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CENTERING DEVICE

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This invention relates to centering devices, and more particularly to those which are used to center misaligned workpieces, such as successive strips of steel, preparatory to the connecting thereof, although not limited thereto.

In the manufacture of strip steel, for example, it is sometimes necessary to connect successive strips in order that they may be processed as a unit. Due to the fact that the strips are heavy and therefore hard to manage, it is difficult to correctly align them.

It is an object of the present invention to center workpieces of various types, and particularly relatively rigid strip metal, in an accurate and rapid manner.

Another object is the provision of apparatus capable of performing in the foregoing manner, which is relatively easy and inexpensive to manufacture, install, and operate.

The invention, then, comprises the features hereinafter fully described and as particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail a certain illustrative embodiment of the invention, this being indicative of one of the number of ways in which the principles of the invention may be employed.

In said drawings:

Figure 1 is a plan of the apparatus of the present invention.

Figure 2 is a side elevation.

Figure 3 is a fragmentary plan, on an enlarged scale, illustrating a detail.

Figure 4 is an enlarged sectional view on the line IV-IV of Figure 2.

The apparatus of the present invention is used in conjunction with a centering device which is adapted to contact the workpiece and move it into a desired position. As a specific instance, the centering device may take the form of a pair of movable side guides which are widely used in the centering of strip steel and the like. These side guides are disposed above and adjacent to a series of rollers over which the strip may be fed, and are operated by motors which are suitably actuated. In a manner well known in the art, these motors are controlled by an operator who is in a position to determine to what extent the workpiece is to be centered.

The foregoing instrumentalities as such form no part of the present invention, and are therefore neither shown nor more specifically described hereinafter.

In accordance with the teachings of the present invention there is provided above, and longi-

tudinally of the direction of movement of the strip or other work object, a pair of spaced parallel horizontally extending guides 2. As a specific instance, these spaced parallel horizontally extending guides 2 may be disposed relatively adjacent the motor-operated side guides described hereinbefore. Disposed for sliding engagement along the upper surface of the guides 2 is a pair of substantially spaced traveling nuts 4 each of which has formed integrally therewith a dovetailed member 5 which rides in a complementarily-formed recess provided by and between the said guides. Connected to and depending from the dovetailed member 5 of each of the nuts 4 is a vertical bar 7 having secured to the bottom thereof a laterally-extending plate 8. Each of the plates 8 carries a depending pivot pin 9. Disposed along the bottom of each of the plates 8 is a horizontally-extending arm 10 which is carried intermediate its ends by the depending pivot pin 9. These arms 10 extend substantially parallel to each other and at one end thereof carry nuts and bolts collectively designated at 12 for the adjustable attachment thereto of a control lever 13 which extends in substantially the same general direction. Carried on the projecting end of each of the control levers 13 is a depending member 14 which is adapted to engage the adjacent edge of the strip or other workpiece to be centered or aligned.

Referring more particularly to Figure 3, each of the plates 8 has formed integrally therewith an extension 16 which carries an adjustable set-screw 17 for engaging the most adjacent side of the arm 10. In view of the fact that it is intended that the arm 10^a normally contact the set-screw 17, it is biased in this direction by means of a load spring 18. The excessive outward movement of the arm 10^a is prevented by a limit switch 20 which is adjacently disposed on the plate 8 and through a suitable electrical circuit (not shown) operates the reversible motor 29 to move the nuts 4 further apart. The movement of the arm 10^a out of contact with the operating arm of the said limit switch discontinues the operation of the reversible motor 29.

According to the foregoing construction and arrangement of parts, it will be perceived that when a strip or other workpiece to be centered is fed along the rollers A and beneath the guides 2, its side edges will be engaged by the strip-engaging elements 14, and if the strip is off-center, one of the control levers 13 will be moved in such manner as to cause the corresponding movement

of the arm 10 against the action of the load spring 18.

Disposed to extend above the opening between the spaced parallel guides 2, and through the traveling nuts 4 is a rotatable screw 25. This rotatable screw is journaled adjacent its ends in end bearings 26, and at its center in a center bearing 27. Those portions of the screw 25 which extend through the nuts 4 are in screw-threaded engagement therewith, one providing a right-hand thread and the other providing a left-hand thread. It will be perceived, too, that these screw-threaded portions are on either side of, and evenly spaced with respect to, the center bearing 27. Disposed adjacent one end of the guides 2 is a reversible motor 29 which, through a gear reduction unit 30 and suitable connecting instrumentalities, is adapted to rotate the screw 25 in either direction. This construction permits the traveling nuts 4 and accordingly the strip-engaging elements 14 to be moved in unison toward and away from each other and in a like manner with respect to a workpiece disposed therebetween.

As will be seen more clearly in Figure 4, each of the depending bars 7 has secured thereto a Selsyn-type transmitter 33, the shaft 34 of which depends vertically and carries a pinion 35. These pinions 35 are engaged by segmental gears 37 which are carried on the adjacent ends of the arms 10. The transmitter cable 40 of each of the Selsyn-type transmitters 33 is connected as at 42 to a conduit 43 which extends along one of the guides 2. Disposed atop the center bearing 27 for the screw 25 is a Selsyn-type differential receiver 45 which is connected through the conduit 43 with the transmitter cable 40 of both of the Selsyn-type transmitters 33. Disposed at suitable intervals along the conduit 43 is a pair of limit switches 47 having instrumentalities susceptible of being engaged by a limit switch operating arm 48 which is carried by one of the nuts 4. The Selsyn-type differential receiver 45 operates in the usual manner a pair of micro-type switches 46 each of which is connected in such manner as to operate the control for one of the motors C of the side guides B.

The electrical circuits connecting the Selsyn-type transmitters 33, the Selsyn-type differential receiver 45, and their associated electrical instrumentalities, are entirely conventional and form no part of the present invention; and accordingly are neither shown herein nor more fully described hereinafter.

In operation:

A strip X, or other workpiece, is fed over the rollers A, between the side guides B and completely over the elevated, laterally-extending horizontal guides 2. When the workpiece X is moved in this manner, the nuts 4 are so disposed that the strip-engaging instrumentalities 14 are spaced with respect to the side edges of the workpiece. The movement of the workpiece is continued until the trailing end thereof approaches proximity to the guides 2. The movement of the workpiece X is continued until the trailing end thereof leaves the side guides B. Disposed between the side guides B and the guides 2 may be a welding machine or other connecting instrumentality (not shown). Another strip (or other workpiece) is fed over the rollers A with its advance end disposed between the side guides B.

The trailing end of the first workpiece and the advance end of the second are thus placed in sufficiently close proximity to permit of their be-

ing connected together, at which time it is essential that they be properly centered.

At this point the operator energizes the motor 29 in such manner as to move the nuts 4 toward each other. This movement is continued until one of the strip edge-engaging instrumentalities 14 makes contact with the adjacent edge of the workpiece X. When one of the strip edge-engaging instrumentalities 14 engages the edge of the strip, its movement is stopped, while there is continued the movement of the nut 4 by which it is carried. This continued movement causes the bar 7, Selsyn-type transmitter 33, and the pinion 35 of the latter, to be moved with respect to the arm 10 carrying the segmental gear 37. This movement, then, causes the partial rotation of the shaft 34 of that particular Selsyn-type transmitter 33.

The partial rotation of the shaft 34 will be such as to cause the shaft of the Selsyn-type differential receiver 45 to rotate in the proper direction to bring about off-center correction. This rotation of the shaft of the Selsyn-type differential receiver 45 is such as to cause the operation of the proper micro-type switch 46, which in turn operates the motor C of the proper side guide B. More specifically, the Selsyn-type transmitters 33 and the Selsyn-type differential receiver 45 are self-synchronous devices which are similar to three-phase induction motors but have shuttle-wound rotors with two definite poles, the windings of which are connected through collector rings to a single-phase, alternating-current source of excitation. The Selsyn-type transmitters 33 are operated at the sending points as generators, and are therefore called "transmitters," while the Selsyn-type differential receiver 45 is operated at the receiving point as a motor, and is therefore known as the "receiver." The energization of the proper side guide B causes the movement of the advance end of the second strip to correct the off-center condition. The operation of the said side guide B continues until the second strip edge-engaging instrumentality 14 engages the edge of the strip, thus causing the rotation of the shaft 34 of the second Selsyn-type transmitter to a degree sufficient to equalize the force impressed on the Selsyn-type differential receiver 45 by the first Selsyn-type transmitter. This causes the shaft of the Selsyn-type differential receiver 45 to reverse, returning it to the neutral position. Upon its return to neutral position, the shaft of the Selsyn-type differential receiver 45 operates the proper micro-type switch 46 to deenergize the motor C of the proper side guide B. In this manner the side guiding is stopped at the proper time, and the two strips will be in exact longitudinal alignment.

As soon as the two strips are in proper longitudinal alignment, they may be connected together in any suitable manner, after which the operator may operate the motor 29 in such manner as to withdraw the nuts 4 and their connected strip edge-engaging instrumentalities 14. This operation of the motor 29 is continued until the outer of the limit switches 47 is operated, at which time the motor is automatically deenergized. The inner limit switch 47 operates to prevent excessive inward movement of the nuts 4.

While I have shown and described one specific embodiment of the present invention, it will be seen that I do not wish to be limited exactly thereto, since various modifications may be made without departing from the scope of the invention as defined in the appended claims.

I claim:

1. The combination with side guides for workpieces, of a centering device comprising means for engaging the workpiece at different points, and means actuated thereby for controlling the operation of said side guides, said means including synchronous electrical motors.

2. The combination with side guides for workpieces, of a centering device comprising means for engaging two opposite points of a workpiece, and means actuated thereby for controlling the operation of said side guides, said means including synchronous electrical motors.

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