

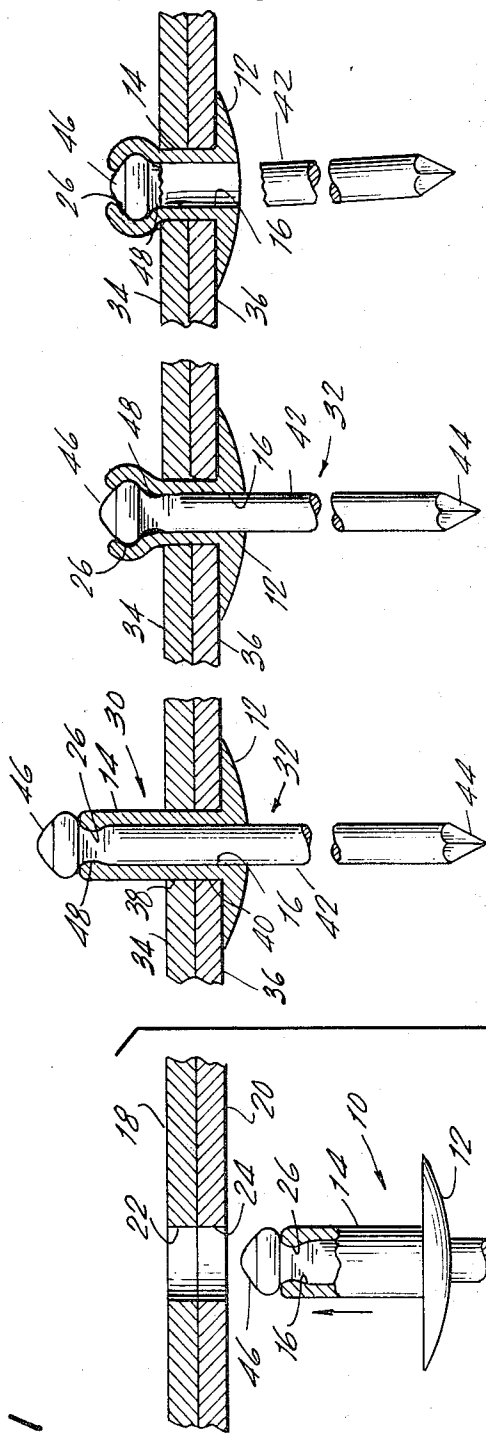
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METHOD FOR SURFACE TREATMENT OF BLIND RIVETS

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METHOD FOR SURFACE TREATMENT OF  
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6 Claims

## ABSTRACT OF THE DISCLOSURE

This invention is directed to a method for treating the surface of a blind rivet so that looseness and/or loss of the mandrel head contained therein will be effectively prevented. The method comprises subjecting the rivet and mandrel to contact with a cleaning solution, preferably caustic solution, for a time sufficient to render the surfaces thereof free of contaminants such as lubricants, thin films of oil, or the like. A resultingly cleaned or treated surface on rivet and mandrel is provided thereby, which mandrel when pulled through the rivet bore will cause enrobing of the rivet shank over the mandrel head in tight enveloping relationship.

## BACKGROUND OF THE INVENTION

## (1) Field of the invention

This invention relates generally to improved blind rivets and more particularly to a method for treating the surfaces of a blind rivet and mandrel so that looseness and/or loss of the mandrel head contained in the rivet will be prevented.

## (2) Description of the prior art

Blind rivets with their associated rivet mandrels are of course well known. When it is desired to secure two workpieces together by such blind rivet, what is done is to insert the rivet containing the rivet mandrel into bores provided therefor in the workpieces, and thereafter the mandrel is pulled through the rivet shank through a shank bore housing the mandrel, by a suitable tool, until the mandrel breaks, thereby securing the two workpieces by means of the mandrel head remaining in the rivet shank bore. However, it has been a distinct disadvantage of the prior art blind rivet that a low coefficient of friction between the mandrel head and rivet shank causes a cylindrically shaped enlargement of the shank, which results in either a loose fit between mandrel head and shank, or the loss of the mandrel head altogether. Obviously, a mandrel head which can easily fall out of the rivet shank can cause innumerable difficulties in mechanical and electrical systems in the proximity of the rivet. Of course, in such vital industries as airplane or vehicle production, the loss of mandrel heads can have disastrous consequences. The low coefficient of friction, aforementioned, is caused by a coating of lubricants, or films of oil, or the like on the surfaces of the rivet and mandrel, which are deposited thereon during existing production methods, or by excessive handling.

## SUMMARY OF THE INVENTION

It is, therefore, among one of the principal objectives of this invention to provide a blind rivet in which the mandrel head is effectively prevented from becoming loose or lost from the rivet shank bore.

In accordance with the present invention, there has been discovered a method of treating the surfaces of a blind rivet and its associated mandrel, so that looseness or loss of the mandrel head contained in the rivet shank bore is prevented, which comprises subjecting the rivet

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and mandrel, preferably as a unit, to contact with a cleaning solution, preferably an aqueous caustic solution for a period of time sufficient to render said surfaces contaminant free, resultingly cleaned surfaces being provided thereby on said rivet and mandrel, which mandrel when pulled through the rivet shank bore will cause enrobing of the rivet shank end over the mandrel head in tight enveloping relationship. It is even more desirable to use a cleaning solution which will not only clean the surfaces scrupulously but also etch them as well.

## BRIEF DESCRIPTION OF THE DRAWING

The invention will be hereinafter more fully described with reference to the accompanying drawing in which:

FIG. 1 is a fragmentary view partially in cross section of a blind rivet and two abutting workpieces to be joined thereby, according to the invention.

FIG. 2 is a view similar to FIG. 1, except that the rivet shank and a mandrel therefor are shown inserted into registered bores provided in the workpieces for that purpose.

FIG. 3 is a view similar to FIG. 2, except that the mandrel stem and the mandrel head are shown partially pulled through the shank bore.

FIG. 4 is a view similar to FIG. 3, except that the mandrel head has now been enrobed by the rivet shank end and the mandrel stem has been broken off.

DESCRIPTION OF THE PREFERRED  
EMBODIMENTS

In a preferred embodiment of the invention, the surfaces of a blind rivet and its associated mandrel, which is contained in a bore provided for that purpose in the shank of the rivet, are freed of contaminants such as lubricants, oils, or the like, by a method comprising subjecting the rivet and mandrel, preferably as a unit, although they may be treated separately, to contact with an aqueous solution of caustic soda for a period of time sufficient to render the said surfaces free of lubricants or oils, or the like. The period of time has been found to be usually about 2½ minutes. The caustic soda solution is prepared by mixing about one pound of flake caustic soda into about four gallons of water, held at about 140° F., until the flakes are dissolved. A batch of about 2500 rivets was treated according to the method of the invention in the following manner, which will serve as an example of the invention, but it is to be understood that the example is merely illustrative and not intended to be limitative.

(1) A batch of 2500 rivets (aluminum) was selected at random and placed into an empty 5-gallon can.

(2) Four gallons of water at about 140° F. were placed into another 5-gallon can.

(3) One pound of flake caustic soda was dissolved in the 4 gallons of water.

(4) The resulting caustic soda solution was poured over the rivets, and with frequent agitation, allowed to react for 2½ minutes, care being taken to dispel corrosive fumes emanating therefrom.

(5) Thereafter the solution was poured off and the rivets were rinsed three times in cold water.

(6) After the third rinse the rivets were spun dry for about five minutes.

Various lots of the rivets, selected at random, were then tested for maximum grip. All of the mandrel heads were tightly enveloped by the rivet shank and of the 20 specifically tested therefor, none of the heads popped out.

Referring now to the figures of the drawing, for purposes of illustration, FIG. 1 depicts a blind rivet 10 comprising a rounded head 12 a shank 14 integrally connected thereto, and a bore 16 coursing through the shank 14 and rounded head 12. A pair of workpieces 18 and 20 to be secured by said blind rivet are shown in flat abut-

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ment with registered bores 22 and 24, respectively, shown therein. The end 26 of the bore 16 is tapered slightly inwardly towards its center, for a reason to be subsequently described hereinbelow, end 26 being the end opposing said rounded head 12. A mandrel 32 is shown inserted into bore 16.

Turning now to FIGS. 2-4, the rivet body 30 and mandrel 32, treated in the manner of the invention, as heretofore described, are shown inserted into a pair of abutting workpieces 34 and 36 by their respective registered bores 38 and 40. The mandrel 32 comprises a stem 42, pointed at its one end 44 and terminating integrally in a rounded mandrel head 46. The point of juncture of the stem 42 with the mandrel head 46 comprises a slightly inwardly tapered portion 48, which is in associating taper with tapered end 26 of the shank bore 16. The diameter of the rounded mandrel head 46 is slightly larger than that of shank bore 16. A suitable tool, such as a hand riveter (not shown), is then employed to pull mandrel 32 through the bore 16. As the mandrel head 46 is resultingly pulled towards rounded head 12 of the said rivet (FIG. 3), it causes the end 26 of shank 14 to enrobe said mandrel head 46, as more fully shown in FIG. 4, and finally the mandrel stem 42 becomes broken off at tapered portion 48. The high coefficient of friction between the mandrel head 46 and shank bore 16 causes the enrobement of the mandrel head by the tapered shank end 26, in a tight enveloping relationship. The bore 16 is substantially closed and the rivet attachment is accordingly strengthened. It is not exactly known what causes such tight enrobement of the mandrel head, but it is believed to be due to the cleaning of the surfaces of the mandrel and rivet by the caustic solution, which in turn provides for the high coefficient of friction, aforementioned. The enrobement is even more effective when the surfaces of the mandrel and rivet become etched as well as cleaned by the cleaning agent. Whatever the cause, what is known is that a blind rivet is produced which is not susceptible to looseness and/or loss of its mandrel head.

The rivet and mandrel may be respectively, aluminum-aluminum, aluminum-steel, or steel-steel, or the like, preferably aluminum-aluminum. While caustic soda has been described as the preferred cleaning and etching reactant, it is to be understood that any other suitable chemical may be used which causes such cleaning and etching, or cleaning alone. In the specification, wherever the terms "blind rivet" or "blind rivet with its associated mandrel"

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have been used, it is to be understood that they have been used interchangeably and mean the same thing.

Having thus described the invention in a specific embodiment or embodiments thereof, it is understood that various changes may be made by those skilled in the art without departing from the scope thereof.

What is claimed is:

1. A method of treating the surfaces of a blind rivet, said blind rivet comprising a metal rivet body and its associated mandrel, said rivet body including a shank, a head and a bore, said mandrel including a head and a stem, which comprises subjecting said blind rivet to contact with a cleaning solution for a period of time sufficient to render said surfaces contaminant-free, so that when said mandrel is drawn through the bore of said rivet body, when said blind rivet is disposed through articles to be joined, said drawing of the mandrel will cause enrobing of the end of the shank over the mandrel head in tight enveloping relationship with the result that said articles are tightly riveting secured.

2. A method according to claim 1 wherein said blind rivet is formed of aluminum.

3. A method according to claim 1 wherein said cleaning solution is an aqueous caustic soda solution.

4. A method according to claim 3 wherein said period of time is about 2½ minutes.

5. A method according to claim 1 wherein the contaminant to be removed is a lubricant.

6. A method according to claim 1 wherein said cleaning solution also etches said surfaces.

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