Sept. 21, 1971 C. P. LEWIS 3,606,783

SEGMENTED ROLL FOR FORMING HELICALLY CORRUGATED PIPE

Filed April 1, 1969 4 Sheets-Sheet 1

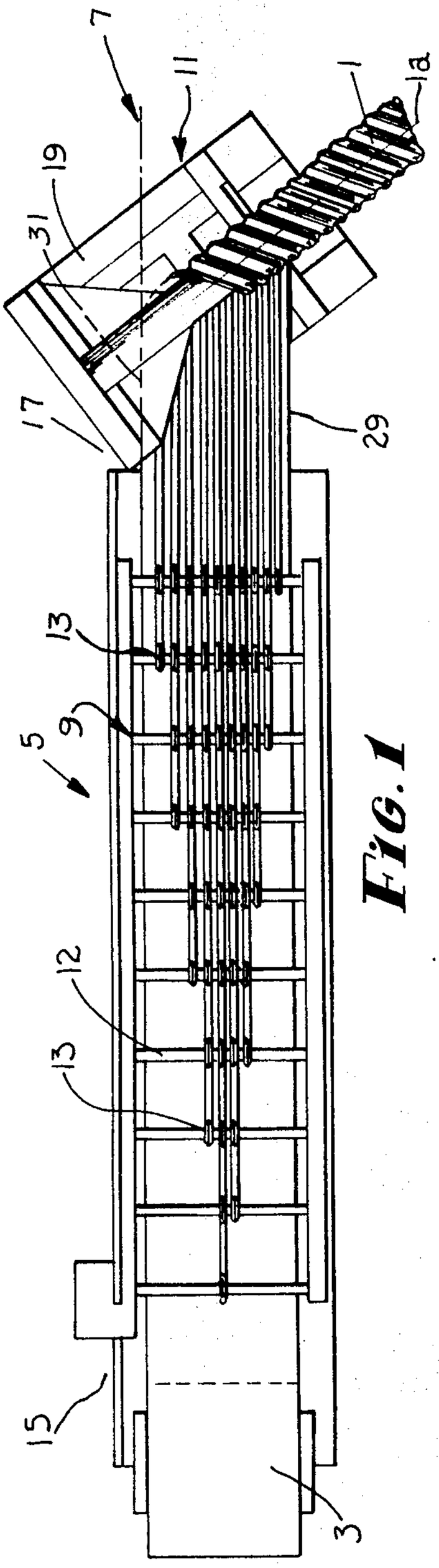

FIG. 1

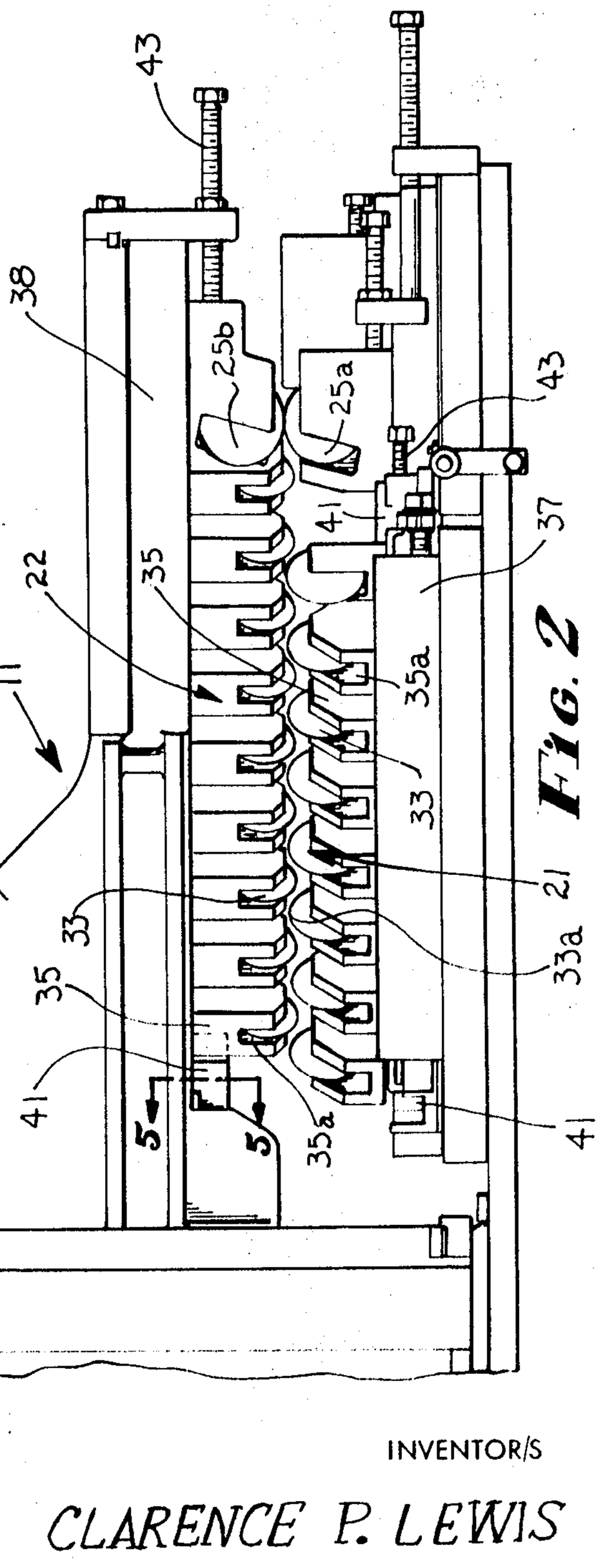

FIG. 2

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SEGMENTED ROLL FOR FORMING HELICALLY CORRUGATED PIPE

Filed April 1, 1969 4 Sheets-Sheet 2

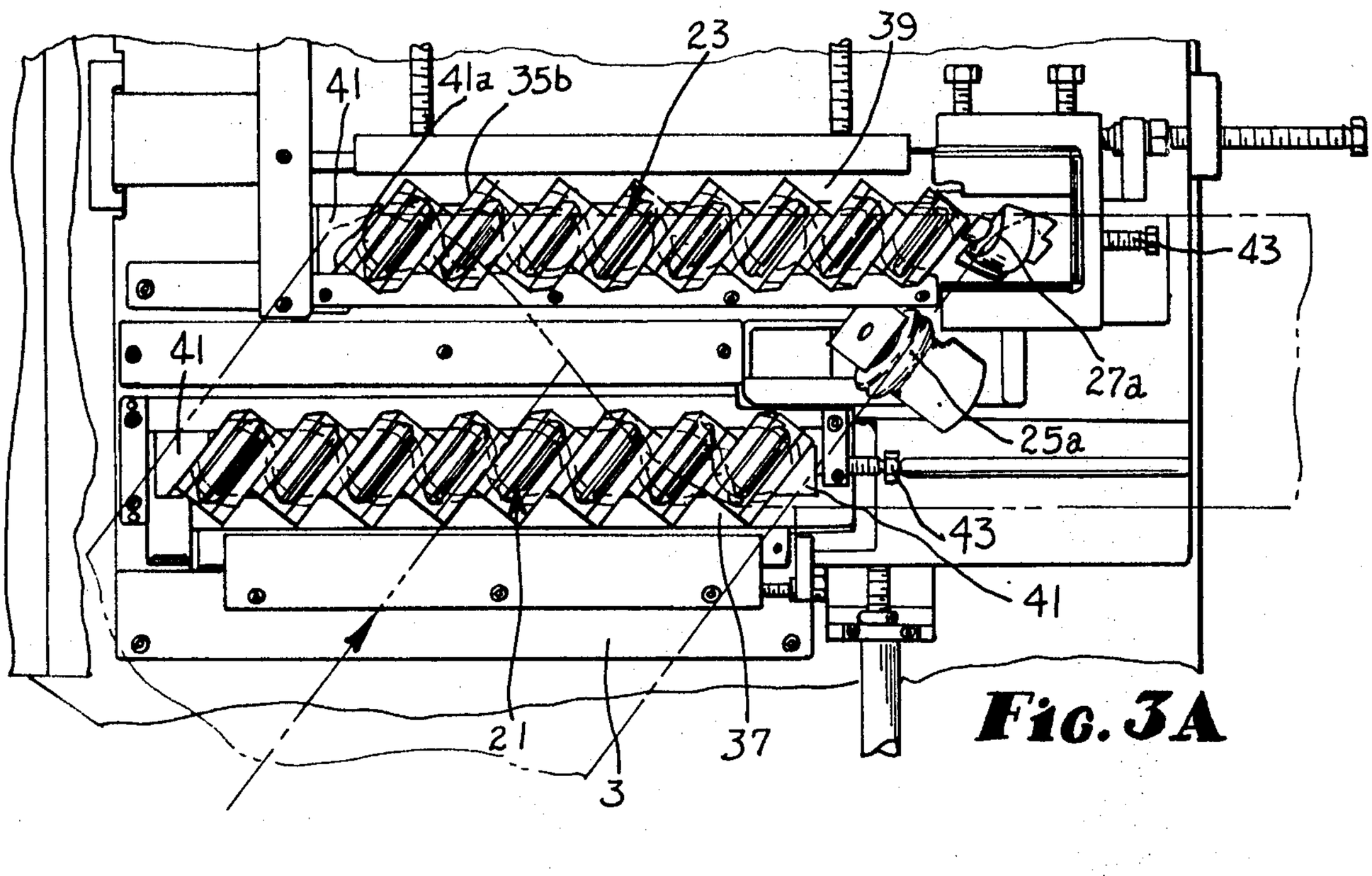

Fig. 3A

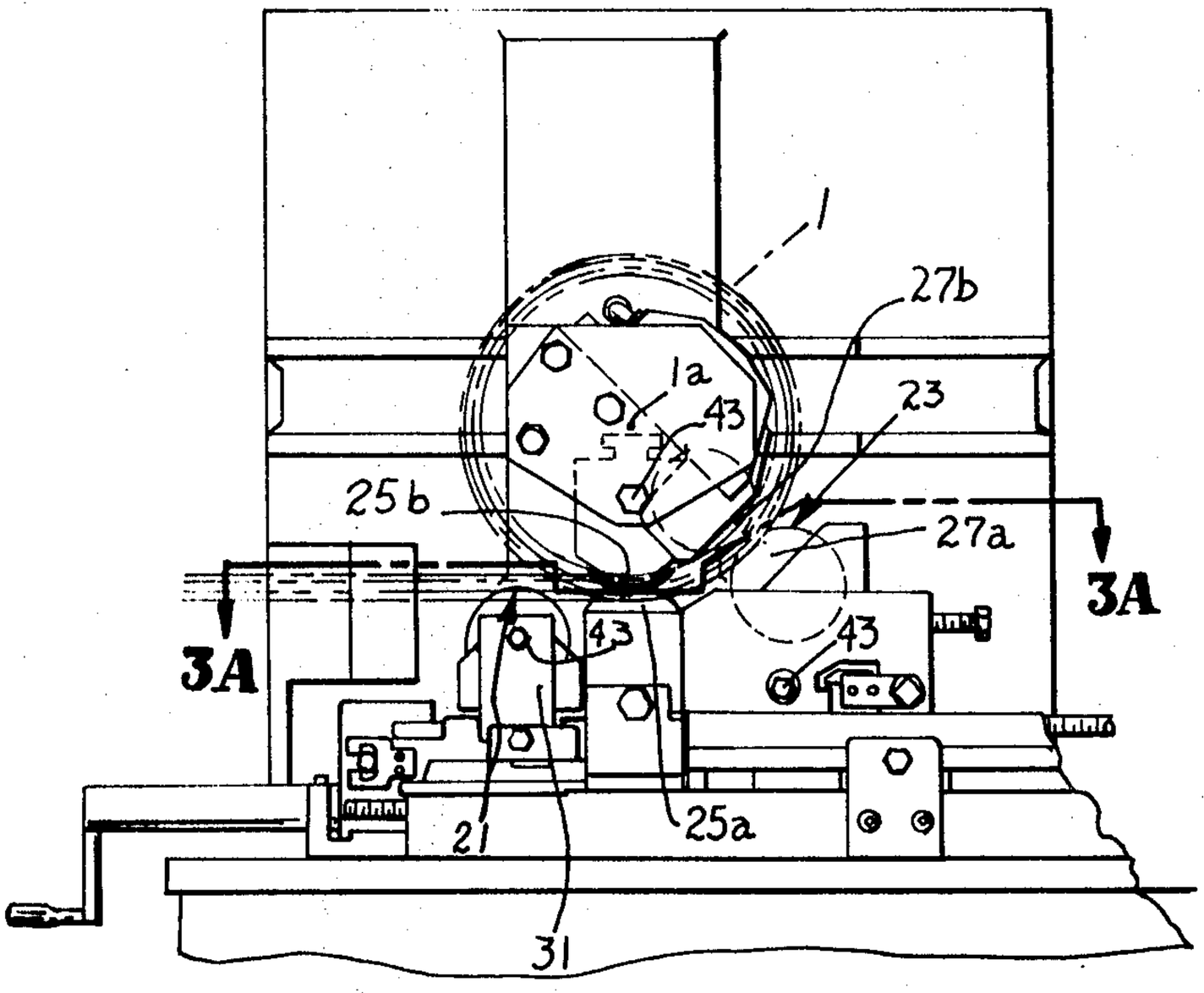

Fig. 4

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SEGMENTED ROLL FOR FORMING HELICALLY CORRUGATED PIPE

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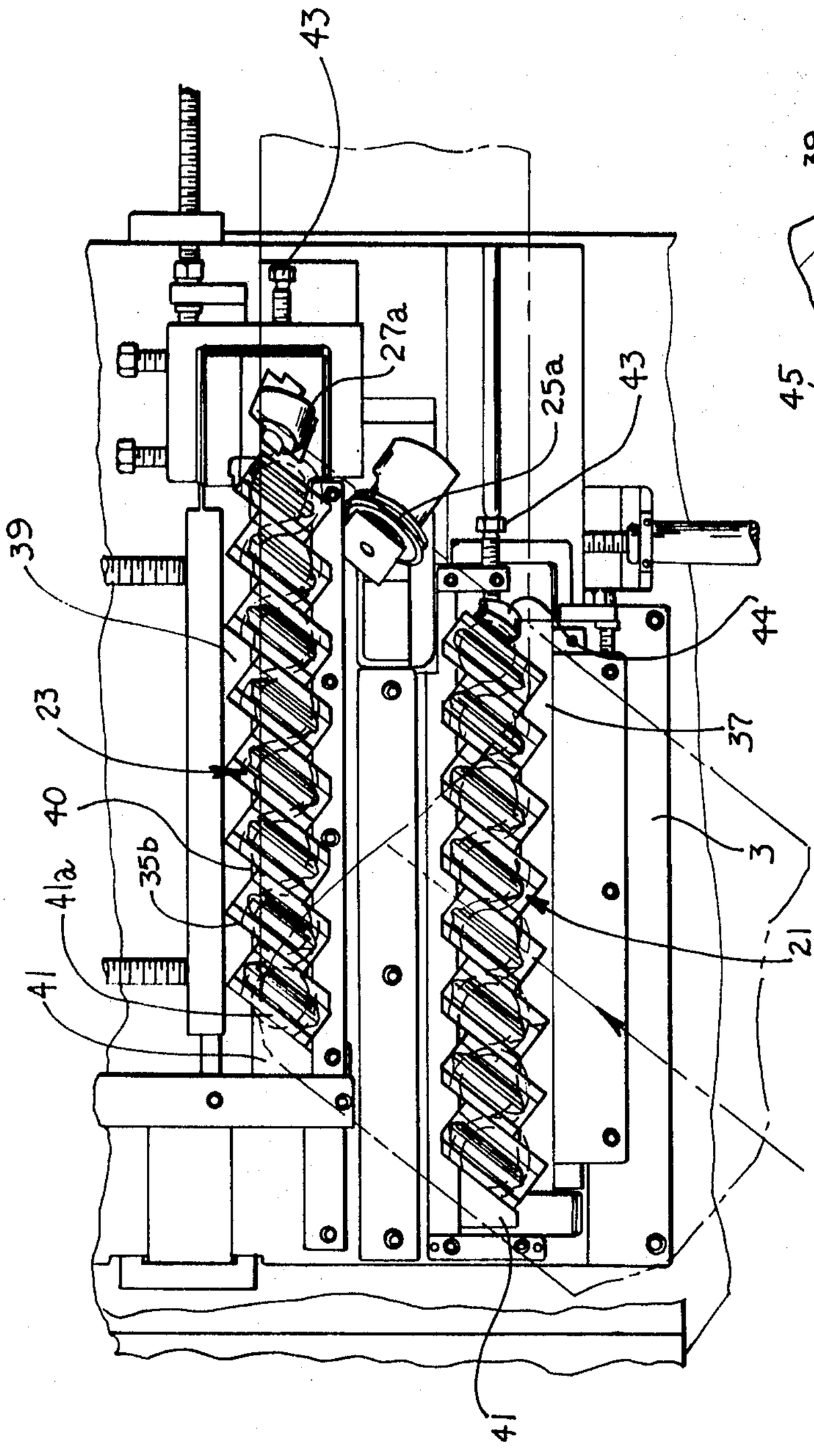

Fig. 3B

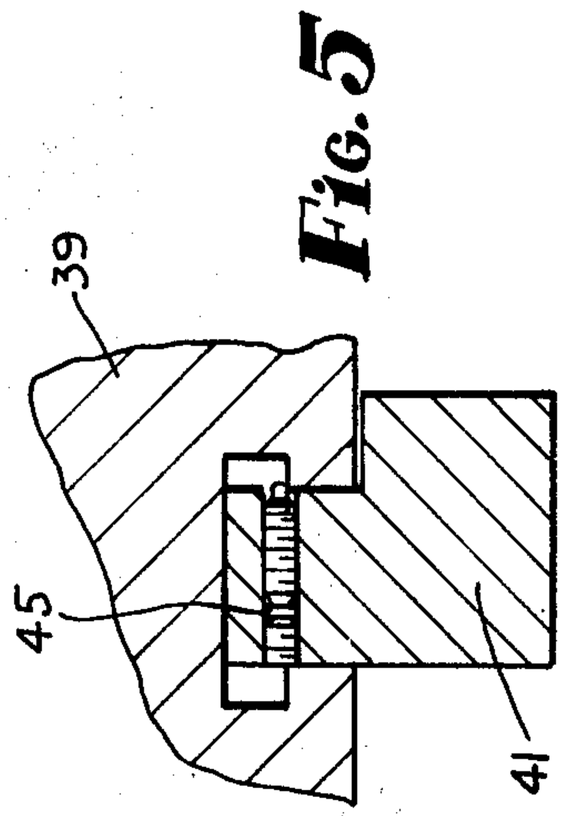

Fig. 5

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SEGMENTED ROLL FOR FORMING HELICALLY CORRUGATED PIPE

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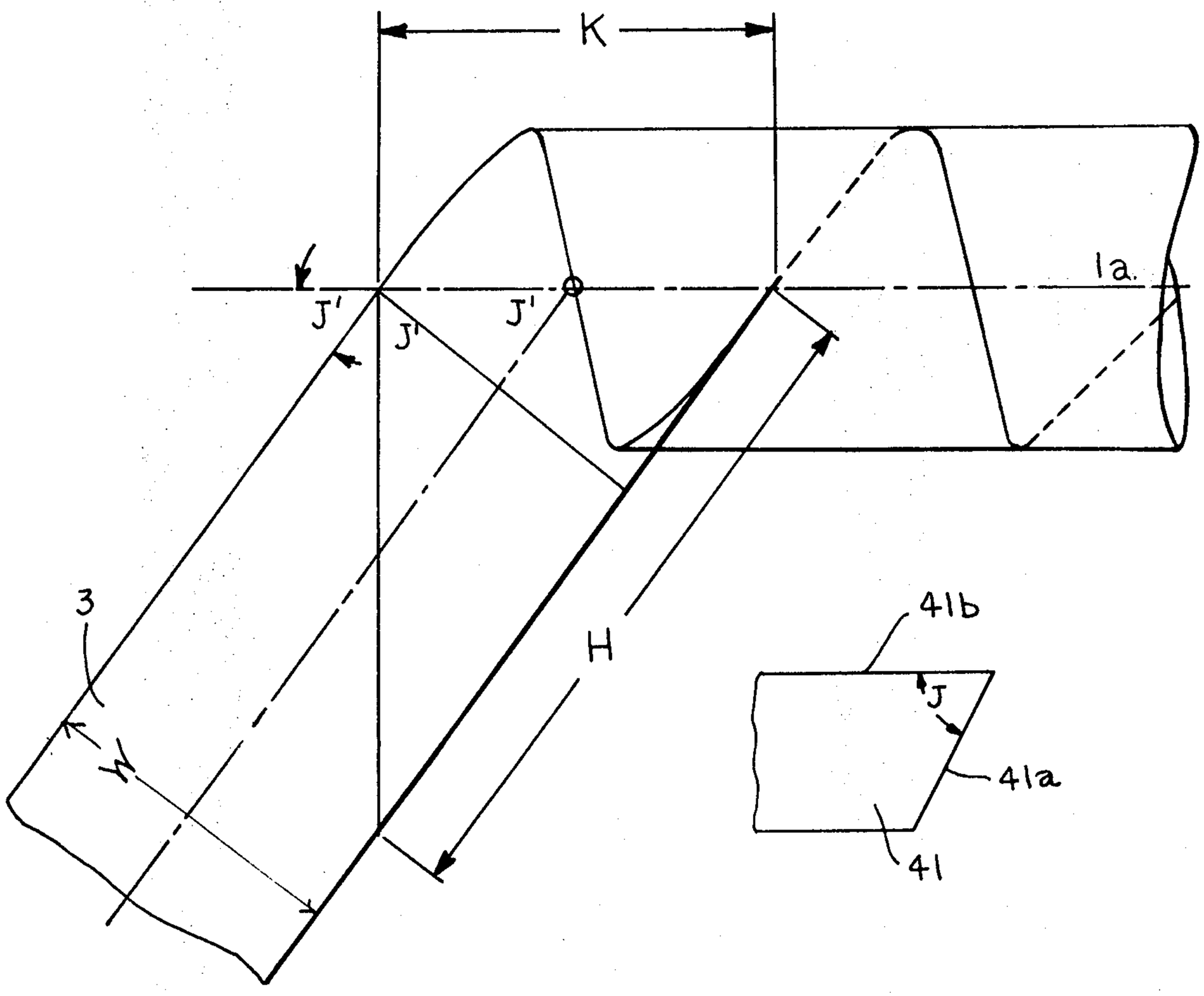
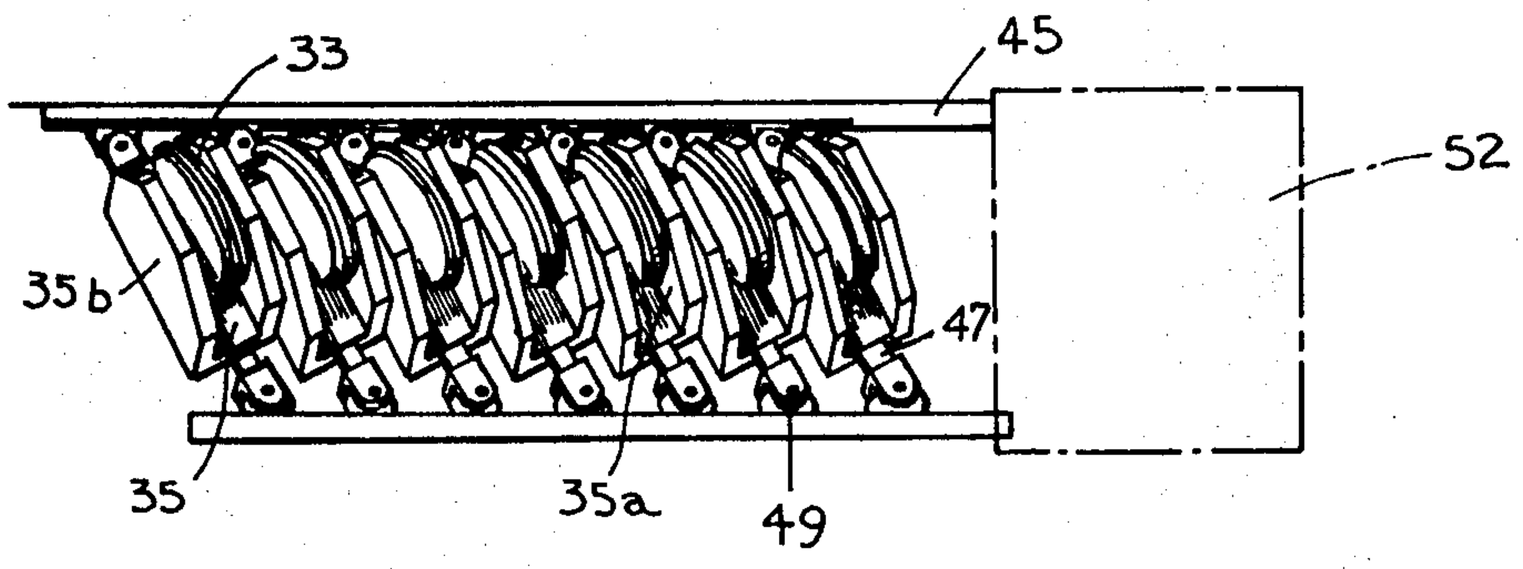


Fig. 6

Fig. 7



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SEGMENTED ROLL FOR FORMING HELICALLY CORRUGATED PIPE

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Int. Cl. B21c *37/12;* B21f *3/02;* B23k *31/00*

U.S. Cl. 72—135 11 Claims

ABSTRACT OF THE DISCLOSURE

An improved segmented roll for forming helically corrugated pipe by curling an elongated strip of sheet metal having longitudinally extending, alternating ridges and valleys therein, into a helical convolution.

BACKGROUND OF THE INVENTION

(1) Field of the Invention

This invention relates to an improved apparatus for making pipe and more particularly to helically forming pipe from an elongated strip of flat sheet metal.

(2) Description of the prior art

A number of machines have heretofore been utilized in forming helically corrugated spiral pipe by bending an elongated strip of sheet metal or the like into helical convolutions and joining or connecting the adjacent edges of the convolutions by welding, forming a lock seam, or the like. However, such machines have generally been restricted to the formation of a single size of pipe for each size of forming shoe employed therewith. The time required to change such a machine from producing one size of pipe to another has therefore been extensive, resulting in increased labor costs and extended periods when the machine was unproductive.

United States Letters Patent No. 3,247,692, in the name of Paul K. Davis, attempted to alleviate the aforementioned difficulties by providing a forming device comprising a plurality of forming rolls containing connected mounting means or plates carrying yokes supporting rollers. However, the C-section connectors joining the mounting means or plates have led to binding problems as dirt accumulates therein and prevents the easy glide of adjacent mounting means or plates.

The machine of Davis is not restricted to the formation of a single size of helically corrugated pipe because Davis provides shifting means for the connected mounting means or plates. One form of shifting means for the connected mounting means or plates comprises the use of an arm to adjust the rollers of the forming rolls of the forming device as the angle between the forming device and the carriage is changed to produce pipe of varying diameter. Such an adjustment aligns the end roller with the crimping wheel used for lock seam pipe or with the weld roller used for welded seam pipe. However, this shifting means has proven unsatisfactory because binding occurs due to the accumulation of dirt in the C-section connectors, thus preventing the easy glide of adjacent mounting means or plates. Additionally, the alignment was found to be unsatisfactory.

Davis also proposes an alternative method of shifting means. Here the angle of the rollers of the forming rolls is set by an adjustment rod. However, this system relies upon a visual adjustment and does not lead to acceptable accuracy. The system, of course, must be readjusted as the diameter of the pipe being formed is changed.

SUMMARY OF THE INVENTION

The present invention has eliminated the aforementioned problems by providing an improved mounting means and shifting means for a segmented roll for forming helically corrugated pipe. Briefly, the mounting means comprises a plurality of independent mounting plates which are slidably mounted within and rotatable with respect to the segmented roll. Each mounting plate is provided with a slot therein for receipt of the circular portion of one of the rollers such that the periphery of the roller projects therefrom. Each mounting plate is also provided with opposed parallel side edges which are generally contiguous with adjacent mounting plates, thereby maintaining the planes of the peripheries of the rollers parallel and spaced apart. Accordingly, excessive dirt particles are prevented from accumulating therebetween so that the easy glide of adjacent mounting plates is maintained.

The shifting means of the present invention for shifting the mounting plates together along the axis and for changing the angle of the planes of the peripheries of the rollers with respect to the longitudinal axis of the elongated supporting member of the segmented roll which houses the mounting plates, may comprise an adjustable means at the end of the elongated supporting member and a tapered spacer block. A portion of the adjustable means is generally contiguous with a side edge of one of the end mounting plates and may be adjusted so that the spacer block may be inserted within the elongated supporting member so that the tapered face thereof is generally contiguous with a side edge of the other end mounting plate. Accordingly, the rollers of the segmented roll may be set and the angle of the plane of the peripheries of the rollers with respect to the longitudinal axis of the elongated supporting member may be changed as the angle of the alternating ridges and valleys or corrugations of the metal strip relative to the axis of the pipe being formed changes.

It will be obvious that a differently angled spacer block is needed for each diameter of pipe being made. The advantage, however, is that "jig bore" accuracy is obtained in an adjustable apparatus.

In a further embodiment of the present invention the shifting means comprises a spacer block slidably received within each end of the elongated supporting means and adjustable means to position them therein with respect to the mounting plates. Each of the spacer blocks is provided with a substantially identical tapered face which is generally contiguous with a side edge of one of the end mounting plates.

In still a further embodiment of the present invention the shifting means comprises at least one templet bar slidably mounted adjacent to and parallel with the segmented roller. Means are provided for pivotally joining each of the mounting plates with the templet bar, and means actuate the templet bar so that the mounting plates may be rotated together to set the rollers and to change the angle of the plane of the peripheries of the rollers with respect to the longitudinal axis of the elongated supporting member as desired.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a top plan view of an apparatus for making helically corrugated pipe which utilizes the improvement of the present invention.

FIG. 2 is an enlarged front elevation of the forming device utilizing the present invention.

FIG. 3A is an enlarged cross sectional view taken on the line 3A—3A of FIG. 4.

FIG. 3B is an enlarged cross sectional view similar to FIG. 3A but showing a modification of the invention.

FIG. 4 is an enlarged end elevation of a portion of the forming device utilizing the present invention.

FIG. 5 is a cross sectional view through a spacer block of the present invention taken on the line 5—5 of FIG. 2.

FIG. 6 is an enlarged view showing the geometric relationship between the forming angle and the angle that the tapered face of the spacer block makes with the longer edge thereof.

FIG. 7 is a perspective view showing a further embodiment of the shifting means according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 discloses a top plan view of an apparatus for forming helically corrugated spiral pipe **1** from an elongated strip of sheet metal **3**. In general, the apparatus comprises a corrugating station **5** and a forming station **7**. At the corrugating station, a carriage, generally designated **9**, receives the strip of sheet metal **3**, forms longitudinal ridges and valleys therein and advances it through the forming device, generally designated **11**, at the forming station where the strip of sheet metal **3** is continuously formed into the pipe **1**. The pipe then proceeds to a discharge station for further processing.

The carriage **9** does not form a part of the present invention and will only be described in sufficient detail as to explain the development of the present invention. It will suffice to say that the carriage **9** carries on its upper side a plurality of corrugating rolls **12**. The rolls **12** have one or more wheels **13** and are arranged in a plurality of stands or matched pairs so that the strip of metal **3** will pass between the upper and lower rolls of each stand and be deformed into corrugations as the strip passes from the input end **15** toward the output end **17** of the carriage **9**. The corrugations formed in the strip of metal **3** by the wheels **13** on the rolls **12** are of a common form comprising alternating ridges and valleys connected by integral oppositely inclined portions. If desired, lock seam elements (not shown) may be formed centrally of oppositely inclined portions at the edges of the strip. However, this will, of course, depend on how the adjacent edges of the helical convolutions are to be joined, such as by welding, forming a lock seam, or the like.

As the strip of metal **3** leaves the output end **17** of the carriage **9** it is fed through the forming device **11**. The forming device, as best seen in FIGS. **2, 3 and 4,** comprises a frame **19** supporting a forming roll mechanism. The forming roll mechanism is located in a position intercepting the feed path of a strip of metal **3** from the carriage **9** and includes supporting segmented heel, arbor and buttress rolls **21, 22** and **23** and first and second matched pairs of seam rollers **25***a*, **25***b* and **27***a*, **27***b* respectively. The arbor roll **22** acts as the pressure roll and curls the strip of metal **3** into an arc using the buttress **23** as the strip of metal **3** is moved therethrough by the driving means on the carriage **9**.

The heel, arbor and buttress rolls **21, 22** and **23**, as will be more fully explained hereinafter, are made up of a plurality of individual rollers **33** and have an axis of rotation parallel to a pipe axis **1***a* about which the strip of metal **3** is curled. In the formation of smooth walled pipe, unitary rolls may be substituted for the segmented rolls **21, 22** and **23**. The unitary rolls will comprise elongated, substantially cylindrical rolls supported for rotation about parallel axes intercepting the feed path of a flat strip at an oblique angle and will similarly function to curl the strip about the pipe axis **1***a*.

The subject segmented heel, arbor and buttress rolls **21, 22** and **23**, with their axes at an oblique angle to the feed path of the strip of metal **3**, cause the strip to be curled by the individual rollers thereon into helical convolutions, the pitch angle of which is the same as the oblique angle. It should be noted that the carriage **9** is supported for swinging relative to the frame **19** of the forming device **11**. Accordingly, the oblique angle between the feed path of the carriage **9** and the segmented heel, arbor and buttress rolls **21, 22** and **23** may be adjusted in relation to the width of the strip of metal **3** at the output end of the carriage **9** and the diameter of the pipe being formed so that the trailing edge **29** of a preceding portion of the strip of metal **3**, when curled through a convolution of 360°, is adjacent the leading edge **31** of a following portion of the strip. In this manner, the strip of metal **3** is curled into closed helical convolutions so that when the adjacent edges are joined a continuous helically corrugated spiral pipe is completed and discharged from the forming device **11** along the pipe axis **1***a*.

The segmented heel, arbor and buttress rolls **21, 22** and **23** preferably comprise a plurality of individually mounted rollers **33**. Each roller **33** has a periphery generally conforming to a corrugation which has been previously formed in the strip of metal **3** by the wheels **13** at the corrugating station **5**. Each of the rollers **33** is rotatably mounted within an independent mounting plate **35** a portion of which is slidably mounted within and rotatable with respect to the segmented roll. Each of the mounting plates **35** has a slot **35***a* therein into which the circular portion **33***a* of the roller **33** fits. As can be seen, the periphery of each roller **33** projects from the end of its mounting plate **35**. Each mounting plate **35** has opposed parallel side edges **35***b* which are generally contiguous with adjacent mounting plates, thereby maintaining the planes of the peripheries of the rollers **33** parallel and spaced apart. It should be noted that the shortest distance between the planes of the rollers **33** is equal to the distance between the adjacent ridges or valleys of the corrugations of the strip of metal **3**.

The independent plates **35** carrying the rollers **33** of the segmented heel, arbor and buttress rolls **21, 22** and **23** are mounted in the elongated members or ways **37, 38** and **39**, respectively, such as within the T-shaped slots **40**, for sliding therewith and rotation with respect thereto. The ways **37, 38** and **39** are secured to the frame **19** of the forming device **11**. It should be emphasized that the mounting plates **35** carrying the rollers **33** are not connected together when they are slidably mounted within the elongated members or way **37, 38** and **39**. This factor is important, because binding problems have been eliminated as excessive dirt particles may not accumulate between the mounting plates **35** so as to prevent the easy glide of adjacent mounting plates.

It is, of course, critical that the rollers **33** conform to the alternating ridges and valleys of the corrugations of the strip of metal **3** as the helical convolution is being formed. However, the angle of the plane of the peripheries of the rollers **33** with respect to the longitudinal axis of the elongated supporting members or ways **37, 38** and **39** must be changed as the angle of the alternating ridges and valleys of the corrugations of the strip of metal **3** relative to the pipe axis **1***a* changes by movement of the carriage **9**. This, of course, is necessary as the diameter of the pipe being formed is changed. According to the present invention the rollers **33** may be kept in proper alignment by shifting means which comprise either two spacer blocks **41** and the adjusting means **43**, as shown in the heel roll **21** in FIGS. 2 and 3A, or a spacer block **41** and the adjusting means **43**, as shown in the heel roll **21** in FIG. 3B. Each spacer block **41** is provided with a tapered face **41***a*. The spacer blocks **41** may be mounted within the elongated supporting members or ways **37, 38** and **39**, as best seen in FIG. 5, by means of a spring plunger **45**.

If the shifting means comprises two spacer blocks **41**, a spacer block **41** is slidably received within each end of the elongated supporting members or ways **37, 38**, and

39 such that the substantially identical tapered edges 41*a* thereof will be generally contiguous with the outside edges 35*b* of the end mounting plates 35 when the adjacent mounting plates 35 are substantially contiguous with each other. In practice, the adjusting pin 43 is loosened sufficiently to allow the spacer blocks 41 to be properly positioned, and then it is tightened so that the planes of the peripheries of the rollers 33 is set. However, if the shifting means comprises a spacer block 41 and the adjusting means 43, which is preferably an adjusting pin 43 having at one end and a pivotally mounted shoe portion 44, as best seen in FIG. 3B, the adjusting pin 43 is loosened sufficiently so that the desired spacer block 41 may be inserted in the elongated supporting members or ways 37, 38 and 39 with the tapered face 41*a* thereof facing toward a side edge 35*b* of one of the end mounting plates 35. The adjusting pin 43 is then tightened until the pivotal shoe portion 44 thereof is generally contiguous with a side edge 35*b* of the other end mounting plate 35 and the parallel side edges 35*b* of the mounting plates 35 are substantially contiguous with each other and the side edge 35*b* of the endmost mounting plate 35 rests against the tapered face 41*a* of the spacer block 41. The plane of the peripheries of the rollers 33 is then set. It should also be noted that the edges 41*a* of the spacer blocks 41 may either bear against the portion of the end mounting plates 41, exterior of the supporting members of ways 37, 38 and 39, as shown in the arbor roll 22 in FIG. 2, or against the portion within the supporting members or ways 37, 38 and 39, such as that portion within the T-shaped slots 40, as shown in the heel roll 21 in FIG. 2. The former position is preferred due to the larger bearing surface area available.

It will be obvious that the angle of the plane of the peripheries of the rollers 33 with respect to the longitudinal axis of the elongated supporting members or ways 37, 38 and 39 may be adjusted with extreme accuracy by varying the tapered face of the spacer block as the angle of the alternating ridges and valleys relative to the axis of the pipe being formed changes. The basic advantage is that a "jig bore" accuracy is obtaining in an adjustable apparatus.

In operation, a plurality of spacer blocks 41, which differ from each other both in the length of the longer edge 41*b* and in the angle J that the tapered face 41*a* makes therewith, are required in order to manufacture helically corrugated spiral pipe of varying diameters.

Turning to FIG. 6, it will be seen that due to the geometric configuration the forming angle J′, which is the acute angle of the alternating ridge and valleys of the corrugations of the strip of metal 3 relative to the pipe axis 1*a*, is equal to the angle J which the tapered side 41*a* of the spacer block 41 makes with the longer edge 41*b* thereof. In practice, where J′ equals the forming angle, K equals the lead, H equals the mean circumference of the pipe being formed, and W equals the width of the strip of metal 3, the forming angle J′, and thus the angle J, may be calculated from the following formula:

$$\text{Cosine } J' = \frac{W}{H} = \frac{W}{\pi(\text{mean diameter})}$$

$$= \frac{W}{\pi(\text{inside diameter} + \text{depth of corrugations})}$$

For example, to make pipe of 18-inch inside diameter from a strip of metal having a width of 24 inches and having ½ inch deep corrugations,

$$\text{Cos } J' = \frac{24}{\pi(18+\frac{1}{2})} = 4128969$$

Accordingly, $J = 65°36'47''$. In practice this angle is rounded off to the nearest minute. The following table represents a compilation of data for helically corrugated spiral

pipe of varying inside diameters to be made from 24 inch wide strip having ½ inch deep corrugations.

Pipe size (inside diam.)	Forming angle J′ and thus angle J	Lead K	Mean circumference H π (I.D.+½)	Cos J′
12	52°20′3″	30.319	39.276	.6110557
15	60°28′30″	27.582	48.701	.4928021
18	65°36′47″	26.351	58.126	.4128969
21	69°11′20″	25.675	67.551	.3552887
24	71°49′59″	25.260	76.975	.3117875
30	75°30′36″	24.789	95.919	.2502102
36	77°55′46″	24.543	114.769	.2091158
42	79°40′2″	24.396	133.807	.1793627
48	80°57′17″	24.302	152.657	.1572155
54	81°57′21″	24.238	171.506	.1399366
60	82°45′50″	24.193	190.541	.1259570
66	83°24′12″	24.160	208.916	.1148787
72	83°57′5″	24.135	227.766	.1053371
78	84°24′55″	24.115	246.615	.0973174
84	84°48′47″	24.098	265.465	.0904073
90	85°9′28″	24.086	284.315	.0844134
96	85°27′34″	24.076	303.165	.0791649

The length of the longer edge 41*b* of the spacer blocks 41 cannot be predicted accurately by geometric relationship due to the tolerance in the thickness and differences in springback characteristics of various metal strips 3. In practice, an approximate length of the longer edge 41*b* is calculated from the geometric relationship and a reasonable increment is subtracted so that all final corrections can be made with the positive addition of shims. Accordingly, the spacer block 41 may be adapted to any particular set of operating conditions. This approximate length calculation is, of course, based on the smallest diameter helically corrugated spiral pipe that will be made in the forming operation, as the large diameter pipe will require a longer edge 41*b* on the spacer blocks 41. Accordingly, the feature of positive shimming will be preserved. It should be noted that the spacer block length calculation for the heel and buttress rolls 21 and 23 will include a compensation for the fact that these rolls are displaced from the pipe axis 1*a* as opposed to the spacer block 41 for the arbor roll 22 which lies directly below the pipe axis 1*a*.

The rollers 33 may also be kept in proper alignment by means of the embodiment of the shifting means disclosed in FIG. 7. There are at least one templet bar 45 is slidably mounted adjacent to and parallel with each of the elongated members or ways 37, 38 and 39. A pin 47 is fixed to each end of the mounting plates 35 and pivotally joins each plate with the templet bar 45, as at 49. Any conventional means 52 may be provided to actuate the templet bar 45, whereby the mounting plates 35 may be rotated together to set the rollers 33 with respect to the longitudinal axis of the elongated members or ways 37, 38 and 39 with extreme accuracy as the angle of the alternating ridges and valleys relative to the axis of the pipe 1*a* being formed changes. In practice, it has been found that two templet bars 45 are preferred and that the conventional actuating means 52 should include gear means joining the bars 45 such that they may be actuated together in opposite directions.

The means 52 to actuate the templet bars 45 may include any conventional dial which is calibrated such that the longitudinal movement of the bars 45 will correspond to the angle of the planes of the peripheries of the rollers with respect to the longitudinal axis of the ways 37, 38 and 39 which is desired.

What I claim is:

1. In a segmented roll for forming helically corrugated pipe by curling an elongated strip of sheet metal having longitudinally extending, alternating ridges and valleys therein, into a helical convolution, of the type having:

(a) a plurality of rollers having peripheries generally conforming to the shape of said ridges and valleys;

(b) mounting means for said rollers, said mounting means mounting each roller for rotation with its periphery in a plane;

(c) elongated supporting means supporting said mounting means with the peripheries of said rollers pro-

jecting therefrom, for engaging said ridges and valleys, said supporting means supporting said mounting means for movement along and with corresponding points on said rollers aligned parallel to the longitudinal axis of said supporting means, and for movement changing the angle of the planes of the peripheries of said rollers with respect to said longitudinal axis of said supporting means; and

(d) means for shifting said mounting means parallel to said axis and for changing the angle of the planes of the peripheries of said rollers with respect to said longitudinal axis of said supporting means;

the improvement wherein said mounting means comprises a plurality of independent mounting plates a portion of which are slidably mounted within and independently swingable with respect to said elongated supporting means, each said mounting plate having a slot therein for receipt of the circular portion of one of said rollers such that the periphery of said roller projects therefrom, and opposed parallel side edges which are generally contiguous with adjacent mounting plates, thereby maintaining the planes of the peripheries of said rollers parallel and spaced apart, whereby excessive dirt particles are prevented from accumulating in said elongated supporting means and so that the easy glide of adjacent mounting plates is maintained, and wherein said shifting means comprises an adjustable pin at one end of said elongated supporting means, said adjustable pin having a pivotally mounted shoe portion at one end thereof which is substantially contiguous with a side edge of one of the end said mounting plates, and at least one spacer block slidably received within the other end of said elongated supporting means, said spacer block having a tapered face which is generally contiguous with a side edge of the other one of said end mounting plates, whereby said adjustable pin and said spacer block set said rollers, and the angle of the plane of the peripheries of said rollers with respect to the longitudinal axis of said elongated supporting means may be changed with extreme accuracy as the angle of said alternating ridges and valleys relative to the axis of said pipe being formed changes by varying said tapered face of said spacer block.

2. The improved segmented roll according to claim **1**, wherein a spring plunger is utilized to retain said spacer block within said elongated supporting member.

3. The improved segmented roll according to claim **1**, wherein said spacer block bears against the portion of one of said end mounting plates exterior of said supporting means.

4. The improved segmented roll according to claim **1**, wherein said spacer block bears against the portion of one of said end mounting plates within said supporting means.

5. The improved segmented roll according to claim **1**, wherein the angle that the tapered face of said spacer block makes with the longer edge thereof may be calculated from the formula:

$$J=W/H$$

where

J=the angle that the tapered face of said spacer block makes with the longer edge thereof;
W=the width of the strip of metal from which a spiral pipe is formed; and
H=the mean circumference of the pipe being formed.

6. In a segmented roll for forming helically corrugated pipe by curling an elongated strip of sheet metal having longitudinally extending, alternating ridges and valleys therein, into a helical convolution, of the type having:

(a) a plurality of rollers having peripheries generally conforming to the shape of said ridges and valleys;

(b) mounting means for said rollers, said mounting means mounting each roller for rotation with its periphery in a plane;

(c) elongated supporting means supporting said mounting means with the peripheries of said rollers projecting therefrom, for engaging said ridges and valleys, said supporting means supporting said mounting means for movement along and with corresponding points on said rollers aligned parallel to the longitudinal axis of said supporting means, and for movement changing the angle of the planes of the peripheries of said rollers with respect to said longitudinal axis of said supporting means; and

(d) means for shifting said mounting means parallel to said axis and for changing the angle of the planes of the peripheries of said rollers with respect to said longitudinal axis of said supporting means;

the improvement wherein said mounting means comprises a plurality of independent mounting plates a portion of which are slidably mounted within and independently swingable with respect to said elongated supporting means, each said mounting plate having a slot therein for receipt of the circular portion of one of said rollers such that the periphery of said roller projects therefrom, and opposed parallel side edges which are generally contiguous with adjacent mounting plates, thereby maintaining the planes of the peripheries of said rollers parallel and spaced apart, whereby excessive dirt particles are prevented from accumulating in said elongated supporting means and so that the easy glide of adjacent mounting plates is maintained, and wherein said shifting means comprises a spacer block slidably received within each end of said elongated supporting means, each said spacer block having a substantially identical tapered face which is generally contiguous with a side edge of one of said end mounting plates, and an adjustable pin at one end of said elongated supporting means, a portion of said adjustable pin being substantially contiguous with one of said spacer blocks, whereby said adjustable pin and said spacer blocks set said rollers, and the angle of the plane of the peripheries of said rollers with respect to the longitudinal axis of said elongated supporting means may be changed with extreme accuracy as the angle of said alternating ridges and valleys relative to the axis of said pipe being formed changes by varying said tapered face of said spacer blocks.

7. The improved segmented roll according to claim **6**, wherein a spring plunger is utilized to retain each said spacer block within said elongated supporting member.

8. The improved segmented roll according to claim **6**, wherein at least one of said spacer blocks bears against the portion of one of said end mounting plates exterior of said supporting means.

9. The improved segmented roll according to claim **6**, wherein at least one of said spacer blocks bears against the portion of one of said end mounting plates within said supporting means.

10. The improved segmented roll according to claim **6**, wherein the angle that the tapered face of said spacer block makes with the longer edge thereof may be calculated from the formula:

$$J=W/H$$

where

J=the angle that the tapered face of said spacer block makes with the longer edge thereof;
W=the width of the strip of metal from which a spiral pipe is formed; and
H=the mean circumference of the pipe being formed.

11. In a segmented roll for forming helically corrugated pipe by curling an elongated strip of sheet metal having longitudinally extending, alternating ridges and valleys therein, into a helical convolution, of the type having:

(a) a plurality of rollers having peripheries generally conforming to the shape of said ridges and valleys;

(b) mounting means for said rollers, said mounting means mounting each roller for rotation with its periphery in a plane;

(c) elongated supporting means supporting said mounting means with the peripheries of said rollers project-

ing therefrom, for engaging said ridges and valleys, said supporting means supporting said mounting means for movement along and with corresponding points on said rollers aligned parallel to the longitudinal axis of said supporting means, and for movement changing the angle of the planes of the peripheries of said rollers with respect to said longitudinal axis of said supporting means; and

(d) means for shifting said mounting means parallel to said axis and for changing the angle of the planes of the peripheries of said rollers with respect to said longitudinal axis of said supporting means;

the improvement wherein said mounting means comprises a plurality of independent mounting plates a portion of which are slidably mounted within and independently swingable with respect to said elongated supporting means, each said mounting plate having a slot therein for receipt of the circular portion of one of said rollers such that the periphery of said roller projects therefrom, and opposed parallel side edges which are generally contiguous with adjacent mounting plates, thereby maintaining the planes of the peripheries of said rollers parallel and spaced apart, whereby excessive dirt particles are prevented from accumulating in said elongated supporting means and so that the easy glide of adjacent mounting plates is maintained, and wherein said shifting means comprises two

templet bars slidably mounted adjacent to and parallel with said elongated supporting means; means pivotally joining each said mounting plate with said templet bar; and means to actuate said templet bar so that said mounting plates may be rotated together to such said rollers, said actuating means including gear means joining said bars such as said bars may be actuated together in opposite directions, the angle of the plane of the peripheries of said rollers with respect to the longitudinal axis of said elongated supporting means may be changed with extreme accuracy as the angle of said alternating ridges and valleys relative to the axis of said pipe being formed changes by varying said tapered face of said spacer block.

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