FAKULTA ELEKTROTECHNICKÁ ZÁPADOČESKÉ UNIVERZITY V PLZNI

# Patent

## Method of Manufacturing Hot Deep Drawn Steel Parts of Sheet Metal


US010391538B2

(12) **United States Patent**
**Jirková et al.**

(10) **Patent No.: US 10,391,538 B2**
(45) **Date of Patent: Aug. 27, 2019**

(54) **METHOD OF MANUFACTURING HOT DEEP DRAWN STEEL PARTS OF SHEET METAL**

(71) Applicant: **Západočeská univerzita v Plzni**, Plzeň (CZ)

(72) Inventors: **Hana Jirková**, Plzeň (CZ); **Bohuslav Mašek**, Kaznějov (CZ)

(73) Assignee: **Zapadoceska Univerzita V Plzni**, Plzen (CZ)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1055 days.

(21) Appl. No.: **14/753,972**

(22) Filed: **Jun. 29, 2015**

(65) **Prior Publication Data**

US 2015/0375286 A1 Dec. 31, 2015

(30) **Foreign Application Priority Data**

Jun. 30, 2014 (CZ) ..... 2014-455

(51) **Int. Cl.**

| | |
|---|---|
| ***B21D 22/02*** | (2006.01) |
| ***B21D 22/20*** | (2006.01) |
| ***B21D 26/021*** | (2011.01) |
| ***B21D 26/033*** | (2011.01) |
| ***B21C 47/26*** | (2006.01) |
| ***B21B 1/088*** | (2006.01) |
| ***C21D 7/13*** | (2006.01) |
| ***C21D 1/673*** | (2006.01) |

(52) **U.S. Cl.**

CPC ..... ***B21D 22/208*** (2013.01); ***B21B 1/088*** (2013.01); ***B21C 47/262*** (2013.01); ***B21D 22/201*** (2013.01); ***B21D 26/021*** (2013.01); ***B21D 26/033*** (2013.01); ***C21D 1/673*** (2013.01); ***C21D 7/13*** (2013.01)

(58) **Field of Classification Search**

CPC .. B21D 22/022; B21D 26/021; B21D 26/033; B21D 22/208; B21D 22/201; C21D 1/673; C21D 7/13; B21B 1/088; B21C 47/262

USPC ..... 72/342.6

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | | |
|---|---|---|---|---|
| 4,054,276 | A * | 10/1977 | Wilson | B21C 47/262 140/2 |
| 4,122,700 | A * | 10/1978 | Granzow | B21D 22/02 72/342.3 |
| 4,619,714 | A * | 10/1986 | Thomas | C21D 8/0226 148/320 |
| 5,966,977 | A * | 10/1999 | Engel | B21B 1/088 72/201 |
| 7,024,897 | B2 * | 4/2006 | Pfaffmann | B21D 26/033 148/520 |
| 8,646,302 | B2 * | 2/2014 | Lety | B21D 22/022 72/342.7 |
| 2011/0239721 | A1 * | 10/2011 | Carter | B21D 26/021 72/60 |
| 2015/0336151 | A1 * | 11/2015 | Frost | B21D 22/022 72/352 |

* cited by examiner

*Primary Examiner* — David B Jones
(74) *Attorney, Agent, or Firm* — Hovey Williams LLP

(57) **ABSTRACT**

The invention relates to a method of manufacturing steel parts of sheet metal by hot deep drawing characterized by bringing the semi-finished product into austenitic condition by heating, subsequently cooling its locations, which would undergo undesirable deformation, to a temperature below the austenite temperature, and then completing the forming process.

**3 Claims, No Drawings**

- V souladu s platnou metodikou United States Patent and Trademar Office je uplatňován patent „Method of Manufacturing Hot Deep Drawn Steel Parts of Sheet Metal“.
- Patent vznikl v přímé souvislosti s řešením projektu č:

  CZ.01.1.02/0.0/0.0/15_019/0004620

- The invention relates to a method of manufacturing steel parts of sheet metal by hot deep drawing characterized by bringing the semi-finished product into austenitic condition by heating, subsequently cooling its locations, which would undergo undesirable deformation, to a temperature below the austenite temperature, and then completing the forming process.

**ČÍSLO PATENTU:**

10,391,538

**DATUM UDĚLENÍ OSVĚDČENÍ:**

27. 08. 2019

**REGISTRAČNÍ ORGÁN:**

United States Patent and Trademark Office

**EVIDENČNÍ ČÍSLO:**

xxxxx

**KONTAKTNÍ OSOBA:**

Lenka Sobotová

tel.: 37763 4230

sobotovl@kae.zcu.cz

**ŘEŠITELSKÉ PRACOVIŠTĚ:**

Západočeská univerzita v Plzni

Fakulta elektrotechnická

Katedra aplikované elektroniky a telekomunikací

Univerzitní 8, 306 14 Plzeň

MINISTERSTVO PRŮMYSLU A OBCHODU

EVROPSKÁ UNIE
Evropský fond pro regionální rozvoj
Operační program Podnikání a inovace pro konkurenceschopnost