Dec. 26, 1961 N. F. CALLAHAN, JR 3,014,274

METHOD OF IMPROVING METAL SURFACES

Filed July 22, 1957

FIG. 1

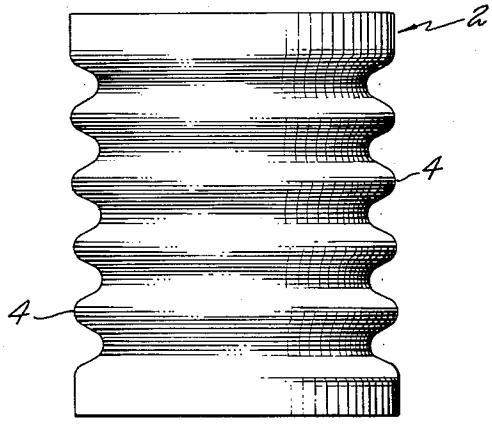
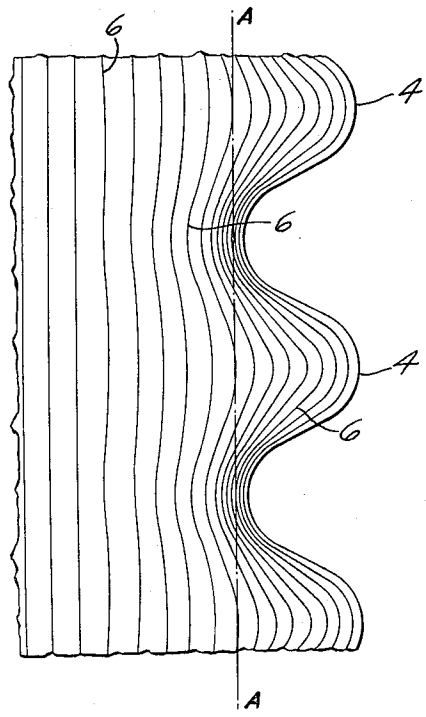


FIG. 2



INVENTOR
NORMAN F. CALLAHAN JR.
BY Jack N. McCarthy
AGENT

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METHOD OF IMPROVING METAL SURFACES

Norman F. Callahan, Jr., Stevenson, Conn., assignor to United Aircraft Corporation, East Hartford, Conn., a corporation of Delaware

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This invention relates to a method for forming a metal surface minimizing imperfections therein and more particularly nonmetallic inclusions in the finished machined surface of cylindrical forgings.

An object of this invention is to form a metallic piece having corrugations on the area which is to be transformed into a smooth surface. This piece may be a forged bar member with circumferential corrugations extending therearound.

Another object of this invention is to form a metallic piece in which the longitudinal grainflow thereof extends into the corrugations which have been formed thereon.

A further object of this invention is to form a smooth surface in which the surface contains ends of the metal grain by removing the corrugations.

Another object of this invention is to set up a wavy grainflow extending into corrugations adjacent the surface to be formed to change the orientation of any nonmetallics in the metal so that their end cross sections will be exposed on the finished surface.

A surface of this type will expose only a small end view of a nonmetallic inclusion. This inclusion will then not appear as an imperfection of objectionable size in certain inspection procedures.

Other objects and advantages will be apparent from the specification and claims and from the accompanying drawings which show one embodiment of the invention.

FIG. 1 shows a shaft forged with circumferential corrugations extending therearound.

FIG. 2 is an enlarged section taken through a portion of the shaft shown in FIG. 1 revealing the longitudinal wavy grainflow extending into the corrugations.

While FIG. 1 shows corrugations formed on a cylindrical or bar member, the corrugations may also be formed on pieces having other shapes. The corrugated shaft 2 shown in FIG. 1 can be formed from a metallic rod which has been forged or rolled or formed by some other desired method. To form the corrugations 4, a forging process can be used with dies having corrugations set therein.

Upon completion of the corrugated shaft as shown in FIG. 1, the longitudinal grainflow of the shaft has changed so that the grainflow now waves into the corrugations 4. This grainflow is shown in FIG. 2 by representative lines 6. The extent to which the grainflow extends into the corrugations depends on the width of the corrugation and the depth of the corrugation. To provide a wavy grainflow having a sufficient number of grain lines flowing into the corrugations, the depth of the corrugations and their width can be controlled until a desired number are present.

To form a smooth metal surface, the circumferential corrugations are removed to a depth below the lowest corrugation (see dot and dash line A—A in FIG. 2). It can be seen from this figure that the cross section of any grain line which extended into the corrugations would be exposed on the final surface. This surface can be formed by a machining off of the corrugations. However, this operation can be formed by the removal of the corrugations by other satisfactory means. The material on which a surface can be formed by the method disclosed herein is any material of granular structure which can be formed with corrugations and having the grain flow into the corrugations.

It is to be understood that the invention is not limited by the figures herein illustrated and described but may be used otherwise without departure from its scope as defined in the following claim.

I claim:

A method of making a metal shaft having a surface containing end cross sections of grain flow to control nonmetallic inclusions in a shaft surface from a metal susceptible of being forged which comprises; forging stock to form a shaft having a plurality of circumferential adjacent corrugations extending therearound with a wavy grain flow which flows into the corrugations; while forging, the depth of the corrugations and their width being controlled to provide a wavy grain flow having a sufficient number of grain lines so that when the corrugations are removed the surface contains end cross sections of the wavy grain flow; and then removing the corrugations to a depth to expose end cross sections of the wavy grain flow on the finished surface of the shaft to reduce the length of grain flow appearing on the surface.

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