

Aug. 9, 1966

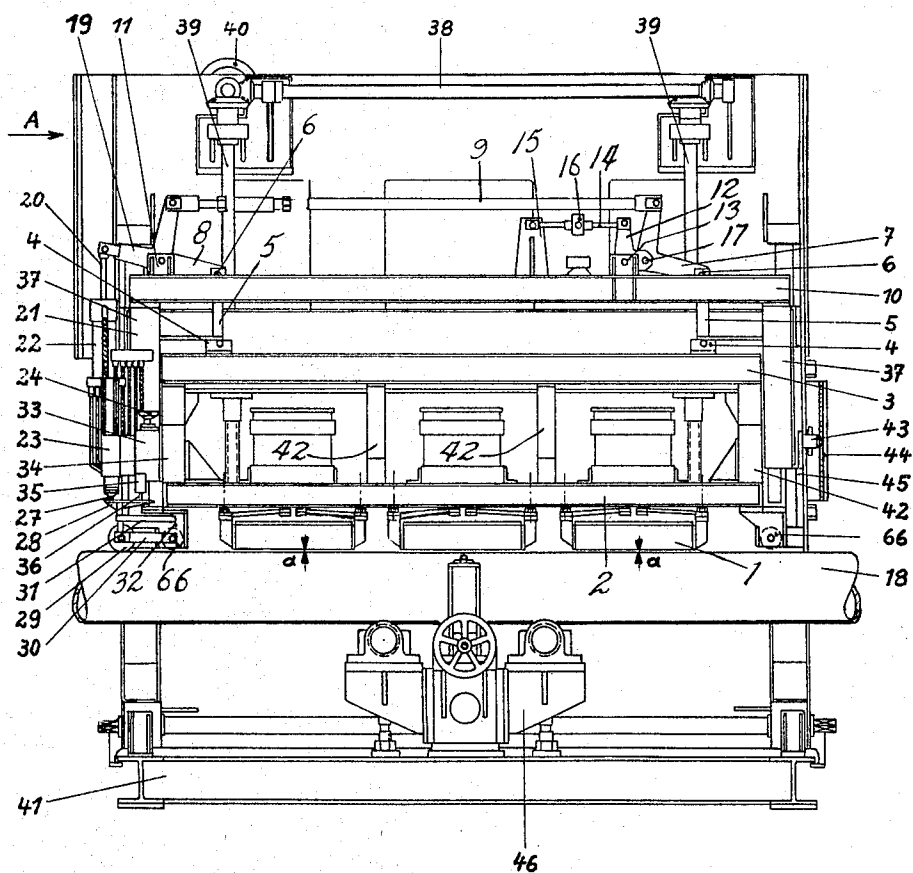
D. GRUBE ETAL
MACHINES FOR ANNEALING THE WELDED SEAMS OF LONGITUDINALLY
WELDED TUBES

3,265,378

Filed Dec. 29, 1964

3 Sheets-Sheet 1

Fig. 1



Aug. 9, 1966

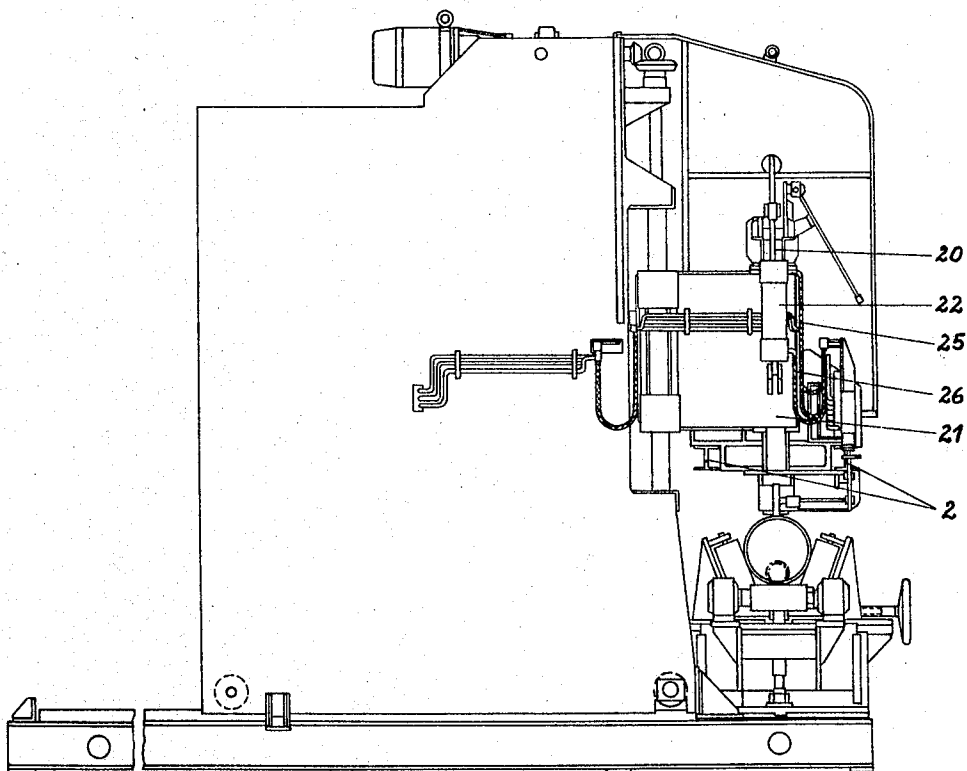
D. GRUBE ETAL
MACHINES FOR ANNEALING THE WELDED SEAMS OF LONGITUDINALLY
WELDED TUBES

3,265,378

Filed Dec. 29, 1964

3 Sheets-Sheet 2

Fig. 2



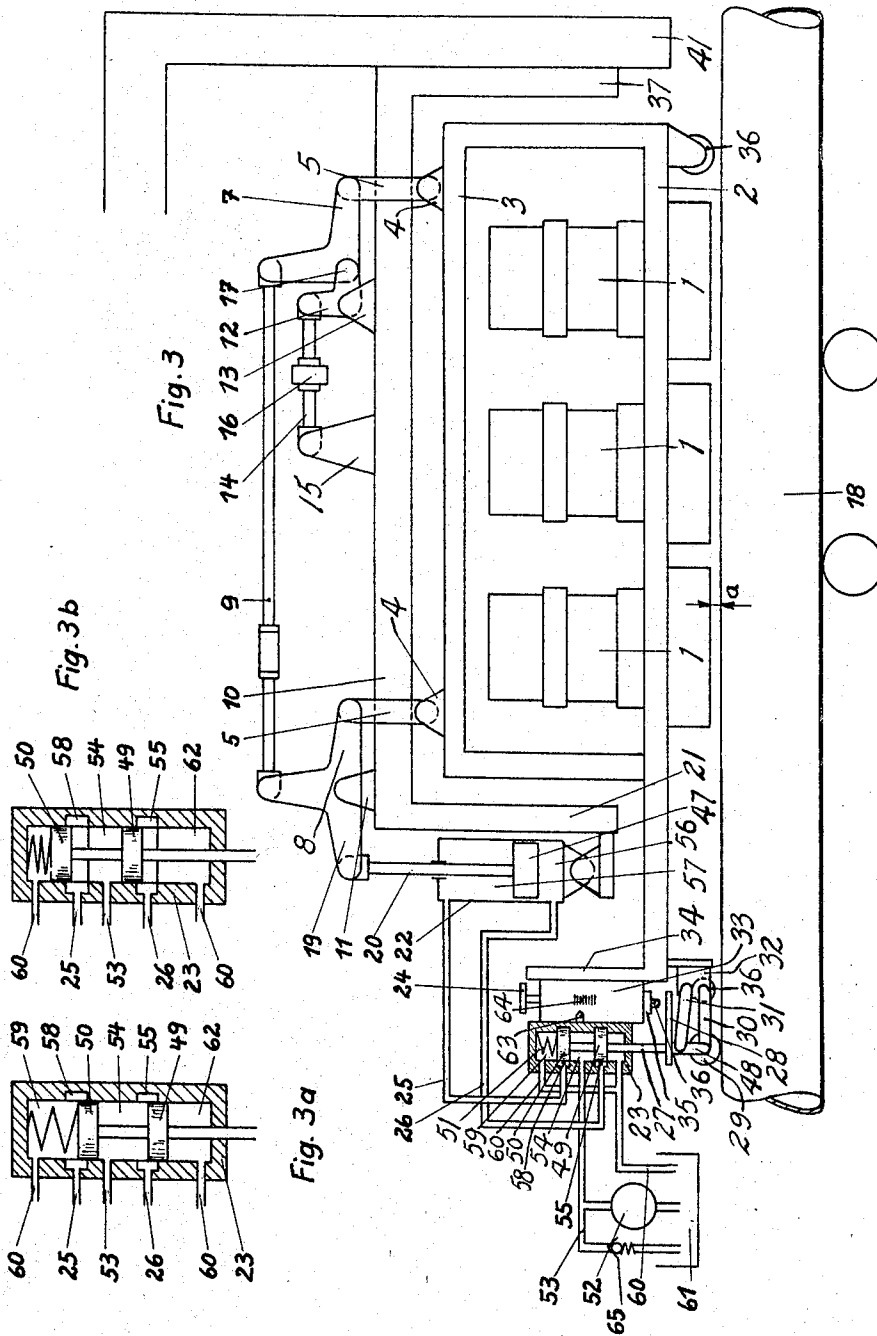
Aug. 9, 1966

1966 D. GRUBE ETAL 3,265,
MACHINES FOR ANNEALING THE WELDED SEAMS OF LONGITUDINALLY
WELDED TUBES

3,265,378

Filed Dec. 29, 1964

3 Sheets-Sheet 3



3,265,378

MACHINES FOR ANNEALING THE WELDED SEAMS OF LONGITUDINALLY WELDED TUBES

Dietrich Grube, Ratingen-Tiefenbroich, Karl Warnke, Dusseldorf-Reisholz, and Franz Sommerfeld, Neuss, Germany, assignors to Schloemann Aktiengesellschaft, Dusseldorf, Germany

Filed Dec. 29, 1964, Ser. No. 421,829

Claims priority, application Germany, Feb. 25, 1964, 34,703

8 Claims. (Cl. 266—5)

This invention relates to a welded-seam annealing machine for longitudinally welded tubes. The annealing device here employed consists in general of a number of inductors secured in a frame. For the equalisation of the welded joint the tube is guided along at a definite speed and at a definite distance beneath the inductors. To enable the requisite distance of the inductors from the welded seam to be accurately maintained, the fastening frame has hitherto been provided with vertically adjustable wheels, bearing upon and rolling upon the tube. According to the adjustment of the height of the wheels with respect to the attachment frame the distance between the inductors and the tube is made greater or less.

This known arrangement and construction of the annealing device has the disadvantage that it is carried by the tube moving along beneath it, and therefore the running wheels, owing to excessive heating from running on the tube, have to be continuously cooled. As a result, not only is the annealing effect impaired, but the current induced by the inductors is also affected by the wheels rolling on the tube. Finally, by the carriage-like fastening frame, inspection of the inductors is hindered, and control of the distance between the inductors and the welded seam is rendered difficult.

The object of the invention is to provide a machine for annealing welded seams in pipes, wherein the welding device, instead of being carried by the pipe guided along beneath it, is carried by the housing of the welded-seam annealing device itself, and wherein the distance of the inductors from the pipe weld can be established by simple controlling means.

According to the invention this result is attained by the feature that the inductors that give rise to the annealing action are secured in a frame suspended from a system of swinging levers, the lever system being in operative connection with one or more double-acting pressure pistons, the position of which in the cylinder can be regulated in dependence upon the distance of the annealing device from the welded seam of the tube.

The regulating of the supply of pressure fluid to the pressure piston or pistons may advantageously be effected by means of a control valve that can be influenced by a key.

An important simplification of the controlling device is yielded if the control valve, with the key, forms a common structural member so arranged on the frame of the annealing device as to be adjustable in height. By this vertically adjustable arrangement of the control valve forming with the key a common structural member, any desired distance of the inductors from the welded seam of the tube is adjustable in a simple manner. In order that the key of the control valve may not itself come into contact with the tube, it co-operates with a roller pivotally connected with the frame of the annealing device and running upon the longitudinally welded seam of the tube, in such a way that a table secured to the shaft of the roller or to its pivotal connection with the frame forms the operative surface thereof. This table may advantageously co-operate simultaneously with a disconnecting switch for the inductors, as soon as the distance thereof from the tube weld falls below a minimum value.

In a further development of the invention, the lever system forming the suspension for the annealing device consists of two levers coupled together and fulcrumed in a frame the height of which is adjustable, one of these levers being coupled to a piston which can be supplied with fluid under pressure on both sides, and the pressure cylinder of which is secured to the frame adjustable in height. This particularly simple construction of the suspension has the special advantage that the position of the pressure piston in the cylinder forms directly a measure of the distance of the inductors from the tube weld. In order that it may be possible to adjust the annealing device parallel to the tube weld, the fulcrum of one of the levers is so arranged in the frame as to be adjustable in height.

One embodiment of a welded-tube annealing machine according to the invention is illustrated by way of example in the accompanying drawings, in which:

FIGURE 1 shows a side view of the machine;

FIGURE 2 shows a front view looking in the direction of the arrow A in FIGURE 1;

FIGURE 3 is a circuit diagram of the invention; and

FIGURES 3a and 3b show on a larger scale a control valve in its lower and upper controlling positions respectively.

The three inductors denoted by 1 are secured in a frame formed from girders 2 and 3. On the girders 3 are arranged bearing blocks 4 for holding members 5, the upper ends 6 of which are pivotally connected with levers 7 and 8. These two levers 7 and 8 are pivotally coupled together by a rod 9. The lever 8 is pivotally mounted on a bearing block 11, secured upon the girders 10. The lever 7 is pivotally mounted upon a lever 12. The lever 12 is supported by a bearing block 13 secured upon the girders 10. The position of the lever 12 is fixed by a rod 14 of variable length, one end of which is pivotally connected with a block 15, likewise secured upon the girders 10. According to the position of a turn-buckle 16, the length of the rod 14 is decreased or increased, and the axis of oscillation 17 of the lever 7 is thereby shifted upwards or downwards, so that the inductors 1 can be adjusted exactly parallel to the welded tube 18.

One arm 19 of the lever 8 is pivotally connected with the piston rod 20 of a pressure cylinder 22, pivotally mounted on a frame member 21. The height of the inductors 1 is thereby directly determined by the position of the piston rod 20. The position of the piston rod 20 is dependent upon the supply of pressure fluid to a pressure piston 47 (FIGURE 3) located in the double-acting cylinder 22. The controlling of the supply of pressure fluid to the pressure piston 47 is effected by a control valve 23, which is arranged on a guiding block 33, and the height of which is adjustable by means of a hand-wheel 24. The guiding block 33 is secured to connecting struts 34, which connect the girders 2 and 3 with one another. In FIGURE 3 the strut 34 is integral with the girder 2.

By pressure pipes 25 and 26, which are arranged between the control valve 23 and upper and lower pressure-cylinder spaces, the pressure piston 47 is supplied with pressure fluid above or below according to the position of the control valve 23. With the control valve 23 in the position shown in FIGURE 3, the pressure piston 47 is not being supplied with fluid on either side, so that its position remains constant. The position of the control valve 23 is affected from outside by a key or valve rod 27, the operative face of which is formed by a table 28, which is connected, by way of a joint member 48, with a roller 29 bearing on the tube 18. The

roller 29 is connected by joint members 30 and 31 with a frame member 32, which forms, with the girders 2, a fixed structural unit. If, owing to inaccuracies in the diameter of the tube for instance, the distance a between the upper edge of the tube, or in other words the longitudinal weld of the tube, and the inductors 1, becomes greater, the table 28, in operative connection with the roller 29, sinks by the same amount. Since the key or valve rod 27 forms a rigid structural unit with the two control pistons 49 and 50 of the valve 23, and the control piston 50 is subjected to pressure by a spring 51, this key 27 always remains in contact with the table 28, and therefore likewise descends with it. Thus the control pistons 49 and 50 are at the same time displaced downwards (FIGURE 3a), so that the middle space 54 of the control valve supplied with pressure fluid by a pump 52 by way of a pressure pipe 53, is in communication with an annular groove 55, and thus, by way of the connecting pipe 26, the lower cylinder space 56 of the cylinder 22 is supplied with pressure fluid. Since, moreover, with a lower position of the control pistons 49 and 50 of the control valve 23, an annular groove 58 in the cylinder 23 is in open communication with the upper space 59 of the control valve 23, the pressure fluid from the upper cylinder space 57 of the cylinder 22 can flow freely back, by way of the connecting pipe 25 and the annular groove 58, into the upper space 59 of the control valve 23, and from there, by way of a pipe 60, into a tank 61, which is at atmospheric pressure, and which at the same time serves as a sump or storage vessel for the pump 52, so that the pressure piston 47, owing to the supply of pressure below it, moves upwards, and thus moves the levers 7 and 8, by way of the piston rod 20, in the direction for a downward movement of the frame members 2 and 3. By this downward movement of the frame members 2 and 3, to which, besides the inductors 1, the control valve 23 is also secured, the key 27 acts in the opposite direction, that is, in the closing direction, upon the control pistons 49 and 50 of the control valve. As soon as the distance a between the tube weld and the inductors 1 is reached again, the control pistons 49 and 50 close the connection between the spaces 54 and 59 and the annular grooves 55 and 58 respectively. The connecting pipes to the lower and upper cylinder spaces 56 and 57 are thus closed again, and the regulating ends.

If the distance a of the tube 18 from the inductors 1 diminishes, the key 27, owing to a corresponding change of distance of the table 28, actuates the control valve 23 in such a manner that the control pistons 49 and 50 move upwards, and thereby establish (FIGURE 3b) a connection of the central pressure space 54 with the annular groove 58, and of the lower space 62 of the valve 23, which is in open communication by way of the connecting pipe 60 with the tank 61, with the annular groove 55. In this position of the control valve 23, the upper space 57 of the cylinder 22, is supplied with pressure fluid by way of the connecting pipe 25, whilst the lower cylinder space 56 is at atmospheric pressure by way of the connecting pipe 26, the annular groove 55, the lower space 62 of the control valve 23, and the pipe 60, so that the pressure fluid located in this cylinder space can flow back into the tank 61. The pressure piston 47, and the piston rod 20 connected with it, therefore execute a downward movement, whilst the lever system 7, 8 brings about an upward movement of the frame members 2 and 3, with the inductors 1. Since the control valve 23 is thus likewise raised with them, the annular grooves 55 and 58 and the control pistons 49 and 50 execute relatively to one another a closing movement. As soon as their closed position, determined by the distance a , is reached, the connecting pipes 25 and 26 to the cylinder spaces 56 and 57 are shut off, and the regulating operation is interrupted, until the distance a between the tube 18 and the inductors 1 changes again. In the closed position of the control valve 23, the pressure liquid delivered by the pump 52

flows back into the tank 61 by way of the pipe 53 and a non-return valve 65.

If a distance different from the distance a is to be maintained between the tube 18 and the inductors 1, this is obtained by appropriately adjusting the height of the control valve 23 by means of the hand-wheel 24. By shifting the control valve 23 downwards by rotating the hand-wheel 24, the distance a is increased, and by shifting it upwards the distance is diminished. The distance can be read off by means of a pointer 63 on a scale 64 attached to the guiding block 33.

On the guiding block 33 is at the same time provided a disconnecting switch 35 for the inductors 1, the tripping pin 36 of which likewise co-operates with the table 28. As soon as the inductors 1 sink below the minimum permissible distance a , the switch 35 comes into operation and interrupts the supply of current.

In order that any contact of the inductors 1 with the tube 18 may be prevented, wheels 66 maintaining the required distance are by way of precaution mounted in the frame member 32.

The girders 10 carrying the lever system are provided at both ends with guide rails 37, and their height, relative to a base structure 41 can be adjusted by means of a positioning drive 38, 39, 40. The lever system thereby admits of being adjusted, jointly with the frame members 2, 3, and 34, and with the connecting stays 42, to tubes of any desired dimension.

A pointer 43 indicates upon a scale 44 the existing height of the carrying frame for the lever system formed by the guiding bars 37. The guiding bars 37 are guided on guide columns 45.

The tube 18, guided along underneath the inductors, is supported by a guide casing 46.

We claim:

1. A machine for annealing welded seams in longitudinally welded tubes, comprising: a base structure, means carried by the base structure for supporting a welded pipe to be annealed, a system of swinging levers pivotally carried by the base structure, a frame suspended from the swinging levers at a selected height above the tube weld to be annealed, an annealing device carried by the said frame, at least one double-acting piston-and-cylinder unit, means operatively connecting a piston of the piston-and-cylinder unit with the system of swinging levers, means for selectively supplying fluid under pressure to the cylinder spaces of the piston-and-cylinder unit, and thereby controlling the height of the annealing device above the tube weld to be annealed, and means for regulating the supply of pressure fluid to the piston-and-cylinder unit in dependence upon the distance of the annealing device from the welded seam of the tube.

2. A machine for annealing welded seams as claimed in claim 1, the said means for regulating the supply of pressure fluid comprising: a control valve, and a key for influencing the control valve.

3. A machine for annealing welded seams as claimed in claim 2, the control valve being mounted on the frame carried by the swinging levers.

4. A machine for annealing welded seams as claimed in claim 2, further comprising: a table secured to the key of the control valve, and a roller pivotally mounted on the frame carried by the swinging levers so as to roll upon the welded tube seam, and to co-operate with the said table in regulating the supply of pressure fluid.

5. A machine for annealing welded seams as claimed in claim 1, comprising means for supplying heating means to the annealing device, and means for automatically disconnecting this supply of heating means whenever the distance between the annealing means and the tube falls below a predetermined minimum permissible distance.

6. A machine for annealing welded seams as claimed in claim 1, further comprising: a girder frame so mounted on the base structure as to be adjustable up and down relatively thereto, the system of swinging levers consisting

5

of two levers coupled together, and each pivotally mounted on the said adjustable girder frame, and the pressure cylinder that contains the double-acting piston coupled to one of the swinging levers also being attached to the said girder frame.

7. A machine for annealing welded seams as claimed in claim 1, further comprising means for varying the height of the fulcrum of one of the swinging levers relatively to the base structure.

8. A machine for annealing welded seams as claimed in claim 6, further comprising means for varying the

6

height, relative to the girder frame, of the fulcrum of the swinging lever which is not directly coupled to the double-acting piston.

References Cited by the Examiner

UNITED STATES PATENTS

2,582,955 1/1952 Body ----- 219—8.5

JOHN F. CAMPBELL, *Primary Examiner*.

WHITMORE A. WILTZ, M. L. FAIGUS, *Examiners*.