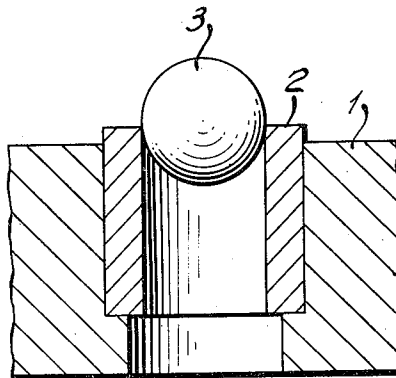


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MANUFACTURE OF CHAIN ROLLERS  
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## MANUFACTURE OF CHAIN ROLLERS

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4 Claims. (Cl. 29—148.4)

This invention relates to chain rollers and has for its object to provide a method of manufacture adapted to improve the fatigue resistance of such rollers.

The invention stems from the discovery that many roller failures commonly thought to initiate on the outside, were in fact starting on the inside of the roller and, further, that under properly controlled conditions, these failures can be greatly delayed, if not prevented, by hardening the roller and thereafter developing a residual compressive stress in a thin layer of the metal surrounding the roller hole.

The preferred method of applying the invention is illustrated in the accompanying drawing, the single figure being a central vertical section (not to scale) through a roller and associated elements.

In carrying out the invention, the roller is fabricated in the usual manner up to the point of finally dimensioning it. The outside diameter is turned to a dimension slightly greater than its finished diameter and the inside diameter is made under-size, that is, the hole is turned or reamed to a diameter less than that required for the finished roller. The roller is then hardened and its outside diameter is ground to size, and a suitable tool, such as a hardened ball of appropriate diameter (over-size with respect to the roller hole) is forced through the roller to create a residual compressive stress in the metal surrounding the hole. With the parts properly proportioned, the resulting hole size is brought to the required finished diameter. Care needs to be taken to avoid distorting or expanding the roller as a whole and it has been found that this can be best accomplished by containing the roller while the ball or the like is being forced through it. For instance, the roller can be nested in a closely fitting hole in a heavy plate. This is illustrated in the drawing, where the confining plate is marked 1, the hardened roller 2 and the ball 3.

The presence of residual stress at the hole in the roller after treatment as described can be demonstrated by cutting through one wall of the roller in a plane containing the roller axis. The two severed ends will spread after cutting, since the tension forces in the outer diameter of the roller which have balanced the compression forces on the inner diameter are relieved by the severance and the roller expands or uncurls.

It has also been found that unless the stressing of the roller as described is properly controlled, overstressing may result and the desired advantages of the method be largely lost. For instance, if the ball is too large, small ruptures or cracks are produced in the treated surface. These stress raisers offset the effect of the residual compressive stress.

In the preferred method of carrying out the invention,

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the inside of the roller is turned to a diameter of approximately .9988 that of the desired finished hole diameter. The roller is then hardened, as usual. Then, the ball or the like is forced through the hole, with the roller contained as above mentioned. The ball diameter, it has been found, should be approximately 1.0061 of that of the hole through which it is to be forced.

A typical example is a roller for a so-called two inch roller chain. The dimensions of such a roller, before treatment, are O. D. 1.125, I. D. .8195, wall thickness .1527. Such a roller is commonly made of alloy steel and, after dimensioning, is hardened to about Rockwell C50. The ball or the like to be forced through it should have a diameter of approximately .8245. The finished dimensions of the roller are then O. D. 1.125, I. D. .8205, wall thickness .1522.

To illustrate the need for holding the dimensions to reasonably close tolerances, it may be mentioned that ruptures of the character described above are created in the example just given if the ball size is increased even to .8305 (that is, to 1.013 of the hole size).

It has been found by endurance tests that rollers treated in accordance with the invention, as compared with otherwise identical untreated (hardened) rollers have an increased life of more than 500%.

In the light of the foregoing description, the following is claimed:

1. The method of making a chain roller which includes the steps of hardening the roller, mounting the hardened roller in a containing fixture closely fitting its outside diameter and forcing through the roller a hardened ball having a diameter greater than, but less than 1.013 of, the hole size of the roller.

2. The method of making a chain roller which consists in turning the roller to its finished outside diameter and to an inside diameter of approximately .9988 of that of the desired finished hole diameter, hardening the roller, mounting the hardened roller in a containing fixture closely fitting its said outside diameter and forcing through the roller a hardened ball having a diameter approximately 1.006 times the said inside diameter.

3. The method of making a chain roller which consists in turning the roller to its finished outside diameter and to an inside diameter of approximately .9988 of that of the desired finished hole diameter, hardening the roller, mounting the hardened roller in a containing fixture closely fitting its said outside diameter and forcing through the roller a hardened ball having a diameter greater than that of the said inside diameter but less than 1.013 of the hole size.

4. The method of making a chain roller which includes the steps of hardening the roller and thereafter forcing through the roller hole a hardened ball of a diameter greater than, but less than 1.013 of, the hole size of the roller.

### References Cited in the file of this patent

#### UNITED STATES PATENTS

|           |          |               |
|-----------|----------|---------------|
| 1,116,776 | Wilcox   | Nov. 10, 1914 |
| 1,402,508 | Lothrop  | Jan. 3, 1922  |
| 1,466,953 | Loomis   | Sept. 4, 1923 |
| 1,714,660 | Crawford | May 28, 1929  |
| 2,038,474 | Brown    | Apr. 21, 1936 |
| 2,047,041 | John     | July 7, 1936  |
| 2,225,572 | Schwartz | Sept. 9, 1941 |