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METHOD OF QUENCHING GEARS

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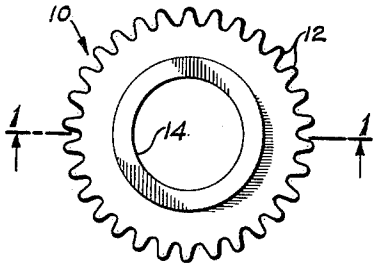


FIG. 2

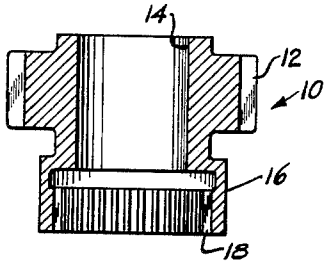


FIG. 1

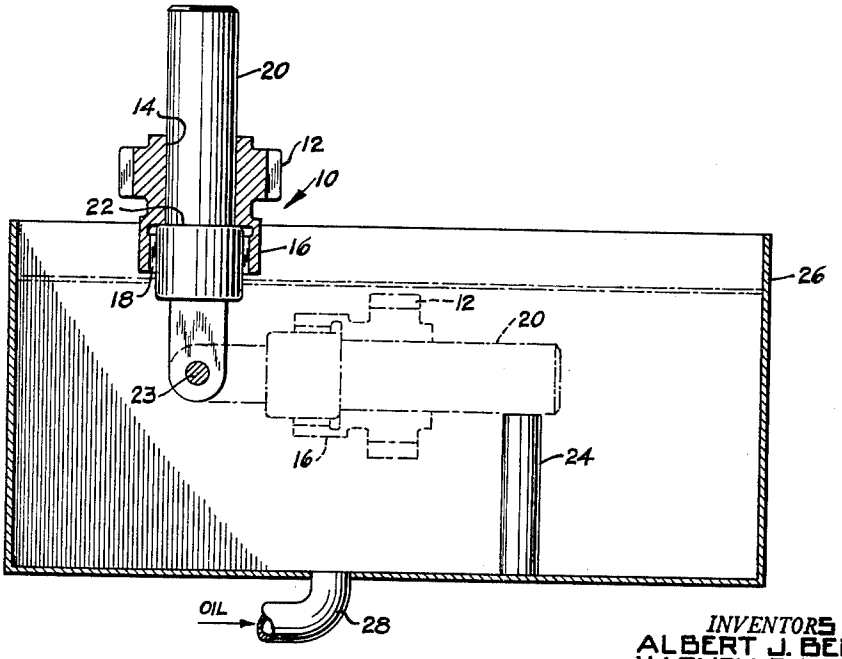


FIG. 3

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METHOD OF QUENCHING GEARS

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This invention relates to a method for heat treating parts and is particularly directed to such a method for quenching of gears.

In the heat treatment of gears it is conventional practice after the gear has been heated in a furnace to remove the gear from the furnace and place it on a vertical plug with the plug passing vertically through the central bore of the gear and then quenching the gear in oil or other liquid by lowering the plug and gear vertically in the liquid and/or causing the liquid to rise vertically, that is axially, over the gear. When spur gears are quenched with this prior quenching procedure, one end face of each gear tooth is quenched first and the quenching proceeds axially along each gear tooth in successive horizontal planes defined by the relatively rising liquid surface. This prior quenching procedure results in distortion of the gear teeth in that they become non-parallel with the gear axis and as a result the gear teeth must be reworked by grinding and/or lapping. An object of the present invention comprises the provision of a novel and simple method of quenching gears so that said gear tooth distortion is eliminated or at least minimized.

A further object of the invention comprises the provision of a novel gear quenching method in which the gear is quenched by immersing in liquid with the gear axis disposed parallel to the level of the liquid as said liquid, relative to the gear, rises over the gear. A still further object comprises the provision of such a method for quenching gears in which the gear to be quenched is first mounted on a post extending through the gear bore for maintaining the proper size and shape of said bore during the quenching operation.

Other objects of the invention will become apparent upon reading the annexed detailed description in connection with the drawing in which:

FIG. 1 is an axial sectional view through a typical gear to be quenched in accordance with the invention;

FIG. 2 is an end view of the gear of FIG. 1; and

FIG. 3 is a sectional view through apparatus for carrying out the invention.

Referring to the drawing, reference numeral **10** designates a typical gear to be quenched in accordance with the invention. The gear **10** has external spur teeth **12** with the sides of the gear teeth disposed parallel to the gear axis. The gear **10** also has a stepped co-axial bore **14** therethrough with the larger diameter portion being formed in a cylindrical extension **16**. The cylindrical extension has internal axially-extending splines **18** for providing driving connection to a shaft (not shown).

In order to harden the gear teeth **12** it is conventional practice to heat treat the gear. A typical heat treating operation may involve heating the gear to 1500° F. and then quenching the gear in oil or other liquid. In accordance with the invention the heated gear **10** to be quenched is placed over a vertical plug or post **20**. The post **20** has a stepped diameter portion forming a shoulder

22 which engages a shoulder in the gear bore **14** formed by the stepped construction of said bore thereby locating the gear **10** on said post. The diameter of the stepped portions of the post **20** within the gear correspond to the desired diameter of the adjacent portions of the internal diameter of the gear bore **14**.

The post **20** is pivotally mounted on pivot shaft **23** so that it can be swung from its vertical position, illustrated in full lines in FIG. 3, to a horizontal position, illustrated in dot and dash lines in FIG. 3. For holding the post in its vertical position suitable releasable latch means (not shown) may be provided whereby on release of the latch means the post can be swung to its horizontal position against a rest **24**. The post **20** with the gear **10** mounted thereon is disposed within a tank **26**.

After the gear **10** has been properly positioned on the post **20**, within the tank **26**, the post with the gear is promptly swung to the horizontal position and then oil or other suitable liquid at the desired quenching temperature, is admitted into the bottom of the tank **26** through a supply connection **28** to immerse the heated gear **10** in said liquid. As the liquid level in the tank **26** rises over the gear **10**, for example to the level indicated in FIG. 3, to immerse said gear, the level of said liquid is always parallel to the axis of the gear. With this arrangement, the entire length of each element of a side of a gear tooth **12** in a plane parallel to the liquid level is quenched at the same time. Because the gear teeth **12** are formed with their sides parallel to the gear axis this method of quenching the gear teeth minimizes the possibility of any tooth distortion during the quenching operation. Obviously, as far as the invention is concerned, in lieu of the gear being immersed in the liquid by the liquid rising over the gear, the gear could be lowered into the liquid. In either case, however, relative to the gear the liquid level rises over the gear and in both cases it is essential that the gear axis be parallel to the liquid level as the gear is being immersed in the oil. The stepped portions of the post **20** maintain the internal diameter portions of the gear **10** contacting said post portions at the desired value during the quenching operation.

After the quenching operation the gear **10** is pulled from the post **20** in any suitable manner.

While we have described our invention in detail in its present preferred embodiment, it will be obvious to those skilled in the art, after understanding our invention, that various changes and modifications may be made therein without departing from the spirit or scope thereof. We aim in the appended claims to cover all such modifications.

We claim as our invention:

1. A process for quenching a heated gear having a co-axial bore therethrough and having gear teeth with the sides of said teeth being disposed parallel to the gear axis; said process comprising the steps of supporting the gear on a post of circular cross-section extending into said bore and having substantially the desired dimension of said bore such that said post is effective to maintain the desired internal bore dimensions of said gear during the subsequent immersion step; and then, while mounted on said post, immersing all of said gear in a liquid with the gear axis disposed parallel to the level of the liquid as, relative to the gear, the liquid level rises over the gear.

2. A process for quenching a heated gear having a co-

axial bore therethrough and having gear teeth with the sides of said gear teeth being disposed parallel to the gear axis; said process comprising the steps of mounting the gear on a vertical post with said post of circular cross-section extending co-axially into said bore and with the portion of said post within said bore having substantially the desired dimension of said bore such that said post is effective to maintain the desired internal bore dimensions of said gear during the subsequent immersion step; moving said post with said gear to a position in which their axes are horizontal; and then, while so mounted on said post, immersing all of said gear in a liquid with the gear axis disposed parallel to the level of the liquid as, relative to the gear, the liquid level rises over the gear.

References Cited in the file of this patent

UNITED STATES PATENTS

Re. 18,661	Davis	Nov. 22, 1932
2,146,516	Stephenson	Feb. 7, 1939
2,684,073	Gregg	July 20, 1954
2,699,412	Adair et al.	Jan. 11, 1955