ABSTRACT OF THE DISCLOSURE

A method of securing together two cast metal pieces which comprises excavating a rectangularly shaped cavity in each cast metal piece, the cavities being opposite the other and adjacent the junction of the cast metal pieces, placing within each cavity a metal piece having the same dimension as the cavity, securing the piece therein, the metal piece having stud attached thereto, said studs receiving a bolt extending, continuously, from one stud to the other, said bolt furnishing reinforcement for the cast metal junction when in place.

BACKGROUND OF THE INVENTION

Field of the invention

The invention relates to new and useful improvements in methods of reinforcing the junction of two cast metal parts.

Description of the prior art

Special problems arise in the reinforcement of cast iron piece junctions which, heretofore, have been almost without a satisfactory solution. These junctions are normally held secure by head-bolts, which are placed on the inside of the cast pieces. The head-bolts secure the cast pieces by extending through flanges which are built onto the inner walls of the cast pieces. If internal pressure on the cast pieces is too great these flanges sometime give way, completely eliminating the effectiveness of the head-bolt system.

The cast iron pieces to which this invention is principally directed are extremely large, heavy and cumbersome. Consequently, when a defect occurs, down-time and repair become serious items to consider. The present invention, on the other hand, provides a method of securing two cast iron machinery parts together in lieu of damaged head-bolts or clips which have been found to be unsatisfactory. The present invention may be used as additional support in reinforcing the junction between cast machinery parts.

SUMMARY OF THE INVENTION

I have invented a novel method of securing together two cast metal pieces which comprises excavating a rectangularly shaped cavity in each cast metal piece, the cavities being opposite the other and adjacent the junction of the two cast metal pieces, placing within each cavity a metal piece having essentially the same dimensions as the cavity, said metal piece having a stud attached thereto and adapted to receive a bolt extending through both studs, securing the metal pieces within said cavities by forming a plurality of spaced openings around the perimeter of the inserted metal pieces in such a manner that each opening lies half in the metal piece and half in the casting, subsequently filling the openings with a suitable bonding metal, and then placing a bolt through the studs on the metal pieces in a manner which permits the cast metal parts to which they have been attached to be drawn together.

The above invention is applicable to situations wherein the two cast iron machinery parts are off-set from each other. In addition, the invention may be applied to securing or reinforcing the junction of two cast metal pieces which form an angle, from the junction thereof, of from about 135° to about 225°. The illustrations, for convenience, are drawn to depicting a junction which forms an angle of 180°.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings wherein an example of the invention is shown, and wherein:

FIG. 1 is an isometric view of a portion of cast metal pieces held securely together by the method of the invention;

FIG. 2 is an enlarged, isometric view of a portion of cast metal pieces joined together, the bolt arrangement being partially exploded;

FIG. 3 is a sectional, diagrammatic elevational view of a portion of two cast metal pieces held together by the repair method of the invention, taken along the line 3—3 of FIG. 1;

FIG. 4 is a sectional, diagrammatic elevational view of a portion of two cast metal parts, being off-set from the other, being secured together by the method of the invention;

FIG. 5 is a front, elevational view of the upper casting piece of FIG. 2;

FIG. 6 is a sectional, diagrammatic elevational view of a portion of the upper casting piece of FIG. 3; and

FIG. 7 is an exploded, isometric view of a portion of a casting illustrating the cavity, metal repair piece with stud, and their relationship in the invention.

In the drawings, the numeral 13 designates the upper casting piece and numeral 14 designates the lower casting piece, in an arrangement of reinforcing the junction between the two cast metal pieces. In carrying out the novel method of reinforcing junction of two cast metal pieces, and referring to FIG. 7, a cavity 29 is formed in each of the cast metal pieces 13, and a metal piece 10 is fitted within said cavity 29, said metal piece 10 completely filling cavity 29. The metal piece 10 has a stud 11 attached thereto and containing means 28 therein for receiving a bolt.

The arrangement of cast pieces 13 and 14, with the metal pieces 10 and 15 fixedly secured within the cavities, and pieces 10 and 15 having studs 11 and 18 attached thereto, is illustrated in FIG. 1. A bolt 16 extends down through stud 11 and into stud 18, where bolt 16 is secured in place. The bolt 16 is secured to the upper stud 11 by bolt head 17 and nut 19 (shown in view in FIG. 2).

In FIG. 2, there is illustrated the bolt 16 withdrawn from studs 11 and 18, to better show the means 27 and 28 for receiving bolt 16. Preferably, the passage 27 in stud 18 is threaded, to assist in retaining bolt 16 in place and in drawing cast pieces 13 and 14 together by rotating bolt 16 and tightening nut 19.

There is shown in FIG. 3 the method of the invention whereby metal pieces 10 and 15 are secured within the cast metal pieces 13 and 14. Subsequent to excavating the cavity 29 (of FIG. 7) and inserting metal pieces 10 and 15 therein, openings 24, 25, and 25a of the cast piece 13 and openings 23, 26 and 26a of cast piece 14, are drilled so that the openings (generally designated hereinafter as 23 and 24) lie half in the metal pieces 10 and 15 and half in the castings 13 and 14. This is more clearly illustrated in FIGS. 2 and 5, wherein the filled openings 23 and 24 are represented by numeral 12. Such an arrangement has proven to afford the maximum strength to the inserted pieces 10 and 15 when
The openings 23 and 24 are drilled around the perimeter of the metal pieces 10 and 15, as shown generally in FIGS. 3 and 4. The depth and spacing of the openings 23 and 24 is illustrated in FIG. 6, wherein casting 13 is shown with metal piece 10 in place and openings 24 and 25a drilled. In particular, the distance A, between openings 24, is preferably at least equal to the radius of the circular opening 24. The distance B should preferably be at least half the depth of the opening 24. Particularly, the opening 24 (as well as 25a) should be drilled to a depth of no more than two-thirds the thickness of the metal piece 13. These dimensions apply, as well, to casting 14 and the metal insert 15.

To bond metal pieces 10 and 15 (with studs 11 and 18) are preferably made from a high-strength, heat treated steel. There are any number of such steel materials commercially available, known in the trade, for example, as K-7 alloy and 41–40 alloy steel. These two steel products have been very useful in practicing the invention. Of course, the studs 11 and 18 should possess qualities of high shear and high tensile. Generally, the studs 11 and 18 and metal pieces 10 and 15 are of a unitary structure, and studs 11 and 18 have been machined into the metal pieces 10 and 15.

In drilling the openings 23 and 24, it is preferable to angle the openings 23 and 24 about 45 degrees from the face of the casting, the point of reference for inclination being the casting pieces 13 and 14 juncture at 20. This is particularly illustrated in FIG. 3, as well as, FIG. 4.

The reinforcing method of the invention is well adapted for repairing and reinforcing reciprocating compressors, centrifugal compressors, gas and steam turbines, diesel and gas engines, industrial pumps and engines, gear housings and varied pieces of paper mill machinery. The method is applicable to most castings and forgings.

I claim:

1. A method of securing together two metal pieces in a side-by-side relation which comprises excavating a rectangularly shaped cavity in each metal piece, the cavities being opposite the other and adjacent the junction of the two metal pieces, placing within each cavity a metal piece having essentially the same dimensions as the cavity, said metal piece having a stud attached thereto and adapted to receive a bolt, which when inserted therethrough, said bolt extending through both studs, securing the inserted metal pieces within said cavities by forming a plurality of spaced openings around the perimeter of the inserted metal pieces in such a manner that each opening lies half in the metal piece and half in the metal being repaired, subsequently filling the openings with a suitable bonding metal, and then placing a bolt through the studs on the metal pieces in a manner which permits the metal parts being repaired, to be drawn together, and drawing said metal parts together.

2. The method of claim 1 wherein the metal parts being repaired are of cast iron.

3. The method of claim 1 wherein the metal parts being repaired are of forged iron.

4. The method of claim 1 wherein two cast metal pieces to be reinforced are joined in a side-by-side relation and are offset from each other.

5. The method of claim 1 wherein two metal pieces to be reinforced are joined in a side-by-side relation and the juncture thereof forms an angle of between about 135° and about 225°.

6. The method of claim 1 wherein two cast metal pieces to be reinforced are joined in a side-by-side relation and the last stud receiving the bolt is threaded to receive said bolt.

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