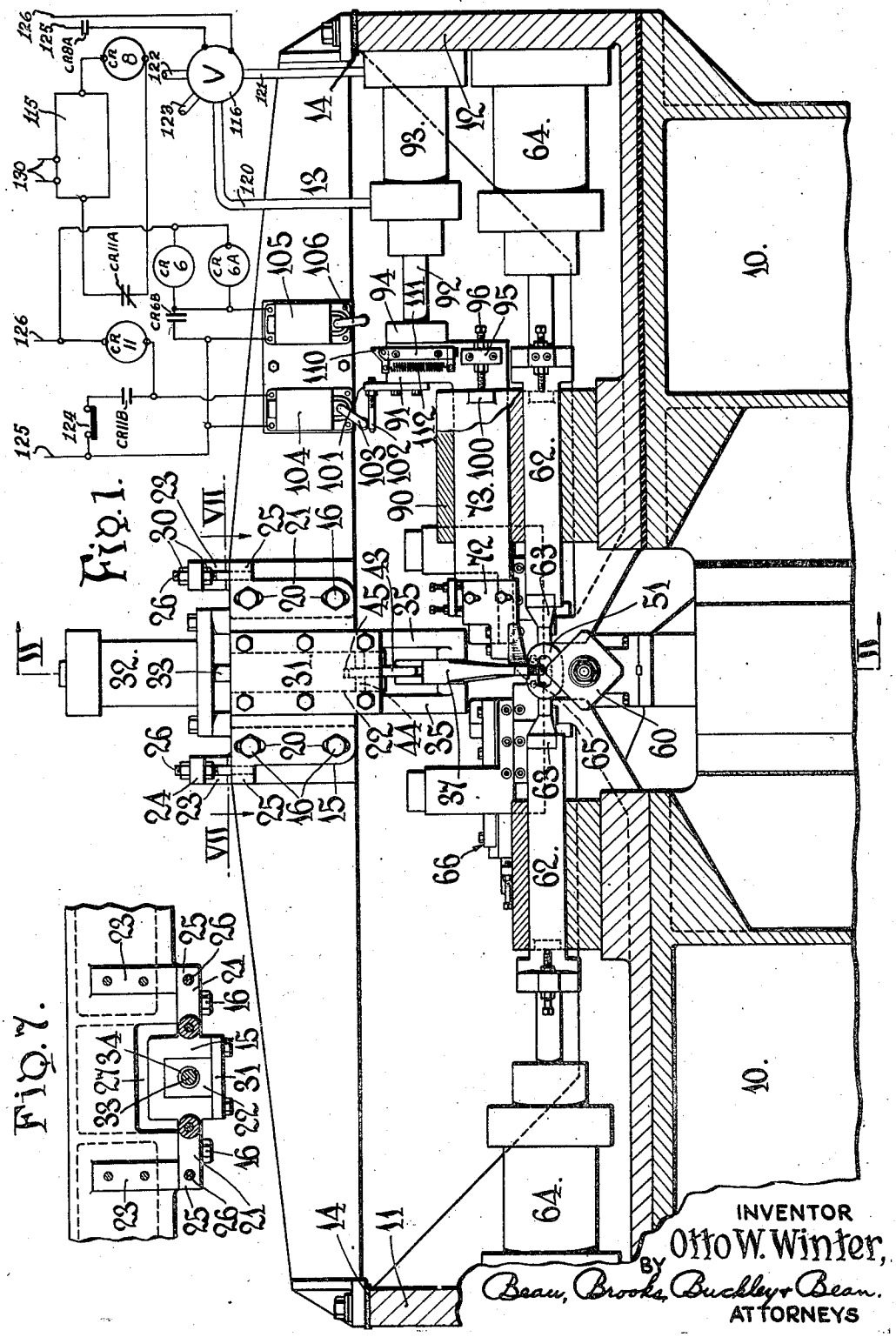
April 10, 1945. O. W. WINTER 2,373,440

MEANS FOR FINISHING WELDED JOINTS

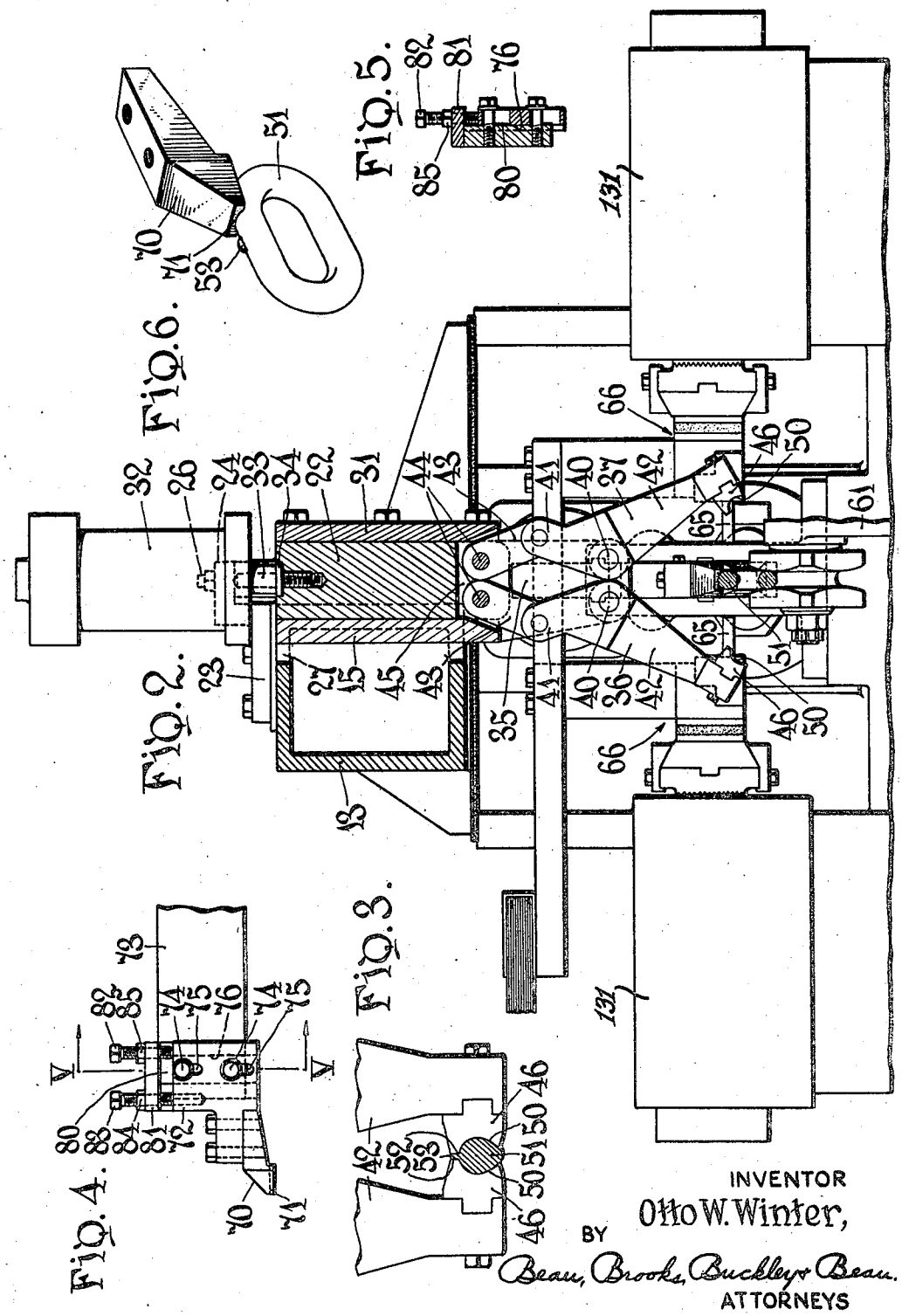
Filed Dec. 3, 1941 2 Sheets-Sheet 1



April 10, 1945. O. W. WINTER 2,373,440

MEANS FOR FINISHING WELDED JOINTS

Filed Dec. 3, 1941 2 Sheets-Sheet 2



Patented Apr. 10, 1945

2,373,440

UNITED STATES PATENT OFFICE

2,373,440

MEANS FOR FINISHING WELDED JOINTS

Otto W. Winter, Grand Island, N. Y., assignor to Columbus McKinnon Chain Corporation, Tonawanda, N. Y., a corporation of New York

Application December 3, 1941, Serial No. 421,481

1 Claim. (Cl. 59—30)

As is well known to those skilled in the art, in the welding of chain links, the ends adjacent the joint are heated by electricity and when the metal in such ends reaches a welding temperature the ends are forced together by pressure produced at each end of the link. As the weld is completed there is a protuberance around the joint formed by the exuded metal and it is the practice to squeeze this fin or protuberance downwardly from the outside so as to produce a swell in the stock opposite the joint on the inside of the link. I find, however, that the condition of the metal at the joint is very much improved by swaging or forging the weld by repeated hammering while still hot.

The principal object of my invention has been therefore to provide a swaging device for compacting forging the metal from opposite sides of the link after the weld is completed.

Another object has been to provide a device of the nature which may be hydraulically operated.

Furthermore, my device is so designed that the swaging dies may be accurately adjusted so as to produce the desired formation at the joint of the link.

Moreover, my invention contemplates the use of a shearing tool for removing the tab remaining at the joint as a result of the swaging operation.

The above objects and advantages have been accomplished by the device shown in the accompanying drawings, of which:

Fig. 1 is a front face view of a welding machine embodying my invention;

Fig. 2 is an enlarged, fragmentary, sectional elevation taken on line II—II of Fig. 1;

Fig. 3 is an enlarged, fragmentary view of the swaging anvils in their operating positions;

Fig. 4 is an enlarged, fragmentary view of the shearing mechanism;

Fig. 5 is a sectional view of the same taken on line V—V of Fig. 4;

Fig. 6 is an enlarged, perspective view showing the shearing tool of my device; and,

Fig. 7 is a fragmentary, sectional, plan view taken on line VII—VII of Fig. 1.

The base of the device to which my invention is applied is represented at 10. This base is formed at its ends with upstanding flange members 11 and 12 to which the swage bracket 13 of my device is secured. This swage bracket is supported by the flange members and is insulated therefrom by insulation strips 14.

The swage bracket supports the swage guide 15 which is secured to the face of the bracket by means of bolts 16 which pass through slots 20 formed in the flanges 21 of the guide. The guide supports a toggle link block 22 in slidable manner and the guide is preferably set into a slot 27 formed in the face of the bracket. At each side of the swage guide, the swage bracket is formed with an adjusting bracket 23 which has an offset end 24 overhanging a flange portion 25 formed on the swage guide. An adjusting bolt 26 passes through the offset end of each of the adjusting brackets and passes into the flange 25 of the guide. An adjusting nut 30 is disposed on each bolt 26 and arranged on each side of each of the offset ends 24, whereby the guide may be raised and lowered for purposes of adjustment.

The toggle link block 22 is held in place within the swage guide by means of a swage guide cap 31. Arranged over the toggle link block is the swage cylinder 32 which is of the hydraulic type operated by suitable fluid under pressure and provided with a piston rod 33. This piston rod is connected to the toggle block by means of a connecting screw 34 whereby reciprocation of the block is brought about by fluid supplied to the cylinder.

The swage guide is provided with two interspaced and downwardly extending arms 35 to the lower end of which are pivotally secured the swage arms 36 and 37. Each of these swage arms is mounted upon a swage arm bolt 40 which is supported by the arms 35 of the guide. Each swage arm has an upper leg 41 and a lower leg 42. The upper leg of each of the swage arms is pivotally attached to the free end of a toggle link 43, the upper ends of such links being secured to the toggle link block 22 by means of pivot pins 44. The links 43 are disposed within a slot 45 formed centrally of the block. The lower legs 42 of the swage arms are each provided with an anvil 46, each formed on its inner face with a curved-shaped surface 50 so proportioned as to bring the sides and top surfaces of the link 51 to substantially the body diameter of the link when finished. The lower portions of the curved surfaces 50 provide for the metal which is swaged downwardly and thus form it into an inner swell at the point in the joint which faces the interior of the link. The adjacent flat surfaces 52 of the anvils preferably do not contact so that the full impactive action of the anvils will be directed onto the heated metal. An upwardly extending tab 53 is thereby formed on the link between the faces 52 of the anvil which is subsequently removed by a trimmer to be hereinafter described.

The chain link 51, which for convenience is shown as separated from the other links, is sup-

ported by means of the usual feed wheel 60 which is rotatably mounted in a bracket 61 and operated in intermittent manner by any suitable means not shown or described in this application, since it does not form part of the invention covered thereby. The usual upset bars 62 are likewise provided, each of which has an upset tool 63 which contacts with the ends of the link and serves through the medium of suitable hydraulic cylinders 64 to push the ends of the link together, thus closing up the joint and completing the weld after the application of heat. Heat is applied in machines of this type by electricity through the medium of electrodes 65 which are carried by electrode holders 66 and moved by means of an electrode cylinder 131 in sequence with the other portions of the device to contact the ends of the link adjacent the joint, whereby a strong current of electricity may be passed therethrough. These electrodes together with their mountings do not form a part of this application and are, therefore, not shown and described in detail.

As above pointed out, after the swaging of the joint is completed following the welding thereof, a tab 53 extending longitudinally of the link remains on the outer surface of the link. In order to remove this tab and to provide a smooth exterior surface on the finished link, I provide a shearing tool 70. The tool is provided with a cutting edge 71 which, as shown in Fig. 6, is curved so as to substantially fit the exterior surface of the finished link and to shear off the tab at a radius substantially equal to and flush with the exterior surface of the stock surrounding the same.

The shearing tool is carried by a tool holder 72 which is secured to the outer end of a shear bar 73. The tool holder is secured to the bar by means of bolts 74 which pass through slots 75 formed in the holder. The holder is provided with a recess 76 which engages with a vertically arranged ridge 80 formed on the end of the bar whereby it is guided in its vertical movement. An adjusting plate 81 is secured to the upper edge of the shear bar and overhangs the recess in which the holder is mounted. An adjusting screw 82 is carried by this plate. The screw is screwthreaded through the plate and extends down into contact with the upper surface of the holder. A lock screw 83 is also provided which passes freely through the adjusting plate and is screwthreaded into the holder. A nut 84 is carried by the lock screw whereby the screw may be raised and lowered so as to raise and lower the holder. The adjusting screw 82 may be used only to lower the holder to effect sensitive adjustment and to hold it in its adjusted position, a lock nut 85 being provided to set the adjusting screw in its final adjustment. The shear bar 73 is slidably mounted in guides 90 supported by the base of the machine. The shear bar is provided at its rear end with an upstanding arm 91 to which the piston rod 92 of the hydraulic cylinder 93 is connected by means of a connector 94. The cylinder 93 is secured to the flange member 12 carried by the base and is supplied with fluid under pressure in well known manner. A stop 95 is carried by the arm 91 of the shear bar and this stop has an adjusting screw 96 which is brought into engagement with a stop lug 100 carried by the guide 90 whereby the forward movement of the shear bar may be limited. Carried by the upstanding arm 91 of the shear bar is a shear switch plate 101 which carries at its upper end a stud 102 that engages with the arm 103 of the shear switch 104. This shear switch is carried by the swage bracket 13 and is closed through the medium of the stud 102 when the shear tool has reached the forward limit of its movement. Another control switch 105 is also carried by the swage bracket 13 and its arm 106 is engaged by a trip dog 110 on the backward movement of the shear bar. This trip dog is carried by a dog holder 111 which is secured to the side face of the arm 91 of the shear bar. The trip dog is held normally in the position shown in Fig. 1 by means of a helical spring 112. On the forward movement of the shear bar the inclined face of the trip dog will ride under the arm 106 against the tension of the spring 112 without operating the switch. As just above described, however, the switch arm 106 will be operated by the trip dog on its reverse movement.

The hydraulic cylinders shown and described in this application are controlled by solenoid-operated valves through the medium of suitable switches. Since the cylinders, solenoid valves and switches are standard articles of manufacture, they are not shown or described in detail. It should be noted, however, that the swage cylinder 32 is operated through suitable means in intermittent manner so that a rapid swaging or hammering action is brought about upon the heated joint of the link during the operation of the swaging anvils. The intermittent operation of the swage arms may be brought about by any suitable relay timing device such as, for instance, the time relay delay mechanism manufactured by the General Electric Company.

In Fig. 1, I have shown in diagrammatic manner the relays controlled by the shear switch 104 and control switch 105, together with a hydraulic control valve and suitable electric circuits for connecting these various parts. In this figure a time delay relay is indicated at 115. A solenoid operated valve indicated at 116 controls the supply of fluid to the cylinder 93 over conduits 120 and 121. Conduit 120 is connected to the piston rod end of the cylinder 93, and conduit 121 is connected with the head end thereof. This valve, which is retained in normal position by spring means, is provided with an inlet conduit 122 which is connected to a suitable source of supply or a pump (not shown) and a conduit 123 is also provided for conducting fluid from the cylinder back to the reservoir (not shown). I also show in diagram a limit switch 124 which is actuated by the upset bars 62 when said bars are withdrawn backwardly to the limit of their return stroke. Leads 125—125 and 126—126 carry electricity from a suitable source of supply.

In the operation of my device through the medium of he apparatus and circuits diagrammatically shown in Fig. 1, current is supplied to the time delay relay 115 over leads 130 from a suitable source of current and controlled by another part of the welding machine operated in sequence with the swaging dies, but forming no part of this invention. When the relay 115 is energized, the operating coil of relay CR8 is also energized. When the operating coil of CR8 is energized it energizes the spring loaded hydraulic solenoid valve 116 and operates the valve to supply fluid under pressure to the head end of the shear cylinder 93. When fluid is supplied to this end of the cylinder, the piston rod 92 is moved forwardly thus operating the shearing mechanism. As the rod moves forwardly the end of the stud 102 engages the arm 103 of the shear switch 104 and closes the normally open contacts of this

switch. The closing of these limit switch contacts completes a circuit to energize relay CR11. A normally closed contact CR11A of this relay is thus opened, and since this contact is in series with the operating coil of relay CR8, the solenoid of the valve 116 will be de-energized through the normally open contacts CR8A of this relay. This solenoid, being spring loaded, returns the hydraulic valve to its normal position, in which position fluid under pressure is admitted to and maintained in the rod end of the cylinder, thus returning the shear cylinder piston rod 92 to its inoperative position where it is maintained by the fluid pressure. In order to prevent the shearing mechanism from being operated more than once during each cycle, a holding contact CR11B is provided on relay CR11. As the piston rod 92 of shear cylinder 93 moves backwardly, the dog 110 will engage a trip arm 106 of switch 105 thus serving to close the normally open contacts of this switch. The closing of the contacts of switch 105 causes relays CR6 and CR6A to be energized. These relays are provided with suitable contacts (not shown) and they control the operation of electrode holders 66 and the upset bars 62. These relays are not further described in detail since they do not form a part of this invention. However, holding contacts CR6B are provided which maintain the relays CR6 and CR6A energized throughout their period of operation. The limit switch 124 is actuated by the upset rods 62 when they are returned by their actuating cylinders 64. This switch 124 is in series with the holding contact CR11B of the relay CR11 so that when it is opened by the return of the upset bars, it will cause the de-energization of the relay CR11.

The above shearing operations are carried out after the swaging operation is completed, and while the link is still being held between the upset bars. The shearing tool is carried forward over the link and in engagement with the tab 53, whereby the tab is smoothly sheared to substantially the exterior contour of the link.

It will be obvious from the foregoing that when I use the term swaging, I do not mean simply a squeezing action upon the metal of the joint, but a rapid hammering or forging action which, as heretofore pointed out, decidedly improves the texture of the material of the joint.

Obviously, some modifications of the details herein shown and described may be made without departing from the spirit of my invention or the scope of the appended claim, and I do not, therefore, wish to be limited to the exact embodiment herein shown and described, the form shown being merely a preferred embodiment thereof.

Having thus described my invention, what I claim is:

The combination with a chain welding machine wherein each link is formed at the welded joint with an enlargement, of means for swaging said enlargement in the pre-welded joint to form an inner swell, said means comprising two oppositely arranged swaging anvils, means for mounting said anvils for producing a rapid impactive action simultaneously upon the opposite sides of the joint, fluid actuated means for intermittently operating said anvils at a velocity sufficient to provide a hammering action upon the metal at the welded joint and thereby form a tab on the outside of the link, a slidably mounted shear tool having a concave cutting edge engageable with the exterior surface of the link to shear the said tab therefrom, and hydraulic means for rapidly operating said shear tool.

OTTO W. WINTER.