Oct. 4, 1949. E. V. CULLEN 2,483,811

WORK POSITIONER

Filed Sept. 10, 1945 2 Sheets-Sheet 1

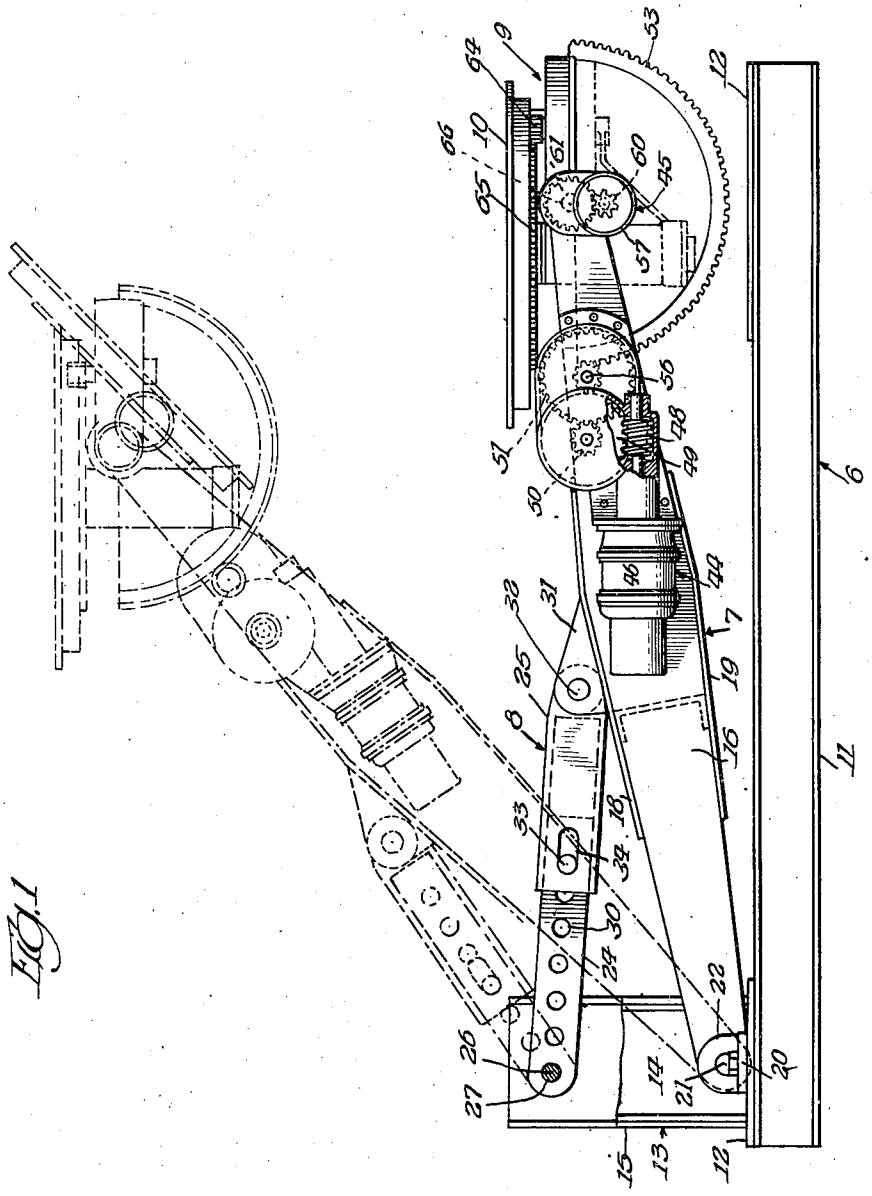

FIG. 1

Inventor:
Edward V. Cullen
By Fred Gerlach atty.

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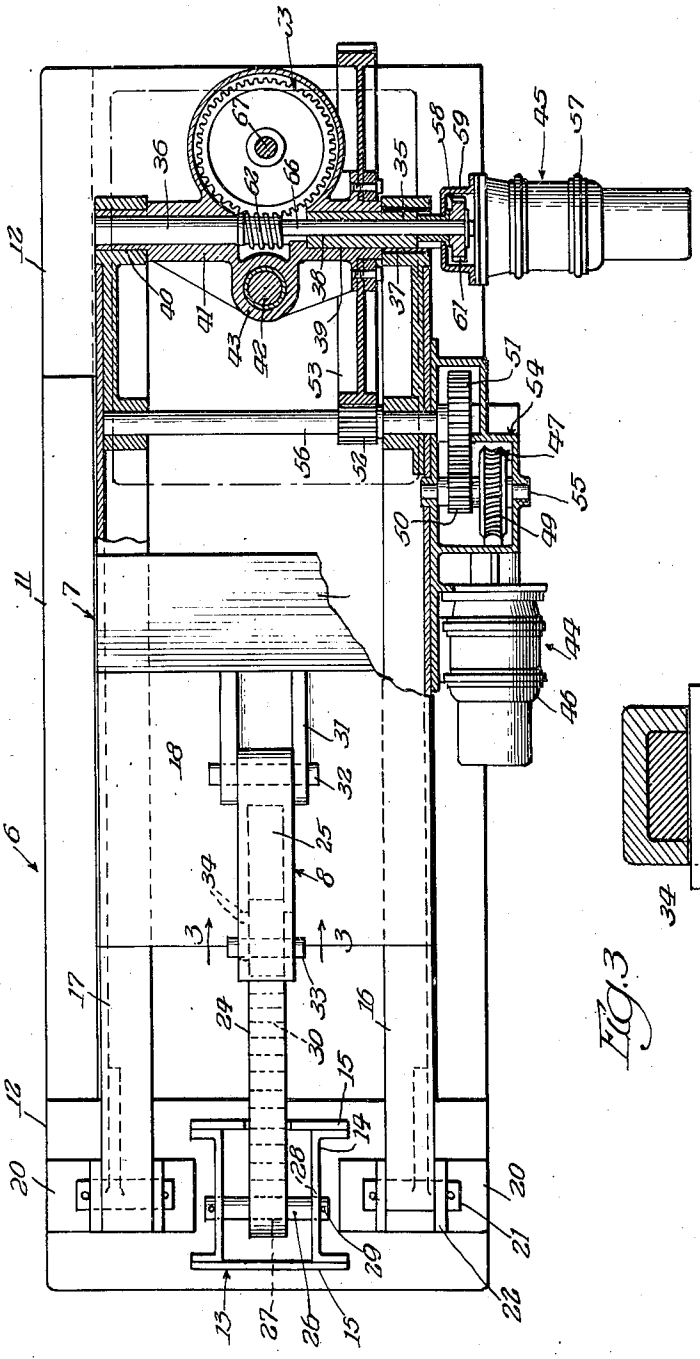

FIG. 2

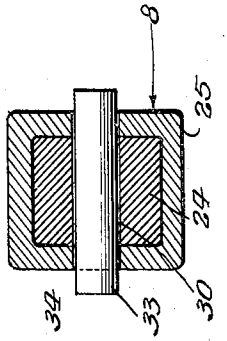

FIG. 3

Inventor:
Edward V. Cullen
By: Fred Gerlach atty.

Patented Oct. 4, 1949

2,483,811

UNITED STATES PATENT OFFICE

2,483,811

WORK POSITIONER

Edward V. Cullen, Chicago, Ill., assignor to The Cullen-Friestedt Company, Chicago, Ill., a corporation of Illinois

Application September 10, 1945, Serial No. 615,288

1 Claim. (Cl. 29—288)

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The present invention relates generally to work positioners. More particularly the invention relates to that type of work positioner which is specially designed or adapted to support and hold metallic structural pieces or other work in different angular positions in connection with welding thereof and as its principal components comprises (1) an elongated base structure; (2) a rigid elongated boom type frame which overlies the base structure, has one end thereof pivotally connected to one end of the base structure so that it is permitted to swing upwards and downwards about a horizontal axis, and embodies at its distal end a work supporting and retaining table together with a mount for supporting the table so that it is capable of being rotated about its center and also tilted back and forth between a position wherein it overlies the distal end of the frame and an inverted position wherein it underlies the distal end of the frame; (3) an upstanding mast which is rigidly connected to the aforementioned one end of the base structure and is positioned adjacent the proximal end of the frame; and (4) a link which is positioned wholly on the upper side of the frame, extends between the central portion of the frame and the upper end of the mast, and serves to retain the frame in the various positions into which it is swung.

The primary object of the invention is to provide a work positioner of this type which is an improvement upon, and has certain advantages over, previously designed work positioners including that which is disclosed in, and forms the subject matter of, United States Letters Patent No. 2,396,161, granted to me on March 5, 1946, and is characterized by the fact that the link is of composite character and consists of a pair of link members, one of which has one of its ends pivotally connected to the upper end of the mast and the other of which has one of its ends pivotally connected to the central portion of the boom type frame and its distal end adjustably connected to the distal end of the one link member in order that the link as a whole may be varied or adjusted as to length. By employing a composite link of this character angular adjustment of the table carrying frame may be effected with facility and the work positioner as a whole is compact by reason of the fact that the link offers substantially no obstruction, especially when it is in its shortened condition while holding the frame in any one of its various up positions.

Another object of the invention is to provide

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a work positioner of the type and character under consideration in which one of the link members of the composite link between the upper end of the mast and the central portion of the frame is tubular and is in telescopically connected relation with the distal end of the other link member.

A further object of the invention is to provide a work positioner of the last mentioned character in which the adjustable connection between the distal ends of the link members consists of a pin which extends through, and is removably mounted in, a pair of opposed registering apertures in the distal end of the tubular link member and is adapted to fit in any one hole of a longitudinal series of holes in the distal end of the other link member.

A still further object of the invention is to provide a work positioner which occupies but a comparatively small amount of space, is both rugged and durable, effectively and efficiently fulfills its intended purpose and because of the specific manner in which the boom type frame is adjustably supported is capable of handling large sized as well as small work pieces.

Other objects of the invention and the various advantages and characteristics of the present work positioner will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by the claim at the conclusion hereof.

In the drawings which accompany and form a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views;

Figure 1 is a side elevation of a work positioner embodying the invention;

Figure 2 is a plan view of the work positioner, parts being broken away and other parts being shown in section for illustrative purposes; and

Figure 3 is an enlarged vertical transverse section taken on the line 3—3 of Figure 2 and illustrating in detail the cross sectional design and construction of the link members of the composite link which extends between the upper end of the mast and the central portion of the boom type frame and serves to hold the frame in the various angular positions into which it is swung.

The positioner which is shown in the drawings constitutes the preferred embodiment of the invention. It is primarily designed for holding

in different angular positions metallic structural pieces or other work in connection with welding thereof, and as its main parts or components comprises a base 6, an elongated boom type frame 7, a link 8, a bracket 9 and a work supporting and retaining table 10. The base, frame, link and bracket together form or constitute a supporting structure whereby the table 10 is mounted or carried so that it is capable of being raised or lowered, tilted angularly to a limited extent, and rotated about its center.

The base 6 is in the form of a fabricated structural steel unit and is adapted to rest upon, and be bolted to, the floor of the room or other enclosure in which the positioner is used. It is rectangular, as shown in Figure 2, and comprises a pair of parallel laterally spaced channel beams 11. The ends of the beams 11 are cross connected by way of a pair of metallic plates 12 and the ends of these plates rest upon, and are riveted or welded to, the top flanges of the beams. The base 6 is provided at one end thereof with a vertically extending mast 13. This mast consists of a pair of parallel laterally spaced channel beams 14 and projects upwards from the central portion of one of the plates 12. The lower end of the mast is welded or otherwise rigidly secured to the subjacent plate 12 in order that the mast is in fixed or rigid relation with the base 6. The central portions and lower ends of the channel beams 14 are cross connected by way of plates 15 and these are welded to the flanges of said beams 14.

The boom type frame 7 overlies the base 6 and embodies a pair of parallel laterally spaced complemental arms 16 and 17 of channel beam design or construction. It is elongated, as shown in Figure 2, and in addition to the arms 16 and 17 it embodies a top plate 18 and a bottom plate 19. The top plate extends across the upper central portion of the two frame arms and is welded at its ends to the central portions of the upper flanges of the arms. The bottom plate 19 underlies the top plate and extends across the lower central portions of the arms 16 and 17. The ends of the bottom plate lap and are welded or otherwise fixedly secured to the central portions of the bottom flanges of the two frame arms. The ends of the arms 16 and 17 that are at one end of the elongated frame 7 are arranged in straddled relation with the mast 13 and are pivoted by way of pairs of brackets 20 and pivot pins 21 so that the frame is permitted to swing upwards and downwards about a horizontal axis or hinge line. The brackets 20 are fixedly secured to the plate 12 that underlies and supports the mast 13 and embody upstanding lugs 22. The pivot pins 21 are carried or supported by these lugs and extend through holes in the adjacent ends of the frame arms 16 and 17. By reason of the construction and arrangement of the pivotal connections which are formed by the lug equipped brackets 20 and the pivot pins, the frame 7 is permitted to swing downwards into a position wherein it is in substantially parallel relation with the base 6. The two frame arms are preferably tapered from the central portions thereof to their ends (see Figure 1).

The link 8 is positioned wholly on the upper side of the boom type frame 7 and serves as a medium or instrumentality for supporting the frame in the various positions into which it is swung or angularly adjusted. It is composite in character and comprises a pair of longitudinally aligned link members 24 and 25. The link member 24 is in the form of a rigid bar and has one end thereof disposed between the upper ends of the channel beams 14 constituting the vertically extending mast 13, as shown in Figures 1 and 2. Such end of the link member 24 is pivotally connected by way of a horizontally extending pin 26 in order that the link member 24 is free to swing vertically. The central portion of the pin 26 extends through a hole 27 in the adjacent end of the link member 24 and the ends of the pin extend through aligned holes 28 in the upper ends of the channel beams 14 and have cotter pins 29 for holding the pin against axial displacement. The distal end of the link member 24 is provided with a longitudinal series of equidistantly spaced holes 30. As shown in the drawings the holes 30 are horizontally disposed and extend from the pin receiving hole 27 to the extreme outer or distal end of the link member 24. The other link member, i. e., the link member 25, of the composite link 8 is tubular in design, as shown in Figure 3. One end of the link member 25 is solid, extends between a pair of laterally spaced upstanding lugs 31 on the central portion of the top plate 18 of the frame 7 and is pivotally connected to such lugs by way of a horizontal pin 32. The latter extend through aligned holes in the lugs and the adjacent end of the link member 25 and serves to permit such link member to swing in a vertical plane with respect to the frame 7. The other or distal end of the link member 25 is arranged telescopically with respect to the distal end of the link member 24. As shown in Figure 3 the interior of the tubular link member 25 is substantially the same in cross sectional shape as the link member 24. A horizontal pin 33 extends through the distal end of the tubular link member 25 and has its ends mounted in apertures 34 in the side walls of said tubular link member so that it is capable of being shifted longitudinally out of its normal position. This pin 33 is adapted, as shown in Figure 1, to extend through any one of the holes 30 in the distal end of the link member 24 and when in place serves so to connect the two link members that the link 8 supports the frame. The apertures 34 are preferably elongated lengthwise of the tubular link member 25 in order that the pin 33 may be readily piloted into the hole 30 that is opposite to, or aligned with, the apertures 34. It is contemplated that an overhead crane or hoist will be employed to raise or lower the frame 7 in connection with angular adjustment of the latter. When, for example, it is desired to swing the frame upwards the operating part of the crane or hoist is applied to the distal end of the frame. Thereafter the pin 33 is slid axially out of engagement with the link member 25 in order to free the two link members for relative sliding movement. Upon removal of the pin the crane or hoist is operated so as to swing upwards the frame 7. When the frame is adjusted to the proper or desired angular position the crane or hoist is stopped. Thereafter the pin 33 is inserted through the elongated apertures 34 and the adjacent hole 30. After the pin is in place the crane or hoist is disconnected from the distal end of the frame. Upon disconnection of the crane or hoist from the frame the frame is supported by the mast 13 and the link 8. The pin 33 and the longitudinally extending series of equidistantly spaced holes 30 constitute or exemplify a simple adjustable connection between the distal ends of the link members where-

by the operative length of the link as a whole may be varied. By reason of the fact that the two link members are telescopically connected together they remain at all times in longitudinal alignment and do not swing downwards one relatively to the other when the pin 33 is removed in connection with a frame adjusting operation. Because the link 8 is in the form of two telescopically connected link members it offers substantially no obstruction, especially when it is in its shortened condition while holding the frame in its uppermost position. By having the composite link disposed wholly on the upper side of the frame the space between the frame and the base is unobstructed and hence the entire space may be utilized to accommodate a work piece when the work supporting and retaining table 10 is in its hereinafter described inverted position in connection with welding of the bottom portion of the work piece.

The bracket 9 is in the form of a one-piece casting and, as hereinafter described more in detail, constitutes a mount whereby the work supporting table 10 is supported so that it is rotatable about its center and also tiltable into different angular positions. It is disposed between the outer or distal ends of the arms 16 and 17 of the frame 7 and is supported by way of a pair of coaxial horizontally extending trunions 35 and 36 so that it, together with the table, is capable of being tilted bodily into different angular positions. The trunnion 35 is fixed to, and projects inwardly from, a socket 37 at the distal end or outer extremity of the frame arm 16 and has a longitudinal bore 38 therein. The inner end of the trunnion 35 fits within a bearing type socket 39 in the bracket 9. The other trunnion, i. e., the trunnion 36, is fixed within, and projects inwardly from a socket 40 in the distal end of the arm 17 of the frame 7 and is solid, as shown in Figure 2. The inner end of the trunnion 36 fits within a bearing type socket 41 in the bracket 9. The two trunnions, as heretofore indicated, permit the bracket 9 together with the table, to be swung about a horizontal axis.

The table 10 is adapted to carry or support the work and has a plurality of holes therein (not shown) whereby the work may be removably secured to it by way of bolts or other attaching devices. It is preferably flat and has a stub shaft 42 fixed to the central portion of its under face. This stub shaft fits within a bearing 43 on the central portion of the bracket 9 and together with the bearing forms a pivotal connection whereby the work supporting and retaining table 10 is permitted to rotate about its center.

In addition to the various parts heretofore described the positioner comprises power mechanism 44 for tilting the bracket 9 and the table 10 relatively to the frame 7 and also power mechanism 45 for rotating the table 10 about its center.

The mechanism 44 comprises an electric motor 46 and speed reducing gearing 47. The motor is mounted on the central portion of the arm 16 of the frame 7 and is located on the outside of the arm. The speed reducing gearing 47 of the power mechanism 44 comprises a worm 48, a worm gear 49, a pinion 50, a gear 51, a pinion 52 and a gear segment 53. The worm 48, the worm gear 49, the pinion 50 and the gear 51 are disposed within a housing 54 which is fixed to the frame arm 16. The worm 48 is fixed to the armature shaft of the electric motor 46 and meshes with the worm gear 49. The latter is mounted on a shaft 55 which extends horizontally and is mounted in suitable bearings in the housing 54. The pinion 50 is fixed to the shaft 55 and meshes with the gear 51. The latter is mounted on one end of a shaft 56 which extends between the frame arms 16 and 17 and is carried by bearings on the arms. The pinion 52 is fixed to the central portion of the shaft 56 and meshes with the gear segment 53. As shown in Figure 2, the segment 53 is bolted to the bracket 9. When the motor 46 is driven in one direction it operates through the medium of the gearing 47 to swing the bracket 9 and table in one direction. When the motor is reversely driven it operates through the medium of the gearing 47 to swing the bracket and table in the opposite direction. The teeth of the gear segment 53 extend throughout an arc of approximately 180°. The segment is so positioned with respect to the bracket 9 that the table is capable of being tilted from a position wherein it overlies and extends in substantially parallel relation with the distal end of the frame 7 to an inverted position wherein it underlies the distal end of the frame. Suitable limit switches (not shown) are employed to stop the electric motor 46 automatically when either end of the gear segment 53 approaches the pinion 52.

The power mechanism 45 for rotating the work supporting and retaining table about its center comprises an electric motor 57 and speed reducing gearing 58. The motor 57 is located outwards of the outer end of the trunnion 35 and is connected to such end of the trunnion by way of a housing 59. The gearing 58 of the power mechanism 45 comprises a pinion 60, a gear 61, a worm 62, a worm gear 63, a pinion 64 and a ring gear 65. The pinion 60 is mounted in the housing 59 and is fixed to one end of the armature shaft of the electric motor 57. The gear 61 meshes with, and is driven by, the pinion 60 and is mounted on one end of a horizontally extending shaft 66. Such shaft, as shown in Figure 2, extends through and is journaled in the bore 38 in the trunnion 35. The worm 62 is located between the inner ends of the trunnions 35 and 36 and is fixed to the inner end of the shaft 66. It is disposed in a recess or chamber in the bracket 9 and meshes with the worm gear 63. The latter is connected to one end of a shaft 67 which is journaled in a bearing forming part of the bracket 9. The pinion 64 is fixed to the other end of the shaft 67 and meshes with the ring gear 65. Such gear surrounds the stub shaft 42 and is fixed to the bottom face of the table 10. When current is supplied to the electric motor 57 of the power mechanism 45 the motor operates through the medium of the speed reducing gearing 58 to rotate the work supporting table 10 about its center.

When the positioner is to be used the frame 7 is swung downwards into its lowermost position in order to bring the work supporting and retaining table in close proximity to the subjacent end of the base 6. Thereafter the work to be welded is placed on the table by way of an overhead crane or hoist. As soon as the work is properly positioned with respect to the table it is bolted to the latter. Thereafter the frame 7 is swung upwards, as hereinbefore described, in order to position the table at the proper elevation for welding. When the table is supported at the desired elevation it may be tilted as desired by operation or actuation of the power mechanism

44. It also may be rotated bodily about its center by actuation of the power mechanism 45.

The aforementioned positioner is both rugged and durable and effectively and efficiently fulfills its intended purpose. It is characterized by the fact that the frame permits the table to be raised and lowered throughout an extremely great range of movement. By reason of the fact that the supporting structure includes the pivoted elongated frame 7 the work to be welded encounters no obstructions when the table is in an inverted position regardless of the elevation of the table. Because the space under the boom type frame 7 is unobstructed the frame may be lowered into a substantially horizontal position when it is desired to use the table for welding small sized work pieces. As shown in Figure 1 of the drawings the upper end of the mast 13 is substantially coplanar with the table 10 when the table is horizontally positioned and is lowered to its fullest extent. Because of this the elongated mast does not interfere with the welding of large sized pieces on the table. Because of the design, arrangement and construction of the composite link 8 adjustment of the table carrying frame 7 may be effected with facility and the work positioner as a whole is compact and offers substantially no obstruction to the work piece or the user of the positioner.

The invention is not to be understood as restricted to the details set forth since these may be modified within the scope of the appended claim without departing from the spirit and scope of the invention.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

In a work positioner comprising a rigid elongated boom type frame having one end thereof pivotally mounted so as to permit it to swing upwards and downwards about a substantially horizontal axis, and embodying at its distal end a work supporting and retaining table together with a mount for supporting the table so that it is capable of being rotated about its center and also tilted back and forth between a position wherein it overlies the distal end of the frame and an inverted position wherein it underlies said distal end of the frame, the combination of a rigid upstanding mast positioned adjacent the proximal end of the frame, and means for retaining the frame in the various positions into which it is swung disposed wholly on the upper side of the frame and comprising a bar type link member having one end thereof pivotally connected to the upper end of the frame and embodying in its other end a longitudinal series of spaced apart transverse holes, a tubular link member having one end thereof pivotally connected to the central portion of the frame and its other end telescopically connected to said other end of the bar type link member and provided with a pair of opposed longitudinally extending elongated apertures, and a pin extending across and removably mounted in said apertures and adapted to fit within any one of the holes of said series.

EDWARD V. CULLEN.

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