Aug. 11, 1964 L. J. NASH 3,144,071

MACHINES FOR FORMING METAL SECTIONS OR TUBES

Filed June 15, 1961 2 Sheets-Sheet 1

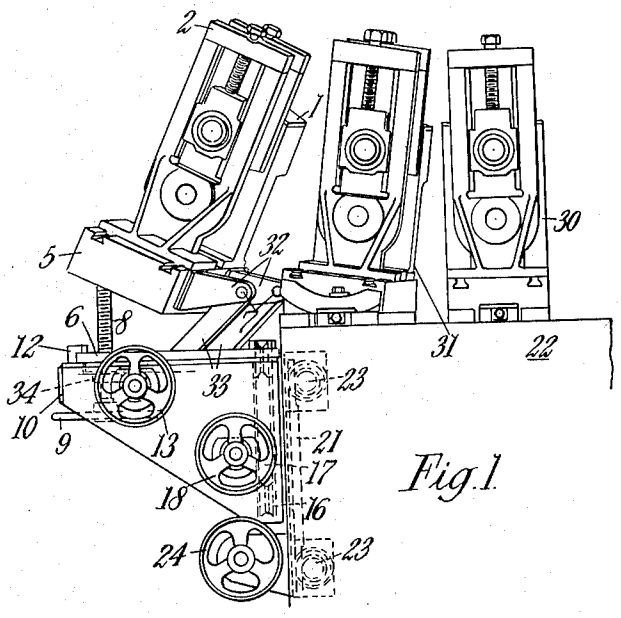

Fig. 1

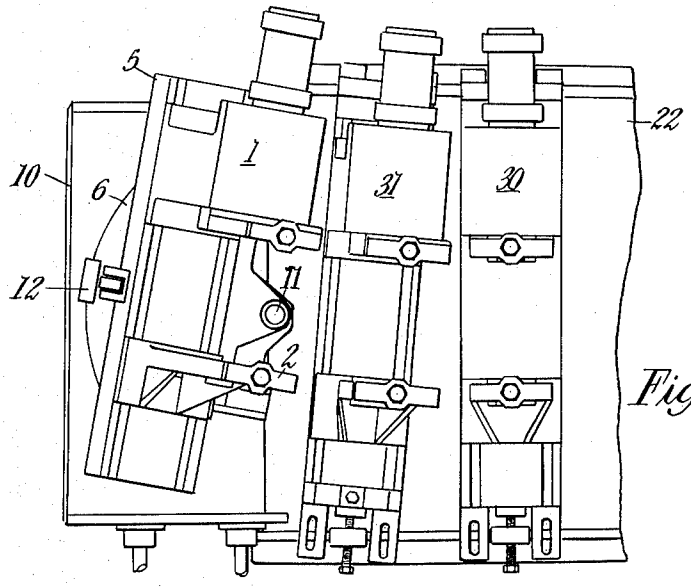

Fig. 3

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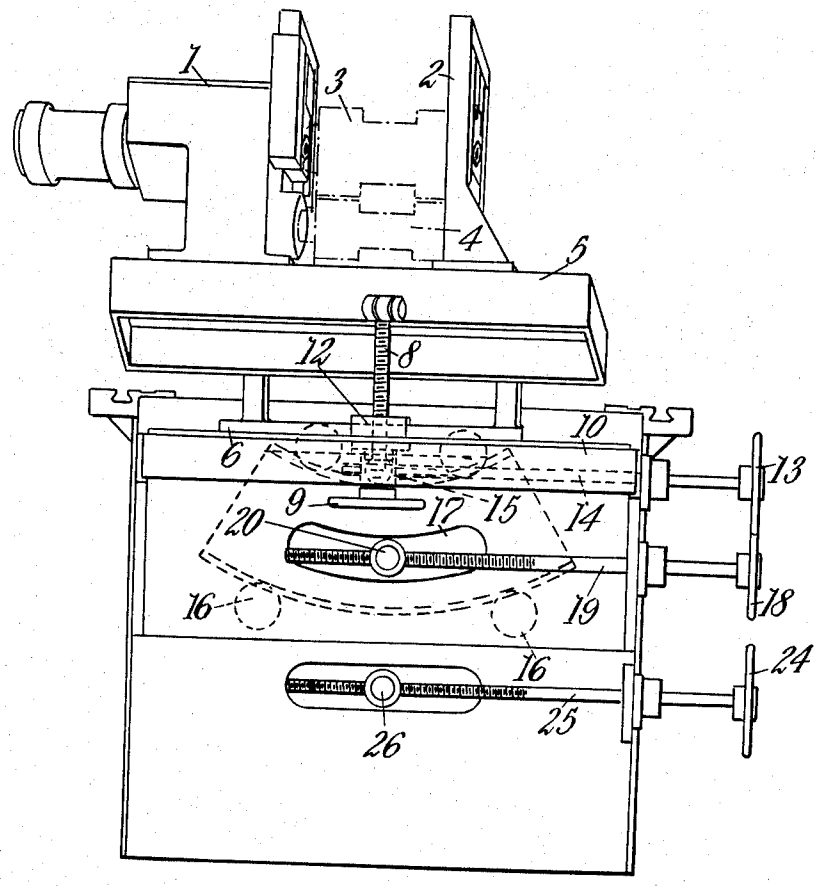

Fig. 2.

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MACHINES FOR FORMING METAL SECTIONS OR TUBES

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This invention relates generally to machines for forming metal sections or tubes and of the kind in which a plurality of operating units are mounted in a line upon a base for successive operation upon a workpiece, each unit comprising a pair or set of rollers between the nip of which the workpieces are intended to be fed.

Usually the formed sections or tubes produced by such machines are straight lengths, but some are produced with a radial contour relative to a vertical axis or a transverse axis or a combination of both these axes.

When an axially formed workpiece issues from the sets of rigidly mounted forming rolls of the machine, it is common for it to deviate fractionally from a chosen linear path due to variations in metal thickness or temper or both.

The straight or contoured workpiece, and undesired deviations therefrom, are at present controlled by adjustably mounted devices generally incorporating one or a combination of the following, namely:

(A) Stationary guide blocks, vertically, transversely and co-axially adjustable.

(B) Idle guide rollers, vertically, transversely and co-axially adjustable.

(C) Mechanically driven guide rollers, vertically adjustable and, at present, transversely and co-axially adjustable to a generally insufficient degree.

With a mechanically powered machine it has not been practicable to adequately drive forming rollers which are adjustably moveable to the desired degree.

In accordance with the invention therefore a straightening or contouring attachment for use with a machine of the kind referred to comprises a pair of forming or guide rollers mounted on a base which is supported by a table bracket mounted or adapted to be mounted on the base of the forming machine, the base plate being angularly adjustable about any of three mutually perpendicular axes and also transversely adjustable, relative to the base of the machine.

Ordinarily one axis extends transversely of the feed axis of the forming machine parallel with the base, another axis extends substantially longitudinally close to the feed axis and the third axis extends substantially perpendicular to the table bracket.

For a better understanding of the invention however, reference should be made to the accompanying drawings which illustrate by way of example one particular and at present preferred form of attachment which is shown fitted to the end of a machine for forming metal sections or tubes.

In these drawings, FIGURES 1, 2 and 3 are a side elevation, end elevation and plan view respectively, of a straightening or contouring attachment.

Referring now to the drawings, the straightening or contouring attachment is shown fitted at the delivery end of the base **22** of a metal section or tube forming machine equipped with a number of forming roller assemblies **30**, **31** each comprising a pair of suitably contoured rollers between which the workpiece is formed. When a workpiece is to be formed with a radial contour roller assembly **31** can be inclined both in a vertical plane and relative to the linear axis of the workpiece.

The attachment comprises a pair of final forming rollers

3, and **4** mounted between side brackets **1**, **2** on a box section base or sub-base **5** having parallel support lugs **32** by means of which it is hinged through pivots **7** on a pair of links **33** fitted to a swivel plate or table **6**.

The sub-base **5** is tiltable in a vertical plane about pivots **7** by a screw threaded rod **8** which passes through a universal ball-nut mounting **34** fastened to the swivel plate or table **6** and including a handwheel **9** by which the rod **8** can be raised and lowered.

The swivel plate **6** is mounted for angular movement about a pivot pin **11** upon the top of a table bracket **10** and is retained by slide gib **12** bearing on its forward edge. The position of the swivel plate **6** on the table bracket **10** is adjusted by rotation of a handwheel **13** secured to the table bracket **10** through a universal ball mounting. The handwheel **13** is coupled to a screw **14** which extends through a nut **15** pivotally mounted beneath the swivel plate **6**.

The table bracket **10** is movable in an arcuate path about an axis located centrally between the rollers **3** and **4**. Attached to the table bracket **10** are four concave V rollers **16** which engage the upper and lower curved surface of a segment plate **17**. The table bracket **10** is adjustable around the segment plate **17** by rotation of a handwheel **18** secured through a universal ball mounting to the table bracket **10**. Rotation of the handwheel **18** turns a screw **19** which passes through a nut **20** pivotally mounted on the side of the segment plate **17**.

The segment plate **17** is secured to a back plate **21** which is transversely moveable across the base **22** of the machine upon slide bars **23** under the control of a handwheel **24** secured through a universal ball mounting to the machine base **22**. Rotation of handwheel **24** turns a screw **25** which passes through a nut **26** pivotally mounted on the side of back plate **21**.

It is to be noted that the axis of each adjustment is relatively close to the previous set of forming rollers thus allowing the axis of the rollers to be near the cross-sectional and radial contour axis of the workpiece.

I claim:

1. In a contouring machine for elongated metal workpieces having a plurality of pairs of parallel cooperating rolls supported on the base of the machine, said base including a longitudinally extending bracket and means mounting the bracket on the base for angular adjustments relative to the direction of feed of the workpiece about a first axis which is substantially horizontal, a table mounted on the bracket for angular adjustments about a second axis which is substantially normal to the first axis, a sub-base mounted on the table for tiltable adjustments about a third axis which is substantially normal to the second axis, and means mounting one of said pairs of rolls on said sub-base.

2. In a contouring machine as defined by claim 1, further including means supporting the bracket on the base for substantially horizontal shifting movement transversely thereof along a line normal to the first axis.

3. In a contouring machine as defined by claim 1, in which the means mounting the bracket on the base for angular adjustments about a horizontal axis includes an arcuate track supported on the base with its curvature in a substantially vertical plane, roller means supporting the bracket on the track, and means for moving the bracket along the track relative to the base and securing it in adjusted positions thereon.

4. In a contouring machine as defined by claim 3, including means mounting the track on the base for transverse horizontal movement normal to the axis of the arcuate track.

5. In a contouring machine as defined by claim 3, in which the means for moving the bracket along the track includes a threaded nut mounted on the track and a

threaded rod secured to the bracket extending into the nut and provided with a handwheel.

6. In a contouring machine as defined by claim 4, in which the means mounting the track on the base comprises a plate secured to the track, a pair of slide bars on the base supporting the plate for said transverse horizontal movement, a threaded nut on the plate, and a threaded rod secured to the base passing through the nut and provided at one end with a handwheel.

7. In a contouring machine as defined by claim 1, in which the sub-base is mounted on the table for tilting movements about the third axis by a pair of arms extending from the table, and a pair of lugs extending from the sub-base and respectively pivoted thereto.

8. In a contouring machine as defined by claim 7, including a threaded rod threadably mounted in the table and engageable with the sub-base, and means for rotating the rod to tilt said sub-base.

9. In a contouring machine as defined by claim 1, in which the table is provided with a threaded nut, a threaded rod secured to the bracket extending through the nut and provided with a handwheel for angularly adjusting the table about the second axis.

10. In a contouring machine for elongated metal workpieces in which a plurality of pairs of parallel cooperating rolls are supported on the base of the machine, said base including a movable support thereon for at least one of said pairs of rolls, means mounting said movable support on the base for adjustably shifting the at least one pair of rolls in vertical and horizontal planes relative to an adjacent pair of rolls and for angularly adjusting the axes of the at least one pair of rolls relative to the axes of the adjacent pair of rolls in horizontal and vertical planes, and means for locking said movable support in adjusted positions.

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