

Aug. 4, 1964

T. F. TRIBE
CLINCHING APPARATUS

3,143,095

Filed Aug. 23. 1961

2 Sheets--Sheet 1

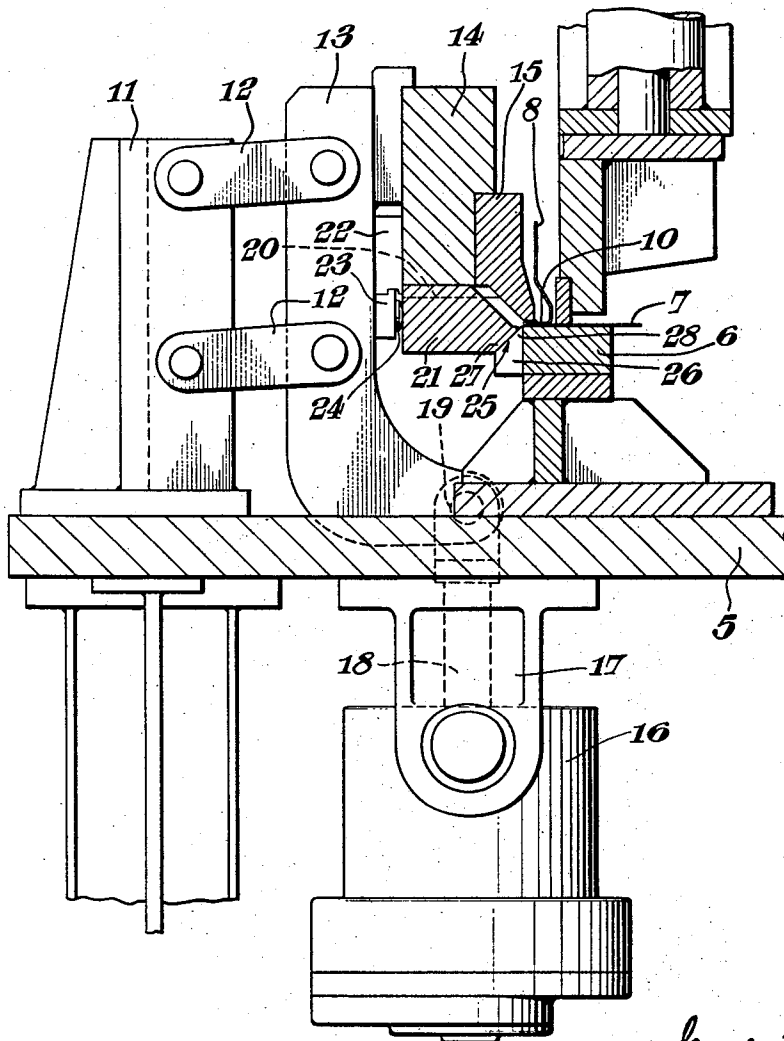


Fig. 1.

Inventor
Thomas F. Tribe

By Kemmer, Palmer, Stewart & Estabrook
Attorneys

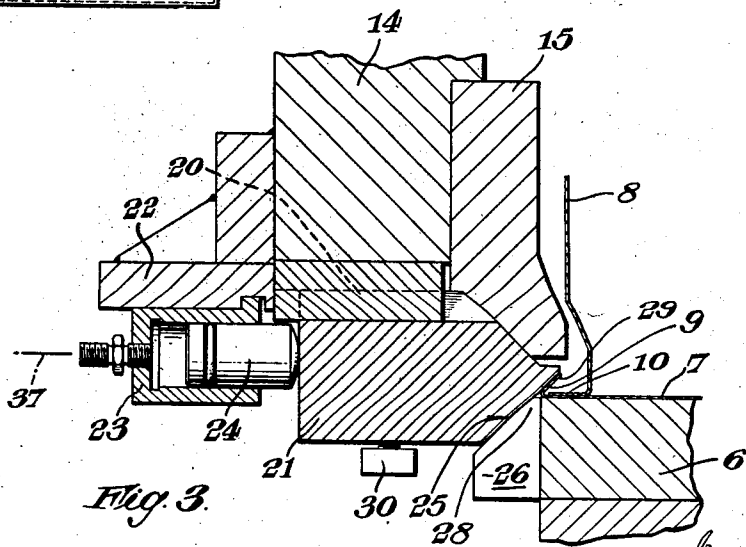
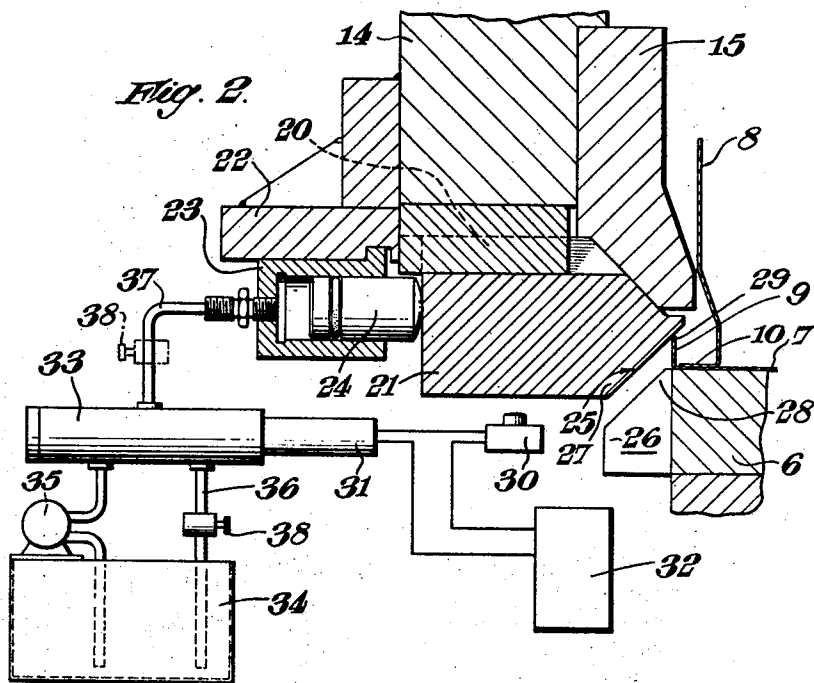
Aug. 4, 1964

T. F. TRIBE

3,143,095

Filed Aug. 23, 1961

2 Sheets-Sheet 2



28  Inventor
Thomas F. Tribe
By Kenyon, Palmer, Stuart & Estabrook
Attorneys

1

3,143,095

CLINCHING APPARATUS

Thomas Francis Tribe, Castle Mill Works, Dudley, England, assignor of one-half to British Federal Welder and Machine Company Limited

Filed Aug. 23, 1961, Ser. No. 133,364

Claims priority, application Great Britain Aug. 30, 1960
4 Claims. (Cl. 113—54)

This invention concerns apparatus for bending over and clinching the upstanding marginal flange of one sheet metal panel (e.g. the outer panel of a vehicle door) over the margin of another sheet metal panel (e.g. the inner panel of the door).

According to this invention the bending-over (or pre-forming) operation and the clinching operation are performed in sequence by a pre-forming member and a clinching member respectively each of which is movable towards and away from the margin of the sheet metal panel to be clinched, the pre-forming member being movable with the clinching member and is also movable, independently of the clinching member, in a direction substantially normal to the direction of movement of said member for performing the pre-forming operation.

A practical application 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 of the apparatus at the end of the clinching operation,

FIG. 2 is a view of a part of the apparatus of FIG. 1, to a larger size, at the commencement of the pre-forming operation, and

FIG. 3 is a view similar to FIG. 2 showing the apparatus on completion of the pre-forming operation.

Referring to FIG. 1: the apparatus comprises a frame 5 on which is mounted a bed or cradle 6 upon which the panels 7, 8 are placed one upon the other. As more particularly shown in FIG. 2 the lower panel 7 has an upstanding marginal flange 9 which is to be bent inwardly to overlie the margin 10 of the upper panel 8. This is the pre-forming operation referred to above. Thereafter the pre-formed flange 9 is pressed down upon the margin 10 and clinched thereto. The pre-forming operation is completed before the clinching operation is commenced.

Reverting to FIG. 1: a pillar 11 is mounted on frame 5 and carries a pair of parallel links 12 which are directed substantially horizontally towards the cradle 6. A connector bar 13 is carried by links 12, the latter being pivoted to the pillar 11 and to the bar 13 for vertical movement. A beam 14 is carried by the bar 13 and in turn supports a clinching member 15.

A hydraulic motor, in the present example in the form of a jack 16, is pivoted to a bracket 17 descending from the frame 5 and the ram-rod 18 of the jack 16 is pivotally connected to the bar 13, at 19.

The under surface of the beam 14 is provided with transverse slideways 20 (FIG. 2) to carry the pre-forming member 21 and there is a carrier 22 secured to the beam 14 to support a hydraulic motor in the form of a jack 23, the ram 24 of which engages the rear face of the member 21. The hydraulic jack 23 moves the member 21 cross-wise of the beam 14 and normal to the direction of movement of the beam, i.e., horizontally in contradistinction to the vertical movement of the beam 14 and clinching member 15.

The front of the member 21 is provided with a downwardly inclined face 25. The face is preferably inclined at about 45°. The cradle 6 carries a plurality of spaced blocks 26 each having a surface which is correspondingly inclined to the face 25. It is arranged that when the beam 14 is fully raised and the member 21 is fully

2

advanced by the hydraulic jack 23 (i.e. is in its extreme right-hand position) the heel 27 of the face 25 overlies at least the upper edges 28 of the blocks 26 with the result that if member 21 is lowered face 25 co-acts with blocks 26 whereby member 21 is retracted, i.e., moved towards the left.

The apparatus may be used in two ways of which the preferred function is illustrated in the accompanying drawings.

While the beam 14 is in its uppermost position the member 21 is fully advanced by the jack 23. Thereafter hydraulic jack 16 is actuated to lower the beam 14. Accordingly the members 15, 21 are moved downwardly at the same time. The member 21 is thus brought to the position shown in FIG. 2 wherein the face 25 of member 21 engages the upper edge 29 of flange 9 and with continued downward movement of beam 14 the flange 9 is bent by the inclined face 25 to overlie the margin 10 of panel 8—see FIG. 3. When the pre-forming operation is completed the face 25 engages the blocks 26.

Immediately on completion of the pre-forming operation the member 21 actuates an electric switch 30 connected in circuit with a solenoid 31 and a source of electric supply 32. Actuation of switch 30 energises solenoid 31 to adjust the valve 33. Hydraulic fluid from the tank 34 is supplied by a pump 35 through the valve 33 to the jack 23 and the valve 33 also controls flow of hydraulic fluid to the tank 34 through a drain pipe 36.

When the valve 33 is suitably adjusted fluid under pressure is supplied to the jack 23 to advance the member 21 as above described. When the solenoid 31 is de-energised the valve 33 is set so that fluid escapes from the jack 23 to the tank 34 through the drain pipe 36.

It will be noted that the jack 23 is connected to the valve 33 by a supply pipe 37.

With further downward movement of the beam 14 from the position shown in FIG. 3 the face 25 co-acts with blocks 26 to retract the member 21 and the jack 23 being connected to drain this movement is not impeded. When retraction of the member 21 has commenced the clinching member 15 engages the bent-over flange 9 and with continued downward movement of beam 14 by the jack 16 the flange 9 is pressed down and clinched. At this time the pre-formed member continues to be retracted. The apparatus on completion of the clinching operation is shown in FIG. 1.

Thereafter the beam 14 is raised whereby switch 30 is actuated to de-energise solenoid 31 whereby valve 33 is positioned so that pressure fluid is supplied by pump 35 to the hydraulic jack 23.

A manually adjustable needle-valve 38 may be provided in either pipe 37 or pipe 36 but preferably in pipe 36. The valve 38 is adjusted to control the rate at which hydraulic fluid is allowed to escape from the jack 23.

A relief valve may be provided in pipe 37 to enable escape of hydraulic fluid from the jack 23 in the event that the valve 33 does not function satisfactorily.

Although the valve 33 is preferably actuated electrically it may alternatively be operated mechanically, pneumatically, or hydraulically.

In the second way in which the apparatus described may function the member 21 is in retracted position when the beam 14 is in its uppermost position and as beam 14 is lowered the member 21 is advanced. The pre-forming operation is performed as the member 21 is moved downwardly and is simultaneously moved to the right and on completion of the pre-forming operation the face 25 engages the blocks 26 in the manner described above. Thereafter the valve 33 connects the jack 23 to drain so that the clinching operation may be performed in the manner described above.

It will be appreciated that the sequence of operations

3

may be a combination of the two main functions described above. Another alternative is to advance the member 21 to bend over the flange 9 while the beam 14 is stationary and thereafter the beam 14 is lowered to perform the clinching operation. The member 21 is retracted prior to the commencement of the clinching operation, preferably in the manner indicated above.

Because the retraction of the pre-forming member is determined by the downward movement of the clinching member 15 it can be ensured that there is no delay (or the delay is reduced to a minimum) in changing over from the pre-forming operation to the clinching operation. In this way the time involved in performing the entire operation is relatively small.

The jack 23 may be connected to an accumulator, the fluid being forced from the jack to the accumulator as the member 21 is retracted. Similarly, if the member 21 is advanced by a pneumatic jack the compressed air may be forced back into the pneumatic system (or an accumulator) on retraction of member 21. Of course alternatively a pneumatic jack for advancing member 21 may be used with a valve 33 as described above.

Also the beam 14 may be raised and lowered in any suitable manner instead of by a hydraulic jack e.g. mechanically or pneumatically.

I claim:

1. Clinching apparatus comprising a frame, a clinching member mounted on said frame, means to move said clinching member towards and away from a panel surface, a pre-form member movably mounted on said clinching member, fluid-pressure means to advance said pre-form

4

member substantially normally towards an upstanding marginal flange of the panel to bend such flange to an acute angle to the panel surface, a stationary part on said frame to retract the advanced pre-form member prior to engagement of said clinching member with the pre-formed flange, and automatic control means associated with said fluid-pressure means to release fluid-pressure during the movement of said clinching and pre-form members towards the panel surface.

2. Clinching apparatus according to claim 1 wherein said fluid-pressure means includes pre-form actuating means and valve means to regulate supply of working fluid to and from said actuating means and said control means permits escape of fluid through said valve means at a pre-selected position during the movement of said clinching and pre-form members towards the panel surface.

3. Clinching apparatus according to claim 2 wherein said control means includes a solenoid to adjust said valve means and an electric switch in the solenoid circuit operated automatically at the pre-selected position by the movement of said clinching and pre-form members.

4. Clinching apparatus according to claim 2 wherein said fluid-pressure means includes further valve means manually adjustable to control the rate of escape of working fluid.

References Cited in the file of this patent

UNITED STATES PATENTS

1,961,582 Eksergian June 5, 1934