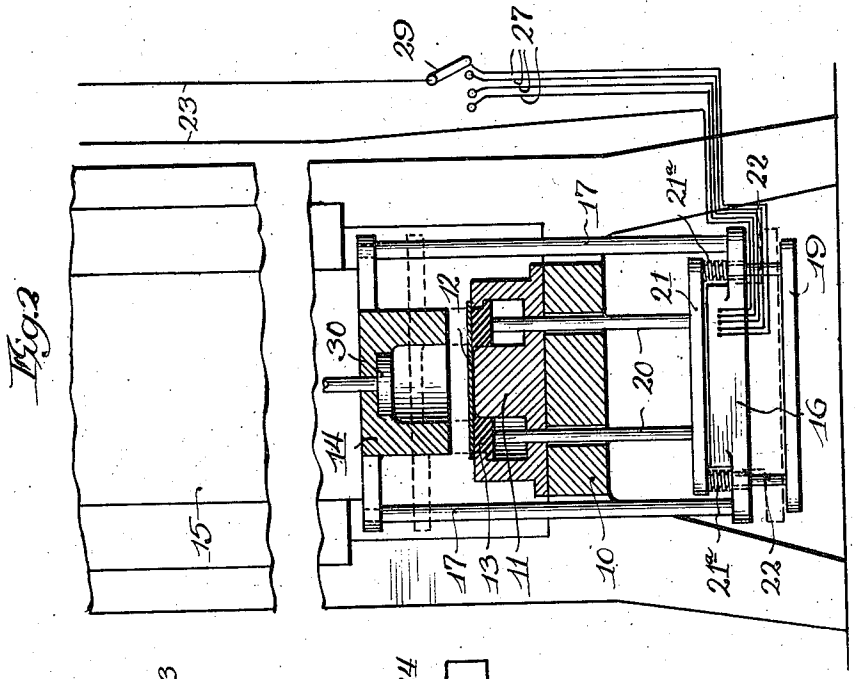
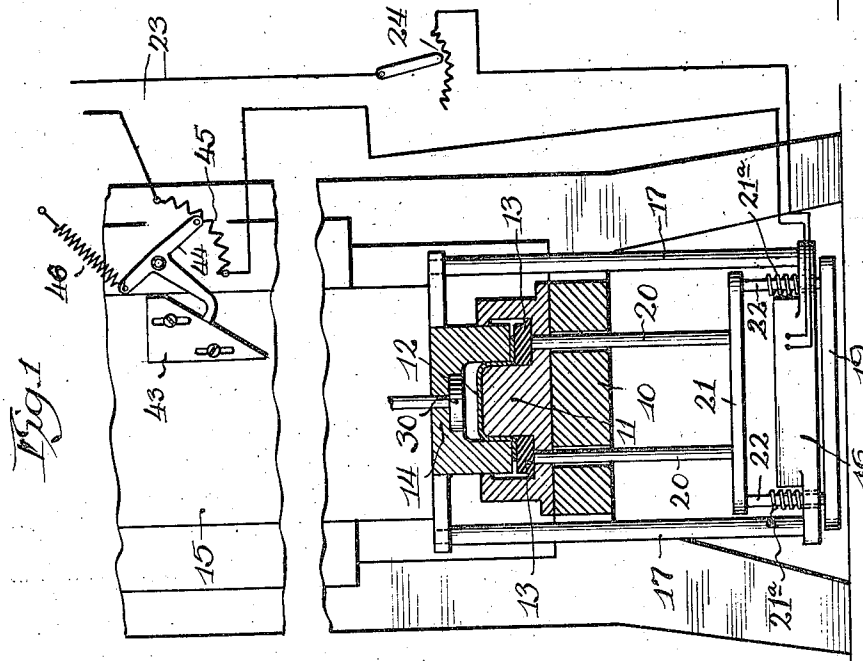
Nov. 9, 1926. 1,606,141

G. BROWN

WORK HOLDING MEANS

Filed Nov. 27, 1925 2 Sheets-Sheet 1





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Nov. 9, 1926.

1,606,141

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WORK HOLDING MEANS

Filed Nov. 27, 1925

2 Sheets-Sheet 2

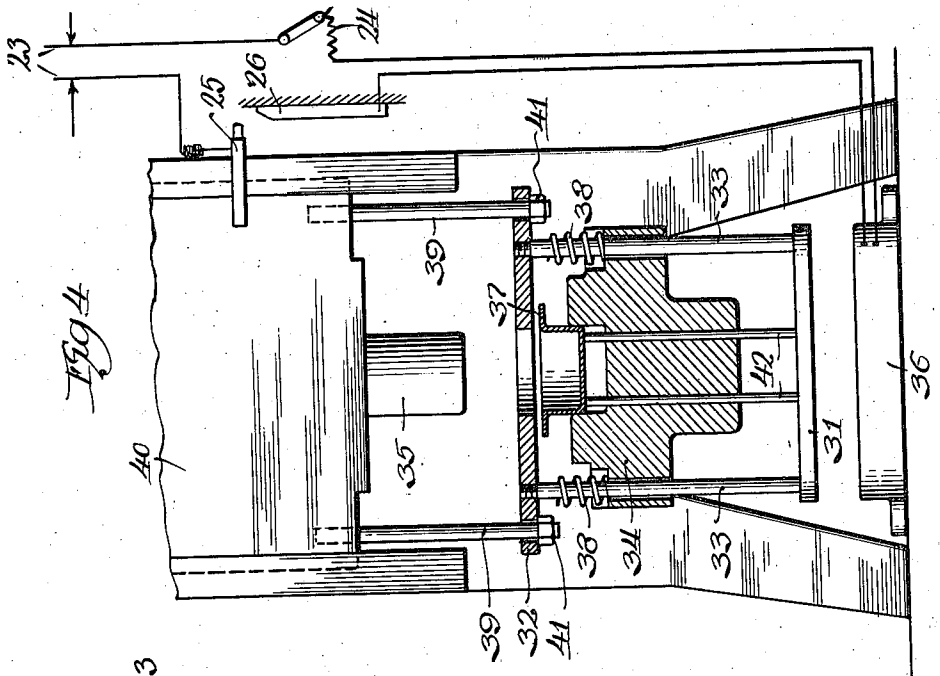


Fig. 4

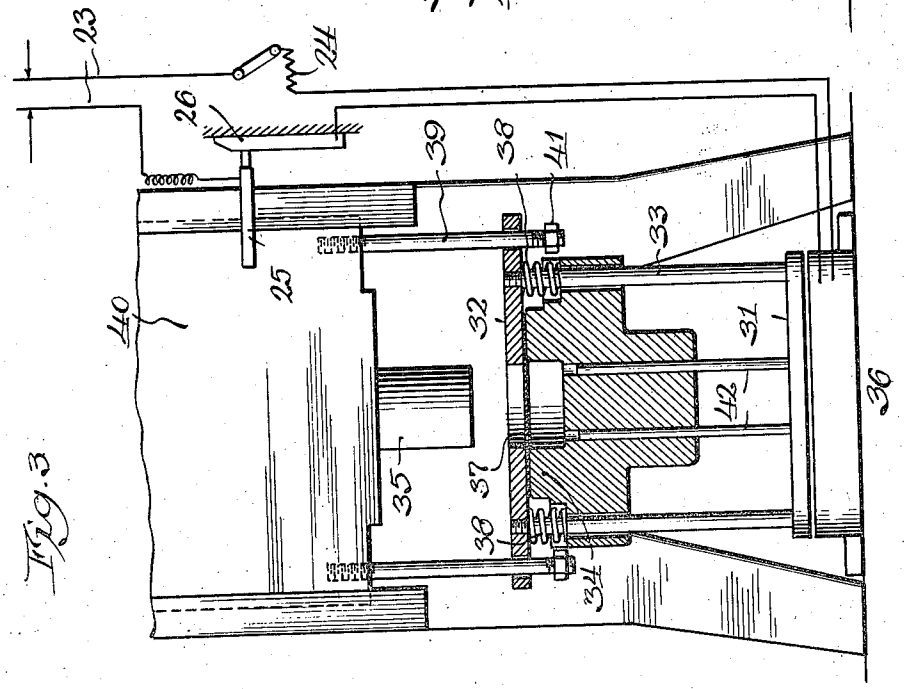


Fig. 3

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UNITED STATES PATENT OFFICE.

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WORK-HOLDING MEANS.

Application filed November 27, 1925. Serial No. 71,587.

In the drawing and pressing of sheet metal by means of dies and shaping it into the desired forms, it is necessary, during the shaping operation to hold the marginal portion of the blank, or that portion adjacent to the forming block, between two moving members suitably pressed together, otherwise, the metal will not be properly drawn or stretched, or the margin of the blank will be wrinkled or folded, the two co-operating members operating to force the metal over a forming block or die.

Various cushioning means have heretofore been employed for this purpose and in some instances very satisfactory results have been accomplished, but in other instances the means provided for this purpose have been unsatisfactory because as the pressure ring descends, the pressure exerted on it by the cushioning means increases, causing the margin of the blank to be gripped so securely and unyieldingly that the metal being drawn will tear and break, with the result that the article will be damaged.

If it is attempted, with some of the prior devices, to employ a lesser pressure then the margin of the blank will not be held securely enough to prevent the metal from wrinkling or cracking.

It is one of the objects of the present invention to overcome these difficulties and objections and to provide electro-magnetic means operating upon the blank holding member to cause the same to grip the work and hold it with the desired degree of pressure, which will hold the work sufficiently tight to permit it to be shaped or drawn and at the same time prevent the margin from wrinkling or cracking while the metal is being drawn or shaped.

A further object is to provide in an electro-magnetic work holder of this character means whereby the intensity of the magnetic field may be varied at will, thereby enabling an extremely wide range of pressure of the work holding means to be obtained.

To the attainment of these ends and the accomplishment of other new and useful objects as will appear, the invention consists in the features of novelty in substantially the construction, combination and arrangement of the several parts hereinafter more fully described and claimed and shown in the accompanying drawings illustrating this invention, and in which—

Figure 1 is a view partly in elevation, partly in section and with parts omitted of a sheet metal shaping machine constructed in accordance with the principles of this invention and showing the electro-magnetic cushioning means operating to influence the draw ring, and with the parts in one position.

Figure 2 is a view similar to Figure 1 showing the parts in another position.

Figure 3 is a view similar to Figure 1 of another form of the invention.

Figure 4 is a view similar to Figure 3 showing the parts in a different position.

Referring more particularly to the drawings and to the form of the invention as shown in Figures 1 and 2, the numeral 10 designates generally a bolster or bed plate of the machine upon which is mounted in any suitable manner a die or block 11, over which the material 12 is adapted to be shaped. A draw ring 13 is provided which encompasses the block or die 11, and this draw ring co-operates with a portion of a shaping or forming die 14 to clamp the edge or margin of the material therebetween and to hold the same during the shaping or forming operation. The die or forming block 13 is connected with a reciprocating member 15 of the press and this member 15 is given a reciprocating movement in any desired or suitable manner (not shown) and which is well known in this art.

An electro-magnetic device 16, preferably in the form of a magnet is connected with the reciprocating member 15 preferably by means of bars or rods 17 that pass through the bed or bolster plate 10 of the press and extend for a considerable distance therebelow so that the magnet 16 will be disposed below the bolster or bed plate 10.

An armature 19 is provided which co-operates with the magnet 16 and the armature has connected with it pins or rods 20, which latter are preferably supported by means of a cross bar or member 21 of non-magnetic material, which in turn is connected by means of connecting rods or supports 22 with the armature. The armature is preferably arranged beneath the magnet 16 and the bars or pins 20 pass through the bed

plate 10 of the machine and contact with the draw ring 13.

The magnet 16 is energized from any suitable source through conductors 23, and within the circuit thus formed may be arranged a rheostat 24 by means of which the strength of the magnet may be varied and thereby vary the intensity of the magnetic field so that the degree of pressure of the draw ring 13 upon the work may be varied.

As shown in Figure 2, the strength of the magnet may be varied by means of a plurality of different windings 27 having contact points 28 with which a switch device 29 arranged in the circuit 23, is adapted to co-operate.

A knock out device 30 of any desired and well known construction may be provided for knocking out or ejecting the shaped article from the die 14 and which knock out device is adapted to be automatically operated at a predetermined point in the cycle of operation of the machine (not shown) and which is well known in this art.

In operation when the ram 15 and die 14 are in a raised position with respect to the forming block 11, the parts will assume the position as shown in Figure 2, the draw ring 13 being held in its uppermost position and with its face flush with the upper face of the forming block or die 11, by means of the magnet 16 attracting the armature 19, the contacts 25 and 26 being so arranged that the magnet will be energized at the proper time. If necessary and as an additional means for holding the draw ring 13 in its uppermost position with its face flush with the upper face of the forming block springs 21^a may be employed.

The work 12 is then placed in position upon the forming die 11 and the blank holder 13. As the ram 15 and die 14 descend the work 12 will be clamped between the draw ring 13 and the adjacent face of the die 14. A further movement of the ram and die 14 in the same direction will cause the material to be shaped over the die or forming block 11, as shown in Figure 1. The strength of the magnet is so regulated that the material 12 will be gripped between the draw ring and the die 14 with sufficient force to permit the article to be shaped and to hold the marginal portion of the article from wrinkling or cracking during the forming operation.

As the ram and die 14 recede the draw ring 13 will follow the movement of the die 14 and the article will be stripped from the forming block 11 and carried upwardly in the die 14 until it is ejected by the knock out device 30.

In the form of the invention shown in Figures 3 and 4 the armature 31 has connected with it a blank holding member 32 through the medium of connecting bars or rods 33, the blank holding member co-operating with the die 34 into which a die 35 operates. The magnet 36 when energized will attract the armature 31 and through the medium of the rods 33 will draw the clamping member 32 against the work 37 so that the latter will be clamped between the edge of the die 34 and the blank holding member 32.

Any suitable means may be provided for automatically opening and closing the circuit to de-energize and energize the magnet, and for that purpose there may be provided a contact 25 which is connected with a reciprocable part of the press and which is arranged within the circuit. This contact 25 is adapted to co-operate with another contact 26 in the circuit.

If desired suitable springs 38 of the desired size and strength may be employed to raise the blank holding member 32 after the forming operation and to permit the insertion of a new piece of material.

The blank holding member 32 may also be raised in any suitable manner such as by means of bars or rods 39 connected with the ram 40 or any movable part of the press. These rods pass loosely through a portion of the blank holding member 32 and have connected therewith nuts 41 so spaced that as the ram 40 and die 35 descend they will pass loosely through the blank holding member 32 so as not to interfere with the operation of the latter. Upon the receding movement of the ram 40 and the die 35 the nuts or collars 41 will at a predetermined point in the cycle of operation of the machine engage and raise the blank holding member 32 to the position shown in Figure 4, so as to permit the removal of the finished article.

Knock out pins 42 may be connected to move with the armature 31 so as to knock out the completed article from the die 34.

In this form of the invention the strength of the magnet 36 may be varied in the same manner as that shown in connection with Figures 1 and 2.

With the invention herein disclosed it will be manifest that an extremely wide range of pressure upon the work may be obtained and may be readily attached to any machine now on the market.

Furthermore with this invention it will be manifest that the ram of the press does not operate against the stress of the magnet as the magnet and armature together with the connected parts, in the form of the invention shown in Figures 1 and 2, move as a unit with the ram. It may be desirable under some conditions of operation to vary the grip or pressure of the blank holding means driving the stroke or operation of the press and in order to accomplish this, means may be provided for automatically varying the intensity of the magnetism in the mag-

net. To that end there may be provided a cam element 43 adjustably mounted upon a movable part of the press such as the ram 15 to co-operate with a rheostat lever 44. The lever 44 is mounted upon a stationary part of the press and co-operates with a rheostat winding 45, and the lever is controlled by a spring 46. In operation as the slide 15 of the press starts its downward movement, the cam 43 engages the lever 44 and the rheostat 45 is operated with the result that the magnetism in the magnet will be varied thereby varying the pressure on the work holding or gripping means. The spring 46 will operate on the back or upstroke of the slide 15 to move the lever 44 back to its normal position after the completion of the return stroke of the press.

While the preferred forms of the invention have been herein shown and described, it is to be understood that various changes may be made in the details of construction and in the combination and arrangement of the several parts, within the scope of the claims, without departing from the spirit of this invention.

What is claimed as new is:—

1. The combination of a sheet material shaping member, means co-operating with said member for shaping the material and embodying gripping means for the material, and electro-magnetic means for maintaining a pressure on the gripping means during the operation of shaping the material.

2. The combination of a sheet material shaping member, means co-operating with said member for shaping the material and embodying gripping means for the material, and electro-magnetic means for maintaining a substantially unvarying pressure on the gripping means during the operation of shaping the material.

3. The combination of a sheet material shaping member, means co-operating with said member for shaping the material and embodying gripping means for the material, electro-magnetic means for maintaining a pressure on the gripping means during the operation of shaping the material, and means for varying at will the degree of pressure of the said gripping means.

4. The combination of a sheet material shaping member, means co-operating with said member for shaping the material and embodying gripping means for the material, electro-magnetic means for maintaining a pressure on the gripping means during the operation of shaping the material, and means for varying at will the intensity of the field of the said electro-magnetic means.

5. The combination of a sheet material shaping member, means co-operating with said member for shaping the material and embodying gripping means for the material, and means for maintaining a pressure on the gripping means during the operation of shaping the material, the said pressure maintaining means embodying a magnet and an armature one of which is operatively connected with one of the parts of the said gripping means.

6. The combination of a sheet material shaping member, means co-operating with said member for shaping the material and embodying gripping means for the material, means for maintaining a pressure on the gripping means during the operation of shaping the material, the said pressure maintaining means embodying a magnet and an armature one of which is operatively connected with one of the parts of the said gripping means, and means for varying at will the intensity of the field of the magnet.

7. The combination of a sheet material shaping member, means co-operating with said member for shaping the material, and embodying gripping means for the material, means for maintaining a pressure on the gripping means during the operation of shaping the material, the said pressure maintaining means embodying a magnet and an armature one of which is operatively connected with one of the parts of the said gripping means, and means operating automatically to render the said magnet active and inactive.

8. The combination of a sheet material shaping member, means co-operating with said member for shaping the material and embodying gripping means for the material, electro-magnetic means for maintaining a pressure on the gripping means during the operation of shaping the material, and means operating automatically to render the said electro-magnetic means active and inactive.

9. The combination of a sheet material shaping member, means co-operating with said member for shaping the material and embodying gripping means for the material, and electro-magnetic means for maintaining a pressure on the gripping means during the operation of shaping the material, the said electro-magnetic means moving as a unit with the first recited means and the said gripping means during the shaping operation.

10. The combination of a sheet material shaping member, means co-operating with said member for shaping the material and embodying gripping means for the material, electro-magnetic means for maintaining a pressure on the gripping means during the operation of shaping the material, the said electro-magnetic means moving as a unit with the second recited means and the said gripping means during the shaping operation, and means operating automatically to energize and deenergize the said electro-magnetic means.

11. The combination of a sheet material shaping member, means co-operating with said member for shaping the material and embodying gripping means for the material, electro-magnetic means for maintaining a pressure on the gripping means during the operation of shaping the material, the said electro-magnetic means moving as a unit with the second recited means and the said gripping means during the shaping operation, and means for varying at will the degree of pressure of the said gripping means.

12. The combination of a sheet material shaping member, means co-operating with said member for shaping the material and embodying gripping means for the material, and means for maintaining a pressure on the gripping means during the operation of shaping the material, said pressure maintaining means embodying a magnet and an armature one of which is connected with the gripping means, all of said parts moving as a unit during the operation of shaping the material.

13. The combination of a sheet material shaping member, means co-operating with said member for shaping the material and embodying gripping means for the material, means for maintaining a pressure on the gripping means during the operation of shaping the material, said pressure maintaining means embodying a magnet and an armature one of which is connected with the gripping means, all of said parts moving as a unit during the operation of shaping the material, and means operating automatically to render the said magnet active and inactive.

14. The combination of a sheet material shaping member, means co-operating with said member for shaping the material and embodying gripping means for the material, means for maintaining a pressure on the gripping means during the operation of shaping the material, said pressure maintaining means embodying a magnet and an armature one of which is connected with the gripping means, all of said parts moving as a unit during the operation of shaping the material, and means for varying at will the intensity of the field of the said magnet.

15. The combination of a sheet material shaping member, means co-operating with said member for shaping the material and embodying gripping means for the material, electro-magnetic means for maintaining a pressure on the gripping means during the operation of shaping the material, and means operating automatically to vary the degree of pressure of the said gripping means during the stroke of the press.

16. The combination of a sheet material shaping member, means co-operating with said member for shaping the material and embodying gripping means for the material, electro-magnetic means for maintaining a pressure on the gripping means during the operation of shaping the material, and automatically operating means for varying the intensity of the electro-magnetic means at predetermined points in the cycle of operation of the press.

17. The combination of a sheet material shaping member, means co-operating with said member for shaping the material and embodying gripping means for the material, means for maintaining a pressure on the gripping means during the operation of shaping the material, the said pressure maintaining means embodying a magnet and an armature one of which is operatively connected with one of the parts of the said gripping means, and means operating automatically during the stroke of the press to vary the intensity of the said magnet.

18. The combination of a sheet material shaping member, means co-operating with said member for shaping the material and embodying gripping means for the material, means for maintaining a pressure on the gripping means during the operation of shaping the material, the said pressure maintaining means embodying a magnet and an armature one of which is operatively connected with one of the parts of the said gripping means, means operating automatically during the stroke of the press to vary the intensity of the said magnet, and means for rendering the magnet inactive and more or less active.

In testimony whereof I have signed my name to this specification, on this 6th day of November, A. D. 1925.

GREGORY BROWN.