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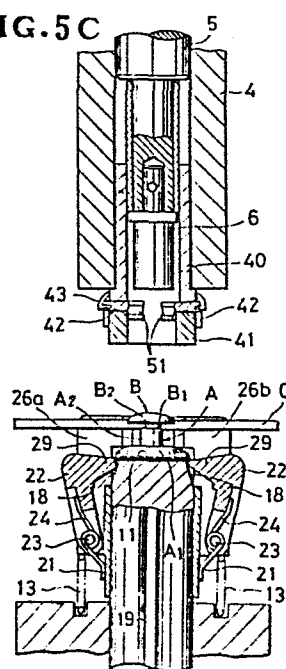
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(54) **Apparatus for assembling a pair of fastener elements.**

(57) An apparatus, for assembling a pair of fastener elements (A, B) of a garment fastener, includes a die (10) having at its upper portion a pair of opposed slant flat surfaces (187, 18), and a clamp assembly (12) slidably mounted on the die (10) and normally urged upwardly by a spring (13). The clamp assembly (12) returns to its upper position as a punch (6) is retracted from the die (10) after the two fastener elements (A, B) have been joined together as compressed between the die (10) and punch (6). During this returning of the clamp assembly (12), the distal end of each pair of spring-biased clamp jaws (22, 22) slides on the respective slant surface (18) to push the joined fastener elements (A, B) away from the die (10).

FIG. 5C



- 1 -

APPARATUS FOR ASSEMBLING

A PAIR OF FASTENER ELEMENTS

The present invention relates to an apparatus for assembling a pair of fastener elements of a garment fastener, such as a snap fastener, a button or an ornament, with or without a garment fabric disposed
5 between the two fastener elements.

Various fastener-assembling apparatus are known in which a pair of fastener elements of a garment fastener is supported on a lower or die unit and an upper or punch units, respectively; a punch of the
10 upper unit moves toward a die of the lower unit to join the two fastener elements together in clinched condition, with or without a garment fabric sandwiched between the two fastener elements. A common problem with such known apparatus is that the individual
15 garment fastener element, which is relatively small, tends to be displaced particularly on the lower unit before the two fastener elements have been joined together.

A solution has been proposed in which a clamp

- 2 -

assembly is vertically movably mounted on an upper portion of the die and includes a pair of clamp jaws to hold the corresponding fastener element in place on the upper end of the die. The clamp jaws are pivotally supported by a support block slidably mounted on the die and normally urged upwardly by a first spring; each clamp jaw is normally urged by a second spring against the die and has a slant undersurface engageable with the fastener element when the support block is in its upper position. At the lower end of the stroke of the upper unit, it depresses the support block against the bias of the first spring, causing the opposed clamp jaws to be moved angularly away from each other against the bias of the second springs to release the fastener element. As the upper unit is retracted from the lower unit after the fastener elements have been joined together as compressed between the die and punch, the support block along with the clamp jaws returns to its original or upper position under the bias of the first spring. As a result the opposed clamp jaws again hold the fastener element (having been joined with its companion fastener element) against the upper end of the die under the bias of the second springs, causing non-easy removal of the joined fastener element pair from the lower unit.

According to the present invention, there is provided an apparatus for assembling a pair of fastener

- 3 -

elements of a garment fastener, comprising:

(a) a frame;

(b) a stationary die supported by said frame;

(c) a plunger reciprocably supported by said
5 frame and having a punch movable, in response to
reciprocating movement of said plunger, toward and away
from said die to join the two fastener elements
together;

(d) first and second clamp assemblies carried by
10 said die and punch, respectively, for holding the
respective fastener elements to be joined together,
said first clamp assembly including

(1) a support block slidably mounted on said
die and movable, in response to the reciprocating
15 movement of said plunger between an upper position and
a lower position,

(2) a first spring normally urging said
support block toward said upper position,

(3) a pair of clamp jaws pivotally mounted on
20 said support block and pivotally movable, in response
to vertical movement of said support block, toward and
away from each other for holding one of the two
fastener elements on an upper end surface of said die
when said punch is lowered toward said die, and

25 (4) a pair of second springs normally urging
said clamp jaws to pivot toward each other; and

(e) said die having on its upper peripheral

- 4 -

portion a pair of slant surfaces contiguous to said upper end surface so that a peripheral portion of said one fastener element, as the latter is placed on said upper end surface, projects from each of said slant surfaces, a distal end of each said clamp jaw being
5 slidable upwardly on the respective slant surface to push said one fastener element on such projected peripheral portion thereof away from said die while said support block returns from said lower position to
10 said upper position in response to retraction of said punch away from said die after the two fastener elements have been joined together as compressed between said die and punch.

The present invention seeks to provide a
15 fastener-assembling apparatus in which a pair of clamp jaws holds one of a pair of fastener elements in place on a die when a punch is lowered toward the die and in which the opposed clamp jaws do not hold such one fastener element against the die when the punch is
20 retracted from the die after the two fastener elements have been joined together as compressed between the die and the punch.

Many other advantages, features and additional objects of the present invention will become manifest
25 to those versed in the art upon making reference to the detailed description and the accompanying sheets of drawings in which a preferred structural embodiment

- 5 -

incorporating the principles of the present invention is shown by way of illustrative example.

Figure 1 is a fragmentary elevational view, partly in cross section, of an apparatus embodying the present invention;

Figure 2 is an exploded perspective view of a lower or die unit of Figure 1;

Figure 3 is an enlarged plan view, with parts omitted, of an upper or punch unit of Figure 1;

Figure 4 is a cross-sectional view taken along line VI - IV of Figure 3; and

Figures 5A, 5B and 5C are views similar to Figure 1, illustrating the operation of the apparatus.

Figure 1 shows an apparatus for attaching a button A (one of a pair of fastener elements) with a tack B (the other fastener element) onto a garment fabric C (Figures 5A, 5B, 5C). The apparatus generally comprises a lower or die unit 1 and an upper or punch unit 2, both supported by a frame (not shown) in opposite relation to each other. The button A has a head A1, and a shank A2 projecting centrally therefrom, while the tack B has a head B1 and a spike B2 projecting centrally therefrom.

As shown in Figures 1 and 2, the lower unit 1 includes a base 3 fixedly supported by a frame (not shown), and a stationary die 10 having a lower end portion fitted in a first vertical bore 14 in the base

- 6 -

3 and non-rotatably fastened to the base 3 by means of a screw 17 (Figure 2). The screw 17, when fastened, extends through the base 3, a washer 16 and a rubber ring 15 and then threadedly extends into the lower end 5 of the die 10. The die 10 has in its upper end surface a recess 11 for receiving the head A1 of the button A with the shank A2 directed upwardly.

The die 10 has on its upper peripheral portion a pair of diametrically opposed slant surfaces 18, 18 10 contiguous to the upper end of the die 10 so that a segmental portion of the button head A1 project from the respective slant surface 18 of the die 10 (for a purpose described below) when the button A is placed concentrically on the upper end of the die 10. Each of 15 the slant surfaces 18 is flat throughout its entire area.

The lower unit 1 further comprises a first clamp assembly 12 for releasably holding the button A on the upper end of the die 10. The first clamp assembly 12 20 includes a support block 21 having a second vertical bore 20 and slidably mounted on the die 10. The support block 21 has a pair of opposed first and second flanges 25, 26 between which a pair of clamp jaws 22, 22 is disposed, each clamp jaw 22 having sandwiched 25 between one first flange half 25a and one second flange half 26b and being pivotally mounted thereon by a pin 23. Each clamp jaw 22 is normally urged to pivot

- 7 -

toward the support block 21 by means of a torsion spring 23 mounted around the pin 23.

Each clamp jaw 22 is of a generally inverted L-shape having a base portion 30 extending along a side surface of the support block 21, a distal end portion 29 lying over the top surface of the support block 21. The distal end portion 29 of each clamp jaw 22 has a slant undersurface 31 engageable with the first head A1 of the button A when the latter is held on the die 10.

10 A compression spring 13 extends around the die 10 and is acting between the base 3 and the support block 21 to normally urge the support block 21 upwardly. The upward movement of the support block 21 is restricted by a stop 28 extending through a horizontal hole 27 in the a longitudinal groove 19 in the peripheral surface of the die 10.

As shown in Figures 1, 3 and 4, the upper unit 1 includes a support 4 integral with the non-illustrated frame and having a third vertical bore 45, and a plunger 5 of circular cross section reciprocatable within the third vertical bore 45 in the support 4. The plunger 5 is operatively connected at its upper end to a suitable drive means, such as an electric motor or a fluid-pressure actuator, for vertical reciprocating movements toward and away from the lower unit 1. At its lower end, the plunger 5 has an integral head 5a of circular cross section extending coaxially with the

- 8 -

plunger 5, the diameter of the head 5a being smaller than the diameter of the plunger 5.

An upper holder 40 has a cylindrical portion 46 vertically movably received in the third vertical bore 5 45 of the support 4, and a cubic portion 47 disposed adjacent to the lower end of the support 4 and integral with the cylindrical portion 46. A punch 6 is secured to the plunger head 5a by means of a horizontal pin 7 extending through the punch 6, the plunger head 5a and 10 a bush 5b and having opposite ends slidably received in a pair of longitudinal slots (not shown) in the cylindrical portion 46. A lower holder 41 is attached to the underside of the cubic portion 47 of the upper holder 40 by means of screws (not shown), and has a 15 fourth vertical bore 49 axially aligned with the third vertical bore 48 in the upper holder 40, there being defined between the upper and lower holders 40, 41 a pair of opposed horizontal guide through-holes 50, 50 each communicating at its inner end with the third and 20 fourth vertical bores 48, 49. Also defined between the upper and lower holders 40, 41 is an opening 60 of generally T-shaped cross section extending perpendicularly to the guide through-holes 50, 50 and communicating with the third and fourth vertical bores 25 48, 49 through which openings the tack B to be joined with the bottom A is introduced.

The upper unit 2 further includes a second clamp

- 9 -

assembly for holding the tack B, with the spike B2 directed downwardly, at the joint of the upper and lower holders 40, 41. The second clamp assembly comprises a pair of cooperative clamping fingers 42, 42
5 slidably received in the respective guide through-holes 50, 50 a pair of springs 43, 43 normally urging the clamping fingers 42, 42 inwardly toward each other to clamp the tack B, and a push member 44 disposed opposite to the openings 60, 61 and slidable
10 perpendicularly to the clamping fingers 42, 42 to push the latter outwardly away from each other and, at the same time, to push the tack B out of the upper unit 2 through the opening 60.

The inner end of each clamping finger 42 has an
15 arcuate surface of a curvature substantially equal to the curvature of a peripheral edge of the tack B, there being in and along the arcuate surface a groove 51 of an arcuate cross section for receiving a portion of the peripheral edge of the tack B.

20 The push member 44 is of an inverted L shape having a horizontal wall 53 and a vertical wall 54 extending downwardly from one or outer end of the horizontal wall 53. The push member 44 is slidably supported by a horizontal pin 56 mounted on the lower
25 holder 41 and extending through the vertical wall 53 of the push member 44. A compression spring 57 (Figure 4) is mounted around the horizontal pin 56 between the

- 10 -

lower holder 41 and the vertical wall 53 of the push member 44 to normally bias the latter outwardly (leftwardly in Figure 4). This outward movement of the push member 44 is limited by a stop ring 58. The other
5 or inner end of the push member 44 has a pair of opposite sloping surfaces 55, 55 (Figure 3).

In operation, the button A is placed upside down in the lower unit 1 with the support block 21 in raised position in which the pair of clamp jaws 22, 22
10 resiliently holds the head A1 of the button A against the upper end of the stationary die 10. Meanwhile the tack A is placed in the upper unit 2 with the head B1 clamped by the pair of clamping fingers 42, 42. A garment fabric C is then placed over the top surfaces
15 of the flanges 25, 26 of the support block 21. Upon actuation of a non-illustrated drive means, the plunger 5 starts to move downwardly toward the die 10. The upper and lower holders 40, 41 move along with the plunger 5 until the bottom surface of the lower holder
20 42 contacts the garment fabric C, as shown in Figure 5A.

With continued downward movement of the plunger 5, the lower holder 42 depresses the support block 21 against the bias of the spring 13, causing the opposed
25 clamp jaws 22, 22 to be gradually moved angularly away from each other against the bias of the respective springs 24, 24 to release the button A (Figure 5B), at

- 11 -

which time the peripheral edge of the button A slides on the slant undersurfaces 31, 31 of the clamp jaws 22, 22. During that time the punch 6 moves downwardly to push the tack B out of engagement with the opposed 5 clamp fingers 42, 42 against the bias of the springs 43, 43 and continues to push the tack B toward the die 10 until the spike B2 of the tack B pierces the garment fabric C into the shank A2 of the button A, as shown in Figure 5B. As a result, the button A has been joined 10 with the tack B and has thus been attached to the garment fabric C.

Upon completion of attachment of the button A, the plunger 5 is actuated to retract, along with the punch 6 and the upper and lower holders 40, 41 and the 15 clamp fingers 42, 42, from the lower unit 1, allowing the support block 21 to return to its original or upper position under the bias of the spring 13. During this returning of the support block 21, the distal end of each clamp jaw 22 is urged against the respective slant 20 surface 18 of the die 10 and slides upwardly on that slant surface 18. Since a segmental portion of the button head A1 projects from the respective slant surface 18 of the die 10, the distal end of each clamp jaw 22 finally hits the projected segmental portion of 25 the button head A1 to push the joined button A and tack B away from the die 10, as shown in Figure 5C.

Because the opposed clamp jaws 22, 22 do not

- 12 -

hold the button A against the die 10 after the
attachment of the button A onto the garment fabric C
has been completed, it is possible to remove the joined
button A and tack C from the lower unit 1 easily
5 without any damage to the button A, the tack B and the
garment fabric C.

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- 13 -

CLAIMS:

1. An apparatus for assembling a pair of fastener elements (A, B) of a garment fastener, comprising: a frame; a stationary die (10) supported by said frame; a plunger (5) reciprocally supported by said frame and having a punch (6) movable, in response to reciprocating movement of said plunger(5), toward and away from said die (10) to join the two fastener elements (A, B) together; first and second clamp assemblies carried by said die (10) and punch (6), respectively, for holding the respective fastener elements (A, B) to be joined together, said first clamp assembly (12) including (a) a support block (21) slidably mounted on said die (10) and movable, in response to the reciprocating movement of said plunger (5), between an upper position and a lower position, (b) a first spring (13) normally urging said support block (21) toward said upper position, (c) a pair of clamp jaws (22, 22) pivotally mounted on said support block (21) and pivotally movable, in response to vertical movement of said support block (21), toward and away from each other for holding one of the two fastener elements (A) on an upper end surface of said die (10) when said punch (6) is lowered toward said die (10), and (d) a pair of second springs (23, 23) normally urging said clamp jaws (22, 22) toward each other; characterized in that said die (10) has on its

- 14 -

upper peripheral portion a pair of slant surfaces (18,
18) contiguous to said upper end surface so that a
peripheral portion of said one fastener element (A), as
the latter is placed on said upper end surface,
5 projects from each of said slant surfaces (18), a
distal end of each said clamp jaw (22) being slidable
upwardly on the respective slant surface (18) to push
said one fastener element (A) on such projected
peripheral portion thereof away from said die (10)
10 while said support block (21) returns from said lower
position to said upper position in response to
retraction of said punch (6) away from said die after
the two fastener elements (A, B) have been joined
together as compressed between said die (10) and punch
15 (6).

2. An apparatus according to claim 1,
characterized in that said slant surfaces (18, 18) are
disposed in diametrically opposite relation with
respect to said die (10).

20 3. An apparatus according to claim 1,
characterized in that each said slant surface (18) is
flat throughout its entire area.

FIG. 1

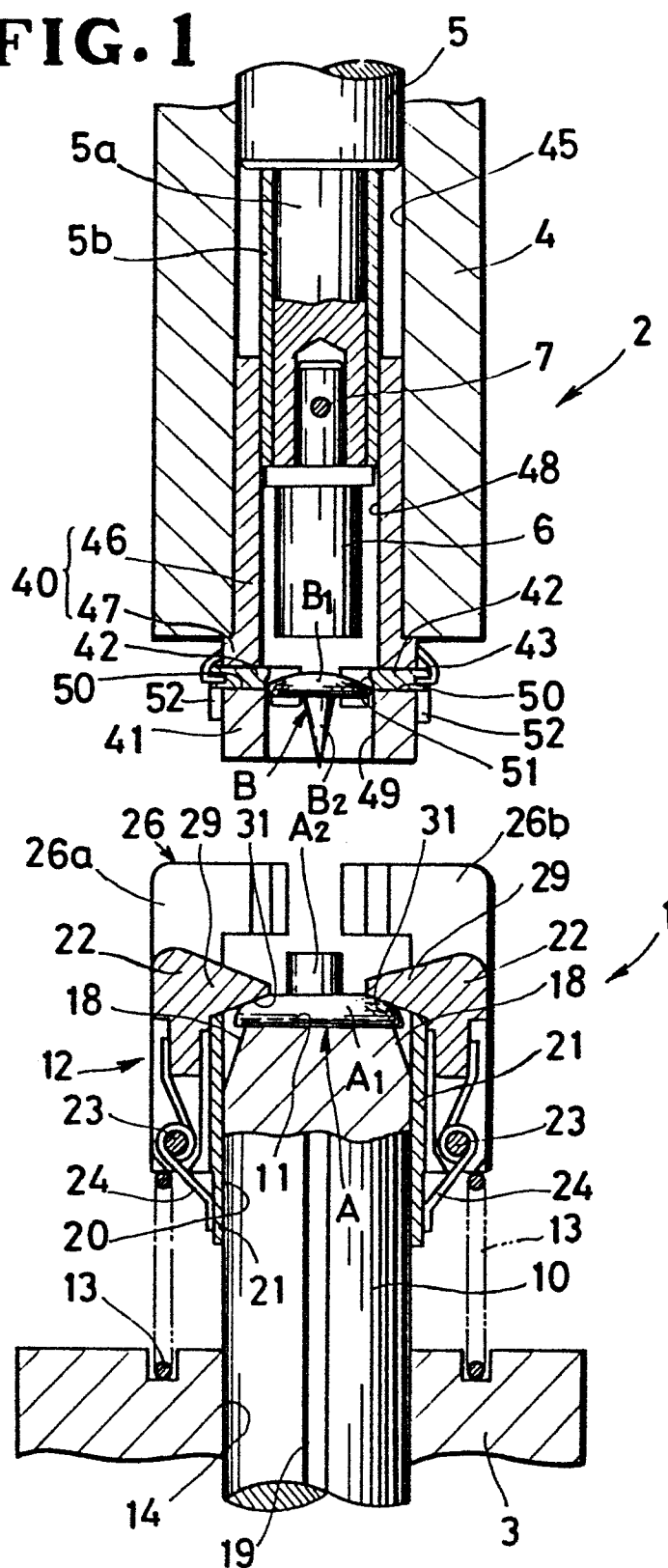


FIG. 2

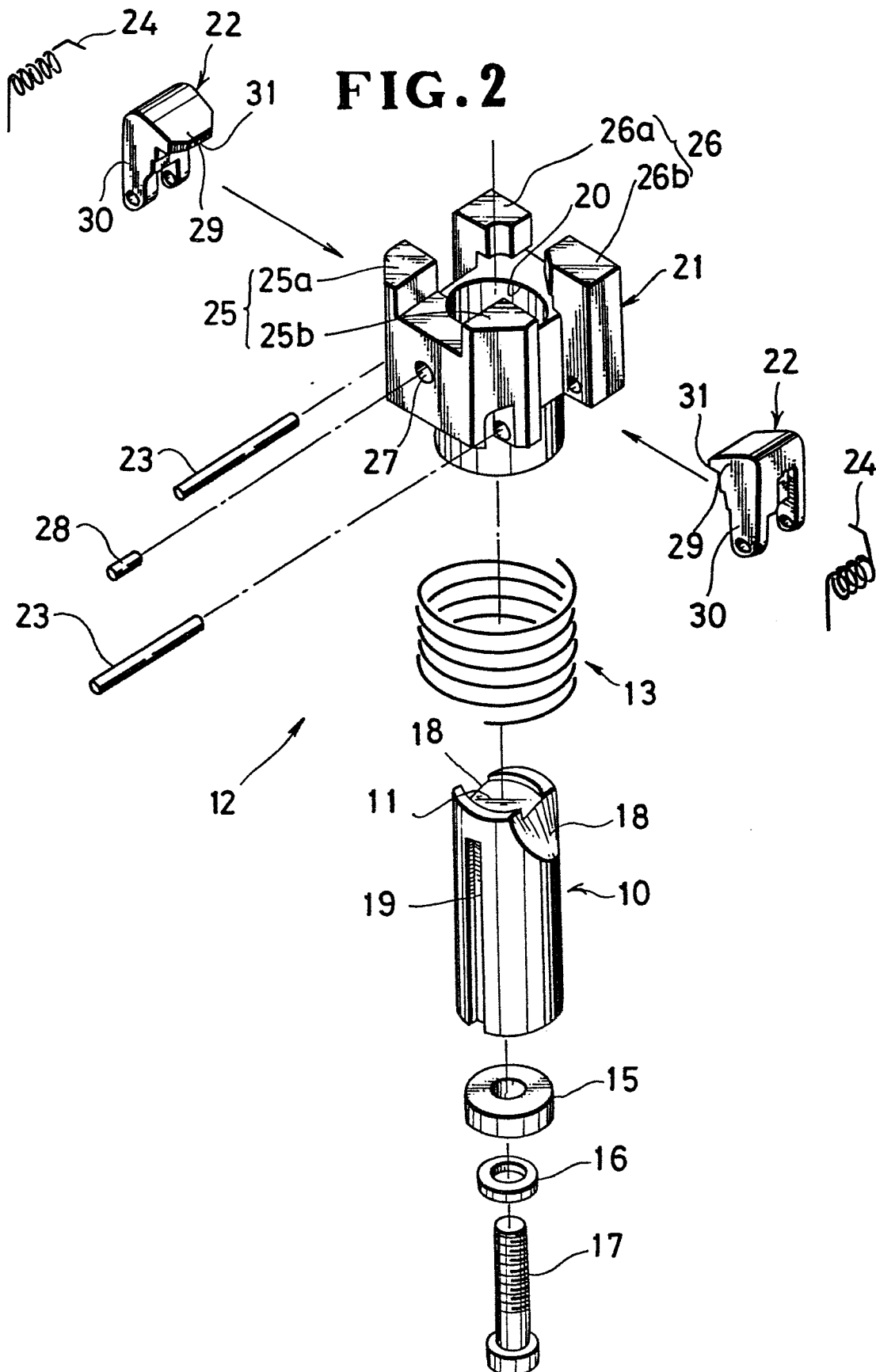


FIG. 3

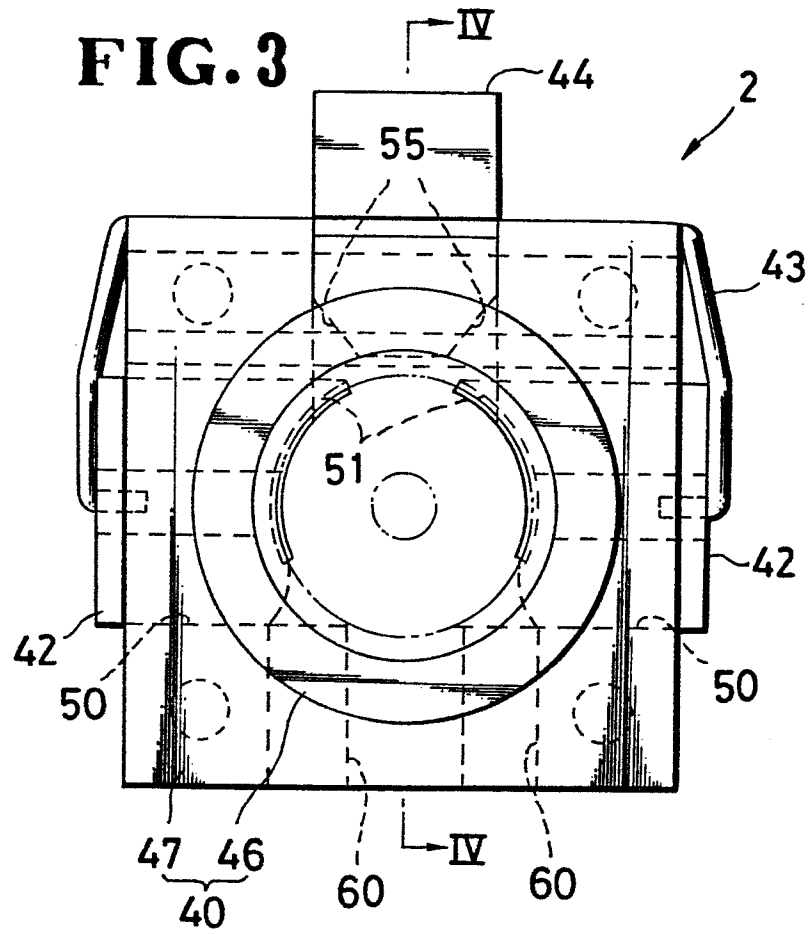


FIG. 4

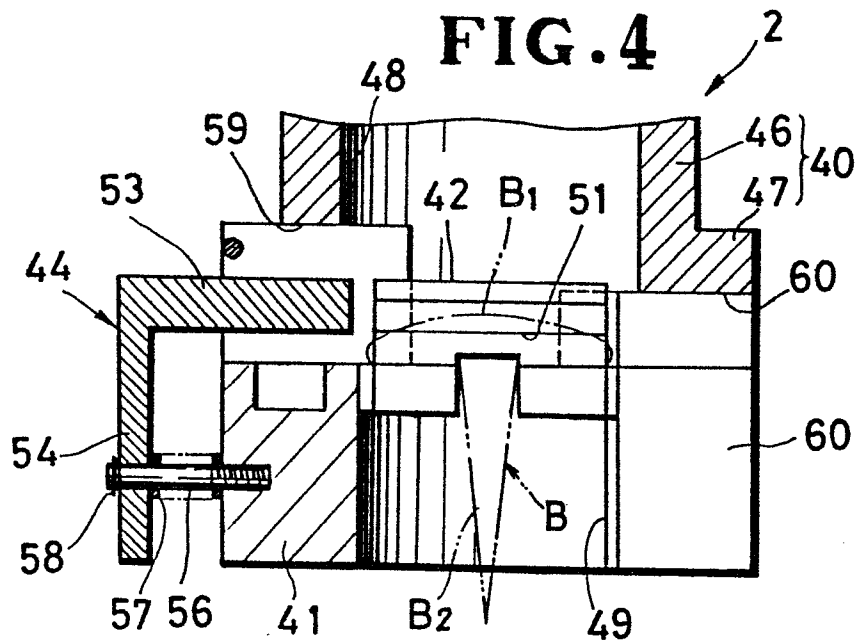


FIG. 5A

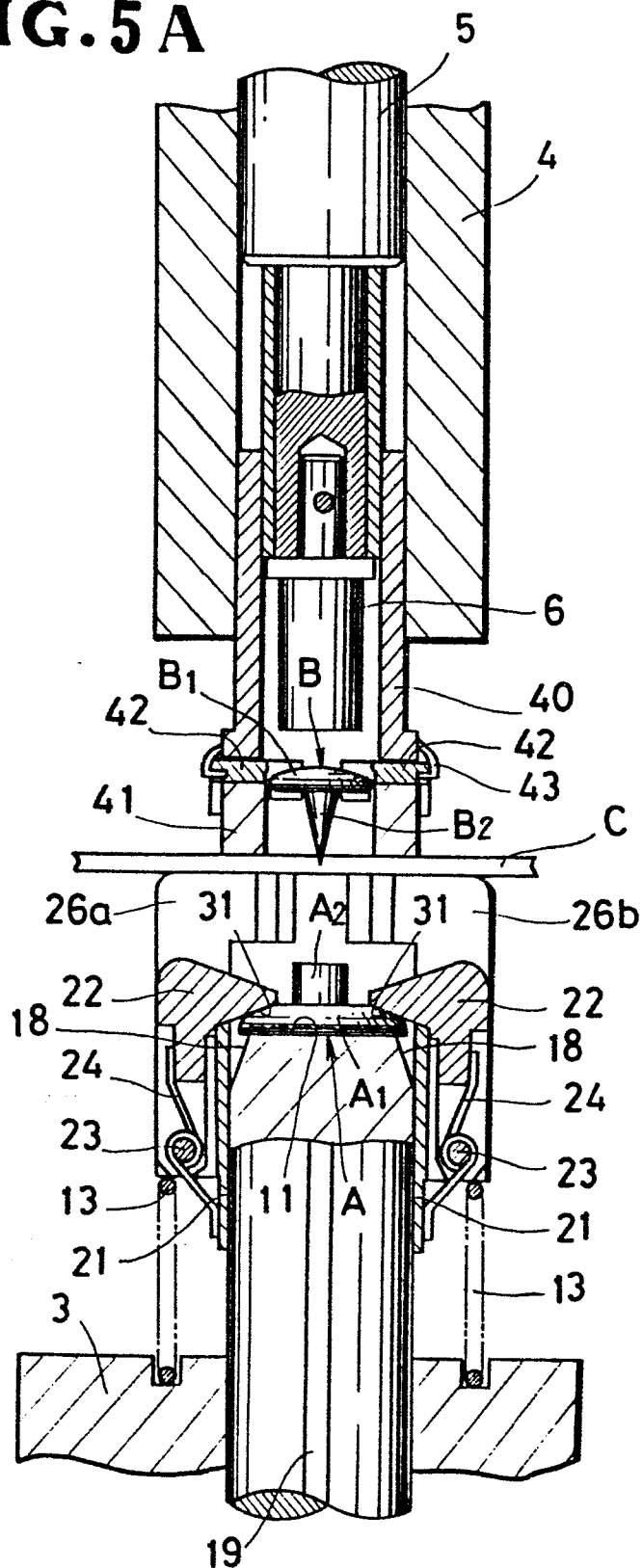


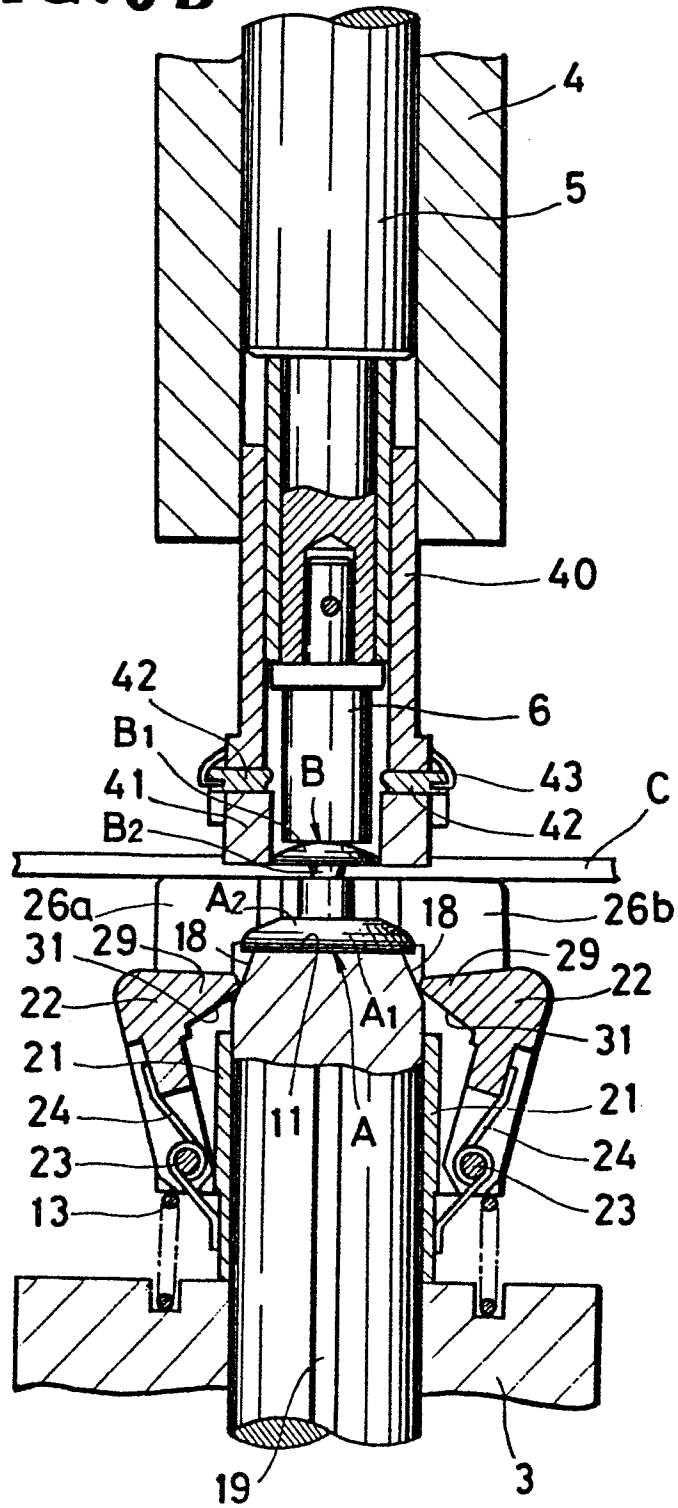
FIG. 5B

FIG. 5C

