March 28, 1961 S. B. WENNES 2,976,754

BLANKING DIE MEANS WITH RESILIENTLY SUPPORTED STRIPPER PLATE MEANS

Filed April 21, 1958

Fig. 1

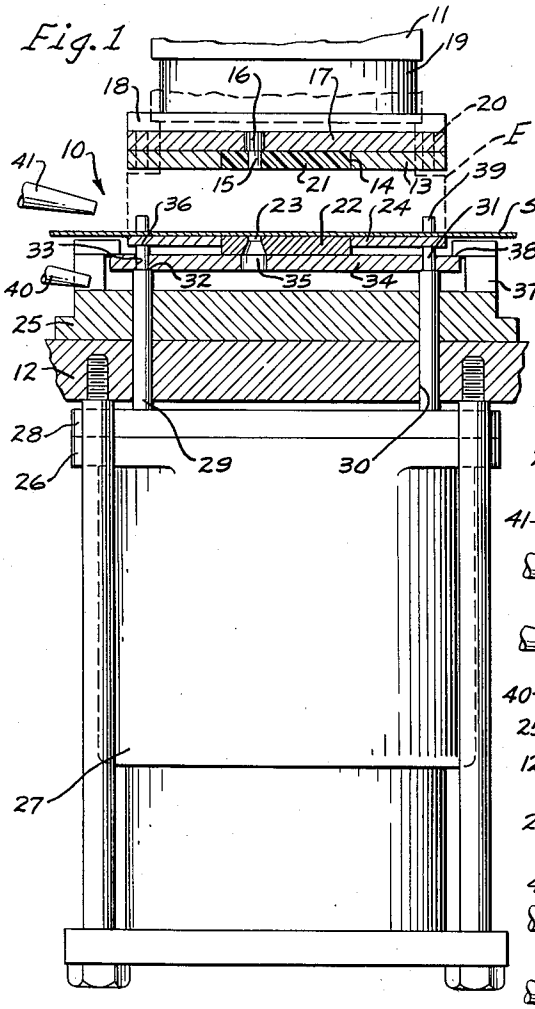


Fig. 2

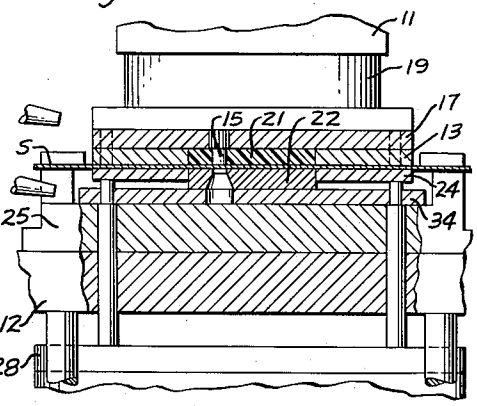


Fig. 3

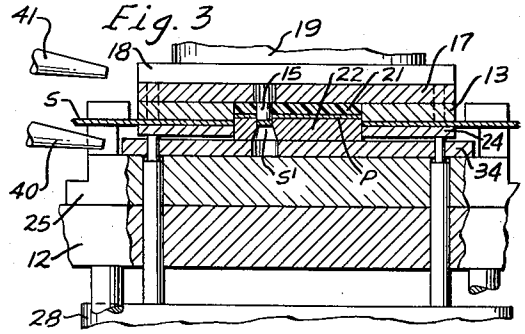


Fig. 4

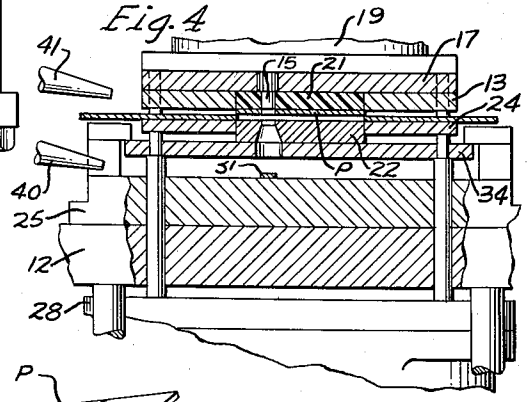
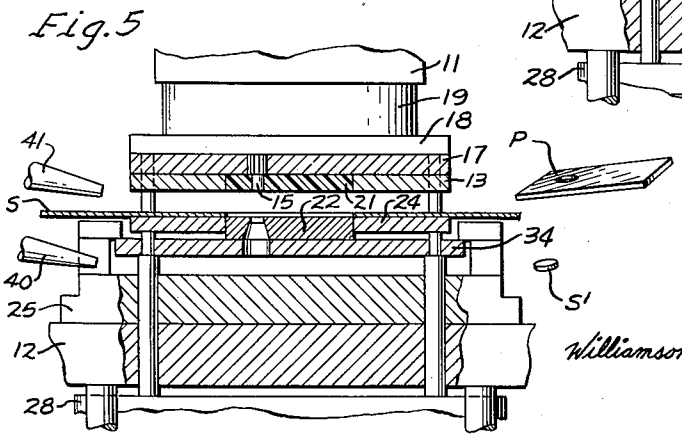


Fig. 5



INVENTOR
STEPHEN B. WENNES
BY
Williamson, Schroeder, Adams & Palmatier
ATTORNEYS

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BLANKING DIE MEANS WITH RESILIENTLY SUPPORTED STRIPPER PLATE MEANS

Stephen B. Wennes, Minneapolis, Minn., assignor to Dayton Rogers Manufacturing Co., Minneapolis, Minn., a corporation of Minnesota

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1 Claim. (Cl. 83—139)

This invention relates to the method of and apparatus for producing apertured metal stampings and the like.

In the past it has been necessary, in the production of apertured metal stampings, to produce the part from the sheet metal by the use of a blanking die and blanking punch, and when the part has been produced in this manner, the part has been inserted into another piercing punch and die assembly to pierce one or more apertures in the part. Obviously, this has required the use of two different punch press machines and because the successive steps were necessary, labor costs in handling the parts materially increased the cost of production.

An object of my invention is the provision of a new and improved method for easily and inexpensively producing apertured parts of sheet metal and the like in a single operation.

Another object of my invention is the provision of an improved compound blanking and piercing apparatus of simple and inexpensive construction and operation for producing sheet metal parts.

Still another object of my invention is the provision of a novel apparatus for simultaneously blanking a part from sheet metal stock and the like and piercing one or more apertures in the part produced.

A further object of my invention is the provision of a new and novel method of producing from sheet metal or the like, a part having an aperture within the periphery thereof by simultaneously punching through the sheet metal stock in one direction to blank the part out of the sheet metal stock and simultaneously punching through the part in the other direction to pierce an aperture in the part, and then stripping the sheet stock off the blanking punch and stripping the part off the piercing punch.

These and other objects and advantages of my invention will more fully appear from the following description made in connection with the accompanying drawings wherein like reference characters refer to the same or similar parts throughout the several views and in which:

Fig. 1 is a detail elevation view, with certain parts shown in section, of the punch and die assembly embodying the present invention, and showing the assembly in operative condition prior to the starting of an operating cycle;

Fig. 2 is a detail elevation view, with certain parts shown in section, and showing the assembly in an intermediate stage of its operating cycle, substantially at the moment blanking and piercing of the material begins;

Fig. 3 is also a detail vertical section view with certain of the parts shown in section and showing the assembly in an intermediate stage of the operation cycle, substantially at the moment blanking and piercing of the part has been completed;

Fig. 4 is also a detail elevation view with certain of the parts shown in section and showing the assembly in an intermediate stage of the operational cycle substantially at the moment of completion of stripping of the blanked part and stock from the punches and die; and

Fig. 5 is also a detail elevation view with certain of the parts shown in section and showing the assembly substantially at the final stage of its operational cycle wherein the parts and slugs have been removed and the stock is ready to be moved for starting another operational cycle.

The method employed herein and comprising a portion of the present invention will be apparent from the description of the construction and operation of the compound blanking and piercing assembly which is indicated in general by numeral **10**.

The assembly **10** is adapted to be mounted in a conventional punch press machine, and in the drawings the vertically reciprocable ram **11** and the bolster plate **12** which is rigid with the bed of the machine are shown. Because the means by which various parts are secured to the ram and bolster plate of the punch press machine are well known to persons skilled in the art, many of these details are eliminated in order to emphasize the primary aspects of the present invention.

The assembly **10** includes a blanking die **13** having a die opening **14** formed therein and shaped to the configuration of the part to be blanked from the sheet stock S such as sheet metal or the like. It will be noted that the die **13** faces downwardly and the cutting edge of the die **13** is disposed at the lower surface thereof. A downwardly facing piercing punch **15** is disposed within the blanking die opening **14** at a predetermined position corresponding to the position of an aperture which is to be produced in the part which is to be blanked.

Means are provided for mounting the blanking die **13** and the piercing punch **15** on the ram of the machine. The piercing punch **15** has its upper mounting end portion **16** secured in a suitable aperture in a punch holder plate **17**. The die **13**, which underlies the punch holder plate **17** is secured in predetermined relation with the punch holder plate and is affixed, along with the punch holder plate **17** to a back-up plate **18** by suitable means (not shown). The back-up plate **18** is affixed to a spacer plate **19** which is affixed to the ram **11** of the machine.

The die **13** and punch holder plate **17** have alignment pin-receiving openings **20** therein.

Means are provided in the die opening **14** and around the piercing punch **15** for stripping the part out of the die opening and in a downward direction, and in the form shown, such means comprise a body **21** of resiliently compressible and expandable material, which in the form shown is constructed of rubber, but could of course be other suitable resiliently yieldable material. The body **21** is shaped to conform to the configuration of the die opening **14** with provision made to allow the piercing punch **15** to extend therethrough. It will be noted that the lower face and cutting edge of the piercing punch **15** is disposed in the same horizontal plane with the cutting edge of the die **13**. The bottom face of the body **21** engages the part as it is being blanked and permits movement of the part upwardly into the die opening. The body subsequently ejects the part after the same is blanked.

The blanking assembly **10** also includes a blanking punch **22** below the die **13** and in alignment with the die opening **14** thereof. The punch **22** has a peripheral configuration substantially identical to that of the die opening **14**. Blanking punch **22** also has a die opening **23** formed vertically therethrough with the cutting edge disposed at the upper surface of the punch **22** and shaped to the identical peripheral configuration as the piercing punch **15** for receiving the piercing punch therein and producing an aperture in the part being blanked. Means are provided for stripping the stock S upwardly off the punch **22** when blanking of a part has been completed, and in the form shown, such means include a stripper

plate 24 which is constructed of somewhat thinner stock than the punch 22, and is fabricated to fit around the punch 22 for vertical movement with respect to the punch.

The bolster plate 12 and the bottom holder 25, which is suitably affixed to the bolster plate, provide the means for supporting the punch 22 during a blanking operation.

Means are provided for mounting the blanking punch 22 in such a position that it is normally spaced upwardly from the bottom holder 25 and to permit, during a blanking operation, downward movement of the punch into supported relation with the bottom holder 25 and to permit additional downward movement of the stripper plate 24 as the punch 22 moves into the die opening 14. In the form shown, such means include a pneumatic die cushion 26 which is suspended from the bolster plate 12 in a conventional fashion and which is constructed so that the upper portion 27 of the cushion and the pin pad 28 are movable downwardly with respect to the bolster plate 12 when substantial downward force is exerted against the pin pad 28. The construction and operation of pneumatic die cushions is well known to persons skilled in the art, and it should merely be noted that the die cushion 26 has resiliently yielding properties. When downward force is applied thereto, the pin pad 28 is resiliently urged in an upward direction so as to oppose the force and cause upward movement of the pad when the force is released. A plurality of upright punch and stripper plate-mounting pins 29 extend through suitably provided apertures 30 in the bolster plate 12 and bottom holder 25 and are slidable therein for limiting vertical reciprocation. Pins 29 have reduced upper end portions 31 defining shoulder surfaces 32. The reduced upper end portions 31 of the pins project through bearing apertures 33 in the punch holder plate 34. The reduced upper end portions 31 of the pins 29 are slidable in the apertures 33. It will be noted that the punch holder plate 34 has a slug or material-discharging opening 35 extending vertically therethrough in alignment with the downwardly enlarged piercing punch-receiving opening 23 in punch 22. It will be understood that the punch 22 is affixed to the punch holder plate 34 by any suitable means.

The stripper plate 24 overlies the upper end surfaces 36 of the pins 29 and it will be seen that the stripper plate 24 is normally spaced above the punch holder plate 34 to permit limited vertical movement of the stripper plate 24 with respect to the punch holder plate 34 and punch 22.

Stop means are provided for limiting the upward movement of the punch holder plate 34 and the pins 29 and therefore upward movement of the stripper plate 24. In the form shown, such means comprise limit blocks 37 which have shoulder surfaces 38 facing downwardly to bear against the upper surface of punch holder plate 34 and thereby limiting upward movement of the punch and pins 29, and stripper plate 24.

Alignment pins 39 are affixed to the punch holder plate 34 and project through suitable apertures in the stripper plate 24 for projection into the apertures 20 of the die 13 and punch holder plate 17.

Means are also provided for sweeping the slugs from between the punch holder plate 34 and the bottom holder 25 when the slugs have been ejected downwardly through the openings 23 and 35 in the punch 22 and plate 34 respectively. In the form shown such means comprise air nozzles 40 which direct a stream of air beneath the punch holder plate 34 and the bottom holder 25 to sweep the slugs off the bottom holder 25. Air nozzles 41 are also provided above the stock S and below the die 13 when the same is in its upper position so as to direct a stream of air for ejecting the part P out of the die assembly.

In operation, the stock S is positioned in overlying relation to the stripper plate 24 and to the punch 22. Subsequently the ram 11 is operated to move the die 13 and punch 15 downwardly to the dotted position F shown in Fig. 1 so as to clamp the stock between the blanking punch 22 and blanking die 13 and between the piercing punch 15 and the portions of punch 22 bounding the periphery of die opening 23. As best seen in Fig. 2, the ram 11 continues to move downwardly, and as this occurs, the punch 22 is also driven downwardly, along with the stripper plate 24 until the punch holder plate 34 engages the bottom holder 25. Of course, as this happens, the bottom holder plate 34 moves downwardly away from the shoulder surface 38 of the limit blocks 37, and the sheet of stock S also moves downwardly slightly.

As seen in Fig. 3, the ram 11 continues to move downwardly as the punch 22 engages the bottom holder 25 and is stopped, and as the ram moves down further, the compound blanking and piercing operation occurs and the production of an apertured part P. The die 13 moves downwardly over the punch 22 so as to cause the punch to project slightly into te die opening 14. Simultaneously with this, the punch 15 moves downwardly into the die opening 23 to produce an aperture in the part P and to produce the slug *s'* which starts to fall downwardly through the openings 23 and 35. Simultaneously with the movement of the punch 22 into the die opening 14, the body 21 of resilient material is compressed to allow the part P to move inwardly of the die opening, and at this same time, the die 13 bears downwardly through the stock S on the stripper plate 24 causing further downward movement of the pins 29 while the punch 22 and plate 34 remain stationary. It will be seen that when the actual piercing and blanking has been completed the stock S surrounds the punch 22. Subsequently the ram 11 starts to move upwardly to relieve the downward force on the stripper plate and punch and of course the punch releases the part P as the punch is withdrawn from the die opening. The pneumatic die cushion 26 urges the pins 29 upwardly which first carries the stripper plate 24 and then the punch-holding plate 34 upwardly. The sheet of stock S is stripped off the punch 22 and the punch and stripper plate return to their normal position wherein further upward movement is restricted by limit blocks 37. As the pressure of the punch on the part P is relieved, the body 21 of resilient material in the die opening strips the part P downwardly out of the die opening.

It will be seen that as a result of the upward movement of the punch 22 and holder plate 34, the slug *s'* which has dropped through the openings 23 and 35 is in the free and unobstructed space beneath the plate 34. Air from the nozzles 40 and 41 is then utilized to sweep the slug *s'* and the part P outwardly to one side of the assembly, substantially in the manner shown in Fig. 5.

It will be seen that I have provided a novel method of and apparatus for producing an apertured part by simultaneously blanking the part from sheet metal stock or the like and piercing the sheet metal within the periphery of the part being produced. Although the description herein has been related only to the production of a single aperture in the part being blanked, it should be understood that a number of apertures may be simultaneously produced in the part during a single blanking and piercing operation by employing a number of piercing punches in the die opening and by forming a number of piercing punch-receiving die openings in the blanking punch.

It will, of course, be understood that various changes may be made in the form, detail, arrangement and proportion of the parts without departing from the scope of my invention which consists of the matter described herein and set forth in the appended claim.

What is claimed is:

Apparatus for use in punch press machines and the like for producing apertured parts from sheet metal and the like, said apparatus comprising a downwardly facing blanking die having a die opening, a downwardly facing piercing punch in the die opening, means mounting the

blanking die and piercing punch on the ram of the machine, stripper means in the blanking die opening and ejecting the blanked parts downwardly from the die opening, an upwardly facing blanking punch below the blanking die and in alignment therewith and having an upwardly facing piercing punch-receiving die opening extending vertically therethrough in alignment with the piercing punch, a punch-holding plate underlying the punch and secured thereto and having a material ejecting opening vertically therethrough and in alignment with the die opening in the blanking punch, a stripper plate surrounding the blanking punch at the upper cutting edge thereof, rigid blanking punch-supporting means stationary with the bed of the machine, a plurality of upright punch and stripper plate-supporting pins slidably mounted in the punch-supporting means and having shoulder surfaces and upper end portions vertically slidably mounting the punch-holding plate and also having means at their upper ends supporting the stripper plate, and resiliently yieldable means supporting the pins with the shoulder surfaces and punch-holding plate spaced above the punch-supporting means, the resiliently yieldable pin-supporting

means continuously urging the pins upwardly, and stop means limiting upward movement of the stripper plate and pins, whereby the punch and stripper plate, after having been driven downwardly by the die, will be resiliently urged upwardly to strip the material from the punch and to allow additional material to fall downwardly through the die opening in the blanking punch and through the opening in the punch-holding plate whereupon the material may be easily removed.

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