

⑫

EUROPEAN PATENT APPLICATION

⑳ Application number: **87304750.0**

⑤① Int. Cl.4: **B 21 D 5/08**

㉔ Date of filing: **28.05.87**

③① Priority: **28.05.86 AU 6173/86**

④③ Date of publication of application:
02.12.87 Bulletin 87/49

⑥④ Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

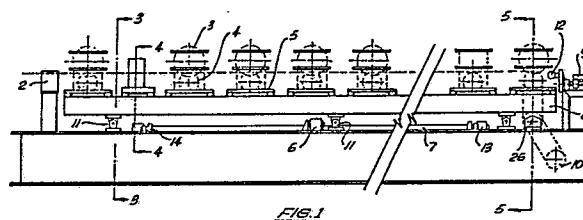
⑦① Applicant: **Loc-Tex International Pty. Limited**
Lot 5, Bromley Street
Emu Plains New South Wales 2750 (AU)

⑦② Inventor: **Noack, Jurgen**
60 James Street
Wingfield South Australia (AU)

⑦④ Representative: **Goodman, Christopher et al**
Eric Potter & Clarkson 14 Oxford Street
Nottingham NG1 5BP (GB)

⑤④ **Roll forming machine.**

⑤⑦ A roll forming machine is disclosed having the upper and lower rollers at each stand mounted on cantilevered drive shafts. The upper and lower rollers are arranged in respective pairs so that the ends of each of the drive shafts of each pair extend towards each other. The drive shafts are attached to movable chassis which enable the axial distance between the opposing drive shaft ends to be adjustably varied thus varying the width of the rolled product.



Description

The invention relates to roll forming machines and in particular to such machines adapted to form standard cross-sections of various sizes.

Roll forming machines of the type under discussion conventionally comprise a series of stands through which the material to be processed is gradually formed into the desired cross-sectional shape, for example a basic channel section. Each stand normally consists of a number of shaped opposed rollers through which the material is passed.

Hitherto, where production of channels in a range of sizes has been required, there have been at least four rollers at each stand, two upper rollers and two opposed lower rollers. The rollers being mounted on a single drive shaft running parallel to a similar drive shaft for the lower rollers. If varying widths or depths of channel were required, the width of the raw sheet fed into the machine could be varied as well as the axial spacing between the rollers on their respective shafts.

In the past, varying the axial distance between the rollers has required repositioning, by sliding or other means, the respective rollers on their respective shafts and locking them in their new position by means of set screws or by changing a collar-like spacer between the upper pair of rollers, or the lower pair as the case may be.

This system has been found generally unsatisfactory in that the machine must be stopped and manually adjusted each time a size change is required. Such a system makes rapid changes in production size difficult, if not impossible.

The present invention seeks to overcome these disadvantages by providing a roll forming machine wherein the spacing between axially adjacent rollers can be readily and easily adjusted.

According to a first aspect, the invention consists in a roll forming machine having at least one rolling stand comprising, two or more pairs of upper and lower opposed rollers through which the material to be formed is passed, each roller being mounted on a cantilevered drive shaft which extends towards a drive shaft of an associated roller in another pair,

said drive shafts being mounted to allow the axial spacing therebetween to be adjustably varied.

Preferably, the cantilevered drive shafts are mounted in bearing assemblies which are fixedly attached to respective chassis frames which extend the length of the roll forming machine. Each chassis may be supported upon parallel support shafts extending transversely of the machine.

For preference, the spacing between each chassis may be altered by means of two or more right and left handedly threaded adjustment shafts also extending transversely of the machine and engaging nuts fixed to a respective chassis. The adjustment shafts may be gear connected to a longitudinally extending drive shaft therefor, so that rotation of the drive shaft causes concerted rotation of the adjustment shafts and thus uniform adjustment of the roller spacing. The longitudinal drive shaft may be

driven by any suitable motor gear-box.

According to a second aspect, the invention provides a guillotine for use in conjunction with said roll forming machine, said guillotine having anvil blocks adapted to move with respect to each other to accommodate various sized product from the roll forming machine and a broad guillotine blade adapted to move downwardly between slots provided in said anvil blocks, said blade being further adapted to hold said product against the anvil blocks during the guillotining operation.

A preferred embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 shows a side elevation view of the roll forming according to the invention,

Figure 2 shows a plan view of the roll forming machine shown in figure 1,

Figure 3 shows a cross-sectional view taken on lines 3-3 of figure 1,

Figure 4 shows a cross-sectional view taken on lines 4-4 of Figure 1,

Figure 5 shows a cross-sectional view taken on lines 5-5 of Figure 1,

Figure 6 shows an enlarged cross-sectional view of one pair of opposed rollers according to the invention,

Figure 7 shows an enlarged cross-sectional view of guillotine arrangement according to the invention.

Referring to the drawings, Figure 1 shows the roll forming machine comprising a main base frame 1 upon which are mounted on two rafts 8. The rafts are adjustable transversely of the machine by means of shafts 14, 17 and 18. Upper and lower roller pairs 3 and 4 respectively are positioned on stand support frames 5. Each shaft is mounted on the base frame by bearing blocks 11 and 19 positioned on either side thereof, as shown in Figure 3. Shaft 17 supports the rafts 8 by means of sliding bearings 20 positioned on each side thereof.

The spacing between the rafts 8 is adjusted by means of a pair of ball nuts 22 each attached by means of bracket 21 to the rafts. The ball nuts are driven by two linear screws 24 formed on each end portion of driven shaft 60. The nuts are arranged to have opposing threads to that rotation of shaft 60 in one direction moves the nuts inwardly towards one another and rotation in the other direction moves the nuts outwardly away from one another. Two driven shafts are provided in this embodiment, one at either end of the roll forming machine. These shafts are driven synchronously by a longitudinal drive shaft 7. This shaft is coupled to said driven shafts by means of bevel gears 14 positioned at each end thereof. A drive motor 6 mounted centrally of said roll forming machine rotates the longitudinal drive shaft as required to vary the spacing between the rafts 8.

The drive arrangement for the upper and lower rollers will be described with particular reference to figure 5. In the particular examples shown the lower

roller 31 is driven by a chain drive and coupled to drive the upper rollers by means of gear wheels 33 and 66. The lower roller shaft has a pair of co-axially mounted chain sprockets 31 and 32.

A motor 10 drives a sprocket 28 which in turn drives shaft 26 via a chain coupled to driven sprocket 29 fixed to shaft 26. Shaft 26 has splined ends for drivably and slidably mounting sprockets 30 and 61. The shaft is supported by bearing blocks 25. Sprocket 30 is coupled to driven sprocket 32 by a further chain drive (not shown) which drives the lower roller as well as driving sprocket 31. Driving sprocket 31 drives the driven sprocket of the next roller pair on the roll forming machine. Similarly, driving sprocket 61 drives driven sprocket 62 and driving sprocket 63 to rotate the lower roller. In this manner drive provided by motor 10 is conveyed to each set of lower rollers on each stand of the roll forming machine. The splined shafts 26 enable the driving sprockets 30 and 61 to move in conjunction with the shafts 8 as their spacing is altered while still maintaining the correct driving relationship with sprockets 32 and 62.

Referring to Figure 6, the bearing and mounting arrangement for a pair of bevelled opposed upper and lower rollers is shown in more detail. Bevelled rollers 27 and 69 are mounted on shafts 39 and 40 respectively. These rollers have depressions provided in the surface thereof to give a "dimpled" surface to material 41 being roll-formed therebetween.

Shaft 40 is rotated by driven sprocket 32 and is mounted on bearing blocks 36. Each bearing block being supported and attached to a support plate 35. Sprocket 31 is a driving sprocket mounted co-axially and rotating in unison with sprocket 32 as to drive the sprocket of a further roller set.

Upper roller 27 is mounted to allow for longitudinal axial movement of the shaft 39. This movement allows upper roller 27 to act as a pressure roller on sheet 41. The pressure being applied by spring means 37, which preferably comprise disk springs. These springs are held against a bearing carrier block 65 by lock nut means 38. This flexible mounting of shaft 39 enables roller 27 to automatically compensate for varying thicknesses of material 41. Gear train 33, 66 drives the upper roller in an opposing direction to the lower roller, drawing the material 41 through the roller pair.

Figure 7 illustrates an embodiment of the guillotine apparatus according to the invention.

The guillotine preferably comprises a broad V-shaped blade 77 mounted movably on a support frame 82 and drivable downwardly by means of a hydraulic ram 78.

A pair of split anvil blocks 75 and 76 are located below the blade such that as the blade descends it moves between each half of the split blocks. The blocks are adapted to hold the finished product firmly therebetween during the cutting operation.

The spacing between said anvil blocks 75 and 76 is adjustable by means of drive screws 83 and 84 which engage nuts attached to said blocks so that rotation of said drive screws results in inward and outward movement of said blocks relative to each

other dependent on the direction of rotation of the screws. Screws 83 and 84 are driven from a main drive shaft 72 by belt drives 85 and 86 coupling pulleys 79, 80 and 73, 74 respectively. Drive screws 83 and 84 are mounted on support plate 71 which in turn is supported on base 81.

In operation, the spacing of the anvil blocks is adjusted by means of motor 70 driving shaft 72 to accommodate the width of the product from the roll forming machine. Once the product is firmly held, the blade 77 descends between the two halves of each split block cutting the product to the desired length. The V-shape of blade forces the product edges against the anvil blocks during the cutting process.

Preferably, the operation of the machine and in particular the adjustment of the axial spacing is controlled by suitable programmed means, such as a computer or microprocessor.

It will be apparent to those skilled in the art that further embodiments of the invention described are possible without departing from the spirit or scope of the invention.

Claims

1. A roll forming machine having at least one rolling stand comprising, two or more pairs of upper and lower opposed rollers through which the material to be formed is passed, each roller being mounted on a cantilevered drive shaft which extends towards a drive shaft of an associated roller in another pair,

said drive shafts being mounted to allow the axial spacing therebetween to be adjustably varied.

2. A roll forming machine according to claim 1 wherein said cantilevered drive shafts are mounted in bearing assemblies which are fixedly attached to respective chassis frames which extend the length of the roll forming machine.

3. A roll forming machine according to claim 2 wherein said respective chassis frames are supported on parallel support shafts extending transversely of the roll forming machine.

4. A roll forming machine according to claims 2 or 3 wherein the axial spacing between said drive shafts and their associated chassis are altered by means of two or more respective right and left handedly threaded adjustment shafts extending transversely of said machine and engaging nuts fixed to a respective chassis.

5. A roll forming machine according to claim 4 wherein said adjustment shafts are gear connected to a longitudinally extending drive shaft therefor, so that rotation of said drive shaft causes concerted rotation of the adjustment shafts and uniform adjustment of said axial spacing between said drive shafts.

6. A roll forming machine according to anyone of the preceding claims wherein said rollers are driven by a chain and sprocket drive,

said sprockets being mounted on splined shafts to allow for axial movement thereof.

7. A roll forming machine according to claim 2 wherein said cantilevered drive shafts are flexibly mounted in said bearing assemblies to compensate for varying thickness of the material being rolled.

5

8. A roll forming machine according to claim 7 including resilient bias means coupled to rollers to urge said upper and lower opposed rollers towards each other.

10

9. A roll forming machine according to anyone of the preceding claims including a guillotine for use in conjunction with said roll forming machine, said guillotine having anvil blocks adapted to move with respect to each other to accommodate various sized product from the roll forming machine and a broad guillotine blade adapted to move downwardly between slots provided in said anvil blocks, said blade being further adapted to hold said product against the anvil blocks during the guillotining operation.

15

20

10. A roll forming machine according to claim 9 wherein said anvil blocks are coupled to said chassis frames to move in conjunction therewith.

25

11. A roll forming machine according to anyone of the preceding claims wherein said axial spacing is adjusted under the control of programmed means.

30

35

40

45

50

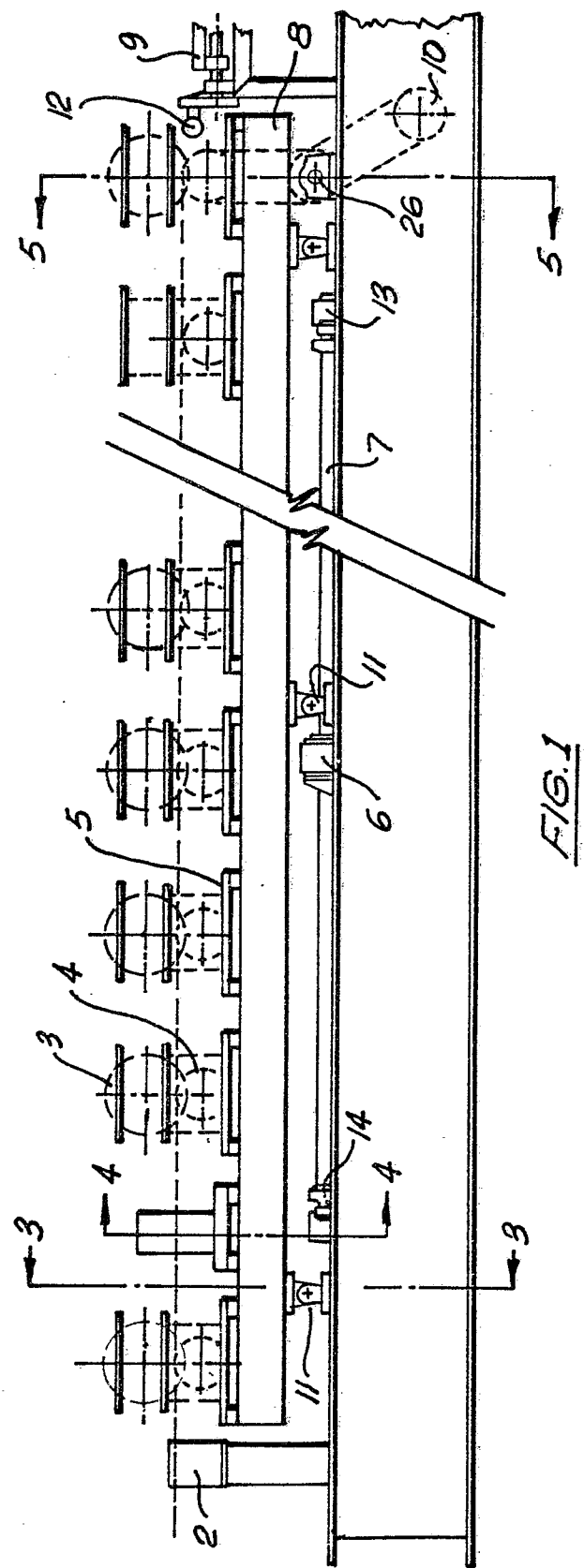
55

60

65

4

0247886



1247886

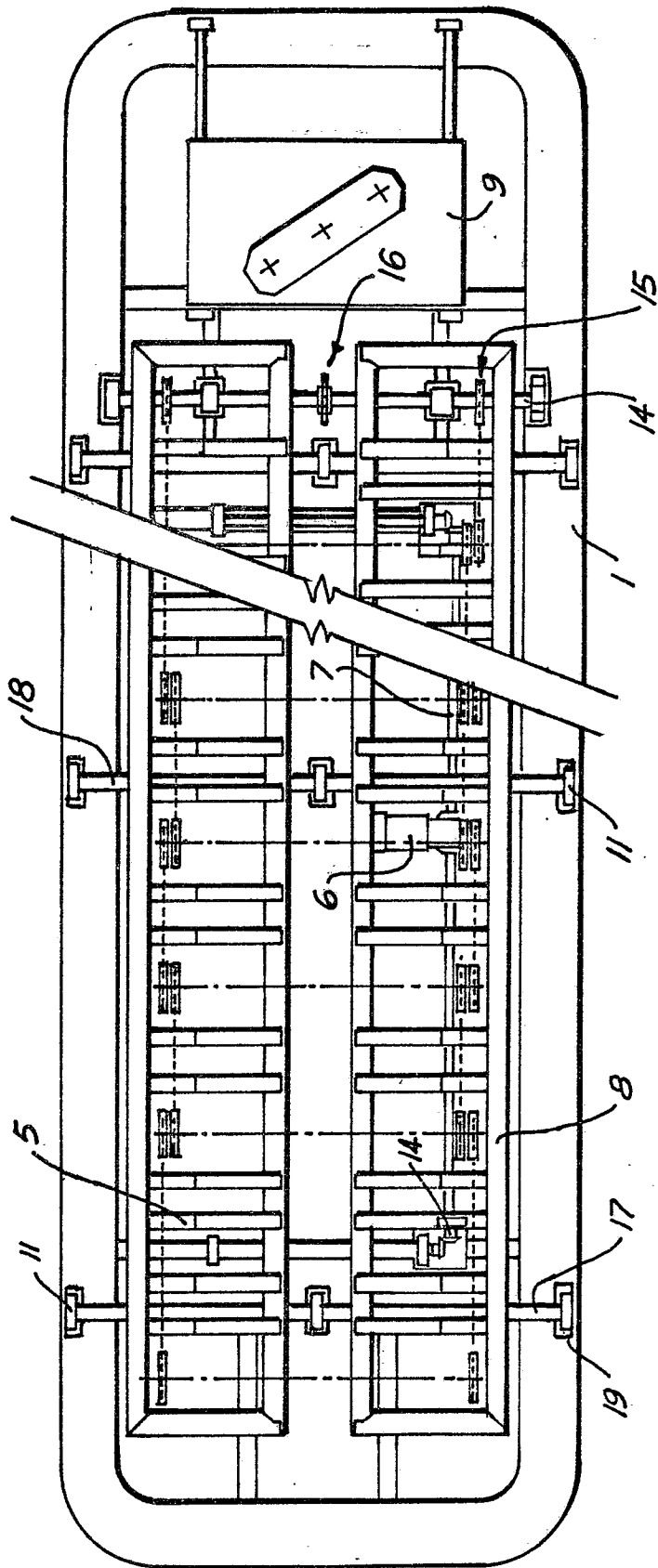


FIG. 2

0247886

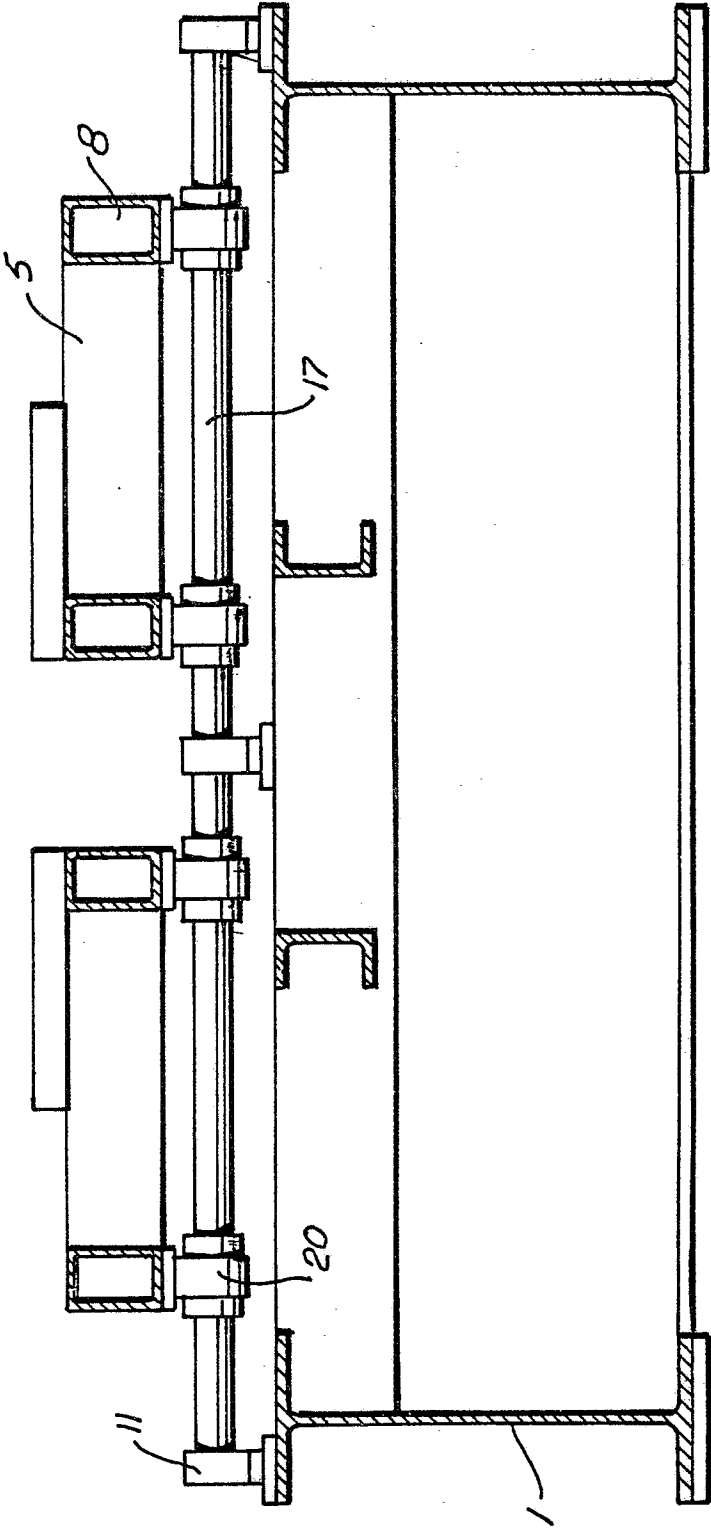


FIG. 3

0247886

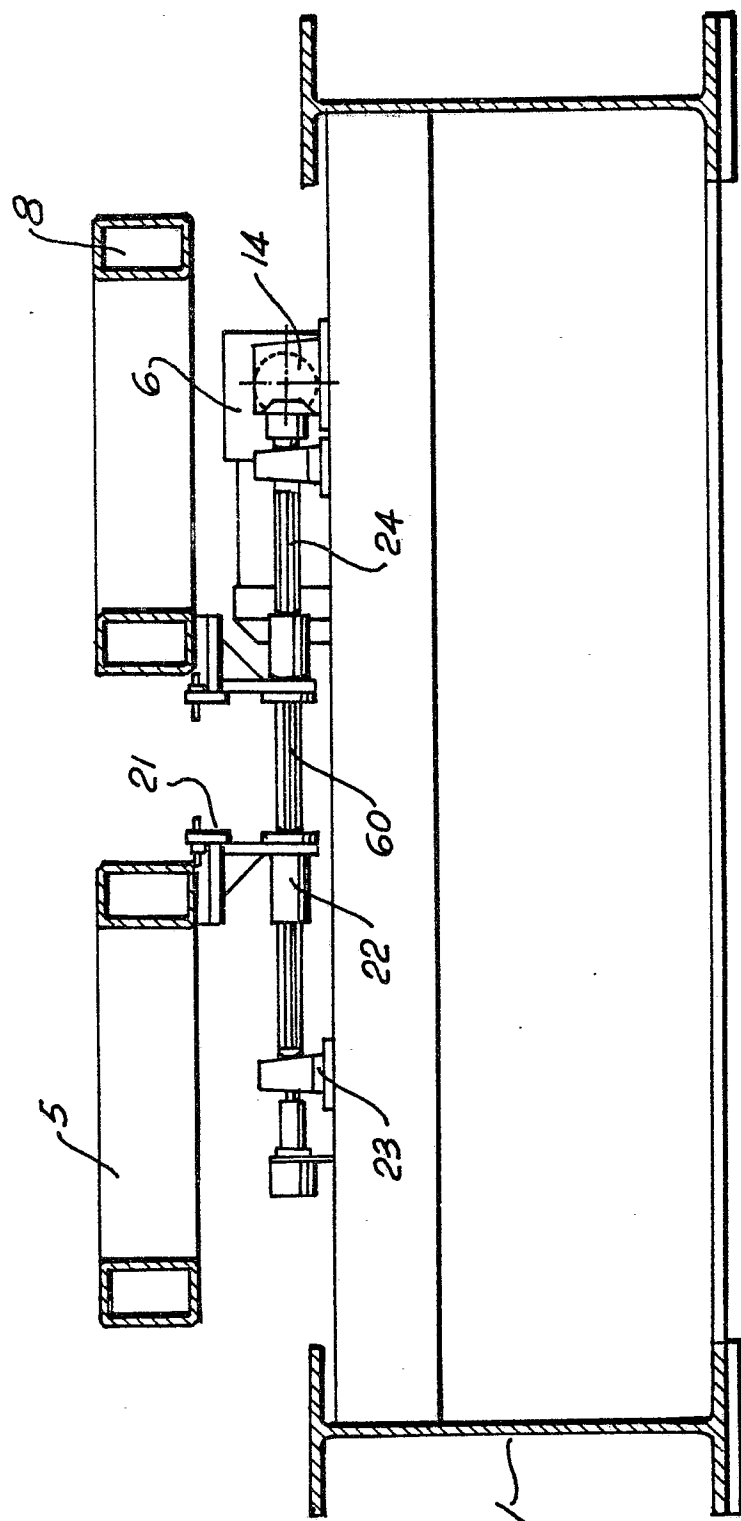


FIG. 4

0247886

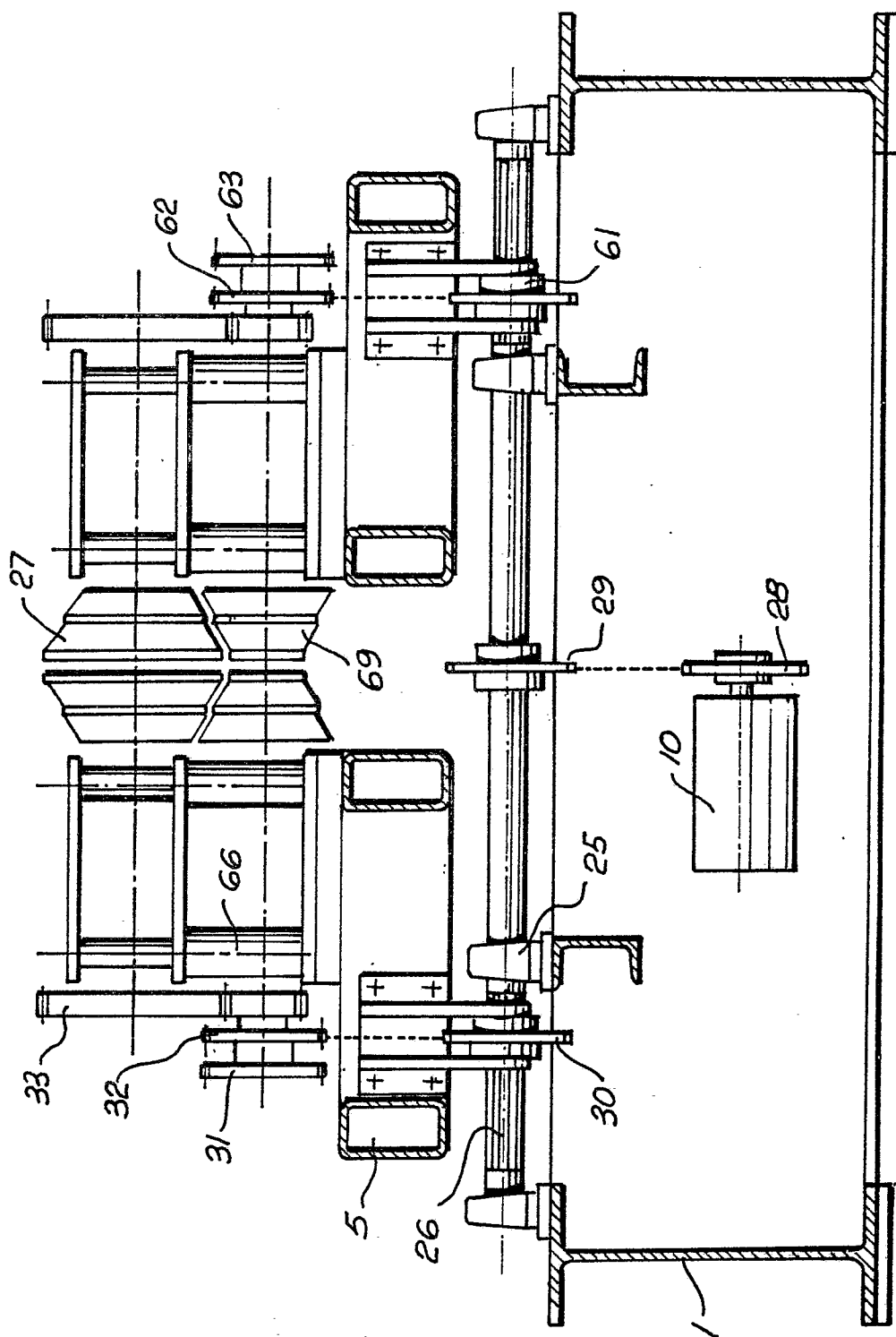
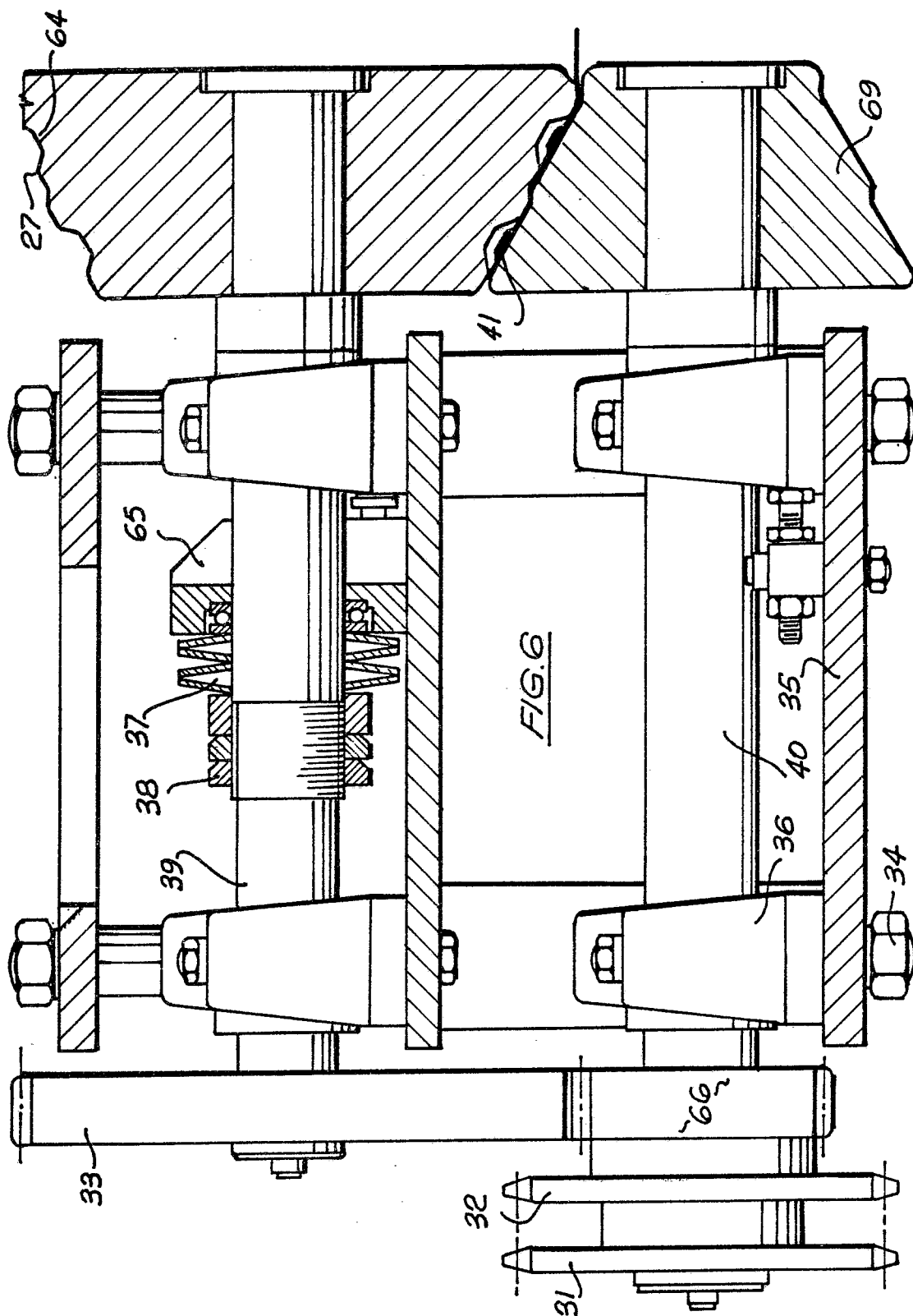


FIG. 5

247886



0247886

