blank prior to the engagement of first said working surface.

2. A roller for working a blank comprising: a shaft; bearing means mounted on said shaft; a first member mounted for rotation on said bearing means and having an annular working surface for engaging and performing a working operation on a blank; a ring-like member mounted for rotation on said bearing means; a second member mounted on said ring-like member and having an annular working surface for engaging and deflecting a blank offset from first said surface in the direction of travel of the roller during a working operation, the offset of last said working surface providing for the deflection of the blank prior to the engagement of first said working surface; and ball bearings interposed between said ring-like member and said second member and providing for rotation of said second member.

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