United States Patent

[11] **3,619,552**

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[21]	Appl. No.	**862,292**
[22]	Filed	**Sept. 30, 1969**
[45]	Patented	**Nov. 9, 1971**
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[32]	Priority	**Sept. 5, 1969**
[33]		**Canada**
[31]		**061,318**

[54] **OSCILLATING WELDING ELECTRODE WITH DWELL CONTROL**
18 Claims, 8 Drawing Figs.

[52] **U.S. Cl.** .... **219/125 R,** 228/27, 228/28

[51] **Int. Cl.** **B23k 9/12**

[50] **Field of Search** .... 219/124, 125 R, 130, 60 R, 60 A, 73, 75; 228/27, 28

[56] **References Cited**

UNITED STATES PATENTS

1,933,340	10/1933	Raymond	219/124
2,472,803	6/1949	Beyer et al.	219/125
3,035,156	5/1962	Statey	219/125
3,128,368	4/1964	Franz et al.	219/125
3,230,341	1/1966	Blackburn	219/125

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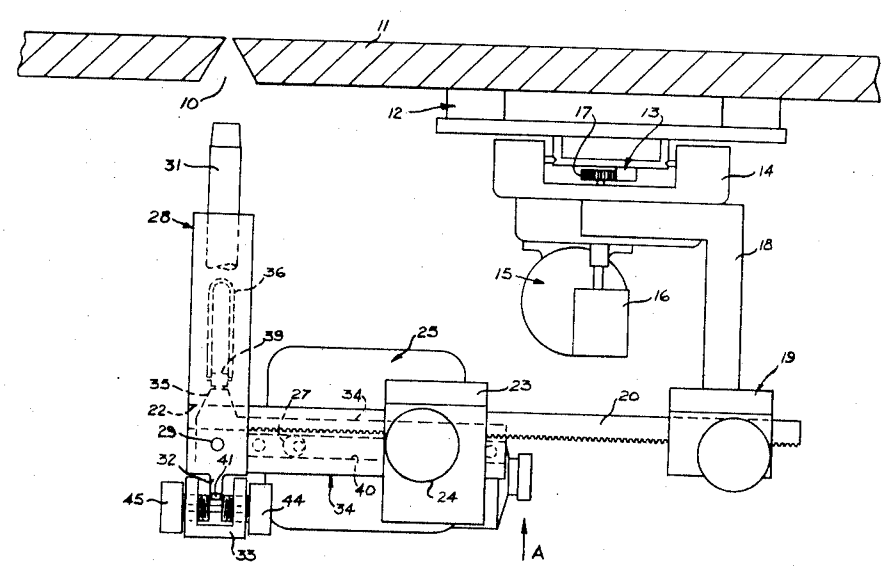
ABSTRACT: An automated welding machine has a welding gun support and first drive means for moving the support in a longitudinal direction, second drive means to produce an oscillatory motion of the support transverse to the longitudinal direction, so that the combined effects of the drive means causes the support to trace out a weaving path. The oscillatory motion of the support, and hence the weave amplitude of the path traced by the support is controlled by adjustable abutment means which cooperate with the support. A resiliently yieldable torque-transmitting element couples the support to the oscillatory driving means to provide lost motion between this driving means and the support when the latter engages the adjustable abutment means. The adjustable abutment means can thus be adjusted to vary the weave amplitude of the support, and is selectively adjustable to alter the dwell period of the support at either or each extremity of its oscillatory motion.



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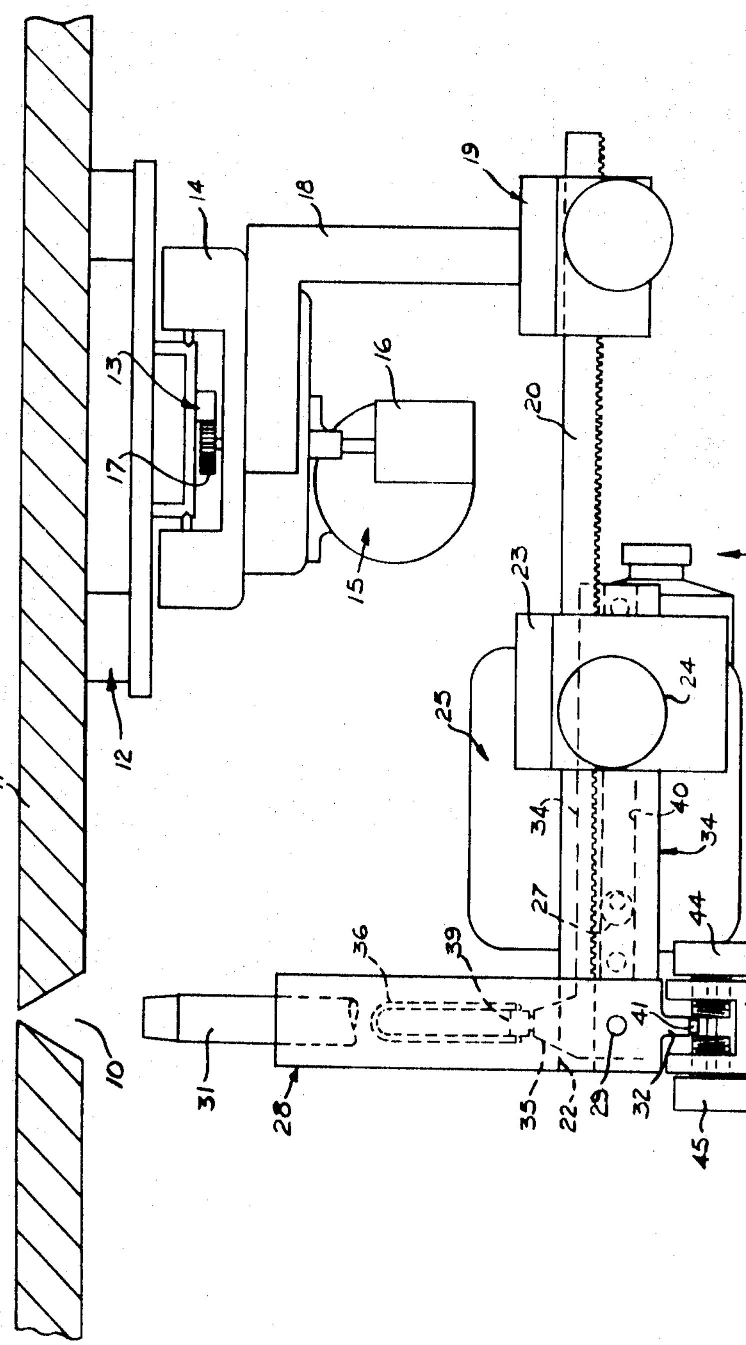

FIG. 1

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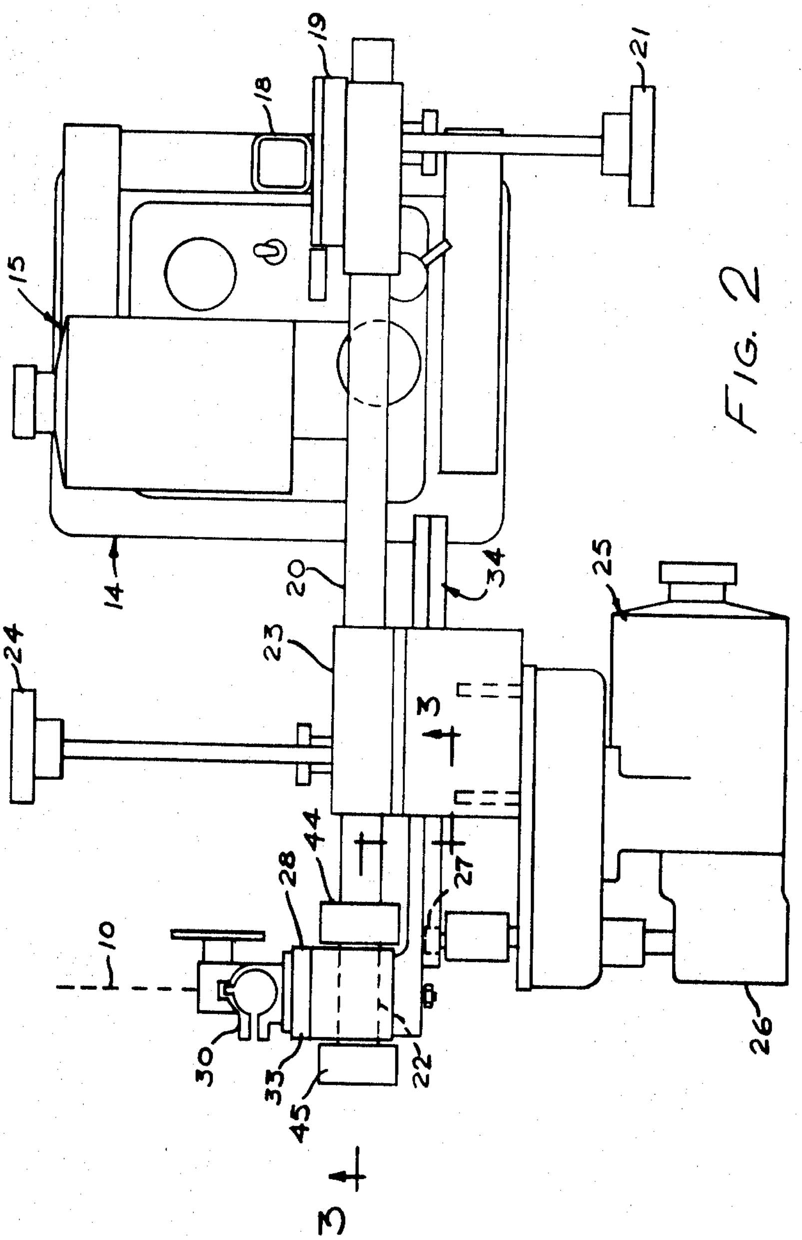

FIG. 2

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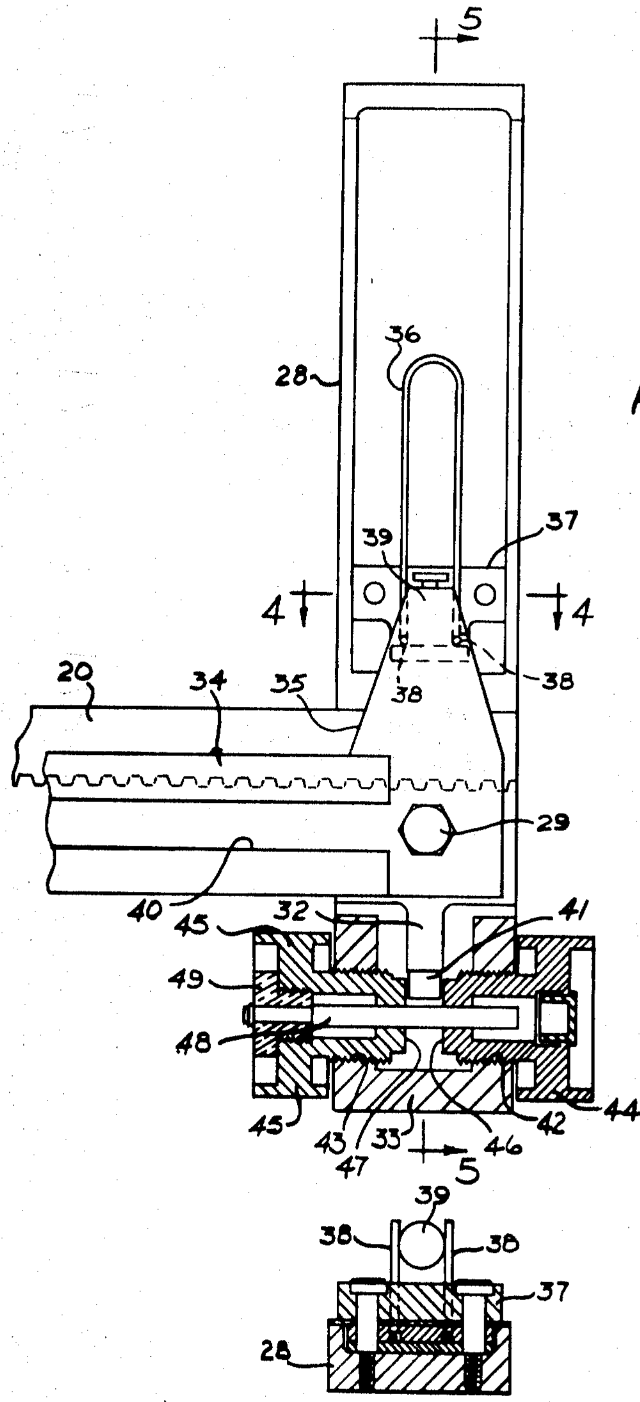

FIG. 3

FIG. 4

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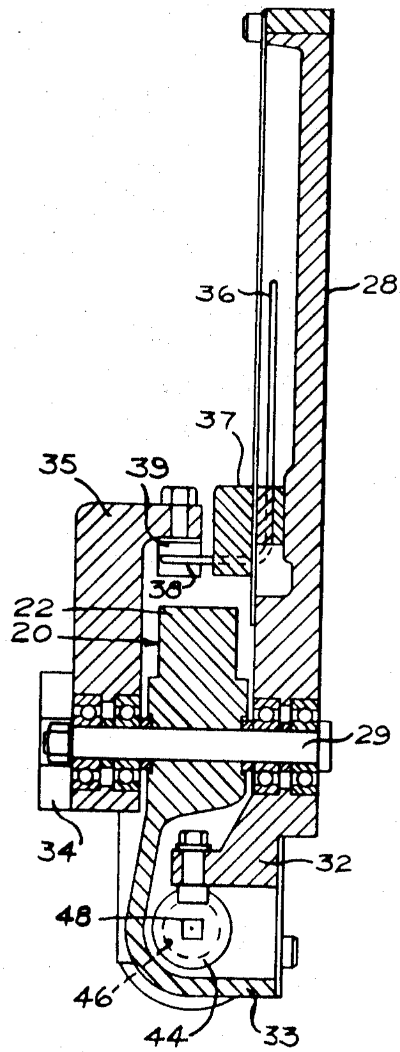

FIG. 5

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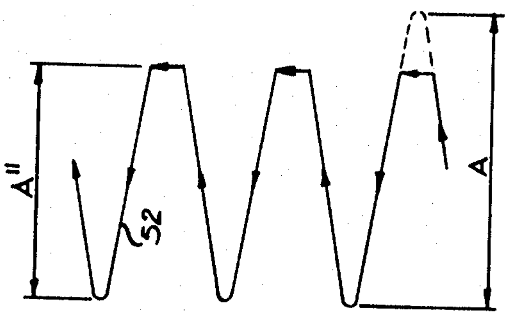

FIG 6c.

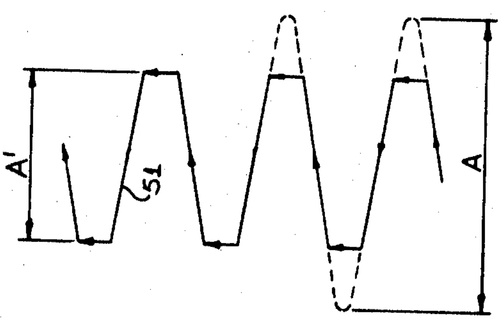

FIG 6b

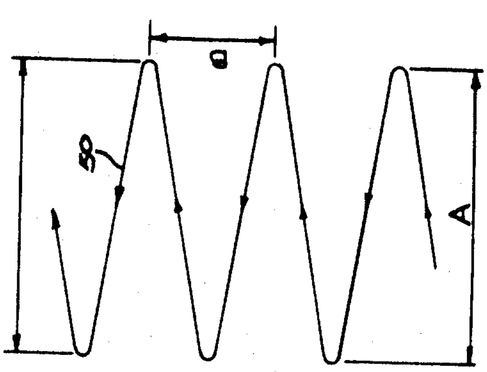

FIG 6a

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OSCILLATING WELDING ELECTRODE WITH DWELL CONTROL

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a new or improved automated welding machine mechanism.

2. Description of the Prior Art

Attempts have been made at various times to build machines which would duplicate the motions of an expert operator welding in joints or on the surfaced of material. All such machines utilize a power-driven carriage running parallel to the welding zone at speeds suitable for weld metal deposition and carrying arms which support a welding gun to deposit bead or waved weld passes. The arms must be capable of producing movement transverse to the direction of travel of the carriage in order to cover the width of weld layer desired. Means for producing this transverse movement in contemporary equipment has been attained by the use of electronic or electric power devices combined with mechanical operating mechanisms. Either type, when operating properly, offers a continuous and repetitive oscillated weave which cannot be duplicated accurately by the most expert operator. They are capable of producing extreme uniformity of bead or layer and quality of weld metal.

Of the two types, the electronic-mechanical units are capable of precise control within the limits required for weld metal deposition. They do, however, possess several serious objections including occasional loss of control inexplicable to the average operator, difficulty in resetting to original levels of adjustment and susceptibility to damage. Their use in field welding is consequently seriously limited. The electric-mechanical types are much more rugged and practical, particularly for field use, since they cannot go out of adjustment and are readily maintained by untrained personnel. Their simplicity is also more suitable for operator training and operation.

The contemporary electric-mechanical equipment at present available will perform all of the control functions available from the electronic-mechanical types with the exception of two features:

a. limitations in the weave range, and

b. inability to control the pause at either of the two sides of the oscillation weave.

Full control of the weave pattern essential for deposition of weld metal in bead or weave passes must include all of the following requirements.

1. A variable speed of travel in the width of weave from zero to maximum. 2. A variable width of weave from zero to maximum. 3. A variable delay or pause on either one or both sides of the weave pattern. 4. For each of these three requirements, it is most desirable that the variable controls must be capable of adjustment while the machine is in operation to accommodate all conditions of welding.

Contemporary electric-mechanical weave mechanisms satisfy the first requirement completely, a portion only of the second requirement, but do not incorporate the third or fourth requirements. The principle behind such equipment utilizes a variable speed motor driving a cam, adjustable in position with reference to a pivot and carrying a welding gun at a free end of a pivoted arm. The variable speed motor will produce the first requirement for variable speed of travel in the width of weave. The adjustable positioning of the motor and cam relative to the arm pivot will determine the width of weave of the welding gun in the second requirement. The minimum distances from cam to pivot will control the maximum weave of the gun, while this maximum distance will control the minimum weave. This however, can never be zero. The third requirement for variable pause during welding at the sides of the weave pattern cannot be met. For a particular cam design, it is possible to obtain a delay on both sides of the weave pattern, but except for stopping the operation to change cam profiles, the contemporary design is virtually unchangeable in this respect. Furthermore, there is a definite limit in the design of the cam below

which lesser pause times cannot be accommodated. Nor is it possible to vary the pause on one side compared to the other.

Consideration of the following description will explain why in welding, requirements 1, 2, and 3 stated previously, are essential to cover all welding conditions during operation of the machine. A simple single-Vee butt weld in 1¼ inch plate in the vertical position will suffice to explain the need for the requirements stipulated.

Field assembly of joints in welded structures produce varying conditions in the fit-up of the joint. Root gaps will vary from 0 to ¼ inch as a reasonable maximum.

The first pass in the root of the joint, whether welding upward or downward, should have a weave approximately equal in width to the root gap. Under these conditions, adequate fusion and reinforcement can be produced on the far side of the joint. No additional work will then be required on the far side—the joint when completed will be welded completely from one side.

Equipment which does not permit continuously variable weave to zero limits while welding, cannot produce adequate fusion and reinforcement of welds on the far side of a joint with a variable gap. Consequently, at some time prior to completion of welding of the joint, it would be essential to gouge out the root of the weld to sound metal of the first side, assembly the equipment on the root side and complete the far side welding.

In subsequent welding following the root pass on the first side of the joint, it is usually desirable to make each weld pass, with the possible exception of the last pass, with a vertical up traverse. The width of weave is now predicated by the layer thickness and joint profile. The speed of traverse and upward rate of progression now becomes quite critical to avoid a convex surface on the resulting bead layer. A trend towards concavity is desirable and this is achieved principally by the relative delay at both sides of the joint. Such delay should be variable in amount in the individual layers. Contemporary equipment does not permit such variation in delay, but the mechanism according to the present invention in its preferred form, does so at any time and in any amount from zero to the limits set by the design of the equipment.

Build-up of one layer after another may continue to the point where it becomes desirable, in order to avoid extra wide weaves, to make one layer in two weaved passes. In doing so, it becomes essential to cause delay to the weave on the side remote from the centerline of the joint, and to decrease or possibly eliminate the delay on the side nearest the centerline. If this was not done, there would be too much metal deposited at the junction of the merging edges of the two weave patterns. Fusions at this line would become more difficult.

SUMMARY OF THE INVENTION

According to the present invention there is provided an automated welding machine mechanism comprising a welding gun support, first driving means coupled to said support and operative to impart thereto a feeding movement in a longitudinal direction, second driving means coupled to said support and operative to superimpose an oscillatory motion on said feeding movement in a direction transverse to said longitudinal direction, and adjustable control means associated with said welding gun support and operable to control or eliminate the oscillatory motion thereof.

Preferably the welding gun support is pivotally mounted on an axis substantially parallel to the longitudinal direction of movement produced by the first driving means. Secondly the second driving means is connected to the welding gun support through a yieldable torque-transmitting element, such as a torsion spring, and the control means comprises adjustable abutment members mounted to cooperate with the welding gun support to limit the oscillatory motion thereof, the torque-transmitting element providing lost motion between the first drive means and the welding gun support.

In a preferred embodiment an automated welding machine mechanism according to the present invention comprises a track extending parallel to the seam to be welded, a carriage mounted on said track, first drive means on said carriage, a pillar on said carriage extending generally at right angles to said track, bracket means on said pillar, a rack supported in said bracket and extending at right angles to said pillar and said track means for adjusting the position of said rack longitudinally thereof in said bracket means, a pivotal mounting on said rack, the welding gun support and a driving arm being pivoted in said pivotal mounting on a common axis substantially parallel to said track, second driving means carried by said rack and coupled to said driving arm, said second driving means being operative to apply an oscillatory motion to said driving arm about said axis, a torque-transmitting element connected between the driving arm and the welding gun support and normally operative to transmit said oscillatory motion to said welding gun support, adjustable abutment means cooperatively arranged on said rack and said welding gun support, and operable to control or eliminate the oscillatory motion of the welding gun support, the torque-transmitting element being yieldable upon engagement of the abutment means to permit movement of the driving arm without corresponding movement of the welding gun support. In its preferred form the welding machine mechanism according to the present invention can be adjusted to provide a variable amplitude and speed of travel in the weave pattern, and also to provide a variable delay of the welding gun support at each side of the weave pattern.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will further be described, by way of example only, with reference to the accompanying drawings wherein:

FIG. 1 is a plan view of an automated welding machine mechanism mounted to weld a vertically extending seam;

FIG. 2 is an elevation of the welding machine mechanism taken in the direction of arrow A in FIG. 1;

FIG. 3 is a fragmentary sectional view taken generally on the line 3—3 in FIG. 2;

FIG. 4 is a fragmentary sectional view taken on the line 4—4 in FIG. 3,

FIG. 5 is a sectional view taken on the line 5—5 in FIG. 3; and

FIG. 6*a* to 6*c* illustrate weave patterns produced by the mechanism of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIGS. 1 and 2 the welding machine mechanism is shown mounted on a position to produce a welded seam in a gap **10** in a workpiece **11**. A base **12** is mounted on the workpiece **11** and carries a track **13** which extends in a vertical direction parallel to the gap **10** to be welded. A carriage **14** is guided for vertical movement on the base **12**, and carries a driving means in the form of a variable speed electric motor **15** coupled to a reduction gearing **16** to a pinion **17** free end meshes with the track **13**.

The carriage **14** supports a pillar **18** which extends horizontally therefrom at right angles to the direction of the track **13**, and a clamping bracket **19** secured on the pillar **18** is adjustable lengthwise thereof. The clamping bracket **19** supports a rack bar **20** which extends horizontally therein at right angles to the track **13** and gap **10**. The clamping bracket **19** carries an adjustment knob **21** which is coupled to the rack bar **20** in and can be rotated to adjust the position of the rack bar **20** in a longitudinal direction to position the free end **22** thereof in alignment with the gap **10** to be welded.

Intermediate its ends the rack bar **20** carries a second clamping bracket **23** which also supports an adjustment knob **24** coupled to the rack bar and rotatable to move the clamping bracket **23** lengthwise of the rack bar. The clamping bracket **23** supports a second driving means in the form of a variable speed electric motor **25**, which is coupled through a reduction gearing **26** to drive an eccentric roller **27** as will later be described in more detail.

The free end of the rack bar **20** forms a pivotal mounting for a welding gun support **28** which extends parallel to the pillar **18** towards the gap **10** to be welded. The support **28** is pivoted on an axis **29** on the free end **22** of the rack bar, and is provided with means such as a clamp **30** to support a welding gun **31**. The support **28** also carries a projecting tang **32** which projects into a bracket **33** carried on the free end **22** of the rack bar.

The free ends **22** of the rack bar also provide a pivotal support for a driving arm **34** which extends generally parallel to the rack bar **20**, and carries a lug **35** extending in the direction of the welding gun support **28**. The driving arm **34** is connected to the welding gun support **28** by means of a yieldable torque-transmitting element in the form of a torsion spring **36** mounted on the support **28** and engaging the lug **35**. As is best shown in FIGS. 3 and 4 the torsion spring **36** is of U-shaped configuration and has two limbs retained by clamping strap **37** which is secured to the welding gun support **28**. The ends **38** of the limbs of the torsion spring are bent at right angles to the length of the welding gun support **28** and project therefrom on opposite sides of a roller **39** carried at the lower end of the lug **35** on the driving arm. This arrangement provides a yieldable torque-transmitting coupling between the driving arm **34** and the welding gun support **28** which is normally effective to cause the support **28** to follow pivotal movements of the driving arm **34** about the axis **29**. However should the welding gun support **28** be prevented from moving, the torsion spring **36** provides lost motion means, and movement of the driving arm **34**, instead of being transmitted to the support **28**, is absorbed by flexure of the arms of the torsion spring **36**.

The driving arm **34** is formed with a guideway **40** extending longitudinally thereof, and in this guideway is received the eccentric roller **27** which is driven by the variable speed electric motor **25**. The eccentric roller **27** is received in sliding engagement between opposed surfaces of the guideway **40** and it will be evident that rotation of this roller imparts an oscillating motion to the driving arm **34** about the pivot axis **29**. The amplitude of this oscillatory motion can be adjusted by varying the distance between the eccentric roller **27** and the pivot axis **29**, and this can be done by actuation of the adjustment knob **24** to move the clamping bracket **23**, and with it the electric motor **25** and eccentric roller **27**, lengthwise of the rack bar.

As can best be seen in FIG. 3 the projecting tang **32** of the support **28** extends into the bracket **33** on the free end of the rack bar **20**, and carries a screw **41** the head of which projects above the upper surface of the projecting tang. The bracket **3** is provided with control means to control the oscillatory motion of the welding gun support arm **28**. More specifically these control means are provided in the form of adjustable abutment surfaces on opposite sides of the headed screw **41** which cooperate therewith in defining the range of movement of the welding gun support **28**. As shown in FIG. 3 the bracket **33** is hollow and is formed at opposite sides thereof with threaded apertures **42** and **43** in each of which is engaged a matting screw threaded spigot of one of a corresponding pair of adjusting knobs **44** and **45** respectively. The end faces **46** and **47** of the threaded portions of the adjusting knobs **44** and **45**, as seen in FIG. 3 are arranged on opposite sides of the headed screw **41**. The screw threads on the adjusting knobs **44** and **45** are of opposite hand, and these knobs are coupled to rotate in unison by a square section shaft **48** which passes through square openings in the ends of the adjusting knobs and is secured in position by a screw-threaded retainer nut **49** engaged in a bore in the adjusting knob **45**. It will be evident that when the adjusting knobs **44** and **45** are coupled by the square section shaft **48**, then rotation of one of the adjusting knobs will cause the end faces **46** and **47** to move in unison, towards or away from the headed screw **41** on the welding gun support arm, according to the direction of rotation. The retaining nut **49** can be unscrewed from the adjusting knob **45** and the square section shaft **48** withdrawn, whereupon the adjusting knobs **44** and **45** can be rotated independently to adjust the positions of the corresponding end faces **46** and **47** respectively in relation to the headed screw **41**. Thus the adjusting knobs **44** and **45** provide a control means whereby the oscillatory motion of the welding gun support **28** can be adjusted both in amplitude of oscillation, and range of oscillation on each side of the median position. So long as the headed pin **41** can move freely between the opposed ends **46** and **47** of the adjusting knobs, the welding gun support **28** will follow the pivotal movement of the driving arm **34**. However when the headed screw **41** engages one or other of the end faces **46** and **47** of the control knobs, the welding gun support **28** is brought to rest, and continued movement of the driving arm **34** is accommodated by torsional deflection of the torsion spring **36**.

In operation the automatic welding machine mechanism is set up as shown in FIG. **1**. The clamping bracket **19** and adjustment knob **21** are set to position the welding gun **31** in the required relationship to the gap **10** to be welded. The weld weaves pattern traced by the gun **31** is selected by the following settings of the mechanism.

a. the variable speed electric motor **15** is set to give the desired rate of movement of the welding gun lengthwise of the track.

b. The variable speed electric motor **25** is set to apply the desired speed of oscillatory motion to the welding gun.

c. The adjustment knob **24** is operated to move the eccentric roller **27** to a selected position lengthwise of the guideway **40** in the driving arm **34** to select the desired amplitude of the oscillatory motion of the welding gun **31**.

d. The adjustment knobs **44** and **45** are adjusted to positions wherein the oscillatory motion of the welding gun support is unimpeded, or to positions wherein the oscillatory motion is restricted on one or both sides of the weld weave.

FIGS. **6*a*** to **6*c*** illustrate the path traced out by the welding gun **31** under various setting conditions of the automated welding machine mechanism. The path **50** in FIG. **6*a*** represents the setting condition wherein the adjusting knobs **44** and **45** are spaced apart by a sufficient distance that they do not impede the oscillatory motion of the welding gun support **28**. The amplitude A of this path is determined, for a given eccentricity of the roller **27**, by the spacing of the eccentric roller **27** from the pivotal axis **29**. The pitch B of this path is determined by the relationship of the speeds of the electric driving motors **15** and **25**.

In FIG. **6*b*** the setting of the variable speeds of driving motors **15** and **25**, and the position of the eccentric roller **27** are unchanged, but the adjusting knobs **44** and **45** have been moved to a position where they restrict the oscillatory motion of the welding gun **31** to an amplitude A′, thus causing a dwell period at both sides of the weld weave pattern.

FIG. **6*c*** illustrates the path **52** traced out under the same setting conditions as for FIG. **6*a***, but wherein one of the adjusting knobs **44** or **45** has been set to restrict the oscillatory motion of the welding gun **31** to a corresponding side of the medial position, thus producing an unsymmetrical weld weave pattern of amplitude A″ in which there is a dwell at one one side of the weave pattern.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An automated welding machine mechanism comprising a welding gun support, first driving means coupled to said support and operative to impart thereto a feeding movement in a longitudinal direction, second driving means coupled to said support and operative to superimpose an oscillatory motion on said feeding movement in a direction transverse to said longitudinal direction, and adjustable control means associated with said welding gun support and operable to control or eliminate the oscillatory motion thereof, said control means including means for providing lost motion between said second drive means and said support for altering the dwell time of the support at either or both extremity of its oscillatory motion.

2. An automated welding machine mechanism according to claim **1** wherein said welding gun support is pivotally mounted on an axis substantially parallel to said longitudinal direction, said second driving means being operative to oscillate the support about said axis.

3. An automated welding machine mechanism according to claim **2** comprising a yieldable torque-transmitting element connected between said support and said second drive means and operative to transmit said oscillatory motion from the second driving means to said support, said adjustable control means comprising adjustable abutment members mounted in said mechanism adjacent said support, and the spaces between said abutment members and said support being adjustable to control the range of the oscillatory movement of said support.

4. An automated welding machine mechanism according to claim **3** wherein said yieldable torque-transmitting element comprise a torsion spring normally operable to transmit said oscillatory motion from said second driving means to said support, said torsion spring being yieldable upon engagement of said support with said abutment means to provide a lost motion means between said second drive means and said support.

5. An automated welding machine mechanism according to claim **3** wherein said first and second driving means comprise variable speed driving motors.

6. An automated welding machine mechanism according to claim **3** wherein said first driving means is mounted upon a carriage guided for movement in said longitudinal direction upon a track, said carriage supporting a pillar extending at right angles to said track, said pillar supporting a bar extending at right angles to said pillar and to said track, said bar having a free end which forms said pivotal mounting for said welding gun support, said second drive means comprising a variable speed motor coupled to drive an eccentric roller and a driving arm pivoted on said pivotal axis and drivingly engaged by said eccentric roller for transmitting and oscillatory motion to said torque-transmitting element, said torque-transmitting element being connected between said driving arm and said welding gun support.

7. An automated welding machine mechanism according to claim **6** further comprising adjustment means between said pillar and said rod whereby the position of said welding gun support is adjustable in a plane at right angles to said track.

8. An automated welding machine mechanism according to claim **7** wherein said driving arm comprises a guideway extending longitudinally thereof, said eccentric roller being operatively engaged in said guideway to transmit an oscillatory motion to said driving arm, and being adjustable in position lengthwise of said guideway to vary the amplitude of said oscillatory motion.

9. An automated welding machine mechanism according to claim **6** wherein said welding gun support carries a projection, sand said adjustable abutment members comprise two adjustment knobs mounted in screw-threaded engagement upon the free end of said rod, said adjustment knobs presenting adjustment surfaces an opposite sides of said projection and being rotatable to vary the spacing therebetween.

10. An automated welding machine mechanism according to claim **9** wherein the screw threads on said adjustment knobs are coaxial but are of opposite hands, said adjustment knobs being interconnected by a removable coupling member whereby they may be rotated in unison, said adjusting knobs being rotatable independently upon removal of said coupling member. including both

11. In an automated welding machine mechanism comprising a track, a carriage mounted on said track, first drive means on said carriage, a framework supported on said carriage and second drive means mounted on said framework, a welding gun support pivotally mounted on said framework on an axis substantially parallel to said track and operatively connected to said second drive means, said first drive means being operative to effect a longitudinal movement of said carriage and in turn said welding gun support with respect to said track, and said second drive means being operative to produce an oscilla-

tory motion of said support about said axis in a direction transverse to said track, the improvement comprising adjustable control means mounted on said framework and operatively associated with said welding gun support, said control means being operative to control or eliminate the oscillatory motion of the welding gun support, said control means including means for providing lost motion between said second drive means and said support for altering the dwell time of the support at either or both extremity of its oscillatory motion.

12. An automated welding machine mechanism according to claim 11 wherein said adjustable control means comprises a pair of coaxially arranged adjusting knobs mounted in threaded engagement upon said framework, each of said adjusting knobs having an abutment surface, said welding gun support having a portion which projects between said abutment surfaces, said adjusting knobs being rotatable to vary the spacing therebetween thereby to control the oscillatory motion of the welding gun support.

13. An automated welding machine mechanism according to claim 11 comprising adjustment means in said framework operative to adjust the position of said welding gun support in a plane at right angles to the direction of said track.

14. An automated welding gun support according to claim 11 wherein said second drove means comprises an oscillating drive means, a driving arm pivoted on said pivotal axis of the welding gun support said oscillating drive means being coupled to said arm to transmit an oscillatory motion thereto, a yieldable torque-transmitting element connected between said arm and said welding gun support and normally operable to transmit said oscillatory motion to the welding gun support, said adjustable control means comprising adjustable abutment means having cooperating abutment surfaces mounted on said support and said framework, the relative positions of said abutment surfaces being adjustable to control or eliminate the oscillatory movement of said support, said yieldable torque-transmitting element being effective, upon engagement of said cooperating abutment surfaces, to provide lost motion between said second drive means and said welding gun support whereby the latter moves through only such part of the oscillatory motion of said second drive means as is determined by the adjustment of said control means.

15. An automated welding gun support according to claim 14 wherein said second drive means comprises a variable speed motor coupled to drive an eccentric roller engaged in a guideway extending longitudinally of said driving arm, said eccentric roller being adjustable in position lengthwise of said guideway thereby to adjust the amplitude of said oscillatory motion transmitted to the welding gun support.

16. An automated welding gun support according to claim 14 wherein said framework comprises a pillar mounted on said carriage and extending at right angles to said track, a bracket releasably secured to said pillar and adjustable in position lengthwise thereof, a rack carried in said bracket extending at right angles to said pillar and to said track, means for adjusting said rack lengthwise thereof in said bracket, said rack having a free end which forms said pivotal mounting force for the welding gun support and for said driving arm, a bracket on the free end of said rack, said adjustable control means comprising adjusting knobs mounted in spaced coaxial relationship in screw-threaded engagement in said bracket, said adjusting knobs presenting opposed abutment surfaces, said support having a portion projecting between said abutment surfaces, said adjusting knobs being operative to limit the oscillatory motion of said welding gun support upon engagement of said portion of the support with one or other of said abutment surfaces.

17. An automated welding gun support according to claim 16 wherein the screw-threaded engagement of said adjusting knobs in said bracket on the free end of said rack are of opposite hands, a releasable coupling being provided between said adjusting knobs being operative to effect simultaneous movement of said abutment surfaces upon rotation of one or other of said adjustment knobs, said abutment surfaces being independently adjustable by rotation of the corresponding adjustment knobs upon removal of said removable coupling.

18. In an automated welding machine mechanism comprising a track, a carriage mounted on said track, first driving means on said carriage, a pillar on said carriage extending generally at right angles to said track, bracket means on said pillar, a rack supported in said bracket and extending at right angles to said pillar and said track, means for adjusting the position of said rack longitudinally thereof in said bracket means, a pivotal mounting on said rack, a welding gun support and a driving arm being pivoted in said pivotal mounting on a common axis substantially parallel to said track, second driving means carried by said rack and coupled to said driving arm, said second driving means being operative to apply an oscillatory motion to said driving arm about said axis, torque-transmitting element connected between said driving arm and said welding gun support and normally operative to transmit said oscillatory motion to said welding gun support, adjustable abutment means cooperatively arranged on side rack and said welding gun support and operable to control or eliminate the oscillatory motion of said welding gun support, said torque-transmitting element being yieldable upon engagement of abutment means to permit movement of said driving arm without corresponding movement of said welding gun support.

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