



- (51) International Patent Classification:  
*B21D 22/02* (2006.01) *B21D 43/11* (2006.01)  
*B21D 37/08* (2006.01)
- (21) International Application Number:  
PCT/TR2016/050561
- (22) International Filing Date:  
29 December 2016 (29.12.2016)
- (25) Filing Language: Turkish
- (26) Publication Language: English
- (30) Priority Data:  
2015/17667 31 December 2015 (31.12.2015) TR
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- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH,

[Continued on next page]

- (54) Title: A DIE ASSEMBLY FOR FORMING SHEET METAL AT A SINGLE STROKE WITH A SINGLE PRESS AND A LINE SYSTEM INTEGRATED THEREWITH

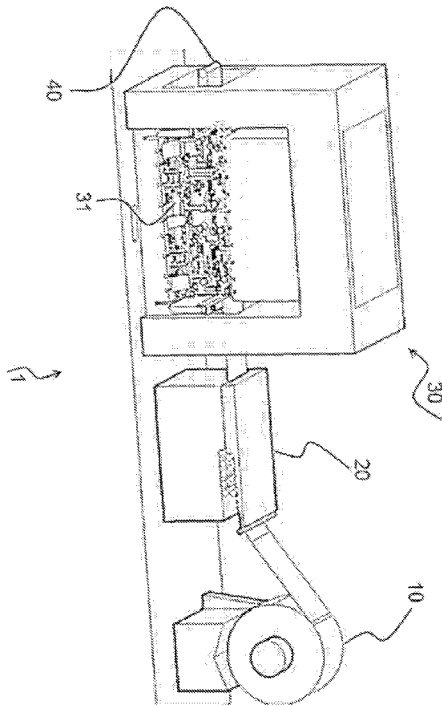


Fig. 1

- (57) Abstract: Disclosed herein is die assembly which allows forming sheet metals, which is integrated with the press and capable of performing more than one process at a single stroke of the press in a single section; and a line system which is adapted to said die assembly and comprising a coil feeder, a driver, and a scrap discharging conveyor.

GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

**Published:**

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

## DESCRIPTION

### A DIE ASSEMBLY FOR FORMING SHEET METAL AT A SINGLE STROKE WITH A SINGLE PRESS AND A LINE SYSTEM INTEGRATED THEREWITH

#### FIELD OF THE INVENTION

5 The invention relates to manufacturing sector, wherein it relates to a die assembly which allows performing sheet metal forming processes with a single press and to a line system integrated with said die assembly.

The invention particularly relates a die assembly which allows performing sheet metal forming processes at a single stroke with a single press and to a line system integrated with  
10 the die assembly.

#### BACKGROUND OF THE INVENTION

The issue of forming sheet metals, which particularly applies to automotive industry, as well as shipbuilding and aircraft industry, white goods manufacturers, machine parts manufacturers, kitchenware producers, and many other fields of the industry, has becoming  
15 more and more important and researches have been and are being made in this regard. The researches focus on the difficulties experienced in development and applications.

Hot and cold rolled flat sheet metals manufactured for forming purposes are formed into various shapes using mechanical and hydraulic presses. Sheet forming process includes bending, stretching, deep drawing, or various combinations of these basic methods. Sheet  
20 forming is performed between the punch (male die) and the matrix (female die).

Several manufacturing techniques are used for manufacturing sheet metal pieces. The first one of said manufacturing techniques is to make dies with the same number as the operations, and then to perform manufacturing with different presses. The workpiece is made into final product after various operations performed thereon. This process comprises several  
25 operations including deep drawing, trimming, piercing, bending, etc. In this case, the workpiece is obtained after as many processes as the number of operations. Another manufacturing technique is the so-called "progressive die" process in which different operations are combined in the same die and step by step manufacturing is performed. In this case, the workpiece is obtained after as many strokes as the number of operations. The  
30 manufacturing process is faster compared to the former technique. This is because the movement of the workpiece between the presses and an operator-dependent operation are eliminated.

The manufacturing process using a progressive die is the technique where the desired workpiece is obtained by simultaneously performing more than one trimming, piercing, drawing, bending, profile operations, etc. at each stroke of the press, instead of advancing the material strip. In progressive die, the operations to be performed with more than one press otherwise can be performed using a single press and running consecutive operations. In recent years, with the efficiency gaining importance in the field of manufacture, it has been preferred to perform consecutive operations using a single die and single press by producing special dies, instead of performing said processes in 3-4, or even 6-7 operations using the conventional low-tonnage presses. Progressive dies are the dies in which the material strip is advanced to perform more than one operation, a series of processes, alternately. A process performed using dies with a pressing capacity of 40-50 tons in average in more than one operation has started to be performed using a single press of 300 tons or more. An alternative method has always been sought for due to the costs of the high-tonnage eccentric presses used for these operations and the difficulty of manufacturing methods.

The typical operations of sheet forming, i.e. forming and trimming operations, are each performed in a separate die and with a separate press operation. For the workpieces which are suitable in terms of shape and amount, in turn, progressive forming and transferring method is envisaged and progressive dies and transfer dies are manufactured therefor. A manufacturing mode apart from these does not exist in the state of the art.

There are several applications regarding single press manufacturing in national and international patent databases and most of these are generally related to a manufacturing process with a progressive die. The National Application No. TR200706614 discloses profile cutting machines which are capable of performing both cutting and punching operations using a formed die and formed die blades thanks to the front and rear support plates, without any distortion, deformation, or scrap in the sheet metal. Another National Application No. TR201213062 discloses a sheet metal processing machine which can perform piercing, bending, trimming, and edge blanking operations.

The International Patent Application No. DE2018207 discloses a sheet metal processing machine which allows forming sheet metals in one operation in one workstation. Again, the International Patent Application No. FR2377855 discloses a multiple stamping press for sheet metal having separate and independent stations.

As a result, the aforementioned problems and the lack of a solution have deemed it necessary to make a development in the related field.

## OBJECTS OF THE INVENTION

The invention aims to solve the problems mentioned above, overcome all the disadvantages, and provide additional advantages to the configuration.

5 The object of the invention is to perform all the processes of the sheet metal piece (forming, trimming) at a single stroke, in a single operation (in the same section), and with a single press, at the same time preserving the quality of the workpiece. In order to achieve this object, a die assembly suited for said process and a line system adapted to said die assembly for mass production have been designed.

10 It is aimed by the invention to perform manufacturing at a single process by minimizing the multiple operations during sheet metal piece manufacturing process. Thus, manufacturing process becomes more efficient and the costs of production are lowered.

15 Further, the number of operations and equipment for sheet metal manufacturing will be reduced according to the invention. Hence, the efficiency of the production will be increased, labor demand will be decreased, saving on time will be achieved, and thereby increasing the production capacity.

Moreover, energy saving will be made thanks to the invention. At the same time, less space in the manufacturing area will be occupied. As a consequence, a more ergonomic working environment will be established.

20 The structural and characteristic features, working principle, and all advantages of the invention will be understood more clearly by referring to the following drawings and the detailed description written with reference to these drawings. Therefore, while making an evaluation, these drawings and the detailed description should be taken into account.

## BRIEF DESCRIPTION OF THE DRAWINGS

25 Fig. 1 shows the die assembly for forming sheet metal and the line system integrated with said die assembly.

## REFERENCE NUMERALS

- 1. Line system
- 10. Coil feeder
- 20. Driver
- 30 30. Press

31. Die assembly

40. Scrap discharging conveyor

### **DETAILED DESCRIPTION OF THE INVENTION**

5 The line system (1) generally comprises a coil feeder (10), a driver (20), a press (30), a die assembly (31), and a scrap discharging conveyor (40). (See Fig. 1)

The coil feeder (10) is the configuration where the sheet metal in coil is located. Said coil feeder (10) has a sheet metal feeding capacity of 60 m/min.

The driver (20) straightens the sheet metal coming from said coil feeder (10) in an inclined manner according to the cutting process and drives the same to the press (30) continuously.

10 The scrap discharging conveyor (40) is the configuration which allows discharging the scraps of the sheet metal resulting from the cutting process, out of the press (30).

Said press (30) is a hydraulic press and performs the desired forming processes on the sheet metal by means of the die assembly (31). The die assembly (31) is capable of performing more than one operation at a single stroke with a single press.

15 The working principle of the line system (1) is as follows: said coil feeder (10) and the driver (20) orient the sheet metal towards the press (30) at a defined speed. The die assembly (31) which is connected to said press (30) and where all operations are combined allows performing all the desired operations on the sheet metal by stroking the target sheet metal at a single stage, at a single stroke, and in the same section. This cycle continues and sheet  
20 metal piece manufacturing process is performed along one line. At each stroke, all of the operations are performed in the same section and 1 workpiece is thus manufactured. The distinctive feature of the present die assembly (31) from the progressive die is that the latter performs manufacturing with consecutive operations. The die assembly (31) included in the line system (1) is capable of performing all the forming, trimming operations at a single stroke  
25 and in the same section. The scrap resulting from the operation are discharged from said press (30) by means of the scrap discharging conveyor (40), without requiring an operator.

**CLAIMS**

1. A line system (1) adapted to a die assembly (31) which allows forming sheet metals, which is integrated with the press and capable of performing all the process of the workpiece at a single stroke, with a single press (30), and in a single section; and the line system (1) characterized in comprising:
- 5
- Coil feeder (10) which carries thereon the sheet metal in coils and which unrolls and feeds said sheet metal at a defined speed, and
  - a driver (20) which straightens the sheet metal coming from said coil feeder (10) in an inclined manner according to the cutting process and drives the same to the press
- 10 (30) continuously.
2. The line system (1) as in Claim 1, characterized in comprising a scrap discharging conveyor (40) which serves for discharging the scraps resulting from forming the sheet metal in said press (30).

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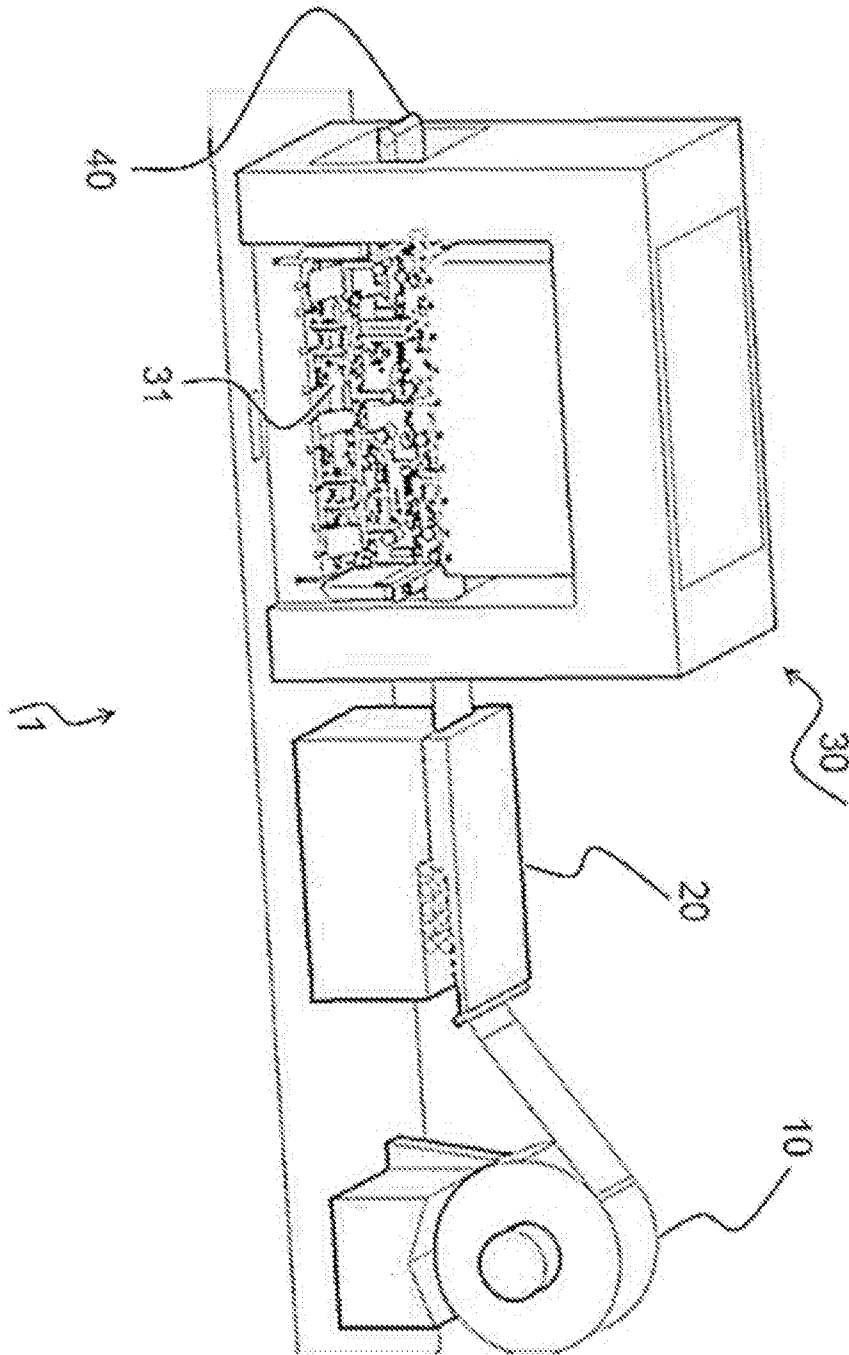


Fig. 1

**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/TR2016/050561

**A. CLASSIFICATION OF SUBJECT MATTER**  
 INV. B21D22/02 B21D37/08 B21D43/11  
 ADD.  
 According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**  
 Minimum documentation searched (classification system followed by classification symbols)  
 B21D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
 EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 20 18 207 A1 (STANDUN INC.) 4 November 1971 (1971-11-04) cited in the application pages 19-21; figures 1,26 -----	1,2
X	US 4 024 747 A (BERGMANN EWALD ET AL) 24 May 1977 (1977-05-24) column 1, lines 62-66; figure 1 -----	1,2

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search  
 9 May 2017

Date of mailing of the international search report  
 17/05/2017

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/TR2016/050561

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 2018207	A1	04-11-1971	NONE
US 4024747	A	24-05-1977	BE 842157 A1 16-09-1976
			CH 595901 A5 28-02-1978
			DE 2538239 A1 10-03-1977
			FR 2321961 A1 25-03-1977
			GB 1512499 A 01-06-1978
			IT 1066988 B 12-03-1985
			JP S592572 B2 19-01-1984
			JP S5228787 A 03-03-1977
			US 4024747 A 24-05-1977