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V. V. VOLOGDIN ET AL

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METHOD OF CASTING A WEAR-RESISTANT LAYER ON CAST-IRON
INTERNAL COMBUSTION ENGINE CYLINDER LINERS

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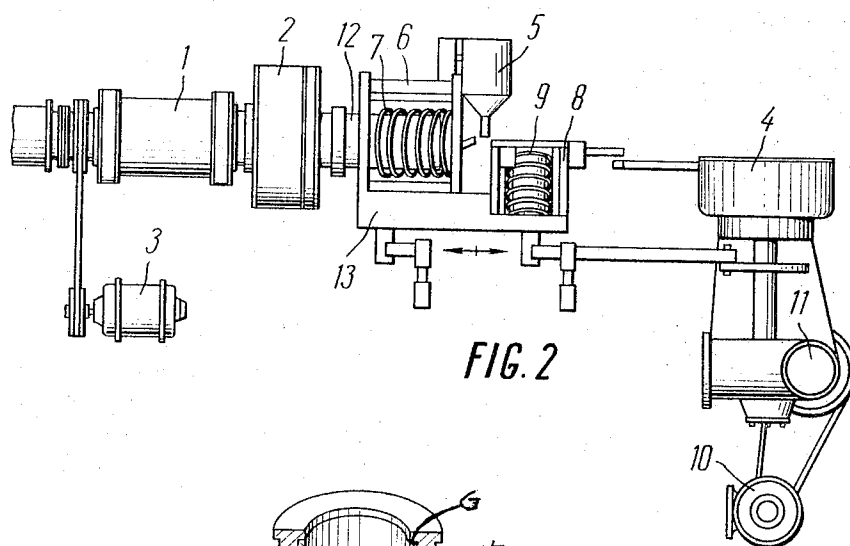
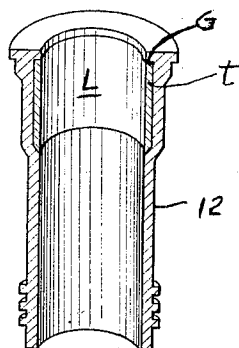


FIG. 1



1

3,304,589

METHOD OF CASTING A WEAR-RESISTANT LAYER ON CAST-IRON INTERNAL COMBUSTION ENGINE CYLINDER LINERS

Vladislav Valentinovich Vologdin, Prospekt Engelsa 70, Apt. 92, Leningrad, U.S.S.R.; Alexei Dmitrievich Demichev, Prospekt Engelsa 36, Apt. 32, Leningrad, U.S.S.R.; Vladimir Petrovich Suchkousov, Lenin St. 44, Apt. 4, Leningrad, U.S.S.R.; Anatoly Vladimirovich Lakedemosky, Avtozavodskaja St., Korpus B, Apt. 280, Moscow, U.S.S.R.; and Yury Emeljanovich Abramenko, Kievskaja St. 18, Apt. 102, Moscow, U.S.S.R.

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3 Claims. (Cl. 22-200.5)

The present invention relates to methods for increasing the wear resistance of internal combustion engine cylinder liners, and more specifically to such methods as are carried out by strengthening the part of the liner most subject to wear with an alloy layer.

During the operation of an internal combustion engine, the cast-iron liners of the cylinders become damaged due to abrasive wear and high-temperature corrosive action, with the maximum damage being noted in the upper part of the liner over a section about 60 mm. wide from its edge.

To reduce this destruction and thus prolong the life of the liners, separately prepared inserts are sometimes pressed into the upper part of the liners. These inserts are usually made of a corrosive-resistant alloy containing nickel, chromium and copper. The manufacture of cast-iron liners with pressed inserts is a labor-consuming process and involves the irrational use of non-ferrous metals. In addition, the absence of a direct connection between the cast-iron liner and the insert causes overheating of the insert and its premature wear during operation of the engine.

In accordance with the present invention, the layer of alloy is applied by direct casting or fusing onto the part of the liner to be strengthened and the centrifugal method of casting may be employed, using high frequency current for heating.

The principal object of this invention is to provide a method for increasing the wear resistance of cast-iron internal combustion engine cylinder liners whereby a firm connection of the layer of alloy to the material of the liner is ensured.

Another object of the invention is to provide a method for increasing the wear resistance of cylinder liners of the type described which permits a reduction in the amount of alloy required.

Additional objects and advantages of the present method for increasing the wear resistance of cast-iron cylinder liners will become more readily apparent to persons skilled in the art from the following detailed specification and drawings, and in which drawings:

FIG. 1 is a view in perspective and partly in cross-section of the cylinder liner, and

FIG. 2 is a diagrammatic view of an apparatus for performing the method.

Prior to the casting on of a wear-resistant alloy, the liner is first subjected to a machining operation, consisting of the rough cutting away of a band for the metal to be cast-on onto the inner surface of the liner and cutting a basic surface for installing the liner on a machine. The magnitude of the allowance for the final machining of the liner and the amount of metal cast-on depend upon the accuracy of preliminary machining of the liner and its installation into the chuck for the casting-on of the metal. The wear-resistant zone of the liners is to be cast-on with the aid of an automatic installation such as disclosed in FIG. 1 wherein a spindle

2

1 provided with chuck 2 is rotated by an electric motor 3 via a belt and pulley drive. A timing device 4 serves for controlling hopper 5 equipped with a batching means, a heater 6 having an inductor 7, and small-size furnace 8 provided within an inductor 9. The timing device 4 is operated by an electric motor 10 through a reduction gear means 11.

A prepared liner 12 (FIG. 1) is secured in the chuck 2 for ensuring a reliable gripping and centering of the liner during the casting-on process. The jaws of the chuck include telescopic drives that permit the jaws to move in a radial direction and retain the liner in two belts. This design of the chuck ensures the reliable securing and centering of the liner when the liner is being heated and expands during the casting-on process.

All of the spindle parts operating in the high temperature zone are provided with artificial cooling and after installing the liner, rotary movement is imparted to the spindle. When this takes place, the batching means of the hopper 5 delivers the required amount of flux to the surface of the liner on which the wear-resistant alloy is to be cast-on. Under the action of centrifugal forces, the flux is uniformly distributed over the machined liner surface thereby protecting the heated surfaces and the metal being cast-on against oxidation.

Then, the part of the liner to which the metal is to be cast-on is heated by means of the heater 6 which is moved onto the rotating liner by means of the timing device 4. Simultaneously with heating of the liner the wear-resistant alloy is melted in the induction furnace 8 which is mounted on platform 13 provided with heater 6. When the liner has reached a definite predetermined temperature, the liquid alloy is automatically poured onto the inner surface of the rotating liner. Under the action of centrifugal forces, the alloy is distributed in a uniform layer along the groove 6 machined in the inner liner surface. The liner-heating inductor and the small-size induction furnace are supplied with power from a source of increased or high frequency current.

When the time necessary for the crystallization of the cast-on layer has elapsed, the installation is deactivated and all the mechanisms return to their initial positions. The liner with the cast-on metal is then removed.

The different thermal expansion coefficients of the liner and the cast-on metal, as well as the non-uniform heating of the liner during the casting-on process may develop internal stresses during cooling which, if necessary, are eliminated by heat treatment.

In comparison with the known methods for increasing the wear resistance of cast-iron liners, the present method permits the reduction of the thickness t of the alloy layer L from 2.5-3.5 to 0.75-1.5 mm., as well as obtain a firm and reliable connection between the liner and the alloy layer thereby improving the conditions for heat removal, increasing the service life of the liner and reducing the amount of nickel, chromium and copper required.

Moreover, the present method overcomes the necessity of preliminarily casting and machining the insert, thus resulting in a reduction in the foundry equipment and machine tools required and an increase in labor productivity.

The invention is not to be confined to any strict conformity to the showings in the drawings but changes and modifications may be made therein so long as such changes or modifications mark no material departure from the spirit and scope of the appended claims.

What we claim is:

1. A method for increasing the wear resistance of cast-iron internal combustion engine cylinder liners, comprising the steps of forming a continuous groove in the inner periphery of the liner in the area thereof to be

3

strengthened, heating that portion of the liner having the groove therein and simultaneously melting a wear resistant alloy, introducing and uniformly distributing the melted alloy into the groove, and arresting the heating of the liner and the melting of the alloy upon the crystallization of the alloy in the groove.

2. A method for increasing the wear resistance of cast-iron internal combustion engine cylinder liners, comprising the steps of forming a continuous groove in the inner periphery of the liner in the area thereof to be strengthened, imparting rotary movement to the liner, heating at least that portion of the liner having the groove therein and simultaneously melting a wear resistant alloy, introducing the melted alloy into the rotating liner when the liner has reached a predetermined temperature whereby due to centrifugal force the melted alloy is distributed in a uniform layer in the groove, and arresting the rotary movement and heating upon the crystallization of the alloy layer.

3. A method for increasing the wear resistance of cast-iron internal combustion engine cylinder liners, comprising the steps of forming a continuous groove in the inner periphery of the liner in the area thereof to be strengthened, imparting rotary movement to the liner, uniformly distributing a flux throughout the groove due to centrifugal force, heating at least that portion of the liner having

4

the groove therein and simultaneously melting a wear resistant alloy by high frequency current, introducing the melted alloy into the rotating liner when the liner has attained a predetermined temperature whereby due to centrifugal force the melted alloy is distributed in a uniform layer in the groove, and arresting the rotary movement and heating upon the recrystallization of the alloy layer.

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J. SPENCER OVERHOLSER, *Primary Examiner*.

R. S. ANNEN, *Assistant Examiner*.