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(54) **METHOD OF HOT STAMPING METAL PARTS**

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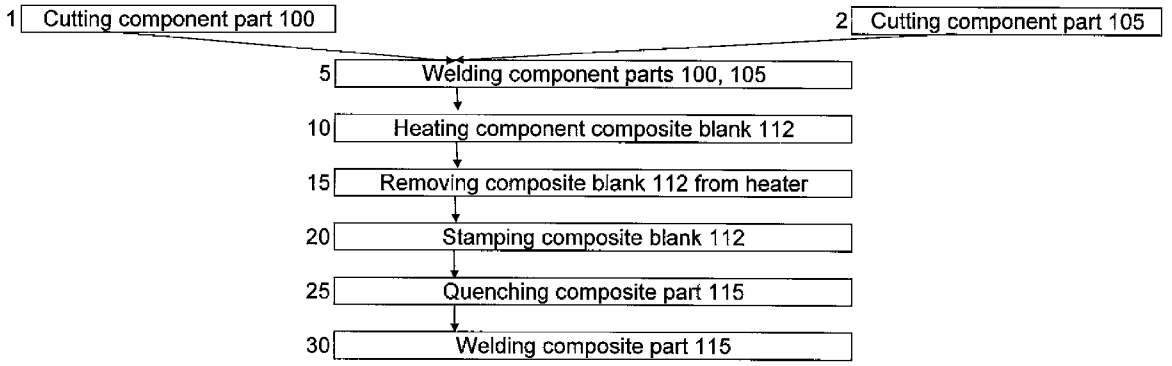
(57) **ABSTRACT**

A method of producing a stamped composite part, the method comprising spot welding two or more metal component parts to each other to hold the component parts in a selected position as a composite part, heating the composite part, and stamping the composite part into a desired shape. The invention also contemplates the further step of welding the two or more metal component parts to each other in the composite part.



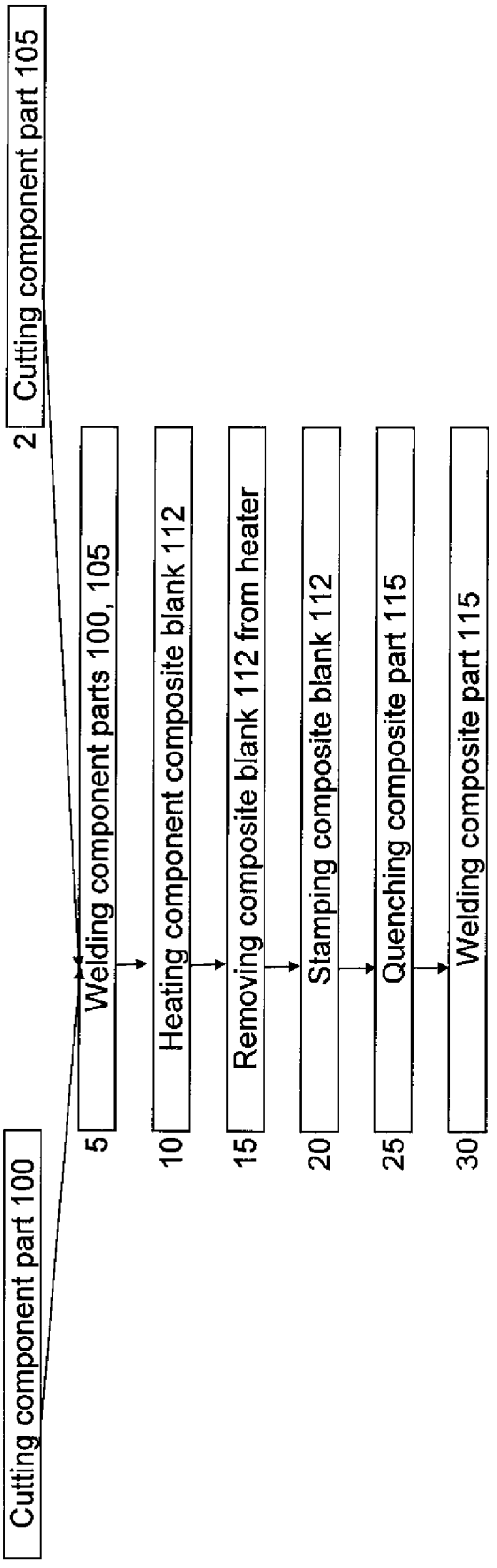

1 Cutting component part 100
2 Cutting component part 105
5 Welding component parts 100, 105
10 Heating component composite blank 112
15 Removing composite blank 112 from heater
20 Stamping composite blank 112
25 Quenching composite part 115
30 Welding composite part 115

Figure 1

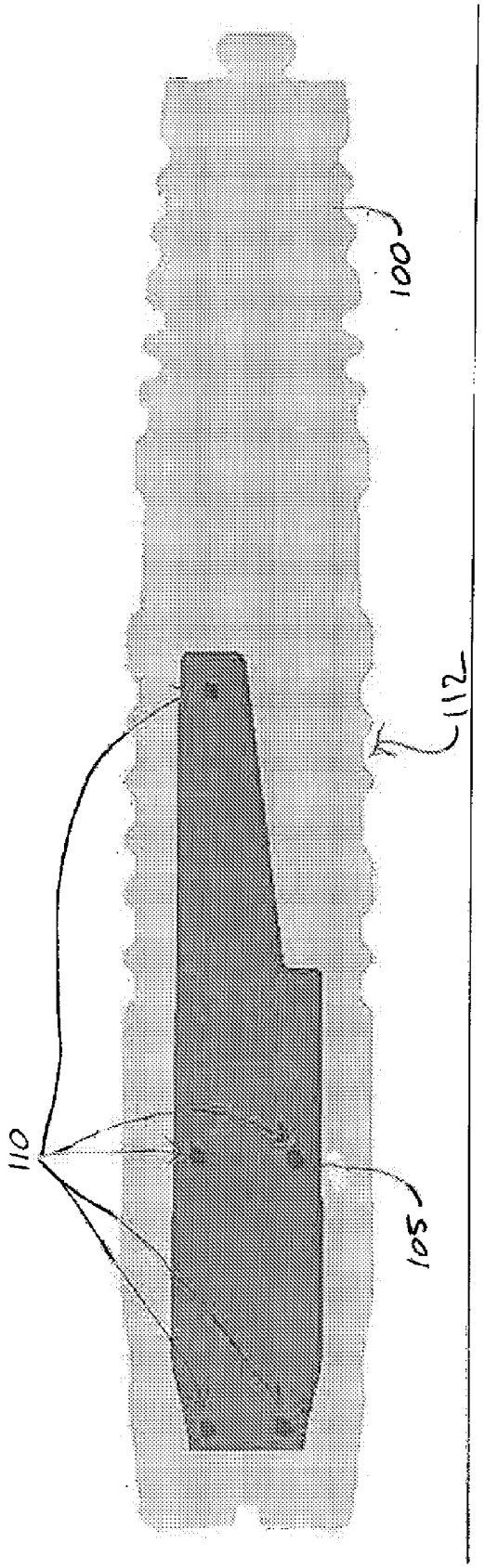


Figure 2

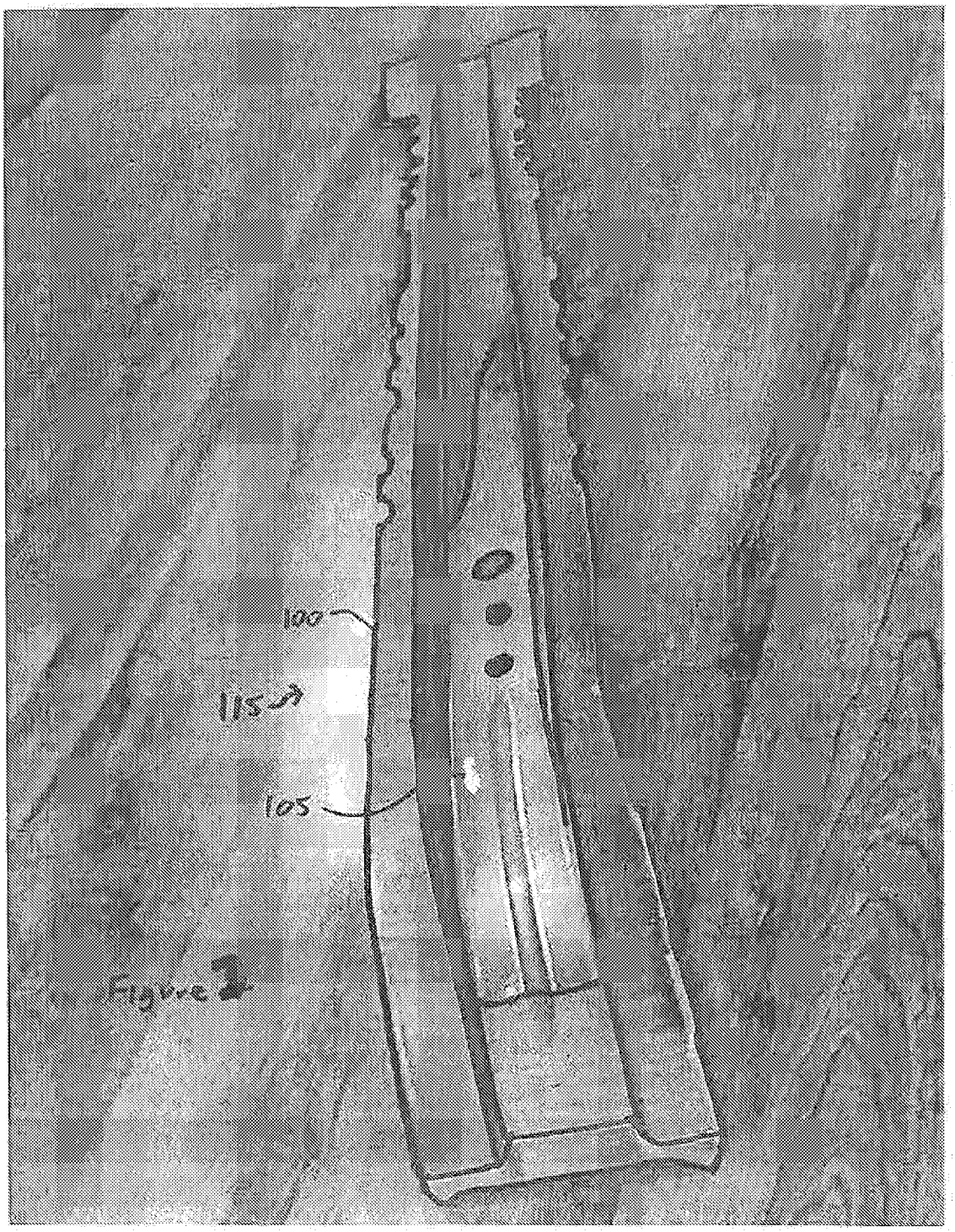


Figure 3

METHOD OF HOT STAMPING METAL PARTS

FIELD OF THE INVENTION

[0001] This invention relates to the process and systems of hot stamping metal parts. In particular, this invention relates to a process of hot stamping and joining metal parts.

BACKGROUND OF THE INVENTION

[0002] Metal parts are often formed from sheet metal. Sheet metal is cut, bent and pressed in to the shape of the desired metal parts. After the metal part is formed, it can then be welded or otherwise attached to other metal parts created by the same process or by other means.

[0003] Hot stamping is a process of forming metal parts from sheet metal stock that involves heating a portion of the sheet metal material to a high temperature for a period of time and then forming the heated material using a die.

[0004] Ovens are often used to heat the pieces to the high temperatures needed. In a manufacturing facility, pieces may be continuously moved through the oven so the parts are consistently heated to the desired temperature for the desired length of time. Ovens are generally an expensive element of the manufacturing facility, in terms of both capital and operating costs, and the throughput of the oven a limiting factor in the hot stamping process.

[0005] The part may then be stamped to form the metal part into the desired shape. Stamping is the forming of metal by using a die and a punch that resembles the shape of the part. By heating the piece, the metal becomes more ductile and easier to form by pressing within the die.

[0006] After being pressed in the die, the formed piece may be quenched by rapidly cooling the part, often using water. Quenching of the metal generally improves certain properties in the metal such as hardness and strength that would not otherwise be present if cooled gradually.

[0007] After the part is cooled, it may be welded or otherwise attached to other parts to create a composite metal component. As often multiple different parts must be welded together, multiple dies must be used to form each of the parts before they can be welded together, and each of the parts must be separately heated in the oven before stamping.

[0008] Hot stamping facilities may hot stamp a first part for a period of time by cutting, heating and stamping the first part. After a suitable quantity of the first part has been created, a second part may be hot stamped by cutting, heating and stamping the second part. Only after the second part is formed, may the first and second parts be welded together. This process requires that a suitable quantity of the first part be stored pending the hot stamping of the second part. Alternatively, a manufacturer must run multiple ovens at the same time in order to heat the first and second parts in parallel, with attendant additional cost and space usage.

[0009] Moreover, it is conventionally considered that the integrity of a weld between parts that are welded together before the parts are heated to a sufficiently hot temperature for hot stamping is suspect, in contrast to welds effected after the hot stamping process.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] In drawings which illustrate by way of example only a preferred embodiment of the invention,

[0011] FIG. **1** is a flow chart showing the hot stamping process according to an implementation of the invention.

[0012] FIG. **2** is a plan view of a composite blank before being hot stamped.

[0013] FIG. **3** a perspective view of a component part after being hot stamped.

DETAILED DESCRIPTION OF THE INVENTION

[0014] The present invention relates to a method of producing a stamped composite part, the method comprising the steps of cutting at least two metal component parts into a desired shape; welding the at least two metal component parts to each other to hold the at least two metal component parts together in a selected position as a composite blank; heating the composite blank for stamping; and stamping the composite blank to form the composite blank into a desired shape, thereby creating a stamped composite part.

[0015] The method may further comprise the step of further welding the at least two metal component parts to each other in the composite part.

[0016] With reference to FIG. **1**, the process is described in relation to creating a stamped component made from two metal component parts. The process of the invention can be used to create a stamped composite part made from more than two metal component parts. As used herein, a metal component part is a single part of metal formed from a single part of sheet metal stock, for example cut as a "blank," that may then be formed and/or welded to another part. Other forms of source material may be used in place of sheet metal stock, such as bar, tube or wire. A composite part consists of two or more metal component parts that have been formed and welded together.

[0017] In the two-component embodiment of the invention described and illustrated by way of example only, as shown at **1** and **2** each of the two metal component parts is cut from sheet metal stock. The sheet metal stock may be cut to form the metal parts using any suitable technique, for example without limitation, punching, laser cutting, trimming, or shearing, to create blanks.

[0018] At block **5**, the two component parts are arranged together in a selected position and held in the selected position with one or more welds, for example spot welds as indicated. The spot welds retain the two parts in the selected position during the heating step **10** and the stamping step **20**. The retaining spot welds may be effected manually or by a machine designed to position and spot weld the parts. In one preferred embodiment the component parts **100**, **105** are further welded together after stamping to augment the strength of the composite part **115**.

[0019] As shown in FIG. **2**, an example of a first component part **100** and a second component part **105** are held in alignment using five aligning spot welds indicated as **110**. This creates a composite part **115**, at this stage still an unformed blank.

[0020] At block **10**, the two component parts are heated, by a heating apparatus, for example a furnace or oven. As mentioned, the two component parts are held together by the retaining spot welds completed at block **5**, creating a composite blank **112**. The two parts **100**, **105** are heated in the heating apparatus preferably to a sufficiently high temperature to prepare the composite blank **112** for the stamping step **20**, for example by rendering the composite blank **112** ductile. After heating the composite blank **112**, the composite blank **112** is removed from the heating apparatus as indicated at

block **15**. The heating apparatus may be a walk through oven such as used in conventional hot stamping processes. Alternatively, the heating apparatus may be an oven with one or more compartments suitable for placing a part. The composite blank may be heated to 920 degrees Centigrade for between 4 to 10 minutes. Heating the composite blank **112** for an undue lengthy period of time may cause damage to any coating on the surface of the two parts **100**, **105**.

[0021] At block **20**, the heated composite blank **112** is placed in a die and pressed using a hot stamping press. The die forms both of the component parts **100**, **105** while the component parts are sufficiently ductile from the heating process **10**, the retaining spot welds from step **5** being sufficient to maintain the two component parts **100**, **105** in position relative to one another during the stamping stage **20**.

[0022] At block **25**, the heated and formed composite part **115** is quenched by rapid cooling, as is conventional. Quenching may be done using water or gas or any other suitable technique. In one embodiment, the die and punch are cooled by water flowing through ducts integrated with the die and punch so that quenching occurs substantially simultaneously with the stamping process. After being hot stamped, the composite part **115** may be need to be cleaned to remove scale from the heating and forming steps.

[0023] After the composite part **115** has been hot stamped, the component parts **100**, **105** may be further welded together to augment the strength or integrity of the composite part **115**, as indicated at block **30**, more fully integrating the two component parts **100**, **105** with the shape and number of welds desired. An example of a completed composite part **115** prepared according to the invention is shown in FIG. **3**.

[0024] By positioning the two component parts **100**, **105** prior to heating the composite blank **112** in the oven, the throughput of the overall process may be increased.

[0025] The integrity of the retaining spot welds is maintained through the heating and stamping parts of the process.

[0026] The process of hot stamping as described above may involve other steps such as quality assurance and dimensional checking as part of the manufacturing process.

[0027] In a composite part **115** produced according to the method of the invention the integrity of the retaining welds between the component parts **100**, **105** is retained despite heating the component parts to a sufficiently hot temperature for hot stamping.

We claim:

1. A method of producing a stamped composite part, the method comprising the steps of:

a) cutting at least two metal component parts into a desired shape;

b) welding the at least two metal component parts to each other to hold the at least two metal component parts together in a selected position as a composite blank;

c) heating the composite blank for stamping; and

d) stamping the composite blank to form the composite blank into a desired shape, thereby creating a stamped composite part.

2. The method of claim **1** further comprising after step d), the step of:

e) further welding the at least two metal component parts to each other in the composite part.

3. The method of claim **2**, wherein step b) comprises the step of spot welding the at least two metal component parts to each other using at least four spot welds.

4. The method of claim **2**, wherein step c) comprises the sub-steps of:

i) placing the composite part in an oven;

ii) heating the composite part in the oven; and

iii) removing the composite part from the oven.

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