US 20060150704A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2006/0150704 A1

Ishihara et al. (43) Pub. Date: Jul. 13, 2006

(54) METAL SHEET PRESSING METHOD

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(21) Appl. No.: **11/374,149**

(22) Filed: **Mar. 14, 2006**

Related U.S. Application Data

(63) Continuation of application No. 11/141,049, filed on Jun. 1, 2005, now abandoned, which is a continuation of application No. 10/621,309, filed on Jul. 18, 2003, now abandoned.

(30) **Foreign Application Priority Data**

Jul. 19, 2002 (JP) 2002-211158

Publication Classification

(51) **Int. Cl.**
B21D 37/16 (2006.01)

(52) **U.S. Cl.** **72/342.1**

(57) **ABSTRACT**

This invention provides a metal sheet pressing method of precision-pressing a metal sheet, wherein after a metal sheet (**1**) is partially drawn so as to form a perforated portion (**1***a*), the perforated portion (**1***a*) is heated by baking and after it is heated by baking, the perforated portion (**1***a*) is pressed with press dies into an uneven-surface shape.

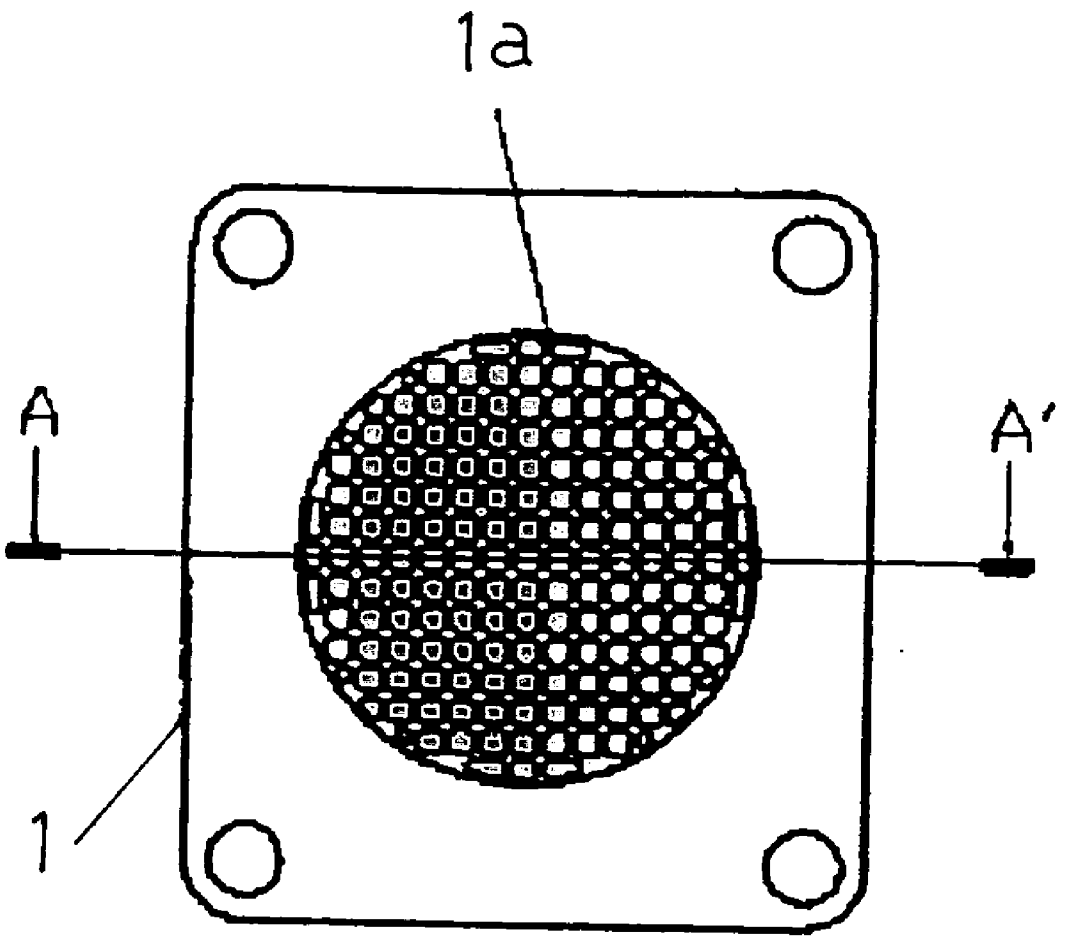


FIG. 1

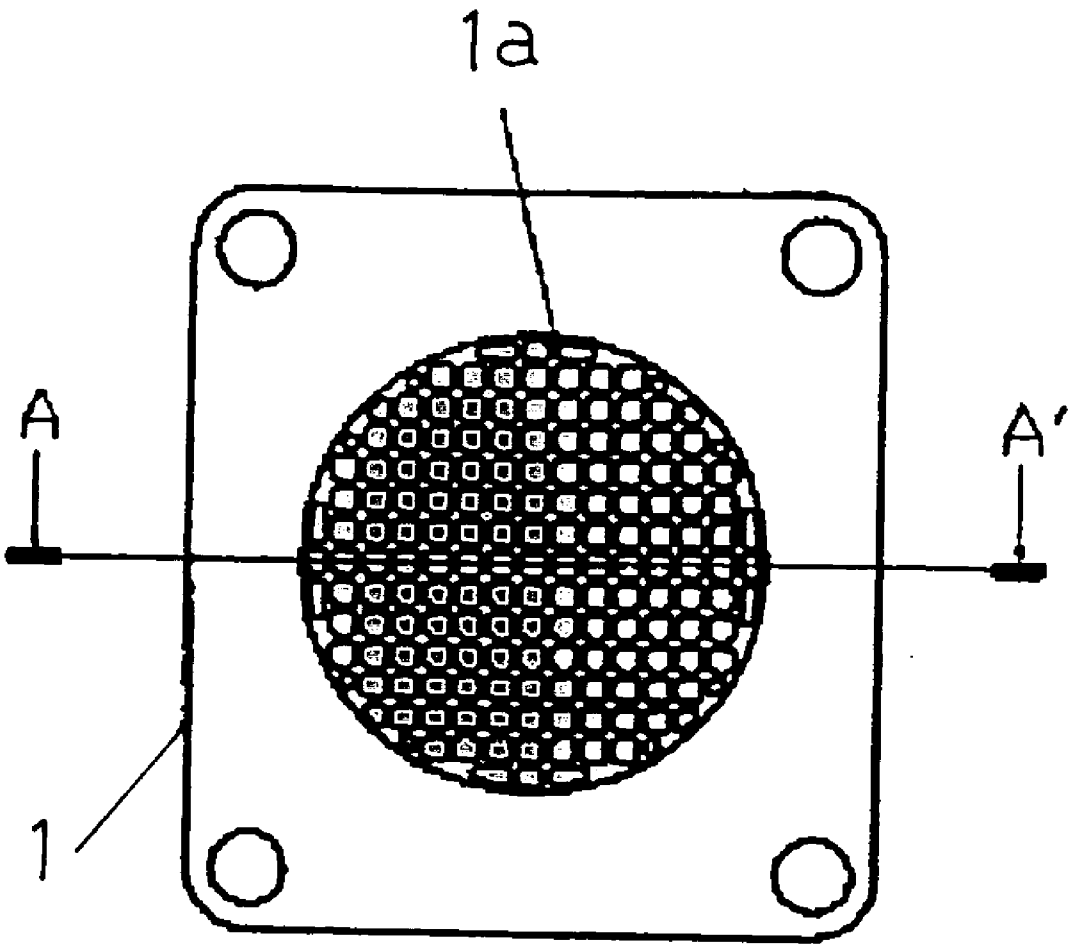


FIG. 2

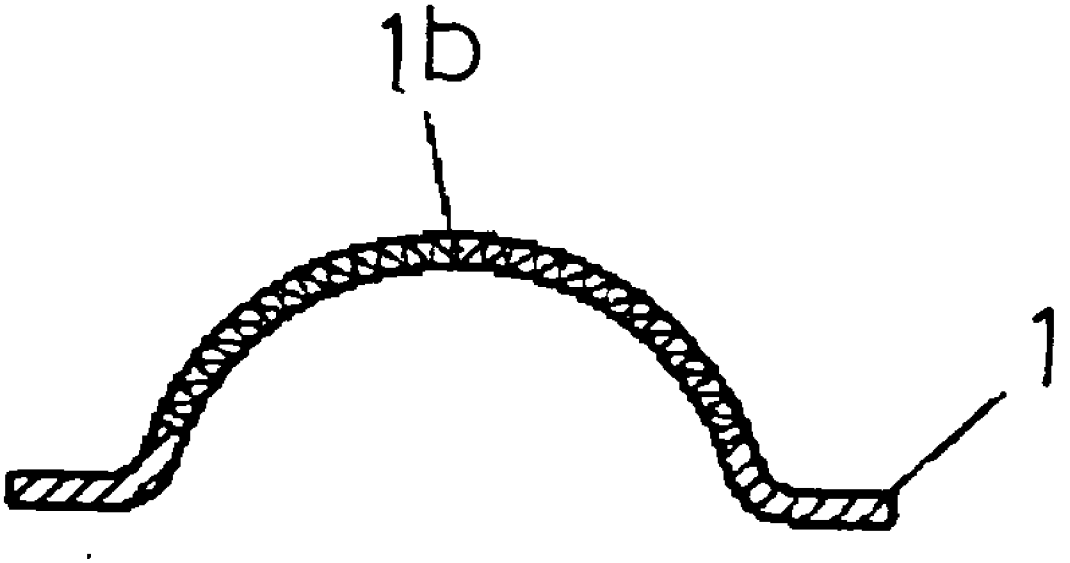


FIG. 3

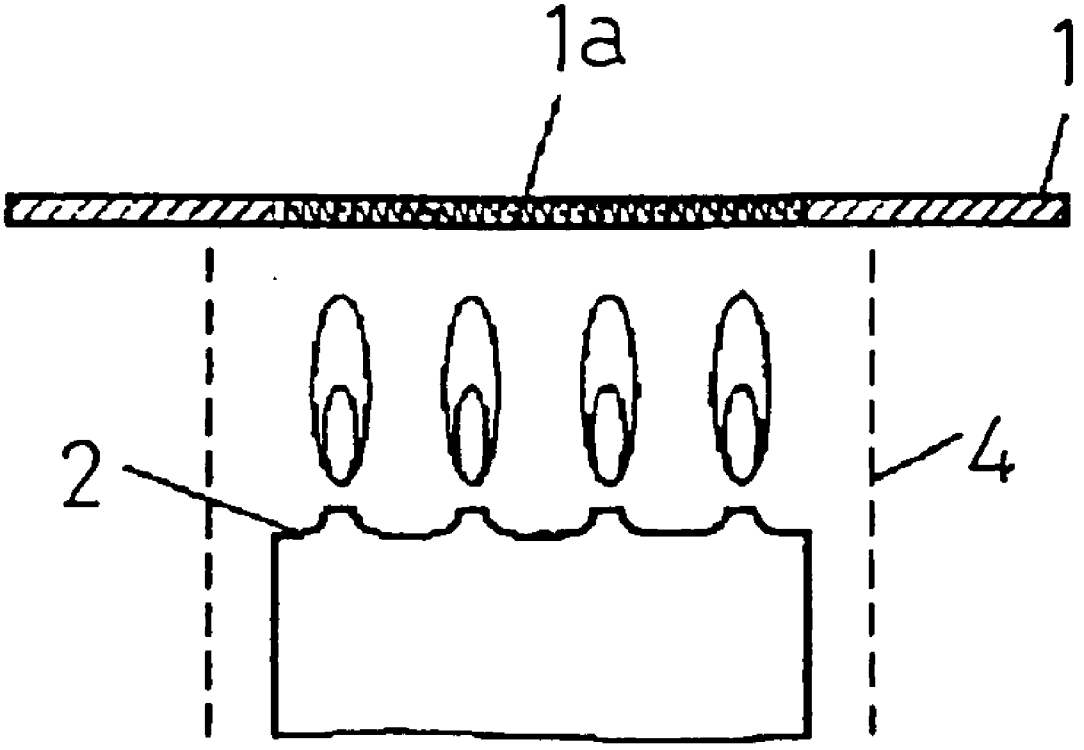
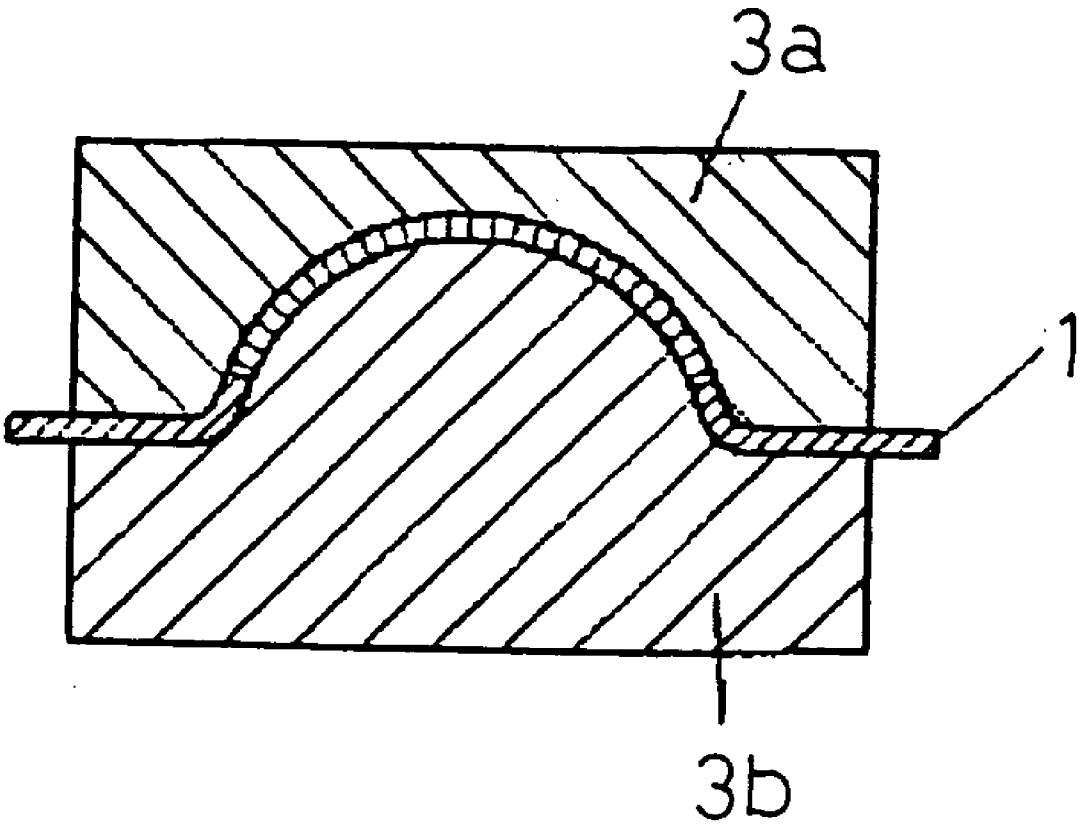


FIG. 4



METAL SHEET PRESSING METHOD

[0001] This application is a continuation of U.S. application Ser. No. 11/141,049, filed Jun. 1, 2005, which is a continuation of U.S. application Ser. No. 10/621,309, filed Jul. 18, 2003.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a method for pressing a steel sheet and more particularly to improvement of a pressing method for pressing a fragile portion of a steel sheet.

[0004] 2. Description of Prior Art

[0005] As a conventional method for pressing a metal sheet such as steel sheet, it has been well known that a thin steel sheet is placed on dies and pressed with a punch into a product configuration.

[0006] The above-mentioned pressing method with the punch has various inconveniences described below and therefore, means for solving these problems has been demanded.

[0007] That is, a formation method of pressing with the punch comprised of simple processes is not good at formation of a complicated uneven-surface shape. To cope with this problem, it is necessary, for example, to retard pressing speed extremely or deepen the formation gradually through multiple pressing steps.

[0008] This problem is particularly remarkable in formation of a fragile portion in which a narrow frame or meshes are formed. In the case where such a fragile portion is formed according to the formation method of pressing with a punch, work efficiency and formation efficiency drop largely.

[0009] In the case of forming a fragile portion having the narrow frame or meshes into an uneven-surface shape according to the method of pressing with the punch, actually, such a form as the narrow frame, meshes is punched out and then, a final product is drawn gradually through several steps using multiple dies each having a different degree of unevenness.

[0010] Even if such a press work with a great deal of labor and time is conducted, an uniform shape in that fragile portion cannot be maintained and it is difficult to draw a target material into a correct shape with a uniform thickness. Further, because a partial fracture or the like is likely to occur, the percentage of defects and manufacturing cost are increased.

SUMMARY OF THE INVENTION

[0011] In view of the above-described defects of the conventional method which needs a great deal of time and labor, an object of the present invention is to provide a metal sheet pressing method of pressing a metal sheet into an uneven-surface shape with press dies, in which a precision pressing work can be done with ease. Particularly, the present invention aims at providing a pressing method capable of pressing only a fragile portion so as to form an uneven-surface shape accurately when a metal sheet is subjected to precision-pressing work.

[0012] The metal sheet pressing method of precision-pressing the metal sheet proposed by the present invention to achieve the above-described object will be described with reference to the accompanying drawings. That is, after a metal sheet **1** is partially drawn so as to form a perforated portion **1***a*, the perforated portion **1***a* is heated by baking and after it is heated by baking, the perforated portion **1***a* is pressed with press dies **3***a*, **3***b* into an uneven-surface shape.

[0013] The perforated portion **1***a* of the metal sheet **1** can be formed into a mesh-like shape as shown in **FIG. 1**.

[0014] According to the present invention, when the metal sheet **1** is precision-pressed, only a fragile portion such as the perforated portion **1***a* formed by drawing is heated by baking as shown in **FIG. 3**. Next, as shown in **FIG. 4**, the fragile portion after heated by baking is pressed with press dies **3***a*, **3***b* having an uneven-surface shape corresponding to the uneven-surface shape **1***b* (shown in **FIG. 2**) to be finally formed. Consequently, the fragile portion can be stretched uniformly and largely through a single process. Consequently, uneven-surface shape can be formed accurately. As a result, a metal sheet pressing method by which uneven-surface shape can be formed accurately without any formation defect is achieved. And, according to this method, forming speed can be reduced.

[0015] As a metal sheet to be pressed, steel sheet, stainless steel sheet and the like can be employed. Namely, common steel, austenitic base stainless steel, ferrite base stainless steel, martensite stainless steel, two-phase stainless steel and the like can be employed.

[0016] According to the present invention, after the metal sheet is partially drawn so as to form the perforated portion, the perforated portion is heated by baking and after it is heated by baking, the perforated portion is pressed with press dies into a desired uneven-surface shape. As a steel sheet to be adopted as that metal sheet, it is preferable to use a steel sheet whose property is not changed despite annealing and which exerts the same characteristic as before heating after it is cooled. The before described austenitic base stainless steel, ferrite base stainless steel, martensite stainless steel and two-phase stainless steel satisfy these requirements.

[0017] Heating of the perforated portion **1***a* by baking can be carried out at temperatures of 800 to 1,000° C. with a heating unit such as a burner as shown in **FIG. 3**. At this time, preferably, the fragile portion such as the perforated portion **1***a* formed by drawing is heated accurately by baking. Then, as a good measure for this purpose, a fence **4** is provided as shown in **FIG. 3** to protect a flame of the heating unit **2** from swinging.

[0018] As described above, according to the present invention, only the fragile portion in the metal sheet formed by drawing is heated by baking, so that the uneven-surface shape can be formed precisely and easily by pressing. Consequently, the fragile portion in which a frame or meshes are formed by drawing can be stretched accurately into a proper shape with a uniform thickness and formed into an uneven-surface shape of a desired size. Consequently, productivity is improved and further, percentage of defects can be reduced.

BRIEF DESCRIPTION OF DRAWINGS

[0019] **FIG. 1** is a plan view for explaining a state in which a metal sheet is partially drawn;

[0020] **FIG. 2** is a sectional view taken along the line A-A of a metal sheet pressed according to the method of the present invention;

[0021] **FIG. 3** is a sectional view taken along the line A-A in **FIG. 1** for explaining heating process by baking; and

[0022] **FIG. 4** is a sectional view taken along the line A-A in **FIG. 1** for explaining a process of pressing a fragile portion after the heating process by baking.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] Hereinafter, the preferred embodiment of the present invention will be described with reference to the accompanying drawings.

[0024] When an austenitic base stainless steel sheet having a thickness of 0.5 t is formed by drawing into a desired product shape as shown in **FIG. 1**, its perforated portion **1***a* is formed into meshes about 5 mm.

[0025] Only the perforated portion **1***a* formed in the mesh form is heated by baking locally to approximately 800 to 1,000° C. with a heating unit **2** such as a gas burner as shown in **FIG. 3**.

[0026] According to the embodiment shown in **FIG. 3**, a fence **4** is provided to prevent a flame from the heating unit **2** from swinging so that only the perforated portion **1***a* is heated accurately by baking.

[0027] After that, as shown in **FIG. 4**, by using pressing dies **3***a*, **3***b* corresponding to an uneven-surface shape to be formed finally as shown in **FIG. 2**, the perforated portion **1***a*, after heated by baking, is pressed into a protruded form having a radius of about 50 mm. Since at this time, other portion than the perforated portion **1***a* subjected to heat treatment by baking is not heated, the other portion than the perforated portion **1***a* maintains its proper shape as a frame so as to form an uneven-surface shape accurately when the perforated portion **1***a* is pressed.

[0028] Consequently, a product in which the perforated portion **1***a*, which is the fragile portion, is formed such that it is largely protruded can be formed as shown in **FIG. 2**.

[0029] In the foregoing, preferable embodiment of the present invention is described, but the present invention is not limited to the above-described embodiment and can be carried out in various modes within the technical scope described in the claims.

What is claimed is:

1. A metal sheet pressing method of precision-pressing a metal sheet, wherein after a metal sheet is partially drawn so as to form a perforated portion, the perforated portion is heated by baking and after it is heated by baking, the perforated portion is pressed with press dies into an uneven-surface shape.

2. A metal sheet pressing method according to claim 1, wherein the perforated portion of the metal sheet is formed in a mesh shape.

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