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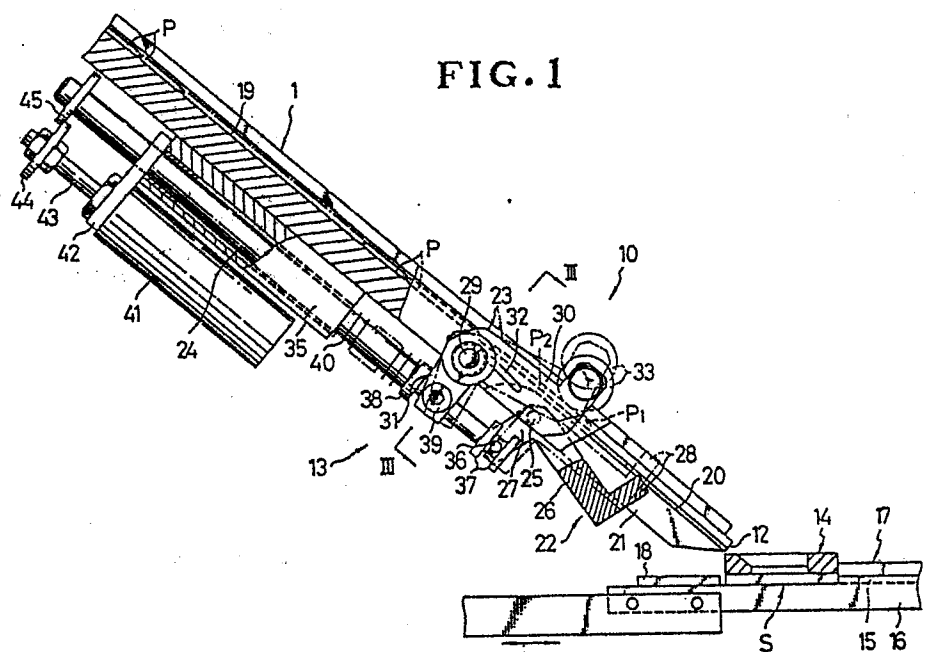
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54 **Parts supplying apparatus for use with fastener assembling and setting machine.**

57 A parts supplying apparatus (10) includes a dropper mechanism (13) associated with a chute (11) for delivering fastener parts one at a time from the chute (11) to a loading station (S) in a fastener assembling and setting machine. The dropper mechanism (13) includes a first bell crank (22) having a stopper portion (28) projectable into a guide track (19) in the chute (11) to prevent a leading fastener part (P1) from sliding downwardly therebeyond, a second bell crank (23) having a presser portion (33) disposed upstream of the stopper portion (28) and projectable into the guide track (19) for pressing the next succeeding fastener part (P2) against the chute (11), and a reciprocable actuating rod (24) operatively connected with the first and second bell cranks (22, 23) for oscillating them to move the stopper portion (28) and the presser portion (33) to alternately project into and retract from the guide track (19). The apparatus (11) also includes a posture-control block (14) disposed on the loading station (S) for introducing the fastener part (P) to the loading station (S) in a flat posture.



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PARTS SUPPLYING APPARATUS FOR USE WITH
FASTENER ASSEMBLING AND SETTING MACHINE

The present invention relates to an apparatus for supplying fastener parts, such as retainer washers for hook-and-eye fasteners, one at a time to a loading station in a fastener assembling and setting
5 machine.

There are known various parts supplying apparatus incorporated into an automatic fastener assembling and setting machine, for supplying fastener parts one at a time to a loading station in the
10 machine. Such known apparatus generally comprise a storage box detachably mounted on a chute for storing a predetermined number of fastener parts, and a pusher associated with the storage box to force the fastener parts one at a time from the box into a longitudinal
15 guide track in the chute. With this construction, the operation of the fastener assembling and setting machine is interrupted each time the storage box is replaced after the fastener parts in one storage box have fully been delivered. This interruption results

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in a low fastener assembling-and-setting efficiency. Another disadvantage is in that the fastener parts are likely to be deformed or otherwise damaged when forced by the pusher into the guide track.

5 The chute of the known apparatus generally includes a lower end portion curved gently toward the loading station to ensure that the fastener parts can be delivered to the loading station in horizontal orientation or posture. The curved lower end portion
10 is however difficult to manufacture and makes the parts supplying apparatus expensive to construct as a whole.

 The present invention seeks to provide a parts supplying apparatus which will overcome or substantially eliminate the foregoing drawbacks of the
15 known apparatus.

 The present invention further seeks to provide an apparatus for supplying fastener parts reliably one at a time to a loading station in a fastener assembling and setting machine without interrupting the operation
20 of the fastener assembling and setting machine.

 The present invention further seeks to provide a parts supplying apparatus having structural features for effecting a damage-free gravity delivery of fastener parts from a chute to a loading station in a
25 fastener assembling and setting machine.

 The present invention further seeks to provide a fastener supplying apparatus having a posture-control

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block which enables the fastener parts to be delivered to a predetermined loading position in horizontal orientation or posture.

According to the present invention, there is
5 provided an apparatus for supplying fastener parts one at a time to a loading station in a fastener assembling and setting machine, said apparatus including: a chute having a longitudinal guide track in and along which the fastener parts slide downwardly one after another,
10 and further having a discharge end disposed adjacent to the loading station; and dropper means associated with said chute for delivering the fastener parts one at a time from said chute to the loading station, characterized in that said dropper means comprises a
15 first bell crank pivotably mounted on said chute and having a stopper portion projectable into said guide track for preventing a leading fastener part from sliding downwardly beyond said stopper portion, a second bell crank pivotably mounted on said chute and
20 having a presser portion spaced upstream from said stopper portion by a distance slightly larger than the maximum extent of each fastener part in the longitudinal direction of said guide track, said presser portion being projectable into said guide track
25 to urge the next succeeding fastener part against said chute, and an actuating rod reciprocally supported on said chute and operatively connected with said first

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and second bell cranks for oscillating the latter to move said stopper portion and said presser portion to alternately project into and retract from said guide track.

5 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 which a preferred structural embodiment incorporating
10 the principles of the present invention is shown by way of illustrative example.

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

15 Figure 2 is an enlarged plan view of a portion of the apparatus of Figure 1, with parts removed for showing a dropper mechanism;

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

20 Figure 4 is an enlarged perspective view of a posture-control block of the apparatus shown in Figure 1; and

Figure 5 is a schematic side elevational, partially cross-sectional view of the apparatus
25 illustrative of the manner in which a fastener part is controlled in its posture by the posture-control block.

As shown in Figure 1, a parts supplying

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apparatus 10 embodying the present invention generally comprises an inclined straight chute 11 (only a lower portion being shown) connected at an upper loading end with a parts feeder (not shown) and having a lower

5 discharge end 12 facing toward a loading station S in a fastener assembling and setting machine, for gravity delivery of fastener parts P from the parts feeder therethrough to the loading station S. The apparatus 10 also includes a dropper mechanism 13 associated with

10 the chute 11 for delivering the fastener parts P one at a time from the chute 11 to the loading station S, and a posture-control block 14 disposed on the loading station S for controlling the posture of each fastener part P as the latter is delivered from the discharge

15 end 12 to the loading station S. The loading station S is defined on a guide groove 15 in a horizontal guide block 16 which constitutes a part of a loading unit 17. The loading unit 17 also includes a feed means or

20 pusher 18 reciprocably movable in and along the guide groove 15 for feeding the fastener part P from the loading station S to a working station (not shown) in the fastener assembling and setting machine. The fastener parts P shown in the illustrated embodiment comprise retainer washers of hook-and eye fasteners.

25 It is noted however that the parts supplying apparatus 10 of the present invention is effectively usefull for supplying planar fastener parts of any kind.

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The chute 11 includes a longitudinal guide track 19 in and along which the fastener parts P slide downwardly one after another, the guide track 19 facing to a front side of the chute 11. The chute 11 also
5 includes a longitudinal slot 20 extending upwardly from the discharge end 12 to a certain extent and opening to the guide track 19, and a longitudinal recessed portion 21 contiguous to the slot 20 and facing away from the guide track 19.

10 The dropper mechanism 13 includes a first bell crank 22 pivotably disposed in the recessed portion 21, a second bell crank 23 pivotably mounted on the chute 11 and disposed upstream of the first bell crank 22, and a reciprocable actuating rod 24 operatively
15 connected with the first and second bell cranks 22, 23 to oscillate them in timed relation to one another.

The first bell crank 22 is pivotably connected by a pin 25 to the chute 11 and has a pair of bifurcated legs 26, 27. One leg 26 is directed toward
20 the discharge end 12 of the chute 11 and the other leg 27 is directed perpendicularly away from the guide track 19. The leg 26 includes a stopper portion 28 disposed on a distal end of the leg 26 and projecting perpendicularly therefrom in a direction away from the
25 leg 26. The stopper portion 28 is movable to project into and retract from the guide track 19 through the slot 20, in response to the rocking movement of the

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first bell crank 22. The stopper portion 28 is normally held in a retracted position remote from the guide track 19.

The second bell crank 23 is pivotably connected
5 by a pin 29 to the chute 11 at one side of the latter and has a pair of bifurcated arms 30, 31, one arm 30 of which extends from the pin 29 in substantially the same direction as the leg 26 of the first bell crank 22, the other arm 31 being directed perpendicularly away from
10 the guide track 19. A torsion coil spring 32 is disposed around the pin 29 and acts between the pin 29 and the second bell crank 23 to turn the latter clockwise in Figure 1. The arm 30 includes a circular presser portion 33 disposed on a distal end thereof for
15 urging the fastener part P2 against the chute 11. As shown in Figures 2 and 3, the presser portion comprises a circular plate or disc supported on the distal end of the arm 30 via a connector block 34 interposed therebetween. The connector block 34 is secured by a
20 screw to the arm 30 and extends therefrom to such an extent that the presser disc 33 is disposed in registry with the guide track 19. As described above, the second bell crank 23 is urged by the spring 32 to turn clockwise in Figure 1, so that the presser disc 33 is
25 normally held in a pressing position where a lower peripheral portion of the presser disc 33 projects into the guide groove 19. The presser portion or disc 33 is

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separated upstream from the stopper portion 28 by a distance slightly greater than the maximum extent of each fastener part P in the longitudinal direction of the guide track 19 so that when the first and second
5 bell cranks 22, 23 are oscillated, one fastener part may escape for each oscillation.

As shown in Figure 1, the actuating rod 24 extends longitudinally of the chute 11 and is slidably supported on a holder 35 secured to the underside of
10 the chute 11. The rod 24 projects at its opposite ends from the holder 35 and has a lower end pivotably connected by a pin 36 to a distal end of the leg 27 of the first bell crank 22. The pin 36 extends diametrically through the rod 24 between a pair of end
15 flanges 37, 37. The rod 24 further includes an intermediate actuating flange 38 disposed between the holder 35 and an upper one of the flanges 37. The intermediate actuating flange 38 is located on an upstream side of an abutment pin 39 secured to a distal
20 end of the arm 31 of the second bell crank 23. A compression coil spring 40 is disposed around the rod 24 and acts between the holder 35 and the actuating flange 38 to urge the rod 24 in the downstream direction of the chute 11, thereby bringing the flange
25 38 into abutment of the pin 39 to turn the second bell crank 23 counterclockwise in Figure 1 against the force of the torsion spring 32.

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A fluid-actuated cylinder 41 is supported on the holder 35 by a support plate 42 and includes a piston rod 43 reciprocably movable in a direction parallel to the actuating rod 24. The piston rod 43 supports on
5 its outer end an engagement collar 44 held in engagement with a stopper flange 45 disposed at an upper end of the actuating rod 24. The piston rod 43 is normally held in a fully extended position as shown in Figure 1. In this instance, the intermediate
10 actuating flange 38 is spaced a distance from the abutment pin 39 on the second bell crank 23.

The posture-control block 14, as shown in Figure 4, has a rectangular shape and includes a downwardly open horizontal guide channel 46 extending
15 longitudinally therethrough for the passage of the pusher 18 (Figure 1), and a central vertical aperture 47 communicating with the guide channel 46 for the passage of the fastener parts P (Figure 5). The vertical aperture 47 has a substantially square shape
20 and is defined jointly by a front vertical wall 47a, a pair of opposed side vertical walls 47b, 47c and a rear vertical wall 47d. The block 14 also has an upper surface recessed around upper edges of the front and side vertical walls 47a, 47b, 47c so as to form a guide
25 surface 48 sloping downwardly convergently toward the aperture 47. The sloped guide surface 48 is composed of a front guide surface 48a contiguous to the front

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vertical wall 47a, and a pair of opposed side guide surfaces 48b, 48b contiguous to the side vertical walls 47b, 47c, respectively. The front guide surface 48a and the side guide surfaces 48b have different angles
5 of inclination and the side guide surfaces 48b are steeper than the front guide surface 48a. The front guide surface 48a preferably has substantially the same angle of inclination as the chute 11, as shown in Figure 5. With the guide surface 48 thus provided, the
10 rear vertical wall 47d extends upwardly beyond the front and side vertical walls 47a, 47b, 47c.

The parts supplying apparatus 10 thus constructed operates as follows. The fluid-actuated cylinder 41 is operated to retract its piston rod 43
15 from the fully extended position of Figure 1 whereupon the actuating rod 24 slides to move in the downstream direction of the chute 11 under the force of the compression coil spring 40. This sliding movement of the actuating rod 24 causes the first bell crank 22 to
20 turn counterclockwise in Figure 1, thereby moving the stopper portion 28 through the slot 20 into the guide track 19, as indicated by phantom lines. Substantially at the same time or preferably slightly thereafter, the intermediate actuating flange 38 impinges upon the
25 abutment pin 39 to turn the second bell crank 23 counterclockwise in Figure 1 against the force of the torsion coil spring, thereby bringing the presser

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portion or disc 33 out of pressing engagement with a leading fastener part P1, as indicated by phantom lines. With the result that the leading fastener part P1 slides downwardly along the guide track 19 until it
5 engages the stopper portion 28.

Then the cylinder 41 is actuated to extend its piston rod 43 to move the actuating rod 24 in the upstream direction of the chute 11 against the force of the compression coil spring 40. This movement of the
10 actuating rod 24 causes the intermediate actuating flange 38 to disengage from the abutment pin 29, whereupon the second bell crank 23 is turned clockwise in Figure 1 by the force of the torsion coil spring 32, thereby bringing the presser disc 33 into engagement
15 with the next succeeding fastener part P2. During that time, the first bell crank 22 is also turned clockwise to retract the stopper portion 28 from the guide track 19, thereby allowing the leading fastener part P1 to slide downwardly along the guide track 19 toward the
20 discharge end 12 of the chute 11. Thus, in response to reciprocation of the actuating rod 24, the first and second bell cranks 22, 23 oscillate in timed relation to one another so as to move the stopper portion 28 and the presser portion 33 to alternately project into and
25 retract from the guide track 19, with the result that one fastener part P is delivered from the chute 11 to the loading station S upon completion of each

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oscillation of the bell cranks 22, 23.

The fastener part P, which has been released from the dropper mechanism 13, falls along the guide track 19 and is discharged from the discharge end 12 of the chute 11 to the loading station S in the loading unit 17, as shown in Figure 5. In this instance, the fastener part P is guided along the sloped front guide surface 48a into the vertical aperture 47, then enters the horizontal guide channel 46 in an inclined posture, and finally lies flatwise over the bottom wall of the guide groove 15 in the guide block 16. Occasionally, the fastener part P rebounds from the guide block 16 upwardly rightwardly in this figure to return into the aperture 47 and impinges upon the rear vertical wall 47d. The impinged fastener part P falls through the vertical aperture 47 into the guide channel 46 while wobbling or flapping the vertical aperture 47. The fallen fastener part P lies flatwise over the bottom wall of the guide groove 15. Then the pusher 18 is actuated to feed the fastener part P from the loading station to the working station (not shown) where the fastener part P is attached to a garment fabric or assembled with a mating fastener part.

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CLAIMS:

1. An apparatus (10) for supplying fastener parts (P) one at a time to a loading station (S) in a fastener assembling and setting machine, said apparatus including: a chute (11) having a longitudinal guide track (19) in and along which the fastener parts (P) slide downwardly one after another, and further having a discharge end (12) disposed adjacent to the loading station (S); and dropper means (13) associated with said chute (11) for delivering the fastener parts (P) one at a time from said chute (11) to the loading station (S), characterized in that said dropper means comprises a first bell crank (22) pivotably mounted on said chute (11) and having a stopper portion (28) projectable into said guide track (19) for preventing a leading fastener part (P1) from sliding downwardly beyond said stopper portion (28), a second bell crank (23) pivotably mounted on said chute (11) and having a presser portion (33) spaced upstream from said stopper portion (28) by a distance slightly larger than the maximum extent of each fastener part (P) in the longitudinal direction of said guide track (19), said presser portion (33) being projectable into said guide track (19) to urge the next succeeding fastener part (P2) against said chute (11), and an actuating rod (24) reciprocally supported on said chute (11) and operatively connected with said first and second bell

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cranks (22, 23) for oscillating the latter to move said stopper portion (28) and said presser portion (33) to alternately project into and retract from said guide track (19).

5 2. An apparatus according to claim 1, each of said stopper portion (28) and said presser portion (33) being movable in a plane substantially perpendicular to the general plane of said guide track (19).

 3. An apparatus according to claim 2, said
10 presser portion (33) entering said guide track from a front side of said chute (11) to which said guide track (19) opens, said stopper portion (28) entering said guide track (19) from a backside of said chute (11).

 4. An apparatus according to ^{one of the} claims 1 to 3, said
15 first bell crank (22) having a pair of bifurcated legs (26, 27), said stopper portion (28) being disposed on a distal end of one leg, the other leg (26) being pivotably coupled with said actuating rod (24), said second bell crank (23) having a pair of bifurcated arms
20 (30, 31), said presser portion (33) being disposed on a distal end of one arm (30), the other arm (31) being operatively connected with said actuating rod (24).

 5. An apparatus according to claim 4, said one leg (26) and said one arm (30) being directed in
25 substantially the same direction, said presser portion (33) entering said guide track (19) from a front side of said chute (11) to which said guide track (19)

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opens, said stopper portion (28) entering said guide track (19) from a backside of said chute (11).

6. An apparatus according to claim 4, said chute (11) further having a slot (20) opening to said guide track (19), said stopper portion (28) projecting from said distal end of said one leg (26) in a direction parallel to said other leg (27), said stopper portion (28) projecting through said slot (20) into said guide track (19).

10 7. An apparatus according to claim 6, said chute (11) having a recessed portion (21) contiguous to said slot (20) and facing away from said guide track (19), said first bell crank (22) being pivotably received in said recessed portion (21).

15 8. An apparatus according to claim 4, said stopper portion (28) being normally held in a retracted position remote from said guide track (19), said presser portion (33) being normally urged to enter said guide track (19), said actuating rod (24) having an actuating flange (38) normally spaced from said other arm (31) and, upon reciprocation of said actuating rod (24), engageable with said other arm (31) to turn the second bell crank (23) to retract said presser portion (33) away from said guide track (19).

25 9. An apparatus according to claim 8, including means for reciprocating said actuating rod (24) between an extended position where said stopper portion (28)

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enters said guide track (19) and said presser portion (33) retracts away from said guide track (19), and a retracted position where said stopper portion (28) retracts away from said guide track (19) and said
5 presser portion (33) enters said guide track (19), said reciprocating means comprising a fluid-actuated cylinder (41) supported on said chute (11) and having a piston rod (43) extending parallel to and operatively connected with said actuating rod (24) for moving the
10 latter in said retracted position, spring means (40) acting on said actuating rod (24) for urging the latter toward said extended position, and a stopper flange disposed on said actuating rod (24) and held in engagement with said piston rod (43) to limit the
15 movement of said actuating rod (24) toward said extended position.

10. An apparatus according to ^{one of the} claim 1 to 9; said chute being inclined and extending straight, including a posture-control block (14) disposed on the loading
20 station (S) for introducing the fastener part (P) flatwise to the loading station (S) in a flat posture, said block (14) including a vertical aperture (47) for the passage of the fastener part (P) and a horizontal guide channel (46) communicating with said aperture
25 (47) and facing toward said loading station (S), said aperture (47) having a rectangular shape defined jointly by a front vertical wall (47a) located adjacent

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to said discharge end (12) of said chute (11), a pair of opposed side vertical walls (47b, 47c) and a rear vertical wall (47d) disposed remote from said discharge end (12), said block (14) having an upper surface
5 recessed around upper edges of said front and side vertical walls (47a, 47b, 47c) so as to form a guide surface (48) sloping downwardly convergently toward said aperture (47).

11. An apparatus according to claim 10, said
10 sloped guide surface (48) including a front guide surface (48a) contiguous to said front vertical wall (47a), and a pair of opposed side guide surfaces (48b) contiguous to said side vertical walls (47b, 47c), respectively.

15 12. An apparatus according to claim 11, said side guide surface (48b) being steeper than said front guide surface (48a).

13. An apparatus according to claim 11, said
front guide surface (48a) having the same angle of
20 inclination as said chute (11).

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FIG. 2

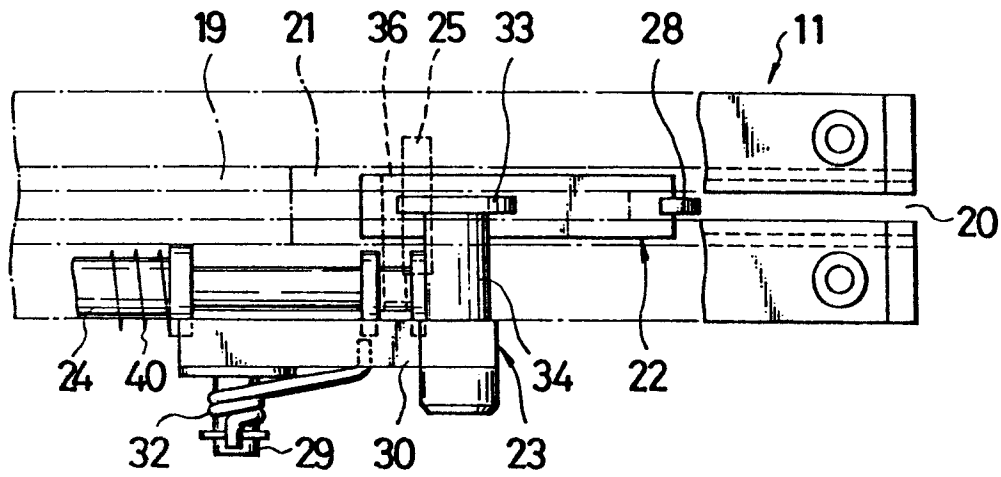
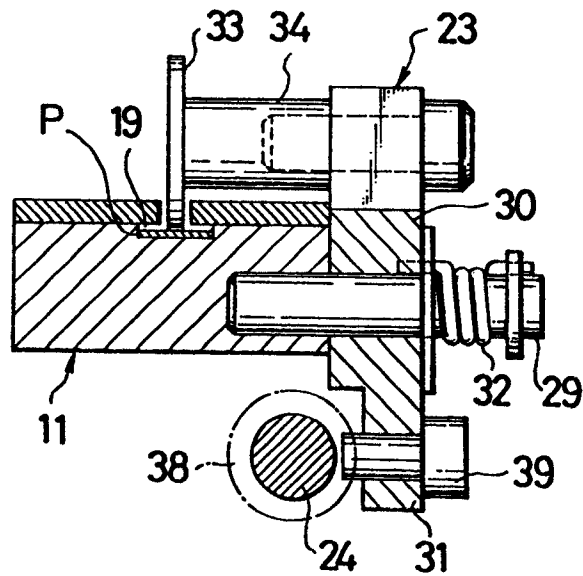
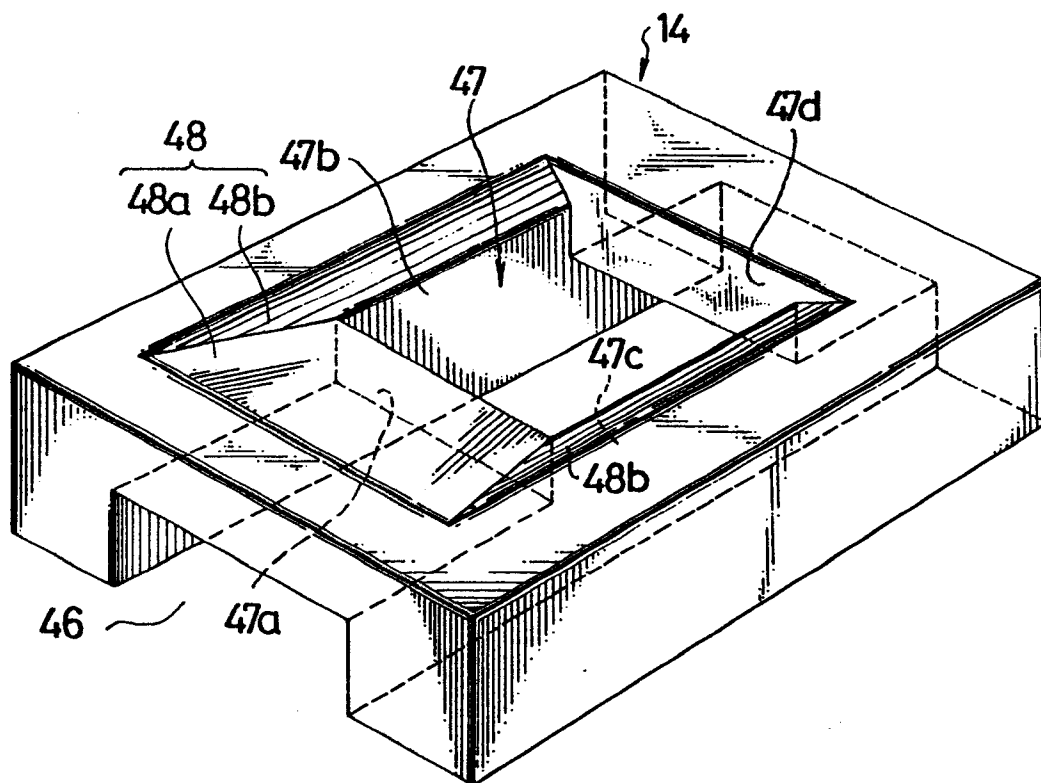


FIG. 3



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FIG. 4



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FIG. 5