Jan. 10, 1956 F. W. PONTING 2,730,157

CONDUIT AND TUBING OFFSET BENDING APPARATUS

Filed Dec. 26, 1952 2 Sheets-Sheet 1

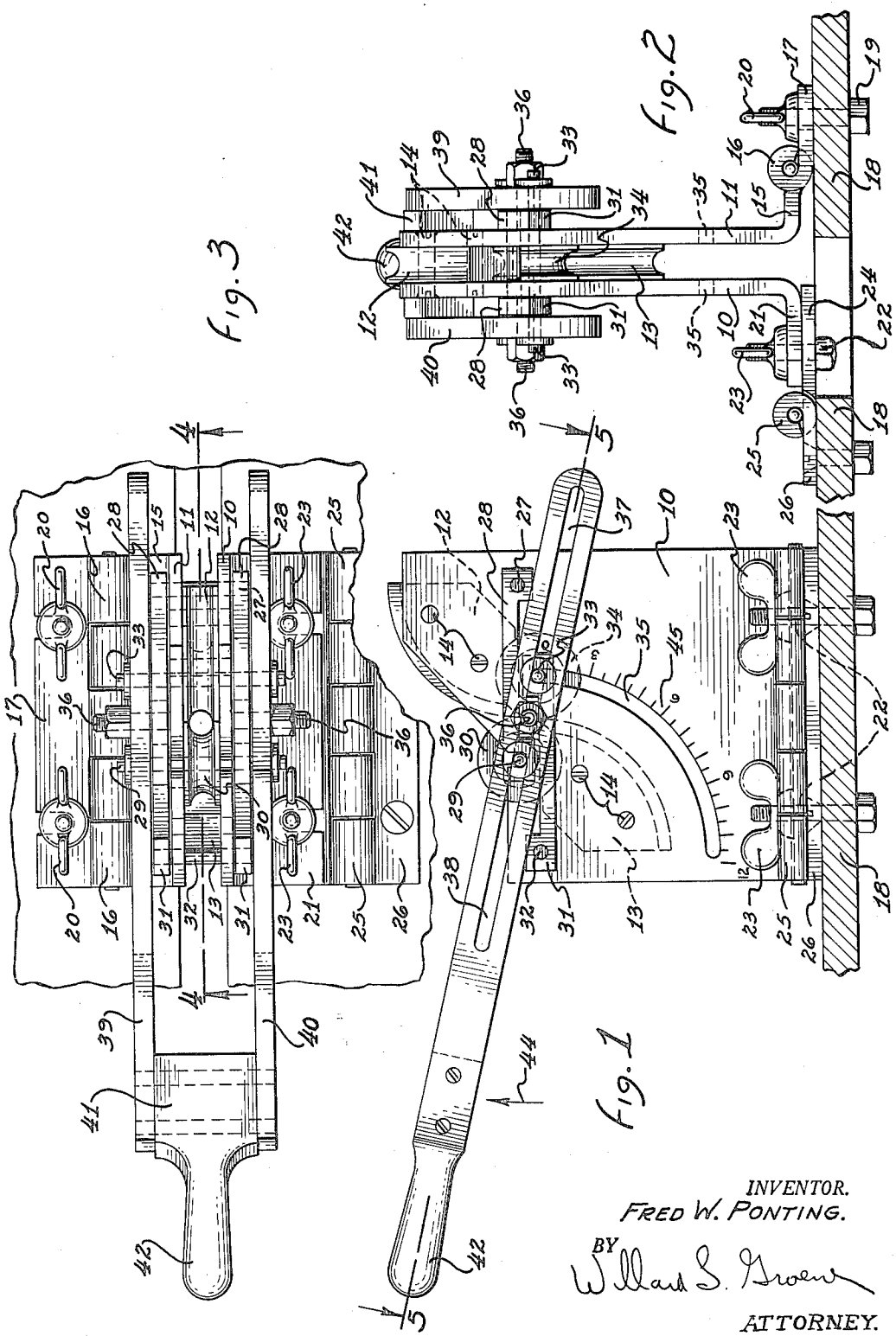


Fig. 3

Fig. 2

Fig. 1

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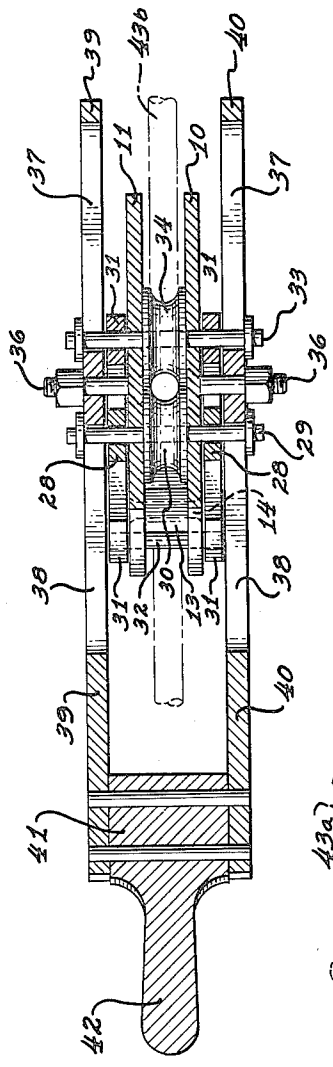


Fig. 5

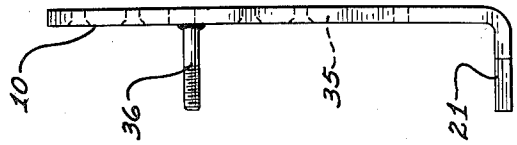


Fig. 7

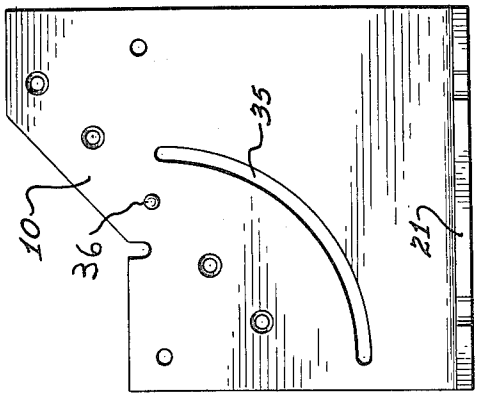


Fig. 6

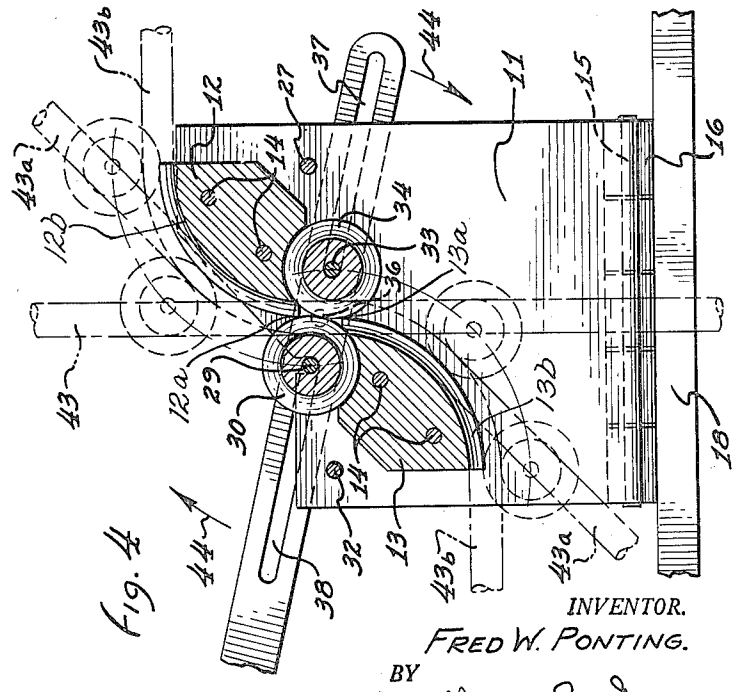


Fig. 4

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CONDUIT AND TUBING OFFSET BENDING APPARATUS

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7 Claims. (Cl. 153—46)

This invention pertains to improvements in bending machines, and is particularly directed to improvements in a conduit and tubing offset bending apparatus.

One of the problems in rapidly installing electrical conduit, piping, rods or the like, is the ability to make offsets in the work piece to pass obstructions which can be done quickly and easily and with accuracy and alignment maintained for the finished bent work piece. It is also important to be able to determine the amount of offset directly so that it is not necessary to keep trying and fitting and returning to the bending apparatus to get the required offset in the work.

One of the objects of this invention is to provide an improved conduit and tubing offset bending apparatus which is simple in construction and efficient in operation throughout the entire amount of bending that the machine is capable of producing in the work.

Another object of this invention is to provide an improved and simplified operating mechanism which provides a maximum of bending force at all times for any degree of offset to be produced in the tubing or conduit.

Still another object of this invention is to provide a simplified pipe bending and tubing offsetting machine having a single lever operable to simultaneously effect opposite bends in the work piece to produce any desired offset therein.

Still another object of this invention is to provide an improved offset bending machine having a pair of oppositely disposed segments and grooved wheels or rollers operating simultaneously in relation thereto, said rollers being supported on the outer ends of pivotally mounted levers and actuated by a main operating lever simultaneously and engaging the outer ends of said grooved wheel supporting levers.

Further features and advantages of this invention will appear from a detailed description of the drawings in which:

Fig. 1 is a side elevation of a conduit and tubing offset bending device incorporating the features of this invention.

Fig. 2 is an end view of the apparatus shown in Fig. 1.

Fig. 3 is a plan view of the apparatus shown in Figs. 1 and 2.

Fig. 4 is a section on the line 4—4 of Fig. 3.

Fig. 5 is a section on the line 5—5 of Fig. 1.

Fig. 6 is a side view of one of the main support plates.

Fig. 7 is an end view of one of the main support plates.

As illustrative of one embodiment of this invention there is shown a conduit and tubing offset bending device comprising a frame consisting of the main support plates 10 and 11 which are spaced apart and secured together by the oppositely disposed arcuate segments 12 and 13 secured to the plates 10 and 11 by suitable screws 14. The plate 11 has a flanged portion 15 terminating in a hinge connection at 16 with a detachable member 17 secured to a support such as a bench, table top or the like 18, bolts 19 and thumb nuts 20 serving to secure the members 17 and 18 together. The member 10 has a flanged portion 21 through which passes the bolts 22 secured in place by the thumb nuts 23 through the member 24 hingedly connected at 25 to a suitable member 26 secured to a table top bench or the like. By releasing the thumb nuts 20 the device may be swung to the left, Fig. 2, about the hinge pin 25 for operation in a horizontal position with the plate 11 upwardly. Similarly, by releasing the thumb nuts 23 the device may be swung around the hinge 16 to the right, Fig. 2, so that the device may be operated in a horizontal position with the plate member 10 in upward position.

Pivotally mounted on a suitable stud or pivot shaft 27 in the supporting plates 10 and 11 are the grooved wheel or roller supporting lever arms 28. Across the outer ends of the levers 28 is mounted the pin 29 upon which is journaled the roller or grooved wheel 30 operating in conjunction with the segment 12. Similarly, a pair of levers 31 are pivotally mounted on a pin 32 in the supporting plates 10 and 11 and have in their outer ends the pin 33 upon which is journaled the roller 34. It is also to be noted that the pin 33 operates in the arcuate slots 35 formed in the support plates 10 and 11. Pivot studs 27 and 32 are located on axes defined by the radii from the arcuate grooved work engaging surfaces 12*b* and 13*b* of the segments 12 and 13.

A main operating lever is pivotally mounted on suitable studs 36 rigidly fixed to the plate members 10 and 11 with the axis of pivoting on said studs lying between the ends 12*a* and 13*a* of the arcuate segments 12 and 13 and has longitudinally disposed elongated slots 37 and 38 in the bifurcated portions 39 and 40 of the main operating lever, the outer ends of the members 39 and 40 being connected together by the block 41 to which is fixed the operating lever 42 for manipulating the device.

The operation of this device is as follows:

The straight piece of work comprising a pipe conduit or tubing 43 is placed in the device as best shown in Fig. 4. The operating lever 42 is then moved upwardly in the direction indicated by the arrow 44 so as to cause the pins 29 and 33 in the slots 38 and 37 respectively of the lever to be moved so as to swing the work contacting rollers 30 and 34 about the segments 12 and 13 to bend the work piece to intermediate positions 43*a* and finally to the maximum position 43*b* as desired. Preferably, an indicating scale at 45 is utilized to determine automatically the amount of offset made in the work piece. It is to be noted that the elongated slots 37 and 38 enable the pins 29 and 33 to readily move out along these slots during the bending operation and that the force applied by the lever is always substantially at right angles to the links 28 and 31 at the point of the rollers 30 and 34 so that high efficiency of operation is obtained with the device throughout its entire range of bending.

While the apparatus herein disclosed and described constitutes a preferred form of the invention, it is also to be understood that the apparatus is capable of mechanical alteration without departing from the spirit of the invention and that such mechanical arrangement and commercial adaptation as fall within the scope of the appendent claims are intended to be included herein.

Having thus fully set forth and described this invention what is claimed and desired to be obtained by United States Letters Patent is:

1. In a conduit and tubing bending machine, a frame, a first work engaging quarter segment fixed on said frame having an arcuate work engaging surface tangent at one end to one side of a work piece in starting position in said machine with said arcuate surface facing in one direction longitudinally of said work piece, a second work engaging quarter segment fixed on said frame having an arcuate

work engaging surface tangent at one end and to the other side of said work piece in starting position with said arcuate surface of said second segment facing in the opposite direction longitudinally of said work piece, a first link pivotally mounted on said frame at the center defined by the radius of curvature of the arcuate work engaging surface of said first segment, a second link pivotally mounted on said frame at the center defined by the radius of curvature of the arcuate work engaging surface of said second segment, work engaging rollers journalled on the outer end of each of said links arranged to roll over the arcuate work engaging surfaces of said segments, an operating lever pivotally mounted on said frame for rocking on an axis located between the points of tangential contact of said arcuate work engaging surfaces of said segments with the work piece when in starting position, and means interacting between said operating lever and said links to effect simultaneous swinging of said links upon rocking of said operating lever.

2. In a conduit and tubing bending machine, a main support, a pair of oppositely disposed arcuate work holding segments fixed to said support comprising a first work engaging quarter segment fixed on said main support having an arcuate work engaging surface tangent at one end to one side of a work piece in starting position in said machine with said arcuate surface facing in one direction longitudinally of said work piece, and a second work engaging quarter segment fixed on said main support having an arcuate work engaging surface tangent at one end and to the other side of said work piece in starting position with said arcuate surface of said second segment facing in the opposite direction longitudinally of said work piece, a link for each of said segments, pins in the outer ends of said links, work engaging rollers journaled on said pins, means for pivotally mounting said links on said main support on axes defined by said arcuate segments so that said links rock about axes coinciding with the axes of said arcuate work holding segments to cause said rollers operatively to swing over said segments, an operating lever pivotally mounted on said main support between the ends of said arcuate segments, and radially disposed elongated slots formed in said operating lever adapted to slidingly receive said pins so that manipulation of said operating lever swings said links to effect the work bending operation.

3. In a conduit and tubing bending machine, a main support, a pair of oppositely disposed arcuate work holding segments fixed to said support comprising a first work engaging quarter segment fixed on said main support having an arcuate work engaging surface tangent at one end to one side of a work piece in starting position in said machine with said arcuate surface facing in one direction longitudinally of said work piece, and a second work engaging quarter segment fixed on said main support having an arcuate work engaging surface tangent at one end and to the other side of said work piece in starting position with said arcuate surface of said second segment facing in the opposite direction longitudinally of said work piece, a link for each of said segments, pins in the outer ends of said links, work engaging rollers journaled on said pins, means for pivotally mounting said links on said main support on axes defined by said arcuate segments so that said links rock about axes coinciding with the axes of said arcuate work holding segments to cause said rollers to operatively swing over said segments, an operating lever pivotally mounted on said main support between said ends of said arcuate segments, radially disposed elongated slots formed in said operating lever adapted to slidingly receive said pins so that manipulation of said operating lever swings said links to effect the work bending operation, and a calibrated scale on said main support indicatively related to the position of said operating lever to indicate the amount of offset made in the work piece.

4. In a work offset bending device, a main support comprising, a pair of spaced support plate members, a pair of oppositely disposed arcuate grooved work holding segments fixed between said spaced support plate members comprising a first work engaging quarter segment fixed between said plate members having an arcuate work engaging surface tangent at one end to one side of a work piece in starting position in said machine with said arcuate surface facing in one direction longitudinally of said work piece, and a second work engaging quarter segment fixed between said plate members having an arcuate work engaging surface tangent at one end and to the other side of said work piece in starting position with said arcuate surface of said second segment facing in the opposite direction longitudinally of said work piece, pairs of spaced links, one pair for each of said segments, pivotally mounted on the outside faces of said spaced support plate members for swinging about axes coinciding with the axes of said arcuate work holding segments, a pin mounted across the outer ends of each of said pairs of links extending parallel to said axes, work engaging grooved rollers journaled on said pins, an operating lever comprising a pair of spaced members, located each side of said pairs of links, pivotally mounted on said main support frame between the ends of said arcuate segments, radially disposed slots in said pair of spaced members located each side of said pivotal mounting of said pair of spaced members and adapted to slidingly receive said pins, and an operating handle connected to rock said pair of spaced members on said pivotal mounting on the support frame located between the ends of said arcuate segments.

5. In a work offset bending device, a main support comprising, a pair of spaced support plate members, a pair of oppositely disposed arcuate grooved work holding segments fixed between said spaced support plate members comprising a first work engaging quarter segment fixed between said plate members having an arcuate work engaging surface tangent at one end to one side of a work piece in starting position in said machine with said arcuate surface facing in one direction longitudinally of said work piece, and a second work engaging quarter segment fixed between said plate members having an arcuate work engaging surface tangent at one end and to the other side of said work piece in starting position with said arcuate surface of said second segment facing in the opposite direction longitudinally of said work piece, pairs of spaced links, one pair for each of said segments, pivotally mounted on the outside faces of said spaced support plate members for swinging about axes coinciding with the axes of said arcuate work holding segments, a pin mounted across the outer ends of each of said pairs of links extending parallel to said axes, work engaging grooved rollers journaled on said pins, an operating lever comprising a pair of spaced members, located each side of said pairs of links, pivotally mounted on said main support frame between the ends of said arcuate segments, radially disposed slots in said pair of spaced members located each side of said pivotal mounting of said pair of spaced members and adapted to slidingly receive said pins, an operating handle connected to rock said pair of spaced members, and a calibrated scale on each side of said main support indicatively related to said pair of spaced members.

6. In a work offset bending device, a main support comprising, a pair of spaced support plate members, a pair of oppositely disposed arcuate grooved work holding segments fixed between said spaced support plate members comprising a first work engaging quarter segment fixed between said plate members having an arcuate work engaging surface tangent at one end to one side of a work piece in starting position in said machine with said arcuate grooved surface facing in one direction longitudinally of said work piece, and a second work engaging quarter segment fixed between said plate members having an arcuate work engaging surface tangent at one end and to

the other side of said work piece in starting position with said arcuate grooved surface of said second segment facing in the opposite direction longitudinally of said work piece, pairs of spaced links, one pair for each of said segments, pivotally mounted on the outside faces of said spaced support plate members for swinging about axes coinciding with the axes of said arcuate work holding segments, a pin mounted across the outer ends of each of said pairs of links extending parallel to said axes, work engaging grooved rollers journaled on said pins, an operating lever comprising a pair of spaced members, located each side of said pivotal mounting of said pair of spaced members and adapted to slidingly receive said pins, an operating handle connected to rock said pair of spaced members, a calibrated scale on each side of said main support indicatively related to said pair of spaced members, and hinged clamping means connected to said main support to allow operation of said device in a vertical or in either horizontal position during the work bending operation.

7. In a work offset bending device, a main support comprising, a pair of spaced support plate members, a pair of oppositely disposed arcuate grooved work holding segments fixed between said spaced support plate members comprising a first work engaging quarter segment fixed between said plate members having an arcuate work engaging surface tangent at one end to one side of a work piece in starting position in said machine with said arcuate grooved surface facing in one direction longitudinally of said work piece, and a second work engaging quarter segment fixed between said plate members having an arcuate work engaging surface tangent at one end and to the other side of said work piece in starting position with said arcuate grooved surface of said second segment facing in the opposite direction longitudinally of said work piece,

pairs of spaced links, one pair for each of said segments, pivotally mounted on the outside faces of said spaced support plate members for swinging about axes coinciding with the axes of said arcuate work holding segments, a pin mounted across the outer ends of each of said pairs of links extending parallel to said axes, work engaging grooved rollers journaled on said pins, an operating lever comprising a pair of spaced members, located each side of said pivotal mounting of said pair of spaced members and adapted to slidingly receive said pins, an operating handle connected to rock said pair of spaced members, a calibrated scale on each side of said main support indicatively related to said pair of spaced members, hinged clamping means connected to said main support to allow operation of said device in a vertical or in either horizontal position during the work bending operation, said hinged clamping means comprising a first hinge member, means for detachably securing said first hinge member to a supporting stand and the like, a pivotal connection between said first hinge member and said main support, a second hinge member secured to said stand, a plate detachably secured to said main support, and a pivotal connection between said second hinge means and said plate.

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