

12

EUROPEAN PATENT APPLICATION

21 Application number: 84114003.1

51 Int. Cl.⁴: B 21 D 53/48

22 Date of filing: 20.11.84

30 Priority: 22.11.83 JP 180594/83 U

43 Date of publication of application:
29.05.85 Bulletin 85/22

84 Designated Contracting States:
BE CH DE FR IT LI NL SE

71 Applicant: NIPPON NOTION KOGYO CO., LTD.
13, 2-chome, Kanda-Sakuma-cho Chiyoda-ku
Tokyo(JP)

72 Inventor: Sodeno, Toshiaki
973, Nizayama Nyuzen-machi
Shimonikawa-gun Toyama-ken(JP)

74 Representative: Patentanwälte Leinweber &
Zimmermann
Rosental 7/II Aufg.
D-8000 München 2(DE)

54 Apparatus for assembling buttons.

57 An apparatus (10) for assembling a pair of fastener elements (A, B), comprises a first drive mechanism (16) for driving a punch assembly (13), and a second drive mechanism (17) operatively connected with a pair of parts feeders (18, 19) to drive them in timed relation to the movement of the punch assembly (13). The second drive mechanism (17) is so constructed as to exert a driving force smaller than the driving force exerted by the first driving mechanism (16) to such an extent as to become halt when the fastener elements (A, B) are jammed in either parts feeder (18, 19). Thus, the jammed parts feeder (18, 19) is free from any damage which would be caused when the parts feeder is forcibly operated under such jamming condition.

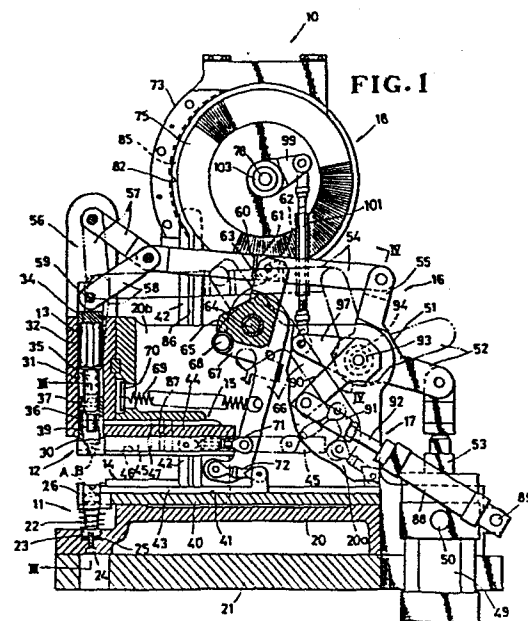
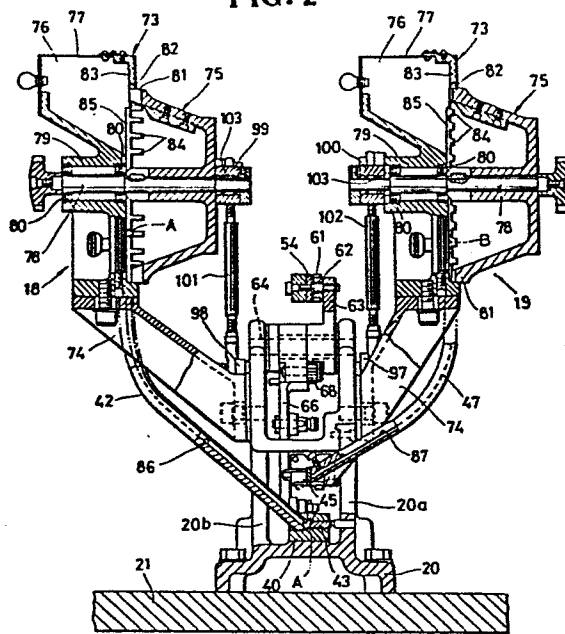


FIG. 2



- 1 -

APPARATUS FOR ASSEMBLING BUTTONS

The present invention relates to an apparatus for assembling a pair of fastener elements of a fastener such as snap fastener, button, ornament or the like, in clinched condition either with or without a garment fabric sandwiched between the two fastener elements.

Various fastener assembling apparatus are known in which a reciprocable punch is moved toward and away from a die to force a fastener element held above the die by means of a gripper, into clinching engagement with a mating fastener element supported on the die. The two fastener elements are automatically supplied from respective parts feeders to corresponding feed units and in turn to the die and the gripper in timed relation to the movement of the punch. All of the parts feeders, feed units and the punch are driven by a common drive mechanism which is constructed to exert a driving force large enough to clinch the two fastener elements between the punch and the die. Such driving

- 2 -

force however is too great to actuate the parts feeders with the result that the parts feeders are forcibly driven to operate even when the fastener elements are jammed in either parts feeder. Such forced operation
5 would damage the jammed parts feeder as well as the fastener elements.

The present invention seeks to provide an apparatus for assembling pairs of fastener elements, which apparatus includes tow parts feeders which are
10 protected from any damage even when the fastener elements are jammed in either parts feeder.

According to the present invention, there is provided an apparatus for assembling a pair of fastener elements, comprising a die assembly for supporting one
15 of the fastener elements, a gripper assembly disposed above said die assembly for releasably holding the other fastener element, a punch assembly reciprocally movable toward and away from said die assembly for urging the other fastener element into clinching
20 engagement with the one fastener, a first loading unit for feeding the one fastener elements one at a time to said die assembly, a second loading unit for feeding the other fastener elements one at a time to said gripper assembly, a first parts feeder for supplying
25 the one fastener elements to said first loading unit, a second parts feeder for supplying the other fastener elements to said second loading unit, and a driving

- 3 -

means for driving said punch assembly, the first and second loading units, and said first and second parts feeders, characterized in that said driving means comprises a first drive mechanism operatively connected
5 with said punch assembly and said first and second loading units for driving them in timed relation with one another, and a second drive mechanism operatively connected with said first and second parts feeders for driving them in timed relation to the movement of the
10 punch assembly, said second drive mechanism being capable of exerting a driving force smaller than the driving force exerted by said first drive mechanism, to such an extent that said second drive mechanism becomes
halt when the fastener elements are jammed in said
15 parts feeders.

Many other advantages and features of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying sheets of drawings in
20 which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example.

Figure 1 is a side elevational view, partly in cross section, of an apparatus according to the present
25 invention, the apparatus being shown with parts cut away for clarity;

Figure 2 is a front elevational view of the

apparatus with parts cut away for clarity;

Figure 3 is an enlarged cross-sectional view taken along line III - III of Figure 1; and

Figure 4 is an enlarged cross-sectional view
5 taken along line IV - IV of Figure 1.

Figure 1 shows an apparatus 10 constructed in accordance with the present invention. The apparatus 10 generally comprises a die assembly 11 for supporting thereon a fastener element A, a gripper assembly 12 for
10 releasably holding a mating fastener element B, a punch assembly 13 for forcing the fastener element B which is held on the gripper assembly 12, against the fastener element A supported on the die assembly 11, a first
15 loading unit 14 for feeding the fastener elements A one at a time to the die assembly 11, a second loading unit 15 for feeding the fastener elements B one at a time to the gripper assembly 12, a first drive mechanism 16 for driving the punch assembly 13 and the first and second
20 loading units 14, 15, and a second drive mechanism 17 for driving a pair of parts feeders 18, 19 (Figure 2) in unison to supply respectively the two fastener elements A, B to the respective loading units 14, 15, all the components 11 - 19 being mounted on a generally C-shaped frame 20 supported on a table 21. In the
25 illustrated embodiment, the fastener elements A, B are adapted to be clinched together to form a female member of a snap button (not shown).

- 5 -

The die assembly 11 includes a clinching die 22 fitted in a bore 23 in the frame 20 and secured to the frame 20 by means of a screw 24 with a rubber pad 25 interposed between the die 22 and the frame 20. The die assembly 11 further includes a clamper 26 for releasably holding the fastener element A on the die 22. The clamper 26, as shown in Figure 3, includes a pair of inverted L-shaped clamp fingers 27, 27 pivoted in facing relation to a support block 28 slidably fitted over the die 22. The clamp fingers 27, 27 have respective distal end portions normally lying over the die 22 and urged toward each other to grip a shank of the fastener element A. The top surface of the die 22 is recessed as at 29 for receiving therein a head of the fastener element A.

The gripper assembly 12 includes a tubular holder 30 slidably mounted in a vertical bore 31 formed in a head portion 32 of the C-shaped frame 20 in alignment with the die 22, and a pair of grip fingers 33, 33 (Figure 3) slidably mounted in opposed relation in a lower exposed portion of the holder 30 and are urged toward each other to grip the fastener element B within the tubular holder 30.

The punch assembly 13 includes a plunger 34 slidably mounted in the vertical bore 31 above the tubular holder 30 and is reduced in diameter at one end to form a smaller-diameter portion 35 partly projecting

- 6 -

into the tubular holder 30. The punch assembly 13 further includes a clinching punch 36 connected to the smaller-diameter portion 34 by means of a pin 37, and a split bush 38 fitted over the smaller-diameter portion 5 35 throughout the length thereof and connected to the latter by the pin 37. The split bush 38 preferably is made of a strip of elastic metal such as spring steel and has an initial or undeformed inside diameter which is larger than the outside diameter of the 10 small-diameter portion 35. Thus, when the split bush 38 is being compressedly fitted in the tubular holder 30, the holder 30 is frictionally supported on the split bush 38 under the resiliency of the latter. As shown in Figure 1, the pin 37 projects through a 15 longitudinal slot in the split bush 38 into an inner longitudinal guide groove 39 so as to prevent rotation of the holder 30 as the latter moves along with the plunger 34.

The first loading unit 14, as shown in Figure 1, 20 includes an elongate guide block 40 mounted on the frame 20 and having throughout the length thereof a guide channel 41 for receiving the fastener element A which is supplied from the parts feeder 18 through a chute 42 (better shown in Figure 2), and a reciprocable 25 pusher bar 43 slidably mounted in the guide channel 41. The guide block 40 extends to the clamper 26 so that the fastener element A is supplied on the clinching die

- 7 -

22 upon reciprocation of the pusher bar 43.

Likewise, the second loading unit 15 comprises an elongate guide block 44 mounted on the frame 20 above the guide block 40, and a reciprocable pusher bar 5 45 slidably mounted in a longitudinal guide channel 46 in the guide block 44. The fastener element B is supplied from the parts feeder 19 (Figure 2) through a chute 47 to the guide channel 46. In order to supply the thus supplied fastener element B to the gripper 10 assembly 12, the guide channel 46 is adapted to communicate at one end with a longitudinal opening 48 (Figure 3) in the tubular holder 30 when the latter is located in the retracted position of Figure 1.

As shown in Figure 1, the first drive mechanism 15 16 comprises a fluid-actuated cylinder 49 pivotably mounted on the frame 20 by means of a pin 50, an L-shaped rocking lever or bell crank 51 rockably mounted on the frame 20 and having one or a lower arm 52 pivotably connected to an end of a piston rod 53 of 20 the cylinder 49, and a connecting rod 54 pivotably connected at opposite ends to the other or an upper arm 55 of the rocking lever 51 and the pivot of a toggle joint 56. The toggle joint 56 has a structure well known per se and includes a pair of upper and lower 25 levers 57, 58 pivoted together at one end. The free end of the lower lever 58 is pivotably connected to the upper end of the plunger 34 by means of a pin 59. A

- 8 -

channel-shaped retainer 60 is secured to the connecting rod 54 substantially at the midpoint of the rod 54 and has a channel 61 extending transversely to the connecting rod 54 for receiving therein a roller 62 which is rotatably mounted on a free end of a first pivot lever 63. The lever 63 is pivotably mounted on a shaft 64 secured to the frame 20 and has a lateral projection 65. A second pivot lever 66 is pivotably mounted on the shaft 64 and includes a lateral projection 67 supporting thereon a roller 68. A tension spring 69 extends between the second pivot lever 66 and a pin 70 disposed in the head portion 32 of the frame 20 so as to urge the second pivot lever 66 to rotate in clockwise direction in Figure 1, thereby holding the roller 68 in rolling engagement with a lower surface of the lateral projection 65. A pair of links 71, 72 is pivoted at one end to the second pivot lever 66 in spaced relation to one another and, at the other end, to the pusher bars 43, 45, respectively.

As shown in Figure 2, each of the parts feeders 18, 19 includes a hopper 73 fixedly mounted on a support arm 74 projecting from the frame 20 laterally upwardly at an oblique angle, and a rotary drum 75 rotatably mounted on the hopper 73. The hopper 73 includes an upper inlet opening 76 through which corresponding ones of the fastener elements A, B are supplied into the hopper 73, and a cover or lid 77

- 9 -

hinged to the hopper 73 to open and close the inlet opening 76. The rotary drum 75 is keyed for corotation to a drive shaft 78 which is rotatably mounted on a central boss 79 of the hopper 73 by means of a pair of ball bearings 80. The rotary drum 75 has a flared inner peripheral edge portion 81 received in a horizontal circular opening 82 provided in a sidewall 83 of the hopper 73. The peripheral edge portion 81 has a plurality of circumferentially spaced recesses 84 spaced at equal intervals and facing the hopper 73. The hopper 73 has a guide groove 85 extending outwardly along the peripheral edge portion 81. Each of the recesses 84 receives a portion of a respective one of the fastener element A, B and the groove 85 guides a different portion of the thus received fastener element A, B. As shown in Figure 1, the chute 42 has a longitudinal guide track 86 communicated at opposite ends with the guide groove 85 of the parts feeder 18 and the guide channel 41 of the loading unit 14. Likewise, the chute 47 has a guide track 87 communicated at opposite ends with the guide groove 85 of the parts feeder 19 (Figure 2) and the guide channel 46 of the loading unit 15. With this arrangement, upon rotation of the rotary drum 75, the fastener elements A or B are successively received in the recesses and then moved into the guide groove 85. Then, the fastener elements A, B slide down the respective guide tracks

- 10 -

86, 87 into the corresponding guide channels 41, 46.

The second drive mechanism 17 comprises a fluid-actuated cylinder 88 pivotably mounted on the frame 20 by means of a pin 89, and a first rocking lever 90 rockingly mounted on the frame 20 and having a free end pivoted to one end of a connector rod 91, the other end of the connector rod 91 being secured to a piston rod 92 of the cylinder 88. As shown in Figure 4, the first rocking lever 90 is mounted on a solid shaft 93 rotatably mounted in a concentric hollow shaft 94 by means of a pair of roller bearings 95. The hollow shaft 93 is secured at opposite ends to a pair of laterally spaced vertical supports 20a, 20b of the frame 20. The rocking lever 51 of the first drive mechanism 16 is pivotably mounted on the hollow shaft 94 by means of a sleeve bearing 96 disposed between the supports 20a, 20b. A pair of second rocking levers 97, 98 is disposed on the outside of the respective supports 20a, 20b and they are secured to the shaft 93 for corotation therewith, one of the levers 97 being held in driven engagement with the first rocking lever 90. As shown in Figures 1 and 2, the rocking levers 97, 98 are connected respectively with a pair of third rocking levers 99, 100 via respective connecting rods 101, 102. Each of the rocking levers 99, 100 is mounted on a corresponding one of the drive shafts 78 via a one-way clutch 103.

- 11 -

The cylinder 88 of the second drive mechanism 17 is smaller in size and power than the cylinder 49 of the first drive mechanism 16. More specifically, the cylinder 88 is so constructed as to exert a drive force to an extent that it comes to halt when the fastener elements A, B are jammed in either parts feeder 16, 17.

The apparatus 10 operates as follows: The cylinder 49 of the first drive mechanism 16 is actuated to extend its piston rod 52 whereupon the toggle joint 56 extends its levers 57, 58 as indicated by phantom lines in Figure 1, thereby clinching the fastener elements A, B between the punch 36 and the die. At the same time, the forward movement of the piston rod 52 causes the levers 63, 66 to pivot about the shaft 64 in the counterclockwise direction in Figure 1, thereby bringing the pusher bars 63, 65 from respective advanced positions to respective retracted positions indicated by phantom lines in this figure. Then, one fastener element A is supplied from the parts feeder 18 through the chute 42 into the guide channel 41 in the guide block 40 of the first loading unit 14. Likewise, one fastener element B supplied from the parts feeder 19 (Figure 2) through the chute 47 into the guide channel 46 in the guide block 44 of the second loading unit 15. When the cylinder 49 is actuated to retract its piston rod 52, the toggle joint 56 contracts its levers 57, 58 to move the plunger 34 and hence the

- 12 -

punch 36 upwardly away from the die 22. During that time, the pusher bars 43, 45 return to the respective advanced positions to thereby push the fastener elements A, B along the guide channels 41, 46, 5 respectively into the clamper 26 and the gripper assembly 12.

The cylinder 88 of the second drive mechanism 17 is actuated in timed relation to the cylinder 49 and hence to the reciprocation of the punch 36 such that 10 the fastener elements A, B are supplied to the respective loading units 14, 15 while the pusher bars 43, 45 are held in the respective retracted positions as described above.

When the cylinder 88 is actuated to retract its 15 piston rod 92, the first locking lever 90 and hence the second locking levers 97, 98 (Figure 4) pivot counterclockwise in Figure 1 to cause the third rocking levers 99, 100 to move through a predetermined angular distance which is substantially equal to the distance 20 between adjacent recesses 84 in the rotary drums 75. The angular movement of the rocking levers 99, 100 (Figure 2) is transmitted through the respective one-way clutches 103 to the drive shafts 78, 78 whereupon the rotary drums 75, 75 turn clockwise in 25 Figure 1 to thereby deliver one of each of the fastener elements A, B into the guide tracks 86, 87 (Figure 2) of the chutes 42, 47. The thus supplied

- 13 -

fastener elements A, B slide down the chutes 42, 47 and are then received in the guide channels 41, 46 of the loading units 14, 15. Thereafter, the cylinder 88 is actuated to extend its piston rod 92 whereupon the
5 rocking levers 99, 100 (Figure 2) turn counterclockwise as viewed in Figure 1. In this instance, the one-way clutches 103, 103 prevent transmission of motion of the levers 99, 100 to the drive shafts 78, 78 whereby the rotary drums 75, 75 are held at rest.

10 When the fastener elements A or B are jammed between the hopper 73 and the rotary drum 75, and more particularly in the guide groove 85 in the parts feeder 18 or 19, during retracting movement of the piston rod 92, the cylinder 88 becomes halt to thereby prevent
15 further movement of the piston rod 92. Thus, the rotary drum 75 is protected from being forcibly driven to rotate stepwise which would otherwise cause damage on the jamming parts feeder 18 or 19.

20

25

CLAIMS:

1. An apparatus (10) for assembling a pair of fastener elements (A, B), comprising a die assembly (11) for supporting one (A) of the fastener elements, a gripper assembly (12) disposed above said die assembly (11) for releasably holding the other fastener element (B), a punch assembly (13) reciprocably movable toward and away from said die assembly (11) for urging the other fastener element (B) into clinching engagement with the one fastener (A), a first loading unit (14) for feeding the one fastener elements (A) one at a time to said die assembly (11), a second loading unit (15) for feeding the other fastener elements (B) one at a time to said gripper assembly (12), a first parts feeder (18) for supplying the one fastener elements (A) to said first loading unit (14), a second parts feeder (19) for supplying the other fastener elements (B) to said second loading unit (15), and a driving means for driving said punch assembly (13), the first and second loading units (14, 15), and said first and second parts feeders (18, 19), characterized in that said driving means comprises a first drive mechanism (16) operatively connected with said punch assembly (13) and said first and second loading units (14, 15) for driving them in timed relation with one another, and a second drive mechanism (17) operatively connected with said first and second parts feeders (18, 19) for

- 15 -

driving them in timed relation to the movement of the punch assembly (13), said second drive mechanism (17) being capable of exerting a driving force smaller than the driving force exerted by said first drive mechanism (16), to such an extent that said second drive
5 mechanism (17) becomes halt when the fastener elements (A, B) are jammed in said parts feeders (18, 19).

2. An apparatus according to claim 1, said first driving mechanism (16) including a fluid-actuated
10 cylinder (49), said second driving mechanism (17) including a fluid-actuated cylinder (88) smaller than said cylinder (49) of said first drive mechanism (16).

3. An apparatus according to claim 2, including a frame (20), said first drive mechanism (16) including
15 a hollow shaft (94) secured to said frame (20), and a rocking lever (51) rockably mounted on said hollow shaft (94) and operatively connected with said cylinder (49) of said first drive mechanism (16), said punch assembly (13) and said first and second loading units
20 (14, 15), said second drive mechanism (17) including a solid shaft (93) extending coaxially through and mounted rotatably in said hollow shaft (94), and a rocking lever (90) secured to said solid shaft (93) and operatively connected with said cylinder (88) of said
25 second drive mechanism (17) and said parts feeders (18, 19).

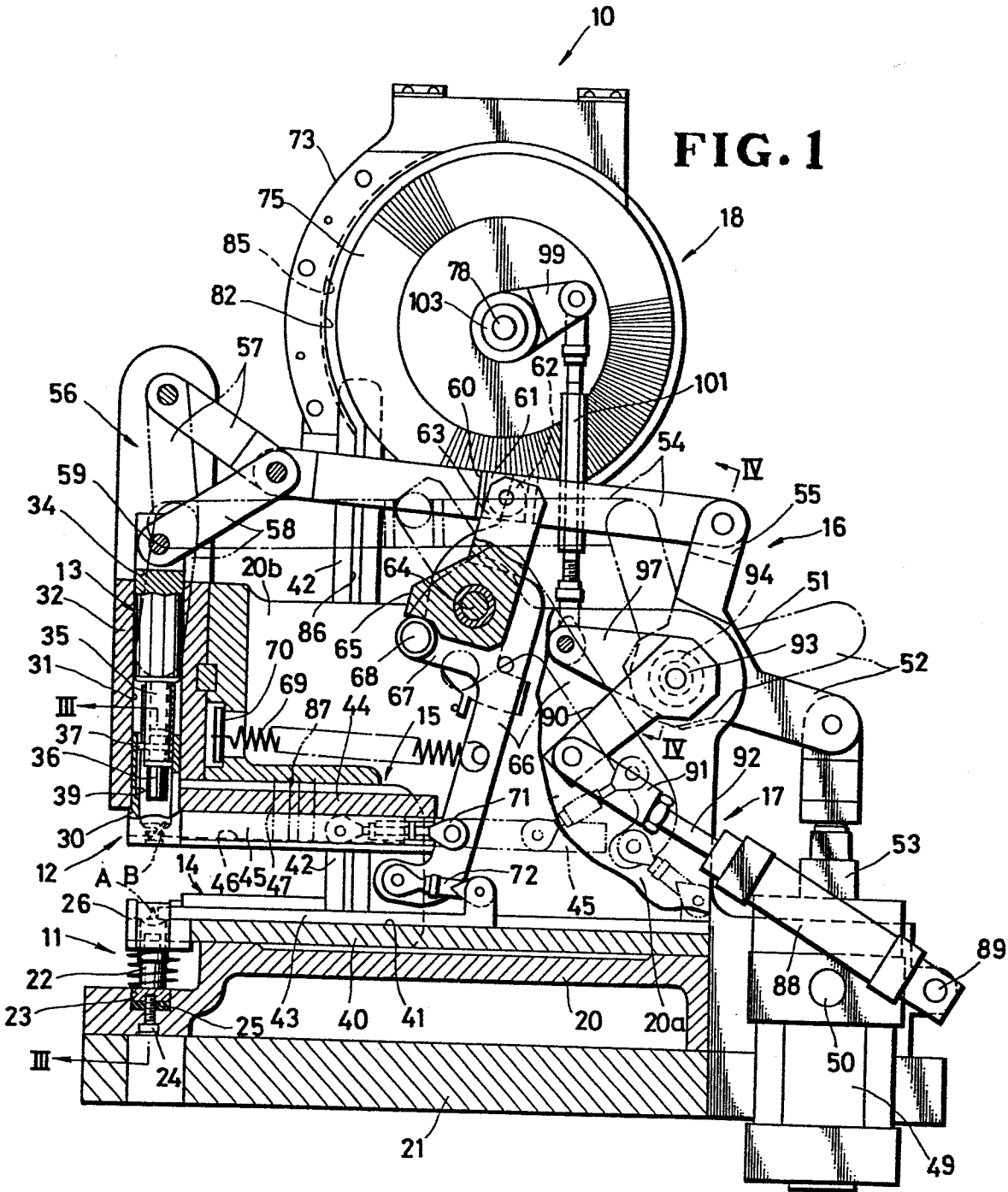


FIG. 2

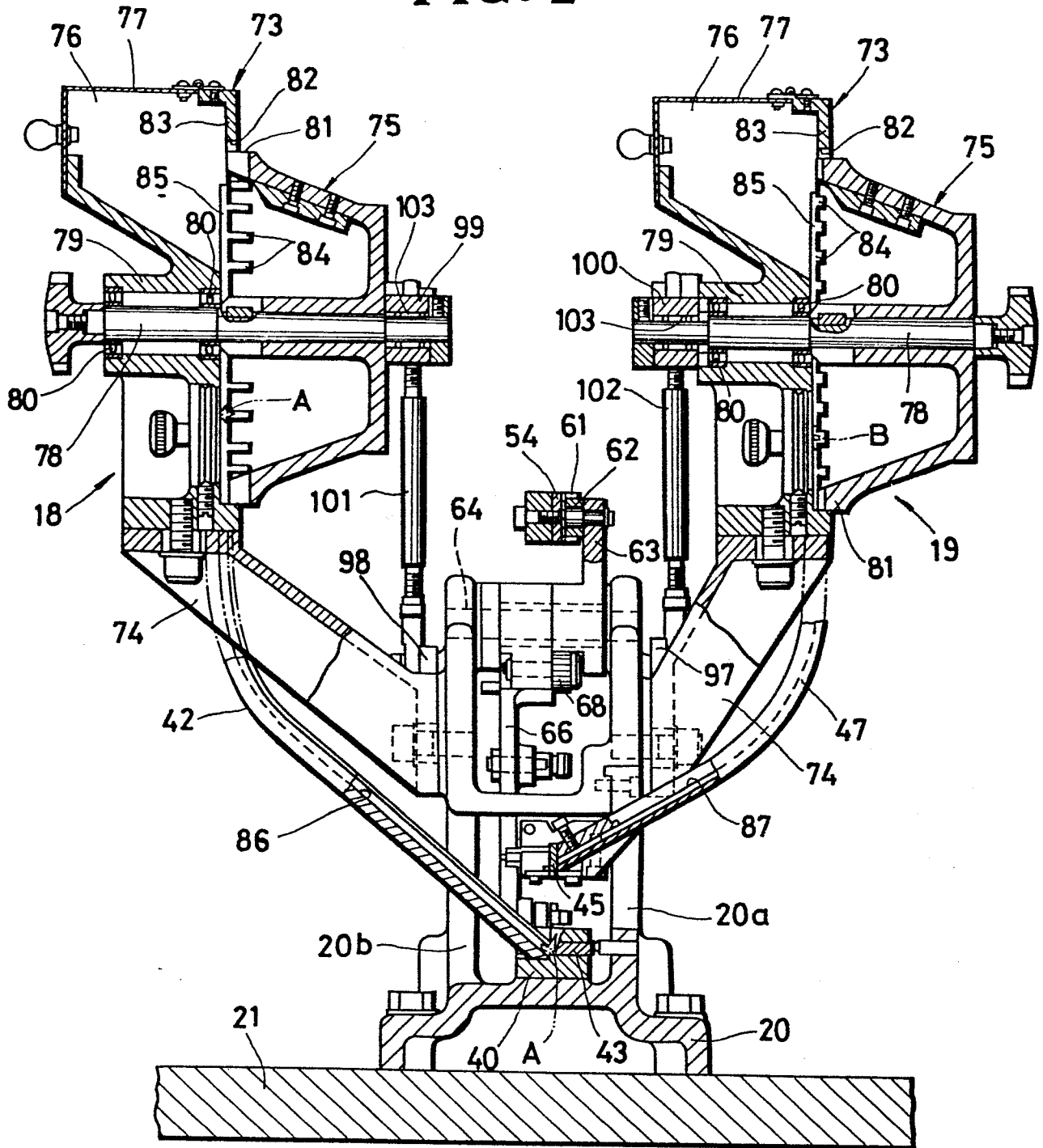


FIG. 4

