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Chartet

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[54] **PROCESS FOR BRAZING STAINLESS STEEL PARTS TO PARTS OF ALUMINUM AND ALUMINUM ALLOYS**

[75] Inventor: **Andre Chartet,** Meudon, France

[73] Assignee: **Societe Anonyme des Usines Chausson,** Asnieres, France

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[58] **Field of Search**.....29/488, 492, 495, 29/496, 504, 196.2; 148/26

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Primary Examiner—J. Spencer Overholser
Assistant Examiner—Ronald J. Shore
Attorney—Imirie & Smiley

[57] **ABSTRACT**

Process for brazing stainless steel parts to parts of aluminum and aluminum alloys in which the steel parts are pickled in an aqueous bath, then dipped in a flux bath containing a salt of zinc and dried in a stove, the steel parts thus coated are then brazed to said parts of aluminum by usual technics.

4 Claims, No Drawings

PROCESS FOR BRAZING STAINLESS STEEL PARTS TO PARTS OF ALUMINUM AND ALUMINUM ALLOYS

This invention relates to a new process wherein it becomes possible in an easy way, to braze stainless steel parts with parts of aluminum and aluminum alloys, by using a brazing alloy containing aluminum and silicon.

According to the invention, stainless steel parts are submitted to a chemical pickling by immersion in a bath selected from an acid and alkaline bath, said parts are washed into cold water upon their removal from the pickling bath, said parts are dipped into an aqueous bath of a zinc containing flux, said parts are dripped, then they are made to dry in a stove, whereby forming a protective coating on the whole surface of said parts which are then brazed to the parts of aluminum and aluminum alloys by usual brazing technics for parts of aluminum and aluminum alloy.

A particularly advantageous embodiment of the invention consists of manufacturing heat exchangers, especially for radiators.

Other characteristics of the invention are shown in the following detailed description.

To braze together parts made respectively of stainless steel and aluminum or aluminum alloys, with a brazing alloy made of aluminum-silicon the process is as follows : the stainless steel part (s) are first degreased and then submitted to a chemical pickling into an aqueous bath which can be an acid or alkaline bath but is preferably an acid bath, the composition thereof, can, for example, be as follows :

nitric acid	0.1 l
sodium fluoride	20 g
water	0.8 l

The pickling in a bath having the composition as shown above as an example requires an immersion into the bath for a duration of about 10 mn, while the bath is kept at a temperature of about 25°C. The immersion duration can of course vary according to the bath acidity and also according to the temperature thereof. However the above duration and temperature have been considered particularly suitable for a pickling in the usual conditions of industrial processing.

When removed from pickling bath, the stainless steel parts are immediately washed with cold water, that is into water at room temperature ; the next operation consists of dipping the parts into an aqueous compound of a brazing flux containing zinc ; a specially suitable brazing flux is an aqueous compound containing for 100 g of water :

zinc chloride	10 g
lithium chloride	10 g
sodium chloride	30 g
potassium chloride	41 g
aluminum fluoride	9 g

As for the pickling bath above described, a compound such as above, allows a processing at room temperature because said compound of brazing flux is sufficiently active to work while kept at a temperature of about 20° to 25°C.

The dipping duration into the brazing flux is about 5 mn.

The next step consists of removing the parts from the brazing flux, then to put them to drip for a period of time long enough for the quantity of brazing flux remaining on said parts to be about 60 g/m². After dipping, the parts are stoved to become dry, the stove temperature can be of about 150°C, thus allowing to obtain on the whole surface of the parts, a continuous protective coating with no blister or embossment.

As to the parts of aluminum or aluminum alloys two main cases can occur.

1°. When the aluminum parts are previously coated, for example, by plating with a brazing coating made of aluminum-silicon, the parts are then treated as usually practised in the brazing technics related to aluminum parts, that is they are degreased and pickled, then dried before being mechanically assembled to the stainless steel parts treated as explained above ; then the brazing operations are performed by submitting the assembly of treated stainless steel parts, and aluminum parts, to a preheating, then to a dipping into a melting salt bath.

2°. When the aluminum parts are not coated with brazing alloys then the brazing alloy in the form of a sheet or other is dipped into the aqueous bath of brazing flux at the same time as stainless steel parts, whereby said brazing alloy thereof is thus coated with flux in the same way as stainless steel parts, said alloy being, as well as the stainless steel parts, submitted to a stoving after dripping operation.

Besides, the aluminum parts are degreased and pickled then as in the above case (1°), they are mechanically assembled with the stainless steel parts provided with threated brazing alloy couplings, the whole assembly being preheated and brazed by dipping into a melting salt bath.

In both above cases, brazing into a melting salt bath can be replaced by brazing into a hot air stove but, in that case, it is advantageous to either slightly increase the thickness of the coating covering the stainless steel parts or to cover the aluminum or aluminum alloy parts with a thin coat of a brazing flux.

It has been noticed that the stainless steel parts treated as explained above, could be submitted to brazing operations several hours after their treatment because the coating of brazing flux, with which they are covered and which contain zinc, forms a protective coat, rendering the surface of stainless steel parts be absolutely free from oxide.

The invention is not restricted to the embodiment shown as an example, for various modifications thereof can moreover be applied to it without departing from the scope of the invention. Especially the aluminum parts with or without a coating of brazing alloys can also be treated to be covered with a zinc containing coating thus avoiding an oxid formation on their surface after pickling.

I claim :

1. Process for brazing stainless steel parts to parts of aluminum and aluminum alloys, comprising the steps of:

a. pickling said stainless steel parts by immersion in a bath selected from the group consisting of an acid bath and an alkaline bath;

b. removing said stainless steel parts from the pickling bath and washing with cold water;

c. dipping said stainless steel parts in an aqueous zinc flux containing bath;

d. removing said parts from said flux bath and allowing said parts to drain by dripping;

e. drying said parts in a drying chamber whereby to form a protective coating on the whole surface of said parts; and

f. brazing said stainless steel parts to said aluminum or aluminum alloy parts by application of an aluminum-silicon brazing alloy.

2. Process as set forth in claim 1, wherein the aqueous bath of flux in which the stainless steel parts are dipped after their chemical pickling consists essentially of, for 100 g of water :

zinc chloride	10 g
lithium chloride	10 g
sodium chloride	30 g

potassium chloride	41 g
aluminum fluoride	9 g

3. Process as set forth in claim 1, wherein a brazing alloy made of aluminum-silicon is also submitted to the action of the brazing flux and to the stoving action to which the stainless steel parts are submitted when brazing of said parts is to be performed with parts of aluminum and aluminum alloy which are not coated with a brazing alloy.

4. Process as set forth in claim 1, wherein the aluminum parts having to be brazed to the stainless steel parts are submitted to a pickling and are covered with a zinc containing coating before to be mechanically assembled to be brazed with said stainless steel parts.

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