(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 659 495 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **94309605.7**

(51) Int. Cl.[6] : **B21B 31/24**

(22) Date of filing : **21.12.94**

(30) Priority : **23.12.93 US 173424**

(43) Date of publication of application :
28.06.95 Bulletin 95/26

(84) Designated Contracting States :
AT BE CH DE ES FR GB IT LI LU PT SE

(71) Applicant : **MORGAN CONSTRUCTION COMPANY**
15 Belmont Street
Worcester Massachusetts 01605 (US)

(72) Inventor : **Wykes, Philip**
20 Stone Avenue
Shrewsbury, Massachusetts 01545 (US)

(74) Representative : **BROOKES & MARTIN**
High Holborn House
52/54 High Holborn
London, WC1V 6SE (GB)

(54) Parting adjustment system for housingless roll stand.

(57) A housingless roll stand has parallel first and second rolls (12,14) extending transversely with respect to the mill passline (P). The roll ends of the first roll (12) are journalled for rotation in bearings (16) contained in first chock assemblies (18) and the roll ends of the second roll (14) are journalled for rotation in bearings (16) contained in second chock assemblies (20). Each of the first chock assemblies is arranged adjacent to a second chock assembly on a respective side of the mill pass line. Pairs of identically configured screw shafts (22) interconnect each of the first chock assemblies to the adjacent second chock assembly. The screw shafts each have a first threaded section (22a) threadedly engaged with the respective first chock assembly and an opposite hand second threaded section (22c) threadedly engaged with the respective second chock assembly. The screw shafts are simultaneously rotated to effect roll parting adjustments.

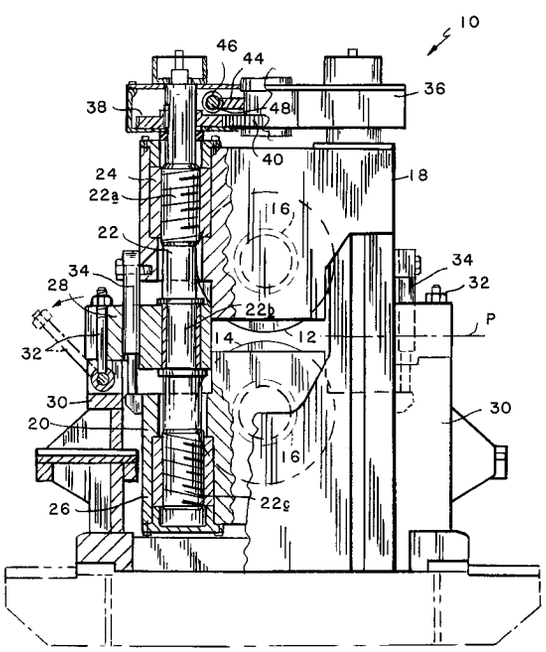

FIG. 2

EP 0 659 495 A2

This invention relates generally to rolling mills, and is concerned in particular with an improved system for adjusting the roll parting between rolls in so-called "housingless stands".

In the conventional housingless stand, the ends of a pair of rolls are journalled for rotation in bearings contained in chock assemblies, and the chock assemblies on each side of the roll stand are interconnected by pairs of screw shafts which take up the roll separating forces during rolling. The screw shafts have opposite hand threaded sections and are contra-rotated to effect parting adjustments between the rolls.

One problem encountered with known housingless stands is that two differently configured screw shafts are required to make up the pairs on each side of the roll stand. For example, in a horizontal mill, one screw shaft will typically have left and right hand threaded sections engaged respectively with the upper and lower chock assemblies, whereas the other screw shaft will be oppositely configured with right and left hand threaded sections engaged respectively with the same chock assemblies. The need to provide differently configured screw shafts unnecessarily complicates maintenance procedures, and also adds significantly to spare parts inventory expenditures.

A further problem with conventional designs is that the screw shafts are powered by unnecessarily complicated drive mechanisms including large gear boxes which impede ready access to the roll stand and which also interfere with close stand stacking along the mill pass line.

An object of the present invention is provide an improved housingless stand where roll parting is controlled by pairs of identically configured screw shafts on each side of the mill pass line.

A companion objective of the present invention is to simplify and reduce the physical size of the drive mechanisms used to power the screw shafts.

According to the present invention, a housingless roll stand has parallel first and second rolls extending transversely with respect to the mill pass line. The roll ends of the first roll are journalled for rotation in bearings contained in first chock assemblies, and the roll ends of the second roll are similarly journalled for rotation in bearings contained in second chock assemblies. Each of the first chock assemblies is arranged adjacent to a second chock assembly on a respective side of the mill pass line. Identically configured screw shafts interconnect the adjacent first and second chock assemblies. The screw shafts each have a first threaded section threadedly engaged with a respective first chock assembly and an opposite hand second threaded section threadedly engaged with a respective second chock assembly. A drive system simultaneously routes the screw shafts of each pair in a common direction in order to effect roll parting adjustments.

Preferably, the screw shafts of each pair are rotatably supported by and axially fixed with respect to shelf members interposed between the adjacent first and second chock assemblies. The shelf members are supported on and removably secured to pedestals located on opposite sides of the rolling line.

The drive system used to effect roll parting adjustments preferably comprises pinion gears carried on each of the screw shafts. The pinion gears of each pair of screw shafts are in meshed relationship with third pinion gears interposed therebetween, and a worm gear is arranged coaxially with and rotationally fixed with respect to each of the third pinion gears. Each of the worm gears is in meshed relationship with a worm carried on a common rotatable drive shaft.

Figure 1 is a front view of a housingless roll stand embodying the concepts of the present invention.

Figure 2 is a side view of the roll stand shown in Figure 1, with portions of the facing support pedestal, chock assemblies and shelf member broken away in order to better illustrate internal components;

Figure 3 is a top plan view of the roll stand shown in Figures 1 and 2;

Figure 4 is a sectional view taken along line 4-4 of Figure 3, with the chock assemblies shown in broken line outline form;

Figure 5 is a sectional view taken along line 5-5 of Figure 4; and

Figure 6 is a diagrammatic three dimensional view of the screw shafts and the associated drive mechanisms.

Referring now to the drawings, a housingless roll stand according to the present invention is shown at 10. The roll stand includes parallel first and second rolls 12, 14 extending transversely with respect to the mill pass line "P". The roll ends of the first roll 12 are journalled for rotation in bearings 16 contained in first chock assemblies 18, and the roll ends of the second roll 14 are similarly journalle for rotation in bearings 16 contained in second chock assemblies 20.

Each of the first chock assemblies 18 is arranged adjacent to a second chock assembly 20 on a respective side of the pass line P. The adjacent first and second chock assemblies are interconnected by pairs of identically configured screw shafts 22. Each screw shaft includes an upper left hand threaded section 22a, an intermediate cylindrical section 22b, and a lower right hand threaded section 22c.

The upper left hand threaded sections are threadedly engaged with left hand nuts 24 housed within the first chock assemblies 18, and the right hand threaded sections are likewise threadedly engaged in right hand nuts 26 housed within the second chock assemblies 20. The intermediate cylindrical sections 22b are axially fixed with respect to and journalled for rotation in shelf members 28. The shelf members are in turn carried on support pedestals 30

to which they are removably secured by swivel bolts 32.

Any backlash between the threaded screw shaft sections 22a, 22c and their respective nuts 24, 26 is taken up by hydraulic piston-cylinder units 34 extending between and connected at their opposite ends to the first and second chock assemblies 18,20.

Each screw shaft 22 protrudes upwardly into one of two gear boxes 36 where it is provided with a pinion gear 38. The pinion gears 38 of each pair of screw shafts are in meshed relationship with a third pinion gear 40 interposed therebetween and carried on an intermediate stub shaft 42. A worm gear 44 overlies each third pinion gear 40 and is keyed or otherwise connected to the stub shaft 42 for rotation therewith.

The worm gears 44 on each side of the mill pass line P mesh and worms 46 carried on a drive shaft 48 extending between the gear boxes 36 in a direction transverse to the mill pass line P. The drive shaft 48 may be powered by any convenient means, including for exampling an electric drive motor 50 carried on one of the gear boxes 36.

The parting between rolls 12, 14 is adjusted by rotating drive shaft 48 in either a clockwise or counterclockwise direction, depending whether the rolls are to be opened or closed. The separating forces exerted by the hydraulic piston-cylinder units 34 are overridden by the forces generated by the screw shafts 22 on the chock assemblies 18,20.

Since the screw shafts 22 are all rotated in a common direction, they can be identically configured, i.e., provide with the same arrangement of opposite hand threaded sections. This simplifies maintenance and minimises inventory costs.

The gearing arrangement driving the screw shafts 22 enables the size of the gear boxes 36 to be minimised, thereby facilitating a close spacing of roll stands along the mill pass line. More particularly, as shown in Figure 6, using the distance "C" between the axes of the screw shafts pairs as a base measurement, the gear boxes 36 can have a width of "W" of approximately C/2 and a length "L" of approximately 3C/2. This compact arrangement is further beneficial in that it also facilitates maintenance by allowing the area overlying the rolls to remain uncluttered and thus readily accessible to operating personnel.

Claims

1. A housingless roll stand having parallel firs and second rolls (12,14) extending transversely with respect to the mill pass line (P), the roll ends of said first roll (12) being journalled for rotation in bearing (16) contained in first chock assemblies (18) and the roll ends of said second roll (14) being journalled for rotation in bearings (16) contained in second chock assemblies (20), each of said first chock assemblies being arranged adjacent to a second chock assembly on a respective side of the mill pass line, apparatus for adjusting the parting between said rolls, said apparatus comprising:

   pairs of identically conjured screw shafts (22) interconnecting each of said chock assemblies to the adjacent second chock assembly, said screw shafts each having a first threaded section (22a) threadedly engaged with the respective first chock assembly and an opposite hand second threaded section (22c) threadedly engaged with the respective second chock assembly; and drive means for simultaneously rotating the screw shafts of each of said pairs in a common direction.

2. Apparatus as claimed in claim 1 wherein said screw shafts are rotatably supported by and axially fixed with respect to shelf members (28) interposed between adjacent first and second chock assemblies, and support means (30) on opposite sides of the mill pass line for supporting said shelves.

3. Apparatus as claimed in claim 2 wherein said support means (30) comprise pedestals, and wherein means (32) are provided for detachably securing said shelf members to said pedestals.

4. Apparatus as claimed in any one of the preceding claims wherein said drive means comprises pinion gears (38) carried on each of said screw shafts, the pinion gears of each pair of screw shafts being in meshed relationship with a third pinion gear (40) interposed therebetween, a worm gear (46) arranged coaxially with and rotationally fixed with respect to each of said third pinion gears, each of said worm gears being in meshed relationship with a worm carried on a common rotatable drive shaft (48).

5. Apparatus as claimed in any one of the preceding claims wherein the threaded sections of said screw shafts are in threaded engagement with nut members (24) comprising integral components of said chock assemblies.

6. Apparatus as claimed in claim 5 further comprising means (34) for exerting separating forces on adjacent first and second chock assemblies in directions parallel to their respective interconnecting screw shafts.

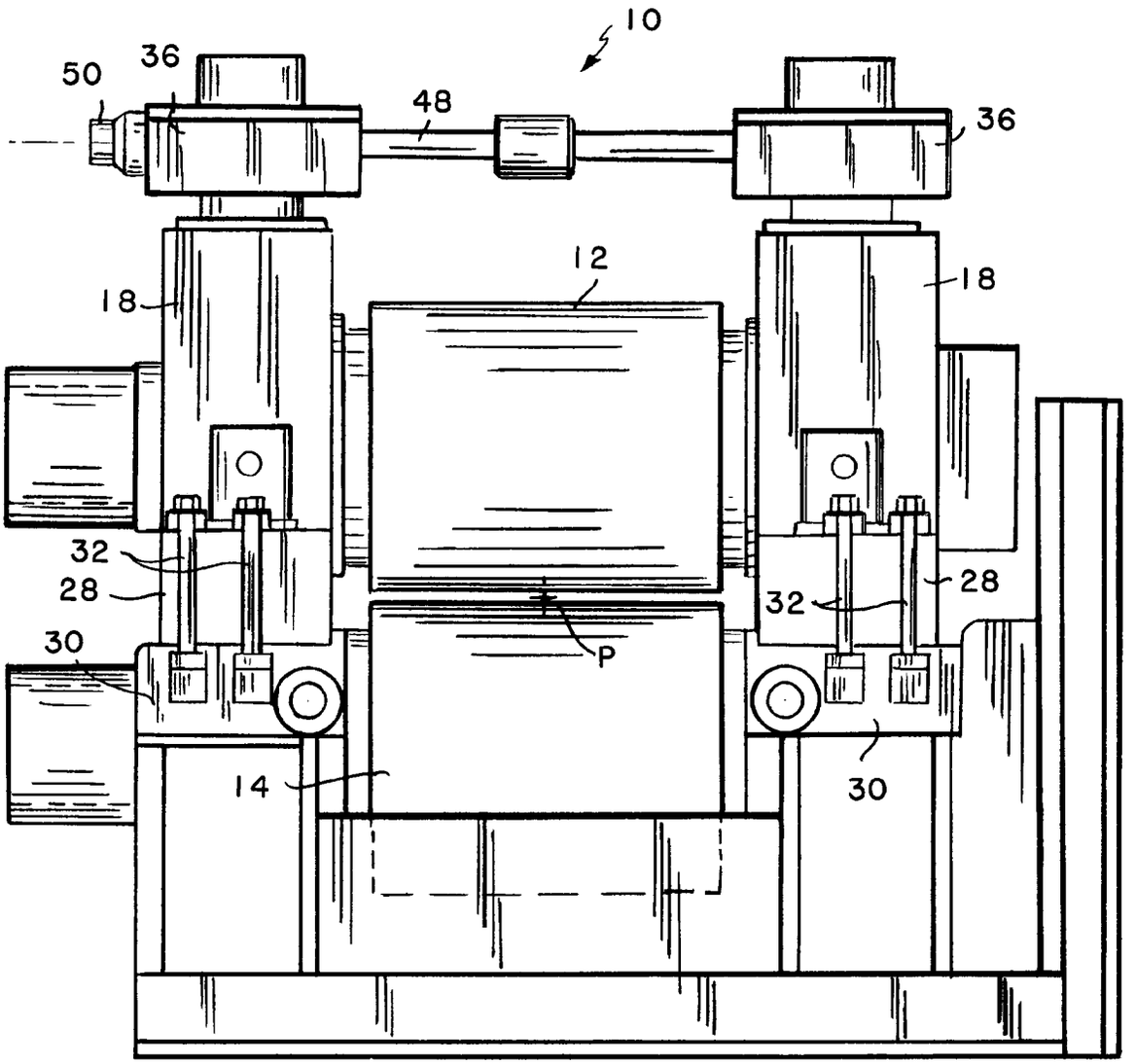

FIG. 1

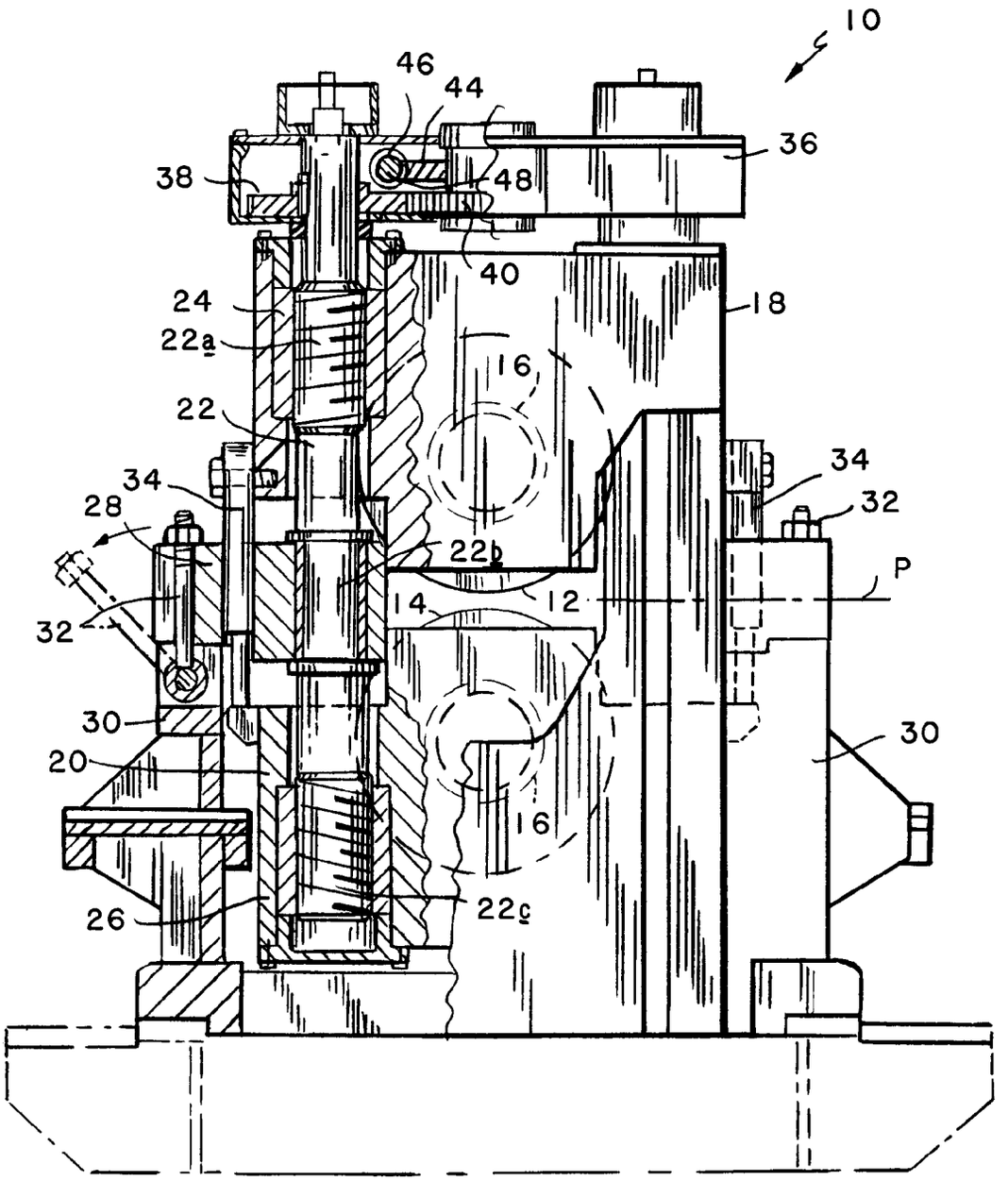
10
46
44
36
38
48
40
18
24
22a
16
22
34
34
28
32
22b
P
14
12
32
30
30
20
16
22c
26

FIG. 2

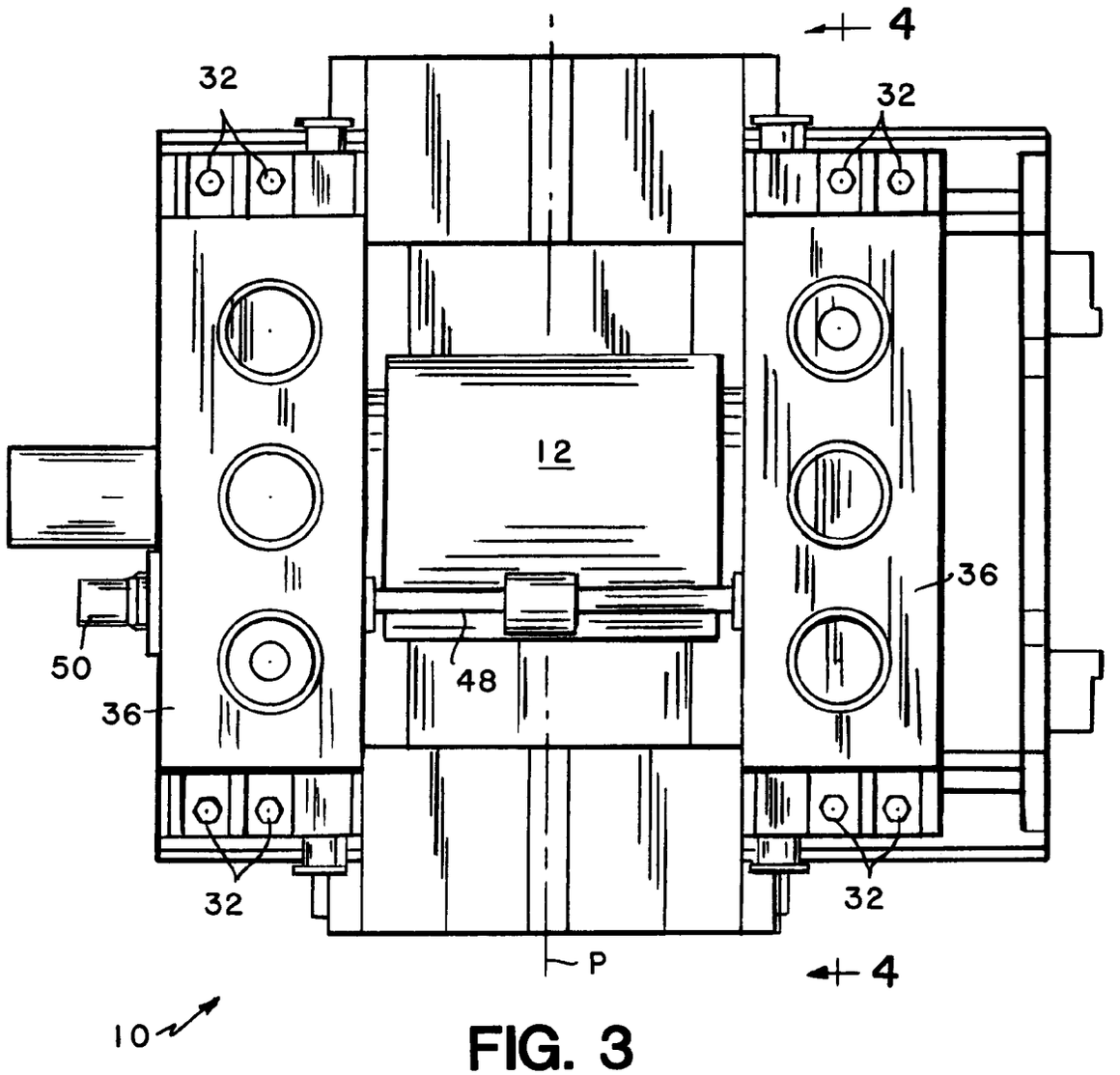

FIG. 3

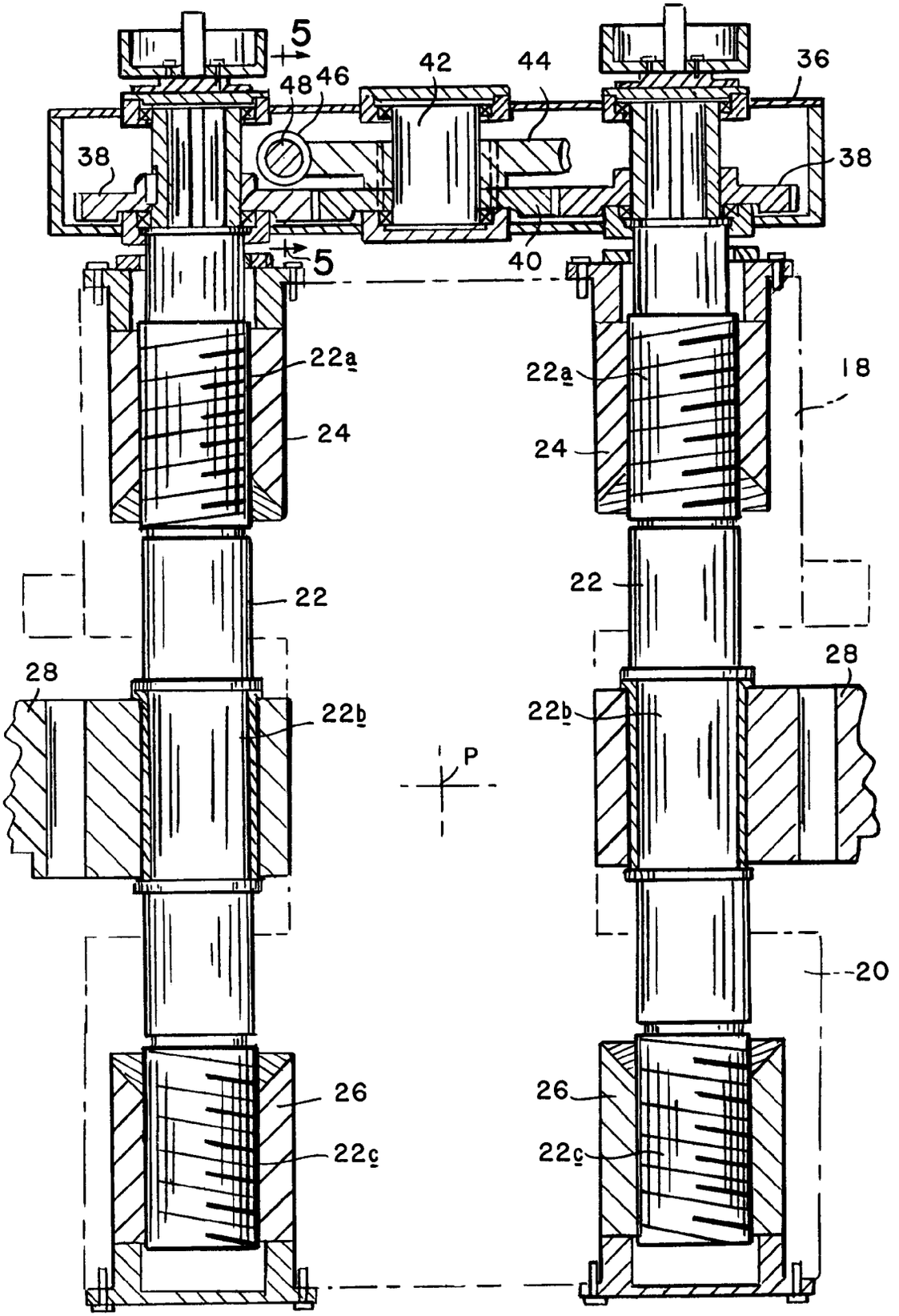
5
5
48
46
42
44
36
38
38
40
22a
22a
18
24
24
22
22
28
28
22b
22b
P
20
26
26
22c
22c

FIG. 4

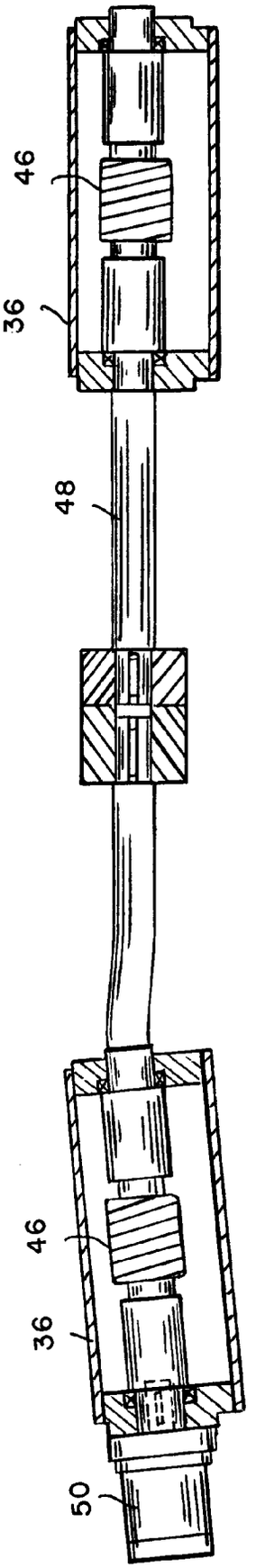

FIG. 5

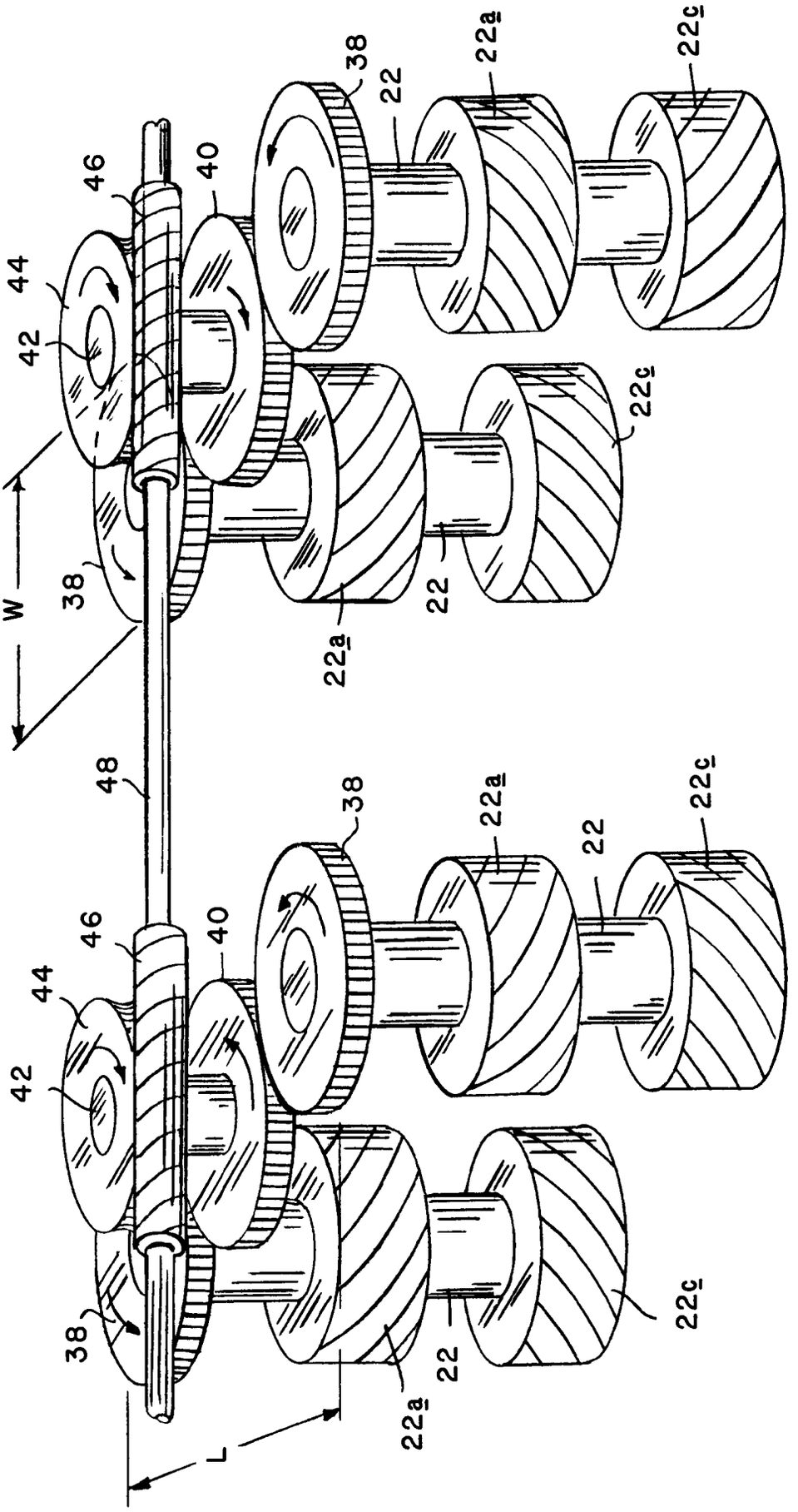
38
22
22a
22c
46
40
44
42
W
38
22
22a
22c
48
38
22a
22
22c
46
40
44
42
38
22
22a
22c
L

FIG. 6