

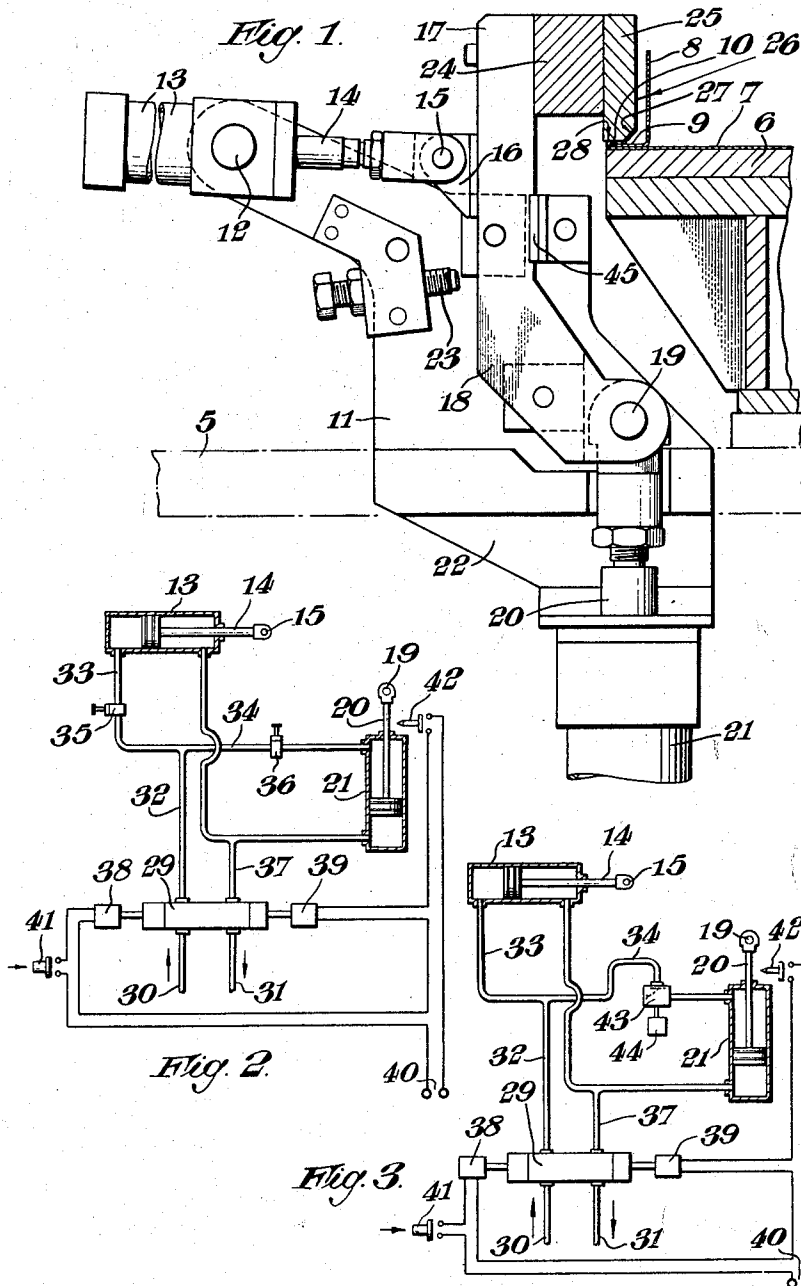
Sept. 8, 1964

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3,147,726

CLINCHING APPARATUS

Filed Aug. 23, 1961



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1

3,147,726

CLINCHING APPARATUS

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Filed Aug. 23, 1961, Ser. No. 133,365

Claims priority, application Great Britain Aug. 31, 1960

4 Claims. (Cl. 113—54)

This invention concerns clinching apparatus of the type in which an upstanding marginal flange of one sheet metal panel is bent (or pre-formed) over the margin of another sheet metal panel and thereafter is pressed down thereon i.e. is clinched, the pre-forming operation and the clinching operation being performed in sequence.

According to this invention the apparatus comprises a single member for performing the pre-forming and the clinching operations and means for advancing said member towards the flange in a direction substantially normal thereto to pre-form the flange and a further means for thereafter moving the advanced member in a direction substantially normal to the surface of the flanged panel to clinch the flange. It is preferred that said single forming means is moved hydraulically or pneumatically and according to a feature of the present invention said member is moved to pre-form the flange by one hydraulic or pneumatic motor and is moved to clinch the flange by another hydraulic or pneumatic motor.

Practical applications of the present invention will now be described, by way of example only, with reference to the accompanying drawings whereof:

FIG. 1 is a side view, partly in section, of an apparatus according to this invention,

FIG. 2 is a schematic view of one arrangement of control for the apparatus of FIG. 1, and

FIG. 3 is a view similar to FIG. 2 showing an alternative control mechanism.

Referring to FIG. 1: the apparatus comprises a frame 5 which carries a cradle 6 upon which is mounted an outer panel 7 and an inner panel 8. The panel 7 is formed with an upstanding marginal flange which is to be bent over and pressed down or clinched upon the marginal portion 10 of the panel 8. The upstanding flange after it has been clinched is indicated by the reference numeral 9 in FIG. 1.

Secured to the frame 5 are a pair of closely spaced upstanding bracket members 11 having a pivot 12 to support a double acting hydraulic motor or jack 13 which lies between the members 11. The ram-rod 14 of motor 13 is connected by pivot 15 to a bracket 16 which is coupled to a connector bar 17 the lower end 18 of which has a pivot 19 which in turn is coupled to the ram-rod 20 of a double acting hydraulic motor or jack 21. The jack 21 is secured beneath the members 11 being connected therewith by a bracket 22.

The hydraulic jack 13 is provided pivotally to adjust the connector bar 17 sideways as shown in FIG. 1, the extent of movement towards the left being limited by an adjustable stop 23. Similarly the extent of movement towards the right is limited by a member 45. The jack 21 is provided to adjust the connector bar 17 in a vertical direction.

The bar 17 carries a beam 24 to which is secured a clinching member 25. The latter has a front face 26, an under face 28 and an inclined face 27 extending between faces 26, 28.

The general operation of the apparatus illustrated in FIG. 1 will now be explained briefly.

Hydraulic jack 21 having set member 25 in its uppermost position and hydraulic jack 13 having adjusted connector bar 17 about pivot 19 so that the member 25 is in the extreme left-hand position, pressure fluid is supplied

2

to the jacks in controlled manner whereby the clinching member 25 is moved towards the right to engage the upstanding marginal flange 10 with the face 26 and thereafter with the face 27 whereby the upstanding marginal flange is bent over e.g. to an angle of about 45°. Thereafter the member 25 is moved downwardly towards the surface of panel 7 so that the face 28 engages the bent-over flange and presses it downwardly towards the surface of panel 7 and the cradle 6 so that the face 28 engages the bent-over flange and presses it downwardly upon the margin 9 of panel 8 and clinches it thereto.

Referring now to FIG. 2: the hydraulic jacks 13, 21 are controlled by a valve 29 that is actuated by the solenoids 38, 39. Pressure fluid is supplied from a pump 15 (not shown) through a pipe line 30 to the valve 29 and thence to the branch pipes 33, 34 with the result that pressure fluid is supplied to the jacks 13 and 21 at the same time. Branch pipe 33 incorporates a manually adjustable valve 35 e.g. a needle valve while the branch pipe 34 similarly incorporates a manually adjustable valve 36. By suitably adjustably the valves 35, 36 it may be arranged that the rate of supply of pressure fluid to the jacks 13, 21 is performed in a predetermined manner whereby the jack 13 is actuated to carry out the pre-forming operation before the hydraulic jack 21 is brought into operation to perform the clinching operation.

The jacks 13, 21 in the mechanism illustrated in FIG. 2 are connected to a pipe 37 which, through valve 29, leads to the drain pipe 31.

A manual switch 41 is provided in a circuit comprising the solenoid 38 and a source of electric supply 40 and similarly a switch 42 is connected in circuit with the solenoid 39 and the supply 40. When the manual switch 41 is closed the solenoid 38 is energised whereby the valve 29 is set in the position indicated in FIG. 2. The switch 42 is actuated by the ram-rod 20 or another moving part of the hydraulic jack 21, the arrangement being that when the clinching member 25 has fully performed its operation the switch 42 is automatically actuated to energise the solenoid 39 whereby the valve 29 is adjusted so that pressure fluid is supplied from the pump through the pipes 31 and 37 to the jacks 13 and 21 to retract the clinching member 25. At the same time fluid from the jacks 13, 21 is permitted to escape to drain through the branch pipes 33, 34 and through the pipe 30.

It will therefore be appreciated that with the arrangement of FIG. 2 the jacks 13, 21 are simultaneously actuated.

Consider now FIG. 3—the jacks 13, 21 are controlled by the valve 29 which is actuated by the solenoids 38, 39 under the control of the switches 41, 42 as already described with reference to FIG. 2. In this arrangement, however, the branch pipe 34 leading to the jack 21 incorporates a valve 43 which is adjustable by a pressure-sensitive device 44. The pressure-sensitive device is exposed to the pressure of the fluid in the pipes 32, 33.

When pressure fluid is delivered through the pipes 32, 33 to the jack 13 to carry out the pre-forming operation the valve 43 remains closed whereby the jack 21 is inoperative. Upon completion of the pre-forming operation the bar 17 engages the member 45 and is held against further movement. Consequently as fluid continues to be delivered through the valve 29 to the pipes 32, 33 the pressure rises and being communicated to the device 44 actuates the latter to adjust the valve 43 whereby pressure fluid is delivered through the branch 34 to the jack 21 so that a clinching operation is carried out.

Instead of mounting member 25 for pivotal movement at 19 it may be on a horizontal slide which is actuated by jack 13 the slide also carrying the bracket 22 and the jack 21.

With this arrangement the beam 24 may be carried

3

from a bracket on the slide by parallel links, the jack 21 moving the beam through a link connecting the ram-rod 20 with the beam.

I claim:

1. Clinching apparatus comprising a frame, cradle means on the frame to station a sheet metal panel presenting a surface and a marginal flange upstanding from the surface, a first fluid pressure actuated ram means arranged on said frame to exert its thrust in a first direction substantially normal to the upstanding flange, a second fluid pressure actuated ram means arranged to exert its thrust in a second direction substantially normal to the panel surface, a single tool member connected to both said ram means so as to be advanced by said first ram means in said first direction to effect a pre-forming operation bending the upstanding flange to an acute angle to the panel surface and by said second ram means in said second direction to effect a clinching operation clinching such pre-formed flange towards the panel surface, a fluid pressure circuit including separate supply lines through which said ram means are actuated from a common fluid-pressure source, and sequence control means associated with said circuit to automatically ensure completion of the pre-forming operation before the clinching operation can be effected.

2. Clinching apparatus according to claim 1 wherein said control means includes a manually adjustable valve in the supply line to said second ram means thereby to

4

control the relative rates of simultaneous movement of both said ram means.

3. Clinching apparatus according to claim 1 wherein said control means comprises a pressure-sensitive valve in the supply line to said second ram means adapted to open upon a predetermined pressure rise in the supply line to said first ram means, an abutment in the path of said tool member causing such pressure rise on completion of the pre-forming operation thereby to actuate said second ram means.

4. Clinching apparatus according to claim 1 wherein said fluid pressure circuit further includes a common supply and drain valve feeding the supply lines, and means is provided to actuate said common valve automatically to re-set both said ram means upon completion of the clinching operation.

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