

TITLE OF THE INVENTION

Recovered Flame Contact Surface of Cylinder Cover

BACKGROUND OF THE INVENTION

Field of the inveniton:

5 The present invention relates to a recovered surface of a flame contact surface portion of a cylinder cover for use in land and marine diesel engines.

Prior art:

Hitherto, for repairing or recovering a crack or cracks
10 taking place on the flame contact surface of a cylinder cover, it has been conventional that the cracked portion is cut out by a grinder, and a cooling hole is repaired by inserting a pipe of same external diameter as diameter of the cooling hole and conducting a buildup welding. It has been also conventional that
15 the cracked flame contact surface is repaired just by welding the cracked portion only.

In the bore cooling type cylinder cover in which a large number of cooling holes are provided radially from the center of the cylinder cover, it is certain that such type of cylinder
20 cover has many advantages such as cooling performance, increased horse power, etc., but, at the same time, has a serious disadvantage of difficulty in finding out a crack taking place due to corrosion of the cooling hole bottom portion after a long time of operation through inspections for crack detection from
25 the flame contact surface side (including color check, magnaflux

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check, ultrasonic crack detection). To overcome such a disadvantage, for inspecting carefully whether or not there is any crack on the cooling hole, it has been heretofore conducted that the cylinder cover is subject to annealing (partly for the purpose of stress relieving of the cylinder cover), cleaning of internal part and troublesome manual inspection by means of an endoscope before the recovery work. However, once corrosion takes place, a serious problem exists in that a crack spreads over to other portions where no crack has been detected and has not recovered yet, which requires a further repairing work, eventually resulting in increase in repairing frequency, a great deal of labor and expenses, and economical loss due to shutdown (engine operation stop).

SUMMARY OF THE INVENTION

The present invention was made to solve the above-discussed problems incidental to the prior arts and has an object of providing an economically recovered flame contact surface of a cylinder cover capable of overcoming the disadvantage of the troublesome inspection and recovery work.

To accomplish the foregoing object, a recovered flame contact surface of a cylinder cover according to the present invention is characterized in that a portion damaged due to flame contact is cut out annularly from a flame contact surface side along the circumference of the flame contact surface which is seen circular from the flame contact surface side to the extent

of having a thickness reaching a cooling hole, and a recovering flame contact surface of the cylinder cover is formed by conducting a buildup welding of a corrosion resistant and heat resistant metal on the cutout portion and providing again
5 cooling holes.

In the recovered flame contact surface of above construction, the entire portion which is most easy to be cracked on the flame contact surface is recovered, resulting in prolonging a of life of the cylinder cover.

10 In the cylinder cover provided with a large number of cooling holes, the recovered flame contact surface according to the invention exhibits advantages such that inspection for flaw detection requiring a long time and much labor is no more necessary, and that the cylinder cover of the recovered flame contact surface
15 may be completely free from recurrence of cracks, eventually resulting in significant economical advantage.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view with a partially enlarged sectional view both showing a structure of the recovered flame
20 contact surface of a cylinder cover;

Fig. 2 is a bottom view seen from the recovered flame contact surface of a cylinder cover;

Fig. 3 is a partially sectional enlarged view of the recovered flame contact surface;

25 Fig. 4 is a partially sectional enlarged view showing a

manner of forming the recovered flame contact surface by inserting a pipe in the cooling hole; and

Fig. 5 is a a partially sectional enlarged view showing a manner of filling the entire circular section of the cooling
5 hole with the recovered flame contact surface.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to Figs. 1 to 3, the flame contact surface
2 of the cylinder cover 1 is subject to buildup welding employing
a corrosion resistant and heat resistant metal to form a recovered
10 flame contact portion having a thickness reaching the cooling
hole 3 annularly from the flame contact surface side (i.e., from
underside in Fig. 1) along the circumference of the flame contact
surface A formed into a certain width of circular part when seen
from the flame contact surface side of the cylinder cover. It
15 is preferable that alloy of nickel chromium steel or chromium
molybdenum steel is employed as the corrosion resistant and heat
resistant metal.

Then, a process for forming the recovering flame contact
surface 2 of the cylinder cover is hereinafter described. First,
20 the cylinder cover 1 of which flame contact surface is damaged
is subject to annealing in a annealing furnace. Then, being
placed on a cutting machine directing the flame contact surface
side to a cutter side, the damaged surface portion of the cylinder
cover 1 is cut out annularly from the flame contact surface side
25 along the circumference of the flame contact side to form an



annular part of certain thickness reaching the cooling hole 3, whereby the flame contact surface welding hole 4 is formed. In this regard, the cutting to form an annular part reaching the cooling hole includes a cutting to a depth of semicircular portion 5 (up to 1/2 of the diameter of the hole) of a circular section of the cooling hole 3 and a cutting to a depth of permitting a full circular section of the cooling hole 3 to be cut out.

After cutting annularly from the flame contact surface side to the semicircular portion of a circular section of the cooling hole 3 along the circumference thereby forming the the flame contact surface welding hole 4, a pipe 5 of the same diameter as the cooling hole is inserted in the cooling hole 3 (see Fig. 4), and the entire circumference of the mentioned cutout portion is subject to buildup welding manually or by automatic welding machine from above, whereby the annular recovering flame contact surface 2 of corrosion resistant and heat resistant metal having a thickness reaching a cooling hole 3 is formed, and thereafter new cooling holes 3 are provided again by drilling, thus completing the recovered flame contact surface according to the invention.

In one aspect of the invention, after cutting annularly from the flame contact surface side to a depth of the semicircular portion of a circular section of the cooling hole 3 along the circumference of the flame contact surface thereby forming the the flame contact surface welding hole 4, the remaining 1/2 of



the semicircular portion left not cut out is filled with a corrosion resistant and heat resistant metal by manual welding, then the entire circumference of the mentioned cutout portion is subject to buildup welding by automatic welding machine, 5 whereby the annular recovering flame contact surface 2 of corrosion resistant and heat resistant metal having a thickness reaching the cooling hole 3 is formed, and thereafter new cooling holes 3 are provided again by drilling.

In another aspect of the invention, as shown in Fig. 5, 10 after cutting annularly from the flame contact surface side to a depth of permitting a full circular section of the cooling hole 3 to be cut out, along the circumference of the flame contact surface, thereby forming the the flame contact surface welding hole 4, the entire circumference of the mentioned cutout portion 15 is subject to buildup welding by automatic welding machine, whereby the annular recovering flame contact surface 2 of corrosion resistant and heat resistant metal having a thickness reaching the cooling hole 3 is formed, and thereafter new cooling holes 3 are provided again by drilling.

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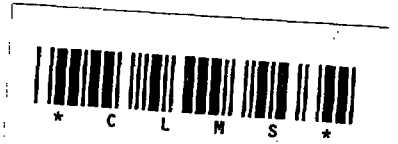




What is claimed is:

1. A recovered flame contact surface of a cylinder cover, characterized in that a surface portion damaged due to flame contact in the cylinder cover is cut out to the extent of having
5 a thickness reaching a semicircular portion of a circular section of a cooling hole 3 thereby forming a flame contact surface welding hole 4, an annular recovering flame contact surface 2 of corrosion resistant and heat resistant metal having a thickness reaching the cooling hole 3 is formed by buildup welding in the formed
10 welding hole 4, said annular recovering flame contact surface 2 being formed annularly from a flame contact surface A side along the circumference of the flame contact surface A of a cylinder cover 1, and cooling holes 3 are provided again.

2. A recovered flame contact surface of a cylinder cover,
15 characterized in that a surface portion damaged due to flame contact in the cylinder cover is cut out to the extent of having a thickness permitting a full circular section of a cooling hole 3 to be cut out thereby forming a flame contact surface welding hole 4, an annular recovering flame contact surface 2 of corrosion
20 resistant and heat resistant metal having a thickness reaching the semicircular portion of the circular section of the cooling hole 3 is formed by buildup welding in the formed welding hole 4, said annular recovering flame contact surface 2 being formed annularly from a flame contact surface A side along the
25 circumference of the flame contact surface A of a cylinder cover



1, and cooling holes 3 are provided again.

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RECOVERED FLAME CONTACT SURFACE OF CYLINDER COVER

ABSTRACT OF THE DISCLOSURE

A cylinder cover provided with a large number of cooling holes which is free from troublesome work of crack detection as well as from recurrence of crack. A damaged surface portion of a cylinder cover is cut out to a depth of having a thickness reaching either a semicircular portion or a full circular portion of a circular section of a cooling hole 3 thereby forming a flame contact surface welding hole 4, then an annular recovering flame contact surface 2 of corrosion resistant and heat resistant metal having a thickness reaching the semicircular portion or full circular portion is formed by buildup welding in the formed welding hole 4 annularly from a flame contact surface A side along the circumference of the flame contact surface A of a cylinder cover 1, and cooling holes 3 are provided again.

FIGURE 1

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FIG. 1

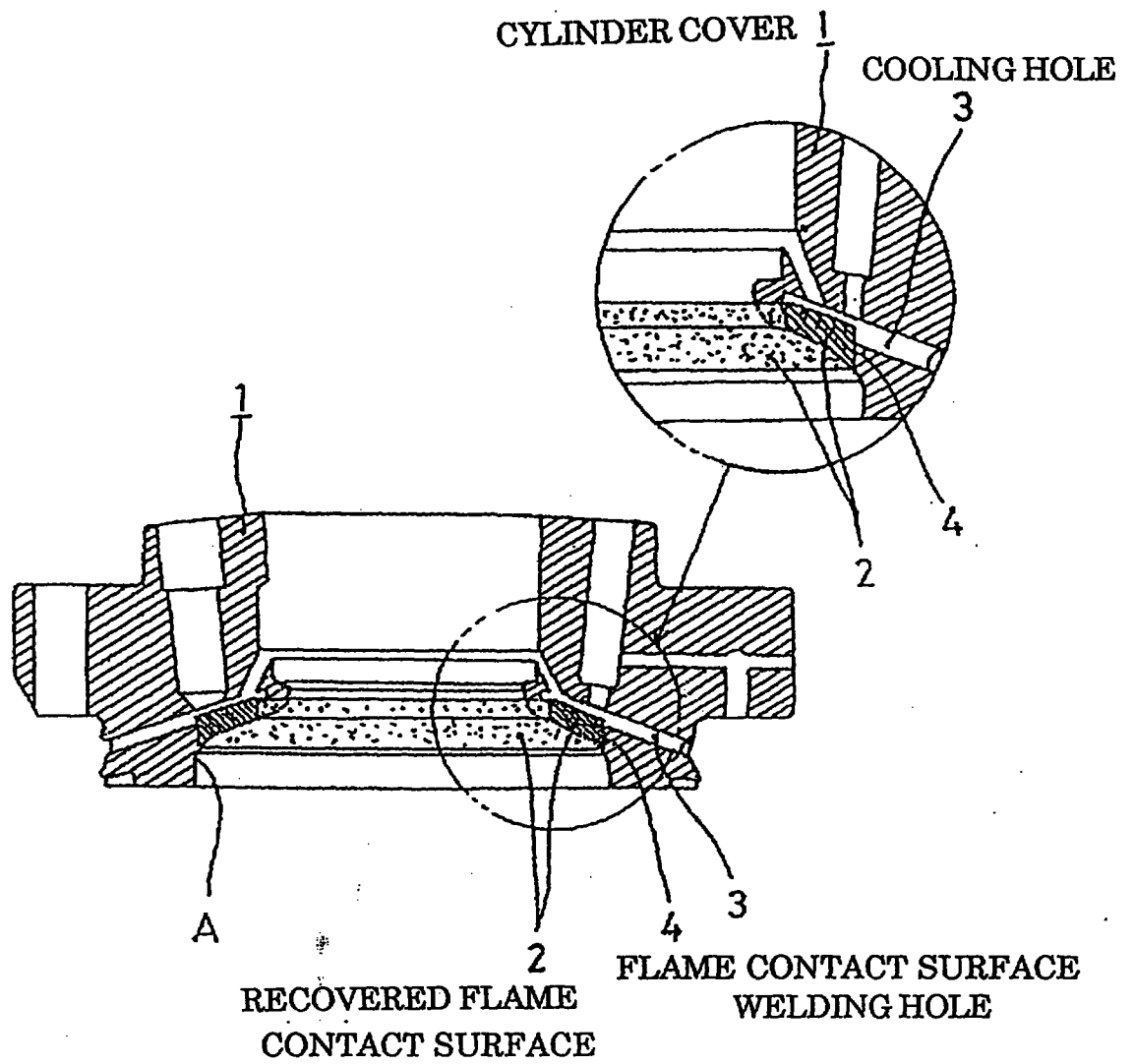


FIG. 2

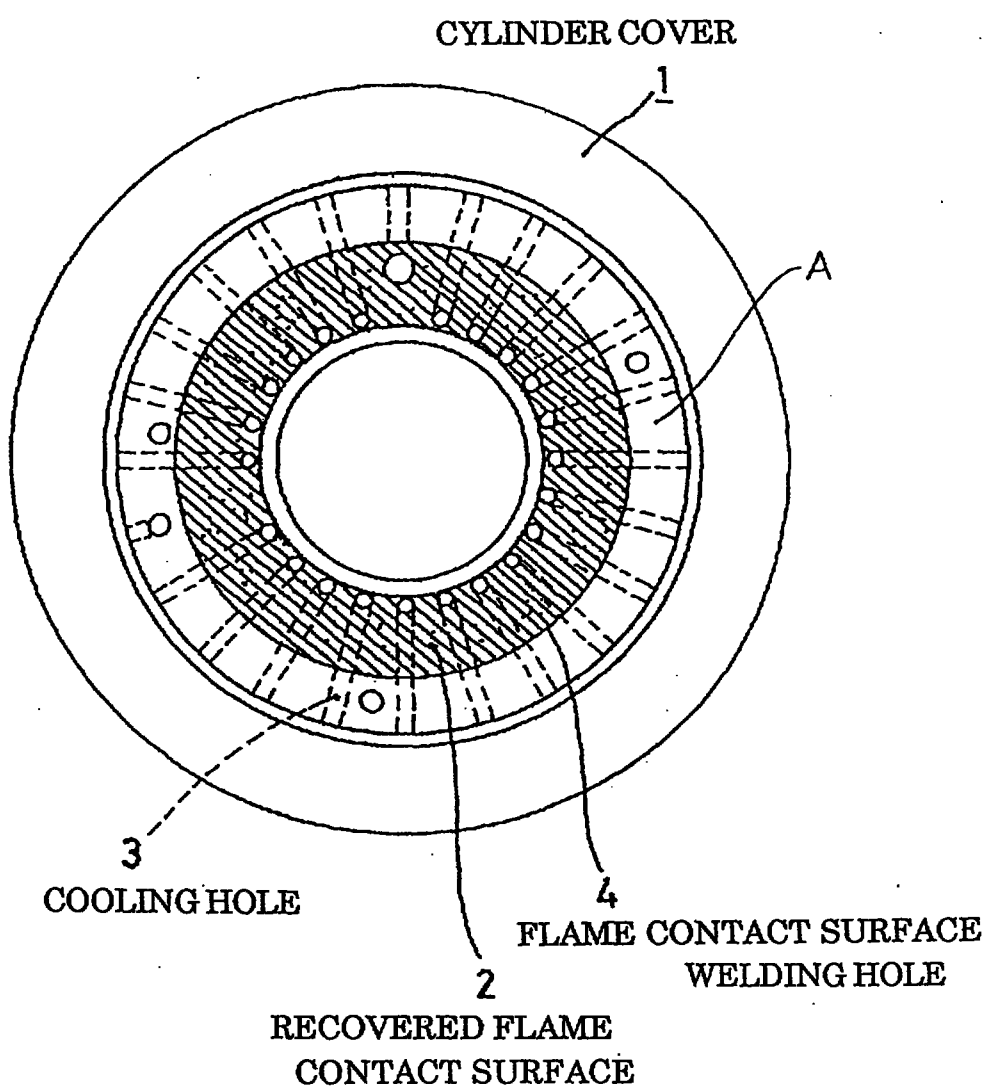


FIG. 3

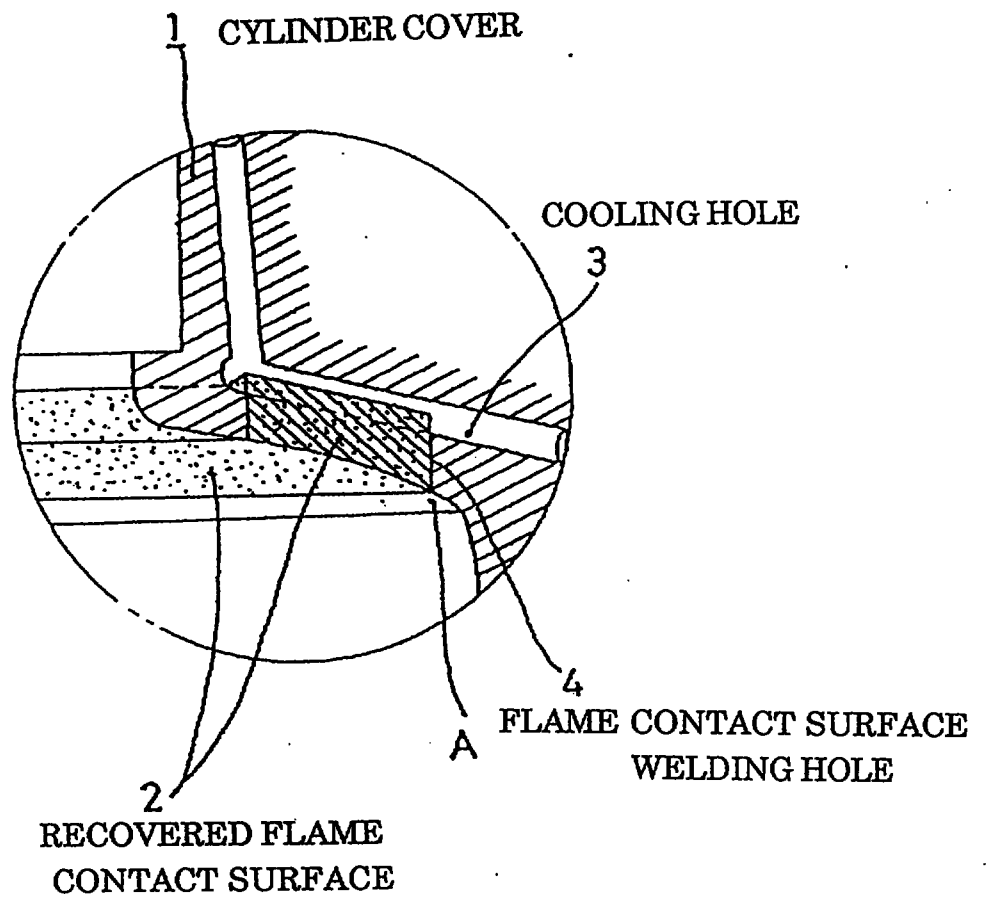


FIG. 4

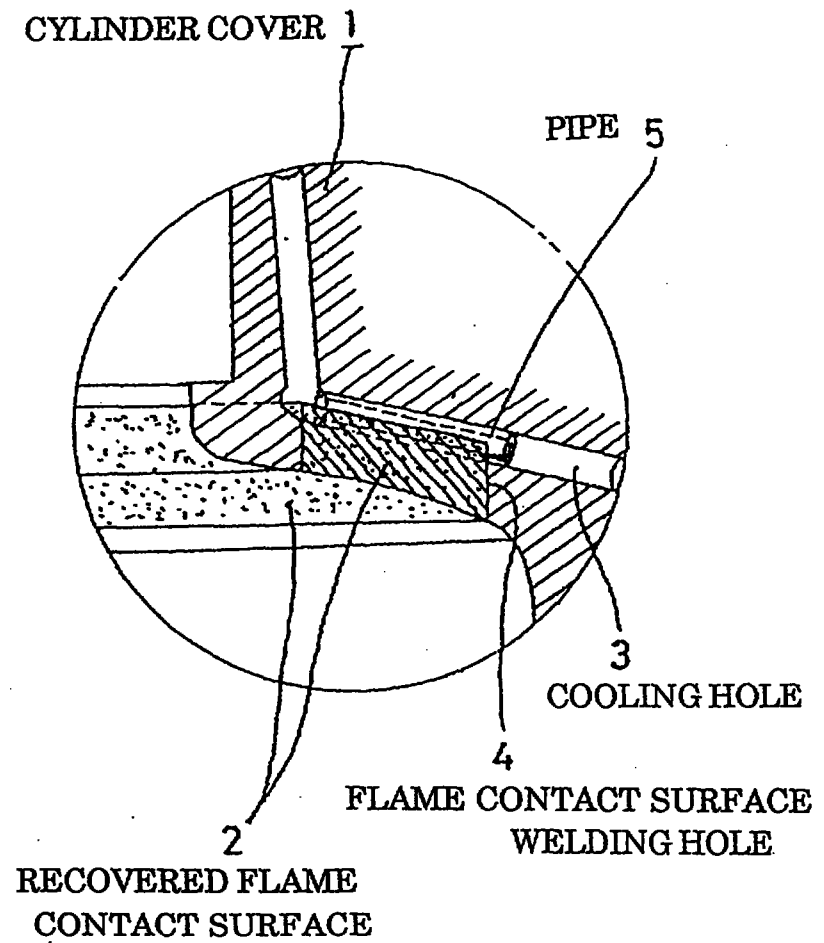
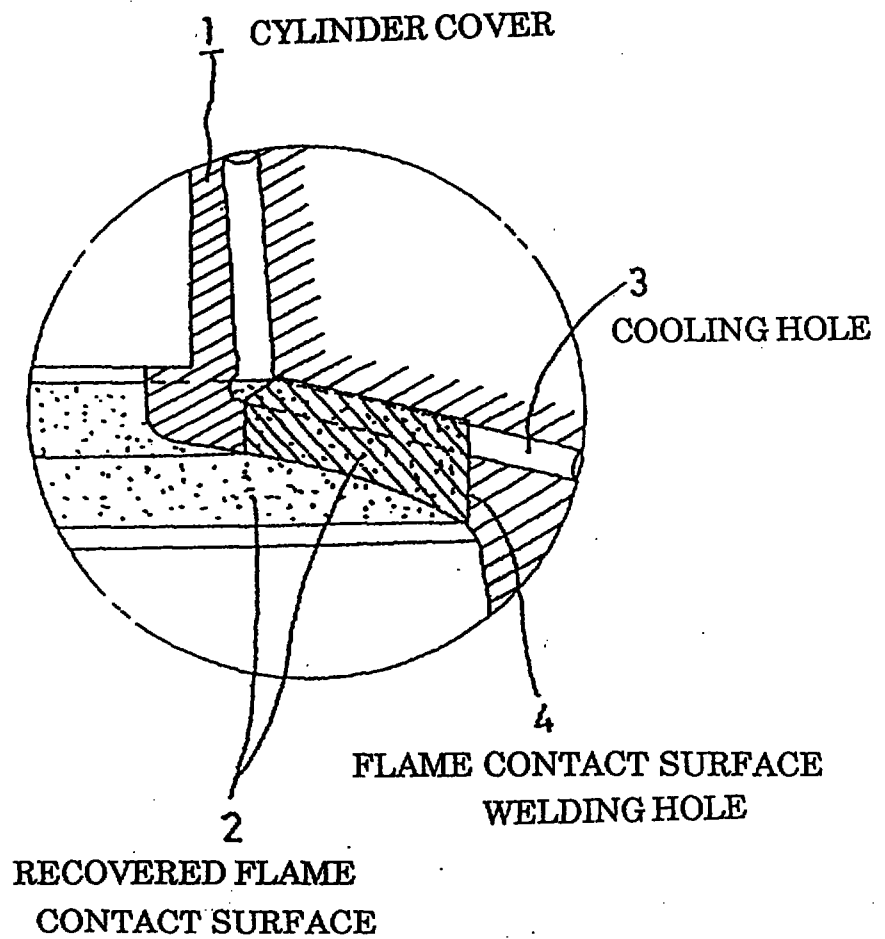


FIG. 5



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20 cover has many advantages such as cooling performance, increased horse power, etc., but, at the same time, has a serious disadvantage of difficulty in finding out a crack taking place due to corrosion of the cooling hole bottom portion after a long time of operation through inspections for crack detection from
25 the flame contact surface side (including color check, magnaflux

manner of forming the recovered flame contact surface by inserting a pipe in the cooling hole; and

Fig. 5 is a partially sectional enlarged view showing a manner of filling the entire circular section of the cooling hole with the recovered flame contact surface.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to Figs. 1 to 3, the flame contact surface 2 of the cylinder cover 1 is subject to buildup welding employing a corrosion resistant and heat resistant metal to form a recovered flame contact portion having a thickness reaching the cooling hole 3 annularly from the flame contact surface side (i.e., from underside in Fig. 1) along the circumference of the flame contact surface A formed into a certain width of circular part when seen from the flame contact surface side of the cylinder cover. It is preferable that alloy of nickel chromium steel or chromium molybdenum steel is employed as the corrosion resistant and heat resistant metal.

Then, a process for forming the recovering flame contact surface 2 of the cylinder cover is hereinafter described. First, the cylinder cover 1 of which flame contact surface is damaged is subject to annealing in an annealing furnace. Then, being placed on a cutting machine directing the flame contact surface side to a cutter side, the damaged surface portion of the cylinder cover 1 is cut out annularly from the flame contact surface side along the circumference of the flame contact side to form an annular part of certain thickness

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reaching the cooling hole 3, whereby the flame contact surface welding hole 4 is formed. In this regard, the cutting to form an annular part reaching the cooling hole includes a cutting to a depth of semicircular portion (up to 1/2 of the diameter of the hole) of a circular section of the cooling hole 3 and a cutting to a depth of permitting a full circular section of the cooling hole 3 to be cut out.

After cutting annularly from the flame contact surface side to the semicircular portion of a circular section of the cooling hole 3 along the circumference thereby forming the flame contact surface welding hole 4, a pipe 5 of the same diameter as the cooling hole is inserted in the cooling hole 3 (see Fig. 4), and the entire circumference of the mentioned cutout portion is subject to buildup welding manually or by automatic welding machine from above, whereby the annular recovering flame contact surface 2 of corrosion resistant and heat resistant metal having a thickness reaching a cooling hole 3 is formed, and thereafter new cooling holes 3 are provided again by drilling, thus completing the recovered flame contact surface according to the invention.

In one aspect of the invention, after cutting annularly from the flame contact surface side to a depth of the semicircular portion of a circular section of the cooling hole 3 along the circumference of the flame contact surface thereby forming the flame contact surface welding hole 4, the remaining 1/2 of the semicircular

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portion left not cut out is filled with a corrosion resistant and heat resistant metal by manual welding, then the entire circumference of the mentioned cutout portion is subject to buildup welding by automatic welding machine, whereby the annular recovering flame contact surface 2 of corrosion resistant and heat resistant metal having a thickness reaching the cooling hole 3 is formed, and thereafter new cooling holes 3 are provided again by drilling.

10 In another aspect of the invention, as shown in Fig. 5, after cutting annularly from the flame contact surface side to a depth of permitting a full circular section of the cooling hole 3 to be cut out, along the circumference of the flame contact surface, thereby forming the flame contact surface welding hole 4, the entire circumference of the mentioned cutout portion is subject to buildup welding by automatic welding machine, whereby the annular recovering flame contact surface 2 of corrosion resistant and heat resistant metal having a thickness reaching the cooling hole 3 is formed, and thereafter new cooling holes 3 are provided again by drilling.

RECOVERED FLAME CONTACT SURFACE OF CYLINDER COVER**ABSTRACT OF THE DISCLOSURE**

A cylinder cover provided with a large number of cooling holes which is free from troublesome work of crack detection as well as from recurrence of crack. A damaged surface portion of a cylinder cover is cut out to a depth of having a thickness reaching either a semicircular portion or a full circular portion of a circular section of a cooling hole 3 thereby forming a flame contact surface welding hole 4, then an annular recovering flame contact surface 2 of corrosion resistant and heat resistant metal having a thickness reaching the semicircular portion or full circular portion is formed by buildup welding in the formed welding hole 4 annularly from a flame contact surface A side along the circumference of the flame contact surface A of a cylinder cover 1, and cooling holes 3 are provided again.

Figure 1