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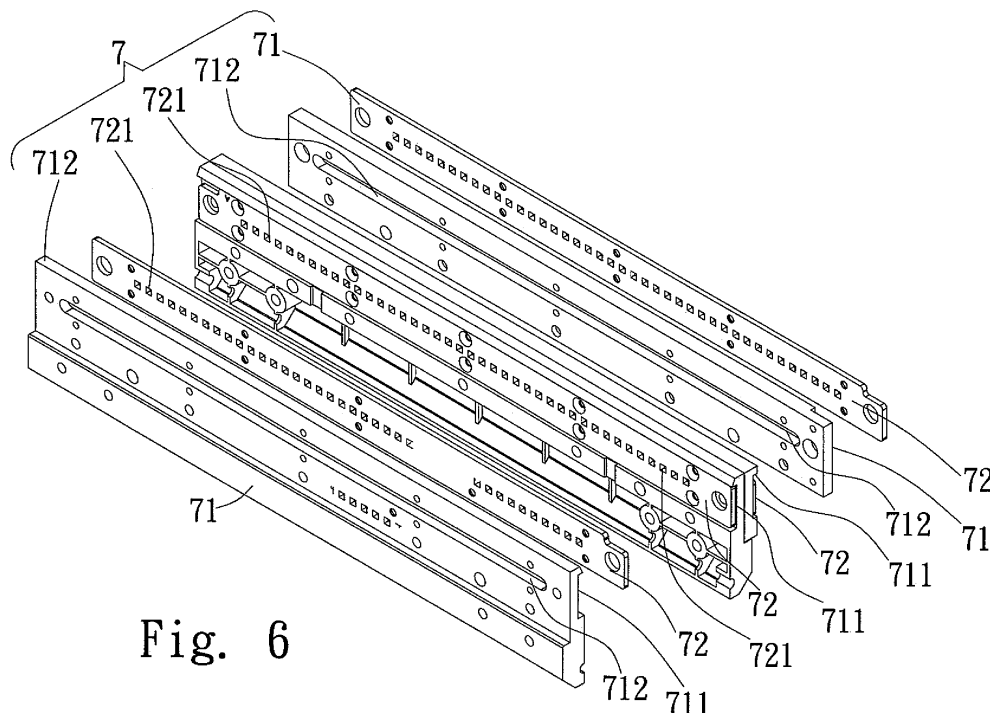
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80504 München (DE)(71) Applicant: **Chiang, Chou-Chih**
Taichung (TW)(54) **A manufacturing method, a hole-punching assembly and a pressing structure for a hole-punching unit**

(57) The present invention discloses an improved manufacturing method, a hole-punching assembly and a pressing structure for a hole-punching unit. The method of the present invention comprises the following steps: 1 Several balancing pieces (71), made of aluminum and with a rectangular shape, are swiftly formed by extrusion, and an indentation area (711) is provided on one side of each balancing piece; 2 An elongated slot (712) is formed by an application of stamping on the indentation area (711) of each balancing piece (71). 3 Several rectangular

pieces (72) (the number of the rectangular pieces should be equal to that of the balancing pieces) made of iron are obtained, and a row of holes (721) are provided by a single application of stamping on each rectangular piece; 4 Each of these rectangular pieces (72) is fitted onto the indentation area (711) of a balancing piece (71), and the balancing pieces (71) are connected together by screws or bolts. The manufacturing method can lower the production cost of the hole-punching assembly and simplify the production process of the hole-punching assembly.

**Fig. 6****EP 1 842 604 A1**

Description**BACKGROUND OF THE INVENTION****1. Field of the invention**

[0001] The invention generally relates to an improved manufacturing method, a hole-punching assembly and a pressing structure for a hole-punching unit. More particularly, the invention relates to an improved manufacturing method that can simplify the production process and lower the production cost and is different from the prior art manufacturing method, which is characterized with a more difficult production process and results in a higher production cost. Whence, the method of the present invention has a higher level of economic value and usefulness.

2. DESCRIPTION OF THE PRIOR ART

[0002] As of now, multiple-hole punching device is used to punch holes on a stack of paper so that the paper may be bound into a book. Because such device has a plurality of punching pieces, such device needs additional components that can hold a stack of paper and set it into a neat condition so that the punching operation may be carried out smoothly.

[0003] Please refer to Fig. 1 and 2. Fig. 1 is a perspective view showing the overall structure of the hole-punching unit of the prior art. Fig. 2 is a partial sectional view showing the hole-punching unit of the prior art.

[0004] The prior art hole-punching unit 10 has a row of slots 11, two retaining plates 111 and 112, a grip portion 13, two rods 14, a positioning piece 15, two elastic elements 141 and a plurality of punching pieces 20. A gap 12 for the insertion of a stack of paper is transversally disposed. The slots 11 are separated by a row of ribs. The two retaining plates 111 and 112 are fitted on by bolts. The grip portion 13 is provided on one side of hole-punching unit 10 so that a user may use the grip portion 13 to fit unit 10 into a hole-punching machine or take it out from such machine. The two rods 14 are disposed in the two sides of a rear portion of the unit 10. The positioning piece 15 is fitted on unit 10 with the two rods 14. Each rod goes through an elastic element 141; the proximal ends of the elastic elements 141 press against unit 10, and the distal ends of the elastic elements 141 press against the positioning piece 15.

[0005] The punching pieces 20 may go through and be held in the row of slots 11. A retaining plate 151 is also provided so as to hold the punching pieces 20 in place. If a different number of holes is wanted, a user may unfasten the retaining plate 151 and then take out or add one or more of the punching pieces 20. If the slots 11 have a rectangular shape, the punching pieces 20 should have a rectangular shape. The punching pieces 20 may have different shapes - rectangular, triangular, circular, etc.

[0006] The prior art hole-punching unit 10 and its manufacturing method have the following eight disadvantages:

1. The prior art hole-punching unit 10 is made of iron and is relatively bulky; hence, more material is needed in its production.

2. The prior art hole-punching unit 10 is made of iron; therefore, it is quite heavy. This causes inconvenience in the production process and transportation.

3. Since unit 10 is larger in size and heavier in weight after it is integrally formed, the processing of its gap 12 and slots 11 requires a bigger machine and is relatively more difficult to carry out as well as takes more time; therefore, the processing cost is higher.

4. Such manufacturing method can only allow the shapes of the slots to be rectangular, triangular or diamond shape (not circular)

5. To cover and protect slots 11, two retaining plates 111 and 112 are provided. Hence, the production cost of such unit 10 is high; therefore, such unit 20 has a lower economic value.

6. In the prior art, in order to make it easier to carry out the production process, unit 10 comprises two halves, which are joined together by screws or bolts. Even so, the disadvantages (such as heavy weight and the processing of slots 11 being difficult to carry out) still remain.

7. Though there are different types (as according to the shapes of the punching pieces) of unit 20, their production cost and hence their selling prices are relatively high due to the above mentioned disadvantages.

8. Since prior art unit 10 is integrally formed and its slots 11 and paper gap 12 require processing, a higher degree of precision in the production and processing is needed; if any of its part is slightly imperfect or imprecise, the operation of the whole unit 10 would be greatly affected and sometimes the whole unit 10 has to be discarded. This constitutes a waste.

[0007] Therefore, the disadvantages (such as the high production cost and the difficult production process) of the prior art hole-punching unit 10 and its manufacturing method need to be overcome or improved. The method of the present invention may be used to overcome these disadvantages as well as to bring up the efficiency in producing hole-punching unit 10, and its pressing structure and to enhance the economic value.

[0008] To eliminate the disadvantages of the prior art, the inventor has put in a lot of effort in the subject and has successfully come up with an improved manufacturing method, a hole-punching assembly and a pressing structure for a hole-punching unit of the present invention. The manufacturing method of the present invention can lower the production cost and simplify the production process of the hole-punching assembly as well as enhance the efficiency in production.

SUMMARY OF THE INVENTION

[0009] It is an object of the present invention to provide an improved manufacturing method, a hole-punching assembly, and a pressing structure for a hole-punching unit. The method of the present invention comprises the following steps: (1) Several balancing pieces, made of aluminum and with a rectangular shape, are swiftly formed by extrusion, and an indentation area is provided on one side of each balancing piece (2) An elongated slot is formed by an application of stamping on the indentation area of each balancing piece. (3) Several rectangular pieces (the number of rectangular pieces should be equal to that of the balancing pieces), made of iron, are obtained, and a row of holes are provided by a single application of stamping on each rectangular piece (4) Each of these rectangular pieces is fitted onto the indentation area of a balancing piece, and the balancing pieces are connected together by screws or bolts. In addition, two of the balancing pieces are arranged with their rectangular pieces facing each other so as to provide a gap for the insertion of a stack of paper.

[0010] It is another object of the present invention to provide a hole-punching assembly for hole-punching unit, wherein a positioning piece is disposed face to face to a clamping piece without using auxiliary tools to help dismantling and switching tool holders and to facilitate the usability of the hole-punching assembly.

[0011] It is still another object of the present invention to provide a hole-punching assembly structure for a hole-punching unit comprising a main plate having a gliding rail obliquely and concavely formed on each side of the main plate for a rod of a clamping piece to easily slide into the gliding rail from outside.

[0012] It is still another object of the present invention to provide a pressing structure of hole-punching unit, wherein the wrenching piece drives the pressing piece to press the hole-punching assembly by its elasticity and to fasten the hole-punching assembly to facilitate the process of switching and maintaining the hole-punching assembly.

[0013] The present invention provides an improved manufacturing method, a hole-punching assembly, and a pressing structure for a hole-punching unit, comprising the following steps:

Step 1: Several balancing pieces, made of aluminum and with a rectangular shape, are swiftly formed by extrusion. An indentation area is provided on one side of each balancing piece.

Step 2: An elongated slot is formed by stamping on the indentation area of each balancing piece.

Step 3: Several rectangular pieces (the number of rectangular pieces should be equal to that of the balancing pieces) made of iron and with a flat rectangular shape, are obtained. A row of holes are provided by a single application of stamping on each rectangular piece such that such row of holes may

be aligned with the elongated slots of other balancing pieces. The shape (may be rectangular, square or circular) and number of the holes may be altered according to actual needs.

Step 4: Fit each of these rectangular pieces onto the indentation area of a balancing piece so that the former and the latter may join together. Then, stack up the balancing pieces (each of them is fitted with a rectangular piece) (the two balancing pieces that are near the proximal end and should have their rectangular pieces facing each other so as to provide a gap for the insertion of a stack of paper), and these pieces are connected together by screws or bolts.

Step 5: Now, the manufacturing of the hole-punching assembly is completed.

Therefore, using the manufacturing method of the present invention with the several aluminum balancing pieces 71 and several iron rectangular pieces 72, the result is lowered production cost, simplified production process and shortened production time; hence, the efficiency in production is enhanced and more hole-punching assemblies may be produced in a certain period. In conclusion, the manufacturing method of the present invention lowers production cost and selling price, and hence the method has a higher level of economic value and usefulness.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The drawings disclose an illustrative embodiment of the present invention which serves to exemplify the advantages and objects hereof, and are as follows:

Fig. 1 is a perspective view showing the overall structure of the hole-punching unit of the prior art;

Fig. 2 is a partial sectional view showing the hole-punching unit of the prior art;

Fig. 3 is a perspective view showing the assembled hole-punching unit of the present invention;

Fig. 4 is an exploded view showing the hole-punching unit of the present invention;

Fig. 5 is a perspective view showing the hole-punching unit of the present invention which has been fitted in a hole-punching machine;

Fig. 6 is an exploded view showing the hole-punching assembly of the present invention;

Fig. 7 is a perspective view showing the assembled hole-punching assembly of the present invention;

Fig. 8 is a perspective view showing another embodiment of the hole-punching assembly of the present invention;

Fig. 9 is a three dimensional view showing an preferred embodiment of the hole-punching assembly of the present invention;

Fig. 10 is another three dimensional view which rotates 90 degree from the preferred embodiment of the hole-punching assembly shown in Fig. 9;

Fig. 10A is a partially magnifying view of Fig. 10;

Fig.11 is a three dimensional decomposing view which rotates 90 degree from the preferred embodiment of the hole-punching assembly shown in Fig.9; Fig.12 is a vertical view of a first state of the clamping piece dismantled in a preferred embodiment of the hole-punching assembly;
 Fig.12A is a partially magnifying view of Fig.12;
 Fig.13 is a vertical view of a second state of the clamping piece dismantled in a preferred embodiment of the hole-punching assembly;
 Fig.14 illustrates a three dimensional view of a first embodiment of the pressing structure;
 Fig.15 illustrates a left side view (1) of the first embodiment of the pressing structure;
 Fig.16 illustrates a left side view (2) of the first embodiment of the pressing structure;
 Fig.16A illustrates a magnifying view of Fig.16 for the first embodiment of the pressing structure;
 Fig.17 illustrates a left side view (1) of a second embodiment of the pressing structure;
 Fig.18 illustrates a left side view (2) of the second embodiment of the pressing structure; and
 Fig.19 illustrates a left side view of a third embodiment of the pressing structure.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0015] Please refer to Fig. 3, 4 and 5. Fig. 3 is a perspective view showing the assembled hole-punching unit of the present invention. Fig. 4 is an exploded view showing the hole-punching unit of the present invention. Fig. 5 is a perspective view showing the hole-punching unit of the present invention which has been fitted in a hole-punching machine.

[0016] The hole-punching unit of the present invention comprises two balancing rods 1, a holes-positioning piece 2, two elastic elements 3, a plurality of punching pieces 4, a retaining piece 5, a hole-punching assembly 7, which may be provided with a grip portion 6, and a marginal distance adjusting unit 8, which may be provided in the hole-punching assembly 7.

[0017] The hole-punching unit may have different types of punching pieces according to the shape of the punching pieces and may be fitted in and detached from a hole-punching unit (as shown in Fig. 5).

[0018] We will now elaborate on the hole-punching assembly of the present invention and omit the discussion on the two balancing rods 1, holes-positioning piece 2, two elastic elements 3, punching pieces 4, retaining piece 5 and grip portion 6, which are prior art techniques.

[0019] Please refer to Fig. 6, which is an exploded view showing the hole-punching assembly of the present invention.

[0020] The manufacturing method of the hole-punching assembly 7 comprises the following five steps.

[0021] Step 1: Several balancing pieces 71, made of aluminum and with a rectangular shape, are swiftly

formed by extrusion. An indentation area 711 is provided on one side of each balancing piece 71.

[0022] Step 2: An elongated slot 712 is formed by stamping on the indentation area 711 of each balancing piece 71.

[0023] Step 3: Several rectangular pieces 72 (the number of rectangular pieces should be equal to that of the balancing pieces 71) made of iron and with a flat rectangular shape, (each rectangular piece should be in flush with a balancing piece after it is fitted on) are obtained. A row of holes 721 are provided by a single application of stamping on each rectangular piece 72 such that such row of holes 721 may be aligned with the elongated slots of other balancing pieces 71. The shape (may be rectangular, square or circular) and number of the holes 721 may be altered according to actual needs.

[0024] Step 4: Fit each of these rectangular pieces 72 onto the indentation area 711 of a balancing piece 71 so that the former and the latter may be joined together. Then, stack up the balancing pieces 71 (each of them is fitted with a rectangular piece 72) (the two balancing pieces 71 that are near the proximal end and should have their rectangular pieces 72 facing each other so as to provide a gap 73 for the insertion of a stack of paper), and these pieces 71 are connected together by screws or bolts.

[0025] Step 5: Now, the manufacturing of the hole-punching assembly 7 is completed (as shown in Fig. 7 and 8).

[0026] From the above, we can see that manufacturing method of the hole-punching assembly 7 is indeed different from the prior art manufacturing method. The manufacturing method of the present invention is characterized with: (1) Several balancing pieces 71 made of aluminum and with a rectangular shape, are swiftly formed by extrusion; (2) Each of the rectangular pieces 72, made of iron and with a flat rectangular shape, is fitted onto the indentation area 711 of a balancing piece 71; (3) A row of holes 721 are provided by stamping on each rectangular piece 72, and an elongated slot 712 is formed by stamping on each balancing piece 71 (such that the row of holes 721 may be aligned up with the elongated slots 712 of other balancing pieces 71); (4) The rows of holes 721 on the rectangular pieces 72 may be formed by a single application of stamping, so are the slots 712 on the balancing pieces 71; (5) The balancing pieces 71 are stacked up and are connected together by screws or bolts. Therefore, the manufacturing of the hole-punching assembly 7 is completed.

[0027] By the employment of the manufacturing method of the hole-punching assembly 7, the manufacturing of the hole-punching assembly 7 is simplified and the production cost is lowered (about one tenth of that of the prior art manufacturing method). The balancing pieces 71 are connected together so as to ensure the strength of the hole-punching assembly 7. Hence, the balancing pieces 71 may have a lighter weight so that it would be easier for the hole-punching assembly 7 to be fitted in or

detached from a hole-punching machine and the assembly 7 may be easily moved around in manufacturing, installation, packaging and transport (hence the efficiency in production may be enhanced).

[0028] In the prior art, the hole-punching assembly is made of iron and the holes forming process is difficult; however, the manufacturing method of the present invention does not have this disadvantage. In the manufacturing method of the present invention, only one application of stamping is needed to form a row of holes 721 on a balancing piece 71; in addition, because each rectangular piece 72 is lighter and thinner, different shapes (circular, rectangular, triangular or other shapes) may be formed easily so as to meet the hole shapes specified by buyers and the market.

[0029] Because the type of the holes (their shape and the distance between them) on each rectangular piece 72 determines the type of a hole-punching assembly 7, the production cost of each type of hole-punching machine is lowered. In addition, because the hole-punching assembly 7 comprises several balancing pieces 71 and several rectangular pieces 72, if a balancing piece 71 or a rectangular piece 72 is damaged, only such piece 71 or 72 needs to be replaced; in contrast, if this happens in the prior art, the whole unit has to be replaced. Furthermore, to manufacture a different type of assembly 7, we only have to provide such type of holes on each rectangular piece 72 by stamping (no need to redo the whole unit as in the prior art manufacturing method).

[0030] Please refer to Fig.9 to Fig. 11. The present invention discloses a hole-punching assembly structure for hole-punching unit, mainly comprising a positioning element 30, a clamping piece 33, a plurality of tool holders 36, two balancing rods 37 and a plurality of hole-punching assemblies 7, wherein each end of positioning element 30 coupling to one of the plurality of hole-punching assemblies 7 via one of two balancing rod 37, each one of the plurality of tool holders 36 going through positioning element 30 axially for positioning element 30 to fix each one of the plurality of tool holders 36, each one of the plurality of tool holders 36 having a first end extending to one of the plurality of hole-punching assemblies 7 and a second end being blocked by clamping piece 33, thereby allowing clamping piece 33 to force the plurality of tool holders 36 to move axially for hole-punching operation; however, the above-mentioned structure will not be further discussed for the sake of brevity and its similarity to prior art techniques.

[0031] Please refer to Fig.10, Fig.10A and Fig.11, positioning element 30 comprising a main plate 31 contiguous to clamping piece 33, main plate 31 having a retaining edge 32 disposed protrudently at each side thereof, each retaining edge 32 having a gliding rail 321 obliquely and concavely formed towards its end and in symmetry with another retaining edge, gliding rail 321 having an end, which is contiguous to main plate 31, extended towards an outer rim of retaining edge 32 and connected to a receiving slot 322, which is axially parallel to main

plate 31, each one of retaining edge 32 forming a confining part 323 along an outer rim of receiving slot 322, each one of retaining edge 32 having a plurality of arc-shape-like operation slots concavely formed at its middle portion, with operation slots 324 forming between gliding rails 321; clamping piece 33 having an elastic plate 34 made of elastic material, which is contiguous to main plate 31, elastic plate 31 having each side restrained and fixed by retaining edges 32, besides, elastic plate 31 having one rod 35 disposed at each end thereof, each one of said rod 35 having a first end and a second end protruded through receiving slot 322 respectively, confining part 323 being used for restraining rods 35 to fix clamping piece 33.

[0032] When an operator needs to change the number of tool holders and their positions or to switch to tool holders having different length due to various hole-punching requirements, the present invention is provided to firstly remove the constrain of clamping piece 33 towards the end of each of the plurality of tool holder 36 to dismantle the hole-punching assembly or to add or to switch the tool holders. Please refer to Fig.12 and Fig.13, when an operator pulls elastic plate 34 to deform elastic plate 34 and to further force rod 35 to slide to gliding rail 321 along receiving slot 322 (as shown in Fig.12A), then rod 35 will slide outside along gliding rail 321 (as shown in Fig.13). By doing so, it is easy and fast to break away clamping piece 33 and positioning element 30, and to release the constrain upon tool holder 36 to facilitate the process of switching tool holders 36. When the adjustment of tool holders is done, perform the above-mentioned operation backwards. That is, slide rod 35 from outside into gliding rail 321, then through gliding rail 321 into receiving slot 322 to dispose rod 35 of clamping piece 33 in receiving slot 322. Afterwards, connect clamping piece 33 once again to positioning element 30 to finish the operation of switching tool holders. Besides, operation slots 324 make it easy to deform elastic plate 34 to enhance the convenience in assembling and dismantling clamping piece 33.

[0033] As described above, the present invention uses a novel structure comprising positioning element 30 and clamping piece 33 to easily and swiftly dismantle clamping piece 33 without using auxiliary tools, thereby facilitating dismantling and switching tool holders to vastly improve the operating efficiency and usability.

[0034] Please refer to Fig. 14 and Fig. 15 for a pressing structure of a hole-punching unit in a first embodiment of the present invention, which mainly comprises an axle 40, two wrenching pieces 50, a pole 60 and two pressing pieces 70, wherein each end of axle 40 is axially connected to a side wall 200 on each side of the case of the hole-punching unit, with one end of axle 40 protruding through the case to axially connect to a control knob 42, each wrenching piece 50 connecting to axle 40 near one of its end, and each wrenching piece 50 having an axle hole 52 disposed thereon for axle 40 to protrude through axle hole 52 to connect to wrenching piece 50, therefore, turning control knob 42 would let axle 40 to drive each

wrenching piece 50 to turn synchronously, each wrenching piece 50 having a retaining edge 54 disposed at each side of it respectively.

[0035] Pole 60 is disposed near a hole-punching assembly 7, with each end of pole 60 being pivotally connected and fixed to one of side walls 200, each pressing piece 70 being disposed on pole 60 and near one side of pole 60, pressing piece 70 being used for twisting a spring, pressing piece 70 having a spring coil 72 disposed at its middle and pivotally connected to pole 60, and pressing piece 70 having a pair of lapping shafts 74 extending from a first side of spring coil 72, and a pair of suppressing shafts 76 extending from a second side of spring coil 72; lapping shaft 74 leaning against an upper edge of wrenching piece 50 and using retaining edge 54 to restrain suppressing shaft 74 so as to keep lapping shaft 74 in contact with wrenching piece 50 and to prevent lapping shaft 74 from slipping away to further ensure the reliability of the mechanism which wrenching piece 50 uses to drive pressing piece 70; suppressing shaft 76 extending towards hole-punching assembly 7 to let suppressing shaft 76 to press hole-punching assembly 7 and to fasten hole-punching assembly 7.

[0036] Please refer to Fig.14~16, when hole-punching assembly 7 is installed in the hole punching unit, in order to fasten hole-punching assembly 7 to commence hole-punching operation, user can turn control knob 42, and consequently through axle 40 to drive each wrenching piece 50 to turn synchronously. When the upper edge of wrenching piece 50 is pushing against lapping shaft 74 to let pressing piece 70 to deform elastically, in the meantime, spring coil 72 would apply elastic force on suppressing shaft 76 to let the latter to press hole-punching assembly 7, as shown in Fig. 16. Besides, as the wrenching piece 50 turns to force lapping shaft 74 to make contact with an end of wrenching piece 50 so that lapping shaft 74 and wrenching piece 50 lean against each other.

[0037] As shown in Fig.16A, when control knob 42 turns each wrenching piece 50, an included angle formed by a vertical line through the center of axle 40 with an end of wrenching piece 50 is smaller than 70°. That is, when user stops turning control knob 42, the counterforce of lapping shaft 74 is still not capable of driving wrenching piece 50 to go back to the previous position, then pressing piece 70 would stay put and continue to press hole-punching assembly 7 to ensure hole-punching assembly 7 to be in the fixed position for certain. Afterwards, when it is necessary to maintain/repair or to switch hole-punching assembly 7, user only needs to turn control knob 42 in the opposite direction to let axle 40 to drive each wrenching piece 50 to turn synchronously, then wrenching piece 50 would no longer press against lapping shaft 74 (as shown in Fig.15), and pressing piece 70 would return to its initial state by elasticity, thereby releasing the pressing force of suppressing shaft 76 on hole-punching assembly 7. Therefore, it is viable to easily and quickly assemble/dismantle the hole-punching assembly without auxiliary tool and to facilitate the usability and con-

venience of the hole-punching unit.

[0038] Besides, the end of suppressing shaft 76 has a suppressing part 78 made of elastic material (such as rubber) disposed thereon, using suppressing part 78 to make contact with hole-punching assembly 7 and to press it. Through the friction between suppressing part 78 and hole-punching assembly 7, it is more reliable for hole-punching assembly 7 to be fastened to the fixed position.

[0039] The second embodiment is derived from the first embodiment mentioned above, please refer to Fig. 17~18. In the second embodiment, the pressing structure further comprises a tact switch 80', a wrenching piece 50' having a protruding part 56' disposed at its outer edge, tact switch 80' comprising an elastic plate 82' for controlling an ON/OFF state of tact switch 80', while protruding part 56' extending to couple with elastic plate 82'. When wrenching piece 50' turns to drive pressing piece 70' to let pressing piece 70' to press hole-punching assembly 7, protruding part 56' would not make contact with elastic plate 82' (as shown in Fig.17) so as to let the hole punching unit to be in ON state. Consequently, when wrenching piece 50' turns in the opposite direction to release the pressing effect of pressing piece 70' on hole-punching assembly 7, protruding part 56' would make contact with elastic plate 82' (as shown in Fig.18) to let hole-punching unit to be in OFF state. Then it is viable to switch/maintain hole-punching assembly 7 and to provide safety when in use.

[0040] The third embodiment of the present invention is a variation of the first embodiment mentioned above. Please refer to Fig.19, in the third embodiment, the pressing structure comprising an axle 40", two wrenching pieces 50", a pole 60", two pressing pieces 70" and a tact switch 80", wherein wrenching piece 50" is disposed inside the case of the hole-punching unit and near the lower end of the hole-punching unit.

[0041] As described above, the present invention provides a new pressing structure for fastening a hole-punching assembly to facilitate the process of switching and maintaining the hole-punching assembly. Therefore, this application is not only novel and but also applicable in the industry.

[0042] Whence, using the manufacturing method of the present invention with several aluminum balancing pieces 71 and several iron rectangular pieces 72, it is viable to lower the production cost and simplify the production process and shorten the production time; hence, the efficiency in production is enhanced and more hole-punching assemblies 7 may be produced in a certain period. In conclusion, the manufacturing method of the present invention enables the lowering of production cost and selling price, and hence the method has a higher level of economic value and usefulness.

[0043] Many changes and modifications in the above described embodiment of the invention can, of course, be carried out without departing from the scope thereof. Accordingly, to promote the progress in science and the

useful arts, the invention is disclosed and is intended to be limited only by the scope of the appended claims.

Claims

1. An improved manufacturing method for a hole-punching assembly of a hole-punching unit, comprising the following steps:

Step 1: Several balancing pieces, made of aluminum and with a rectangular shape, are swiftly formed by extrusion. An indentation area is provided on one side of each balancing piece.

Step 2: An elongated slot is formed by stamping on the indentation area of each balancing piece.

Step 3: Several rectangular pieces (their number should equate that of the balancing pieces), made of a sufficiently strong material and with a width equating the width of the elongated slot, are obtained. A row of holes are provided by a single application of stamping on each rectangular piece so as to allow the punching pieces to go through.

Step 4: Each of these rectangular pieces is fitted onto the indentation area of a balancing piece so that the former and the latter may be joined together. Then, stack up the balancing pieces (each of them is fitted with a rectangular piece) (the two balancing pieces that are near the proximal end and should have their rectangular pieces facing each other so as to provide a gap for the insertion of a stack of paper), and these balancing pieces are connected together by screws or bolts.

Step 5: Now the manufacturing of the hole-punching assembly is thus completed.

2. The improved manufacturing method of Claim 1, wherein the rectangular pieces are made of iron.
3. The improved manufacturing method of Claim 1, wherein the shape and number of the holes provided on each rectangular piece may be adjusted according to the shape and number of the punching pieces.
4. The improved manufacturing method of Claim 1, wherein the shape of the holes provided on each rectangular piece may be rectangular, square or circular.
5. A hole-punching assembly structure for hole-punching unit comprises a positioning element, a clamping piece, a plurality of tool holders, two balancing rods and a plurality of hole-punching assemblies, wherein each end of said positioning element coupling to one of said plurality of hole-punching assemblies via one of two balancing rod, each one of said plurality of

tool holders going through said positioning element axially for said positioning element to fix each one of said plurality of tool holders, each one of said plurality of tool holders having a first end extending to one of said plurality of hole-punching assemblies and a second end being blocked by said clamping piece, thereby allowing said clamping piece to force said plurality of tool holders to move axially for hole-punching operation

said positioning element comprising a main plate, said main plate having one retaining edge disposed protrudently at each side thereof, each one of said retaining edge having a gliding rail concavely formed towards its end and in symmetry with another retaining edge, said gliding rail having an end, which is contiguous to said main plate, connected to a receiving slot, and said retaining edge forming a confining part along an outer rim of said receiving slot ; said clamping piece having a elastic plate which is contiguous to said main plate, said elastic plate having one rod disposed at each end thereof, each one of said rod having a first end and a second end protruded through said receiving slot respectively, said confining part being used for restraining each one of said rod to fasten said clamping piece.

6. The hole-punching assembly structure of Claim 5, wherein each one of said retaining edge having a plurality of operation slots concavely formed at its middle portion, thereby facilitating the convenience in assembling and dismantling of said clamping piece.
7. The hole-punching assembly structure of Claim 6, wherein said plurality of operation slots are in arc shape.
8. The hole-punching assembly structure of Claim 5, wherein said end of said gliding rail extends towards an outer rim of said retaining edge.
9. The hole-punching assembly structure of Claim 5, wherein said receiving slot is axially parallel to said main plate.
10. The hole-punching assembly structure of Claim 5, wherein said gliding rail is obliquely and concavely formed.
11. A pressing structure for a hole-punching unit mainly comprises an axle, two wrenching pieces, a pole and two pressing pieces, wherein said axle is axially attached to a case of said hole-punching unit, with one end of said axle axially connecting to a control knob, each wrenching piece connecting to said axle near its end so as to let said control knob to drive each wrenching piece to move synchronously, said wrenching piece having a retaining edge disposed

at each side thereof;

said pole being disposed near said hole-punching assembly, said pressing piece being pivotally disposed on said pole, said pressing piece having a spring coil disposed at its middle and pivotally connected to said pole, and said pressing piece having a pair of lapping shafts extending from a first side of said spring coil, and a pair of suppressing shafts extending from a second side of said spring coil, said lapping shaft leaning against an upper edge of said wrenching piece, said suppressing shaft extending towards said hole-punching assembly so as to let said suppressing shaft to press said hole-punching assembly and to fasten said hole-punching assembly.

12. The pressing structure of Claim 11, wherein a retaining edge is disposed at each side of said wrenching piece for said retaining edge to restrain said lapping shaft and to keep said lapping shaft in contact with said wrenching piece.
13. The pressing structure of Claim 11, wherein said suppressing shaft having a suppressing part disposed at an end thereof.
14. The pressing structure of Claim 11, wherein control knob drives each wrenching piece to move synchronously, so when said suppressing shaft of said pressing piece is pressing said hole-punching assembly, an included angle α is less than 90° .

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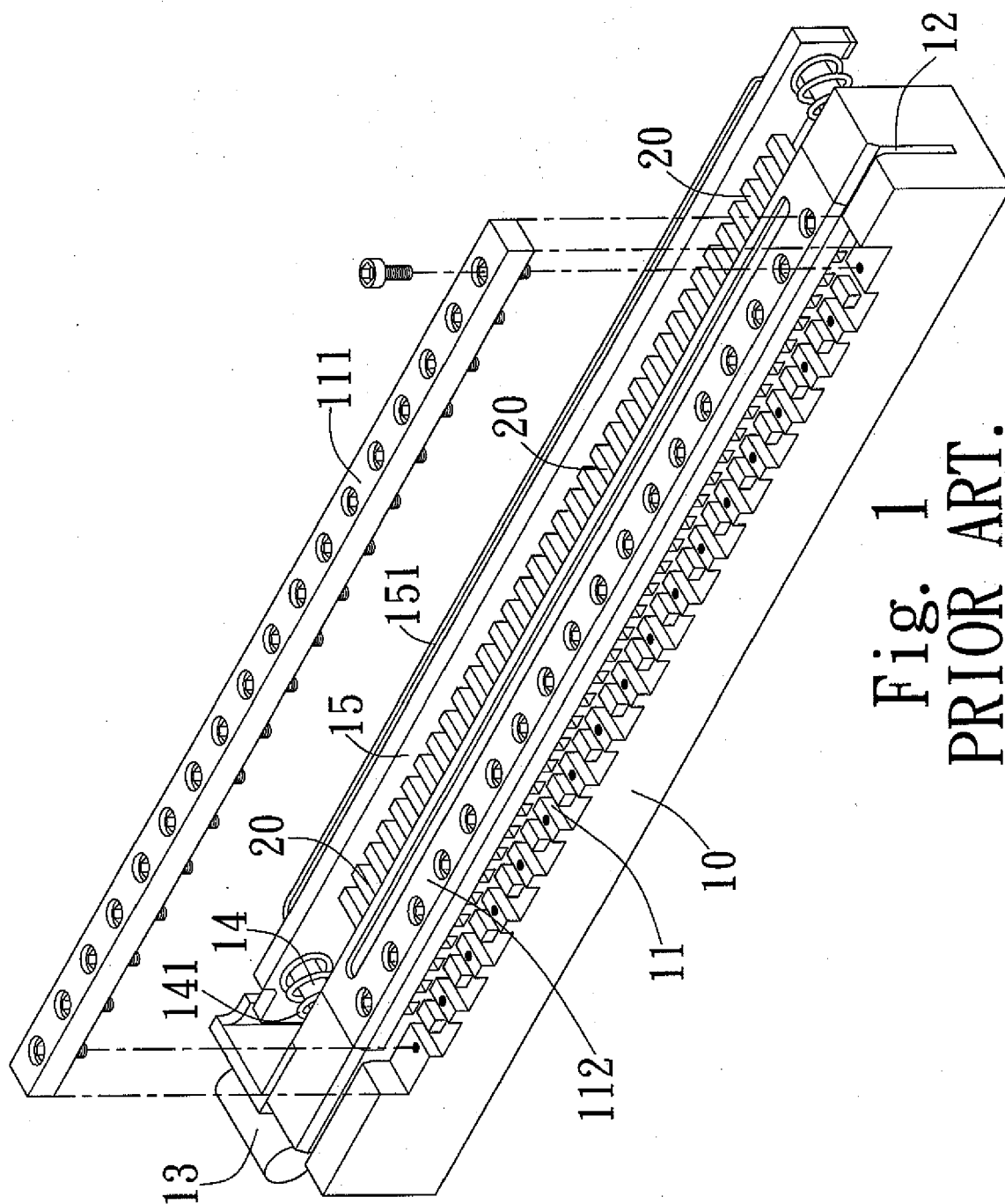


Fig. 1
PRIOR ART.

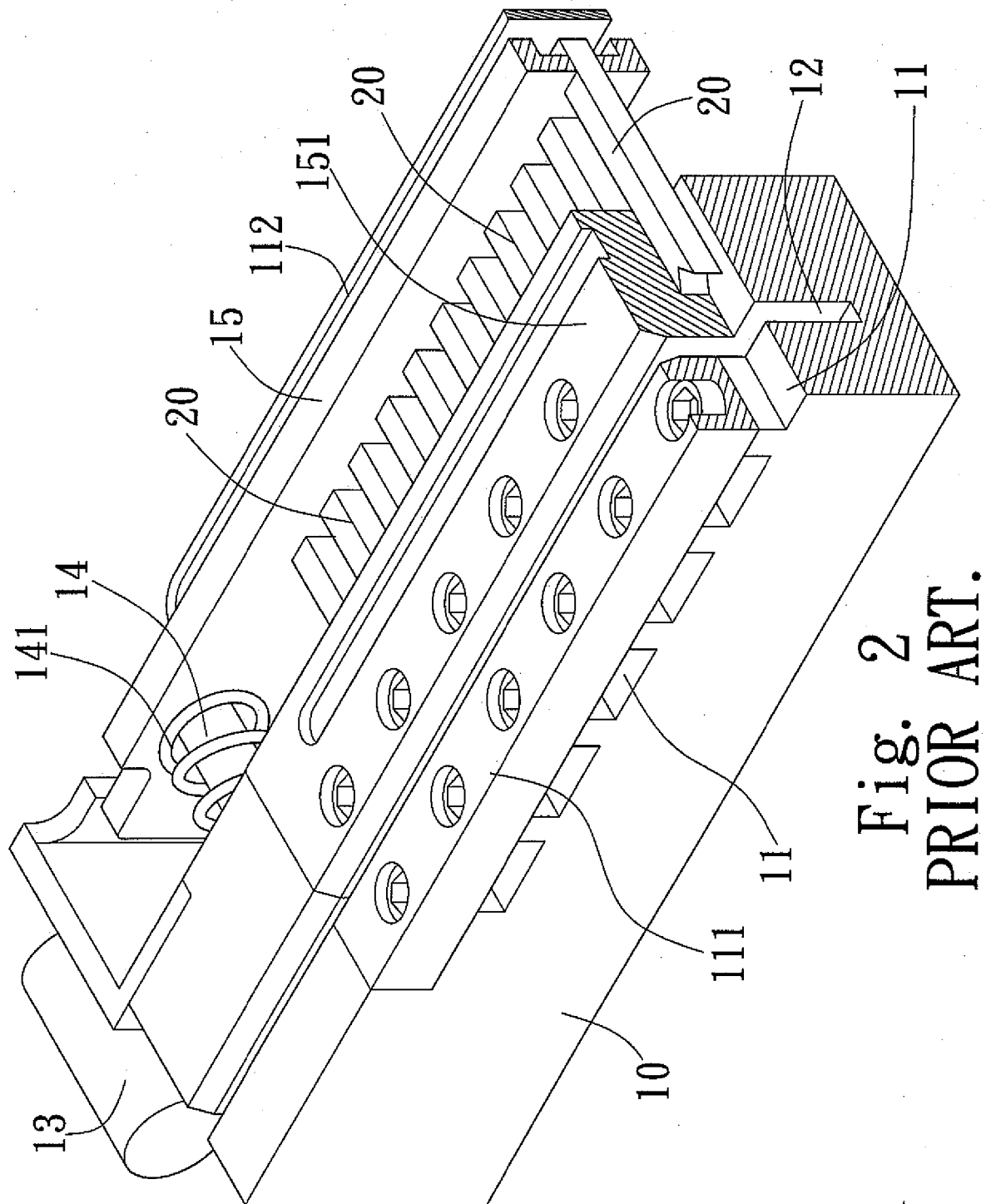
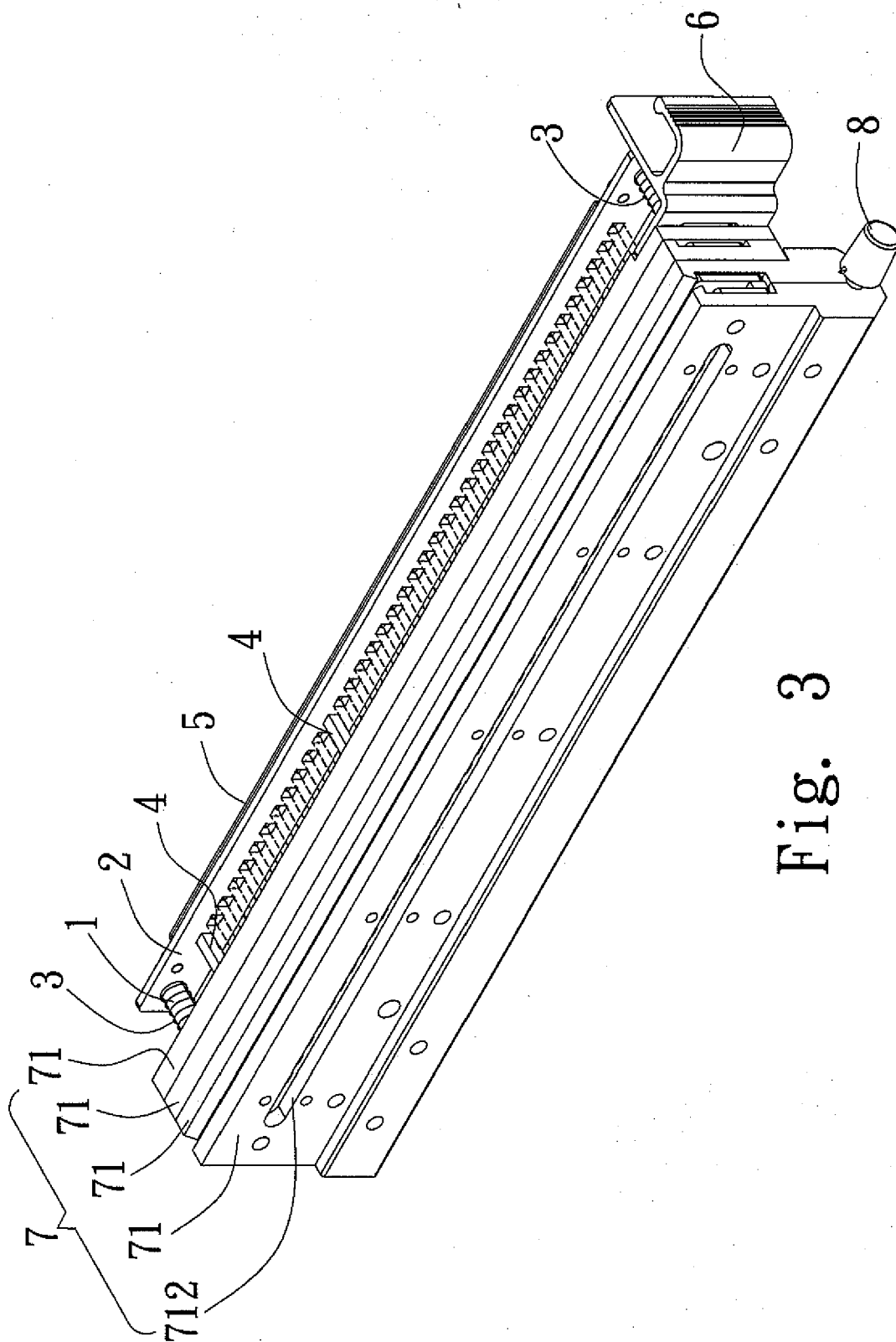


Fig. 2
PRIOR ART.



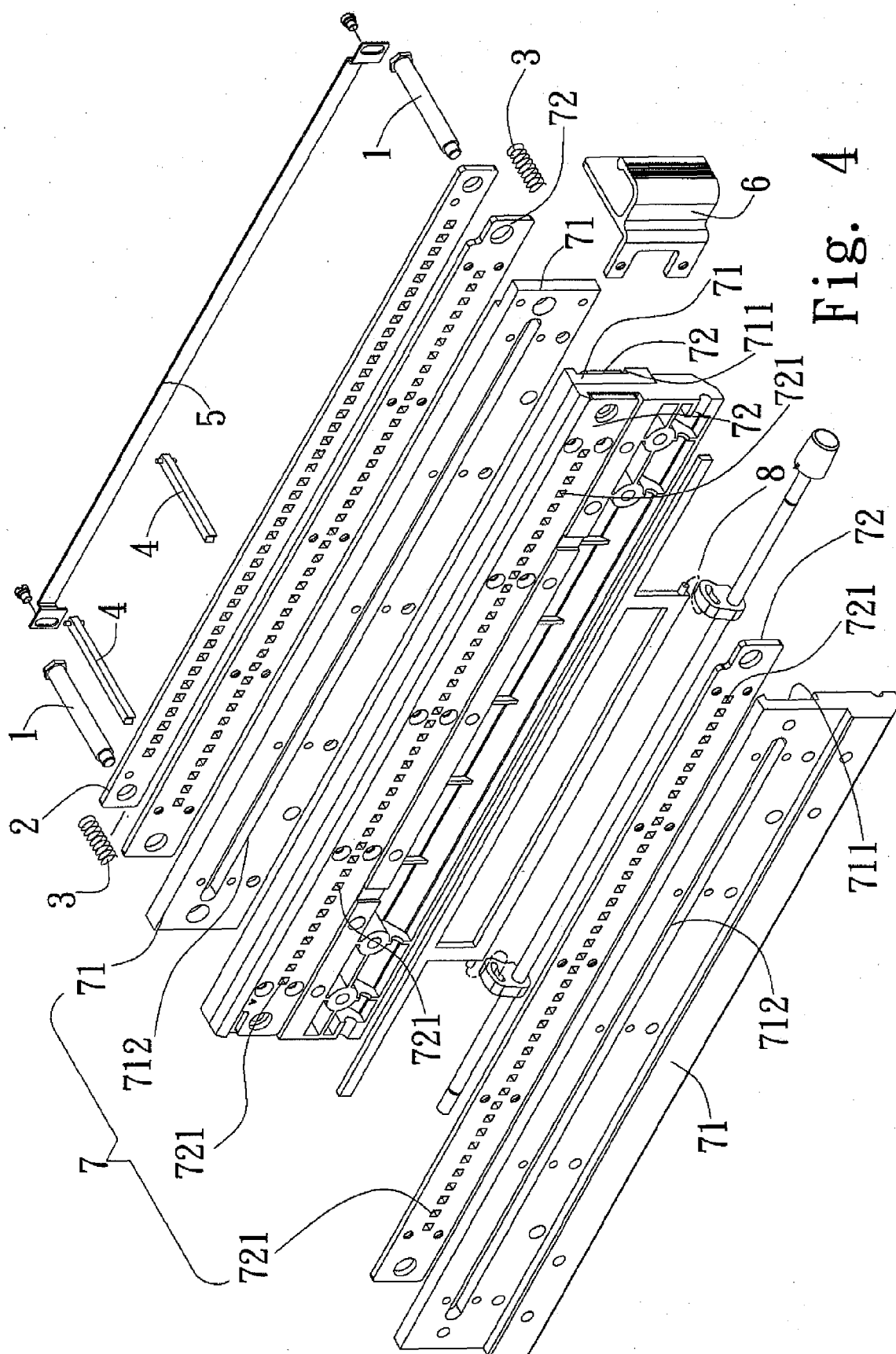


Fig. 4

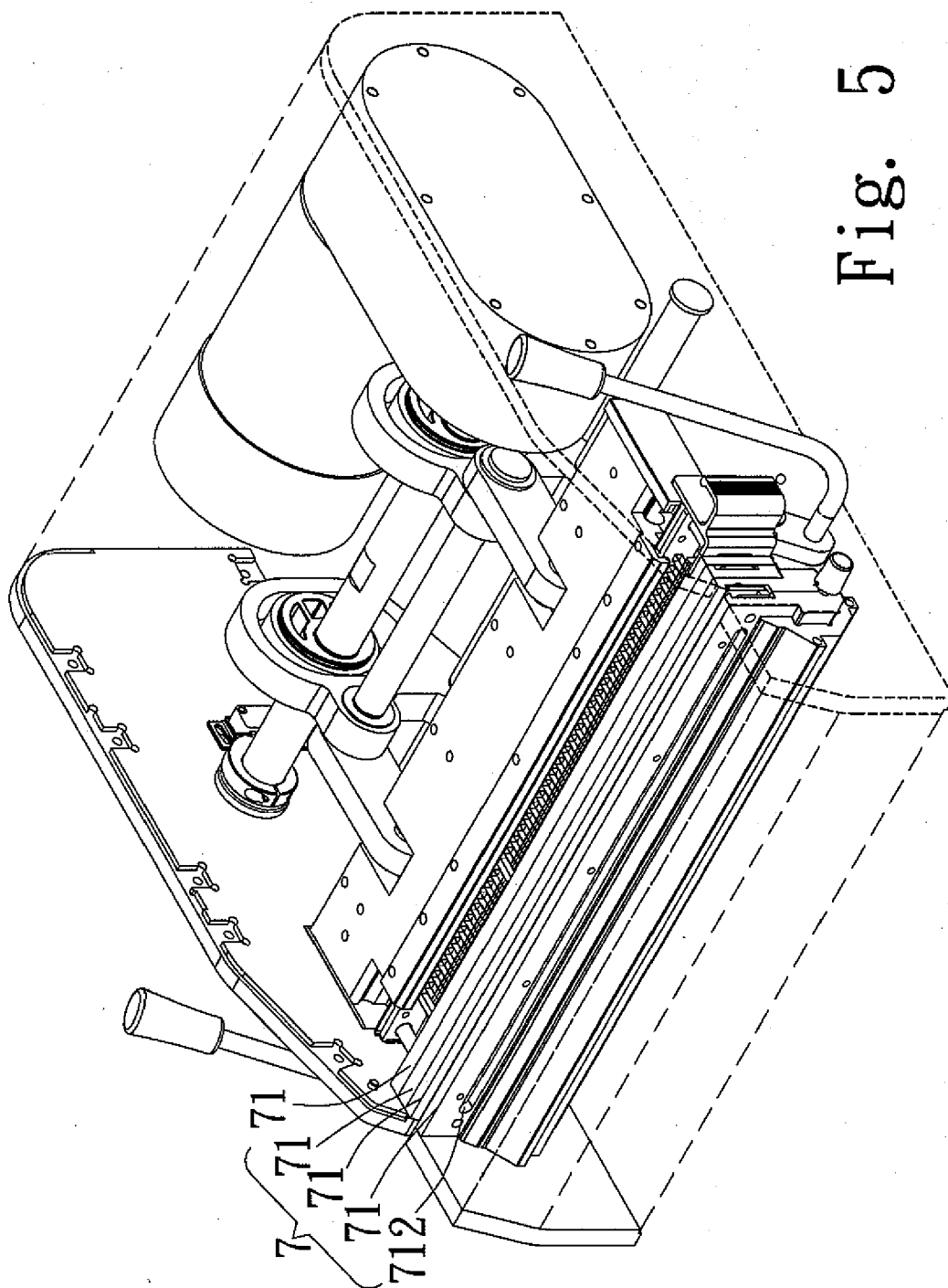


Fig. 5

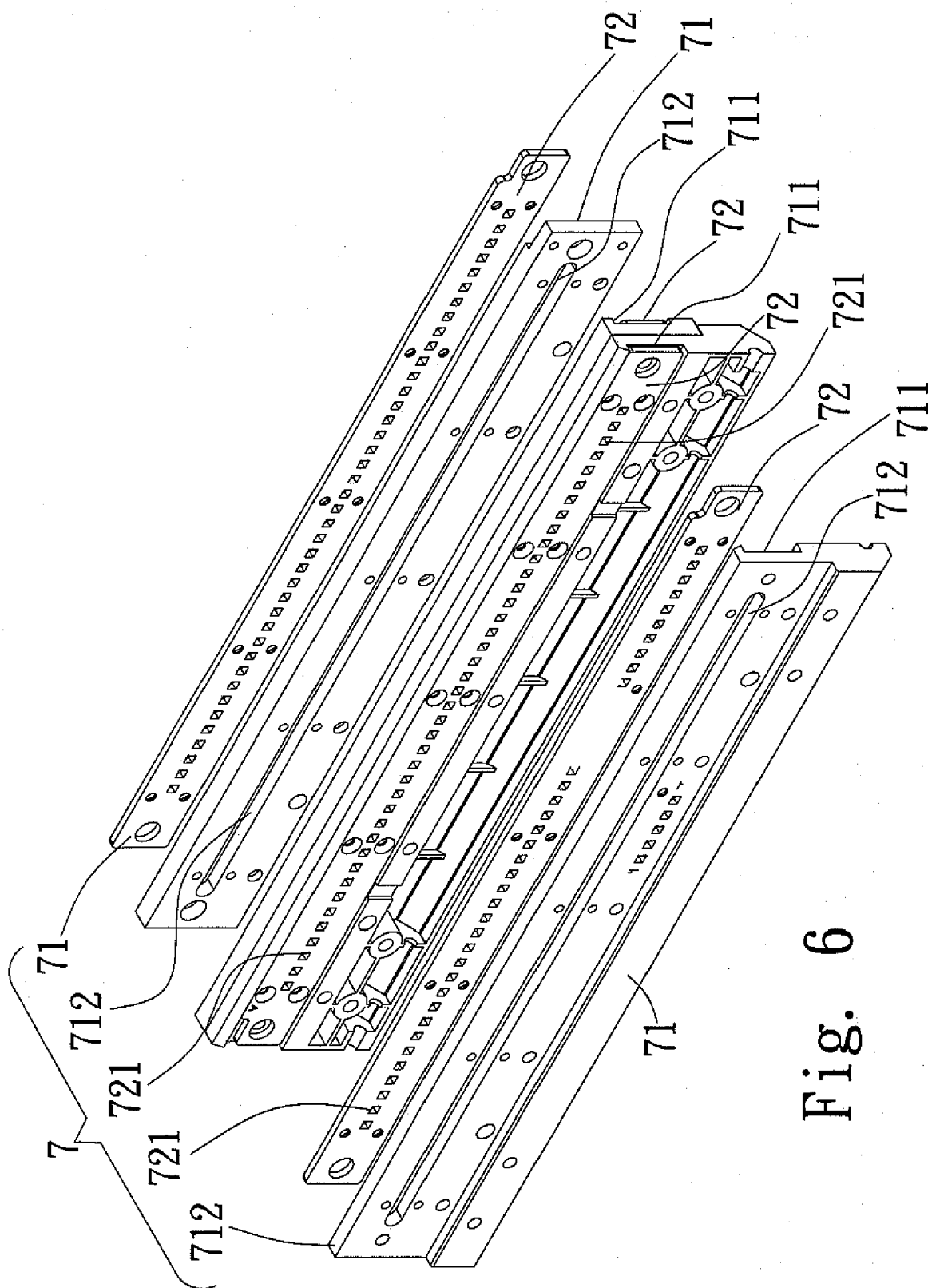


Fig. 6

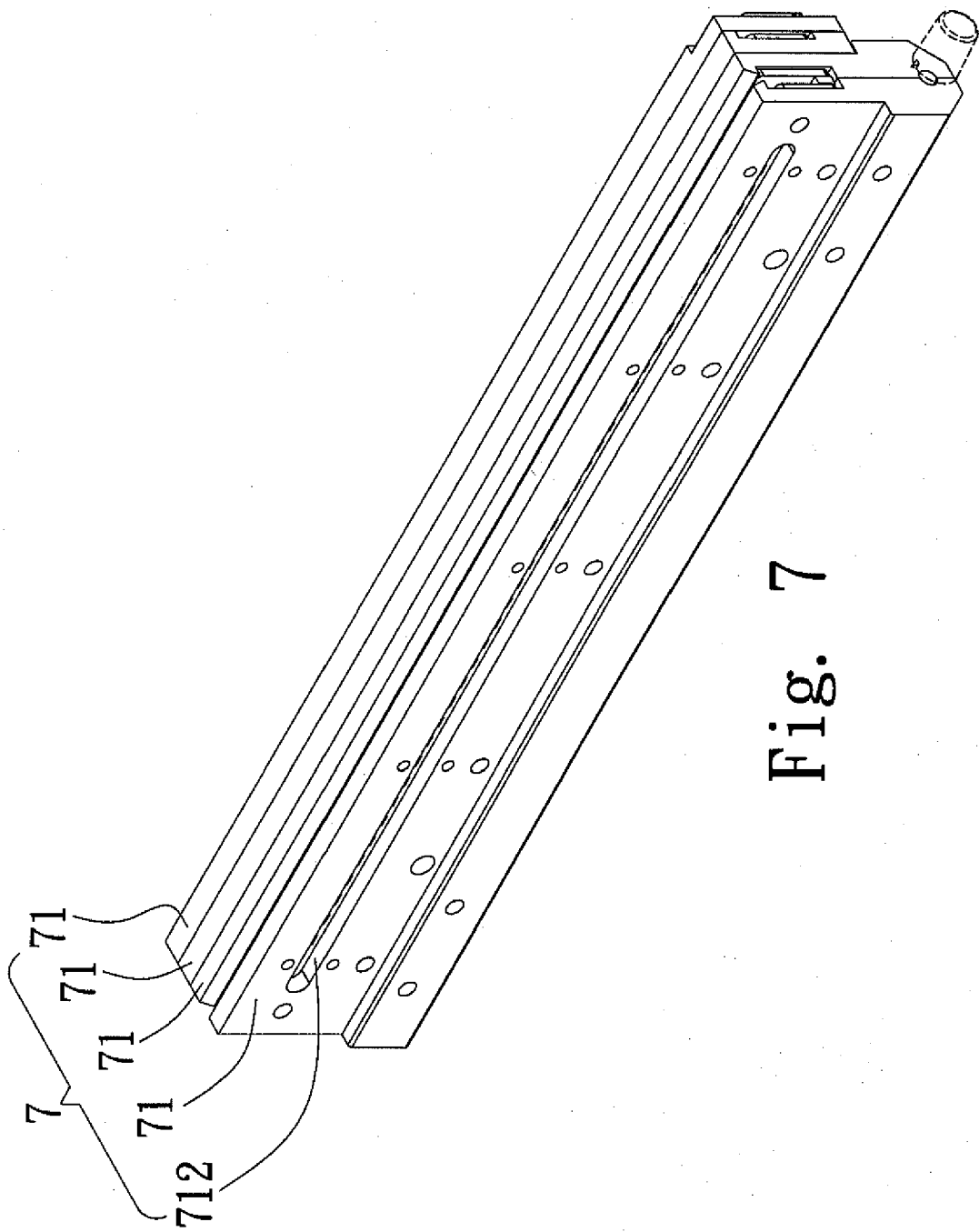


Fig. 7

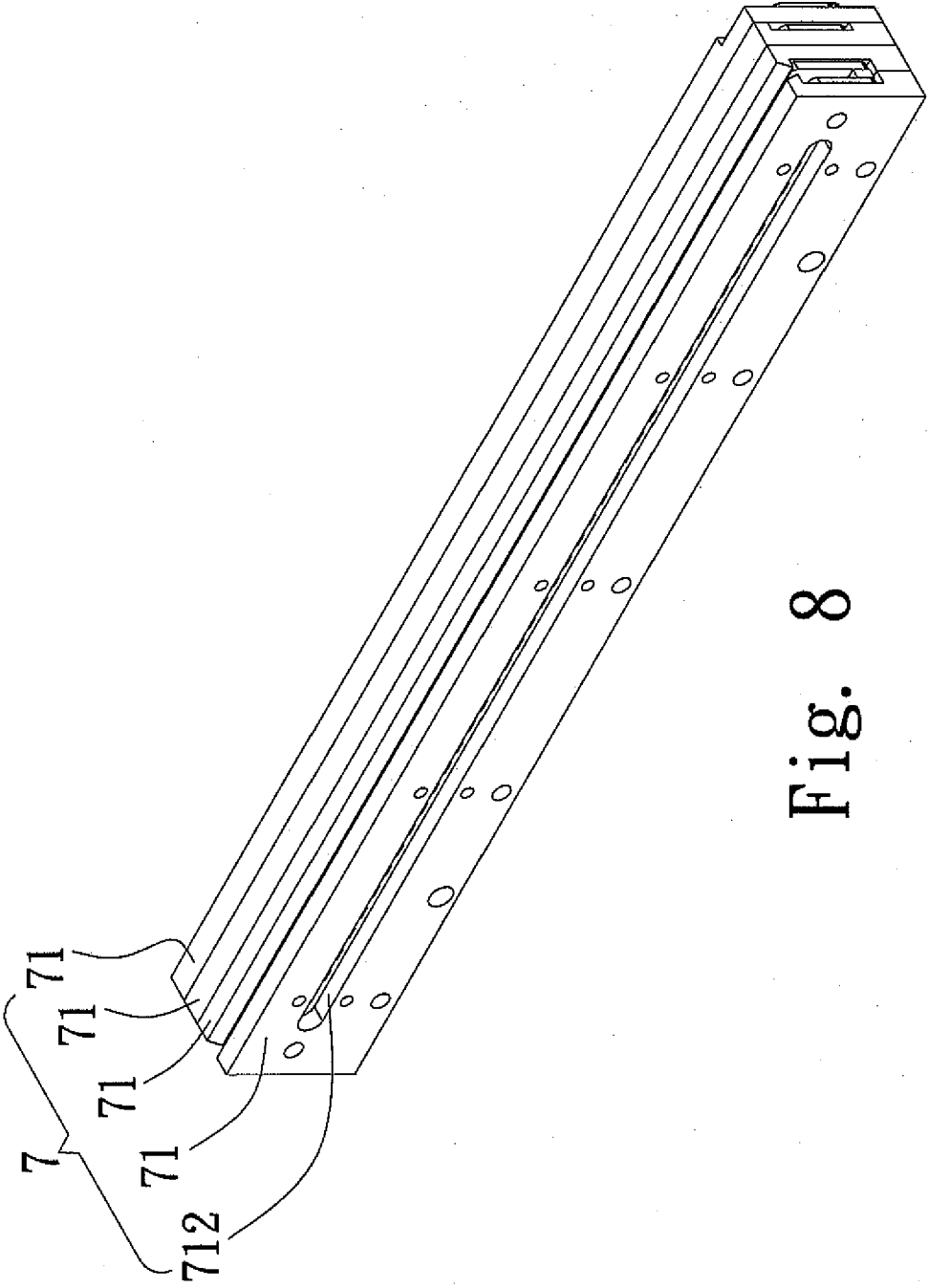


Fig. 8

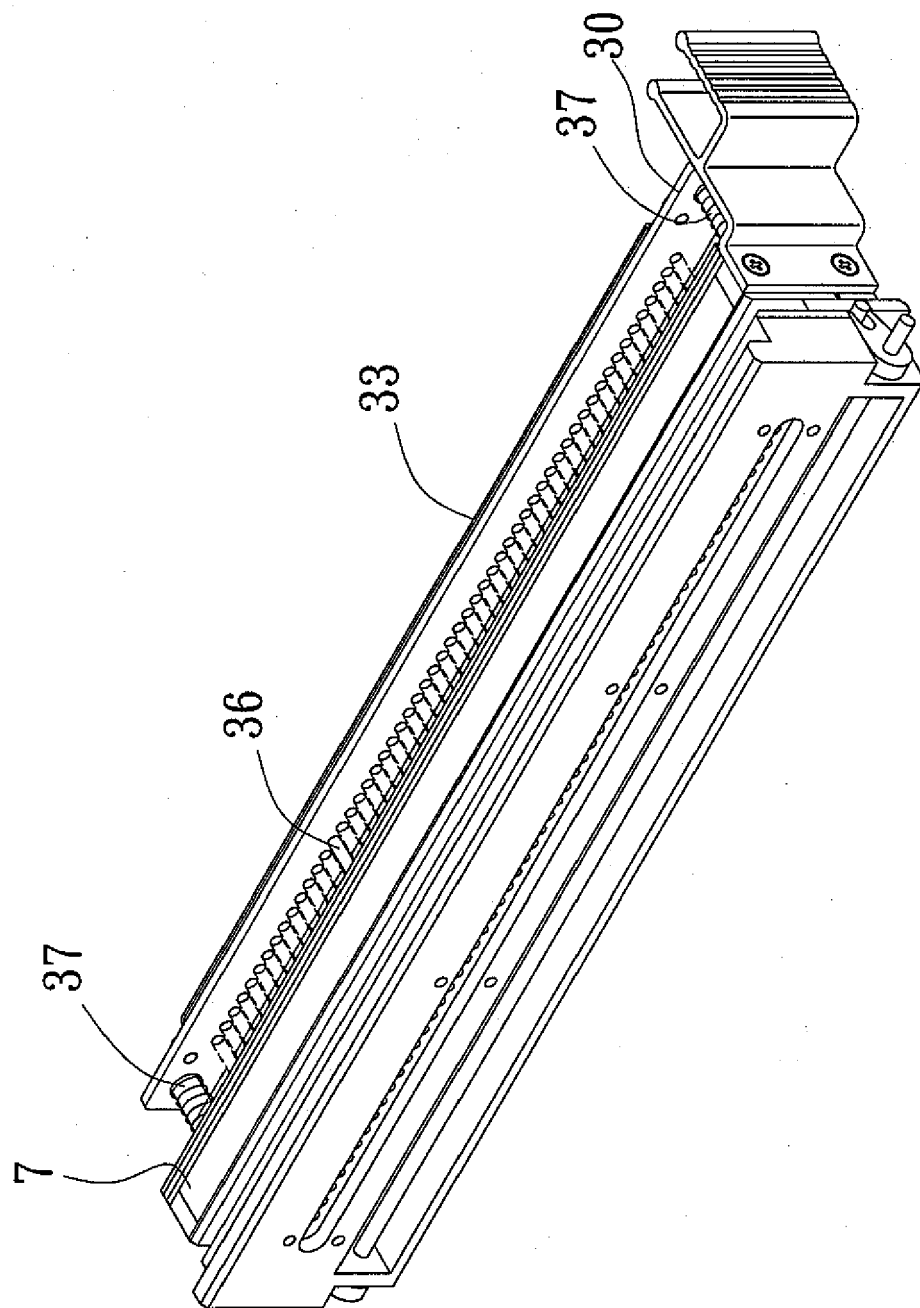


Fig. 9

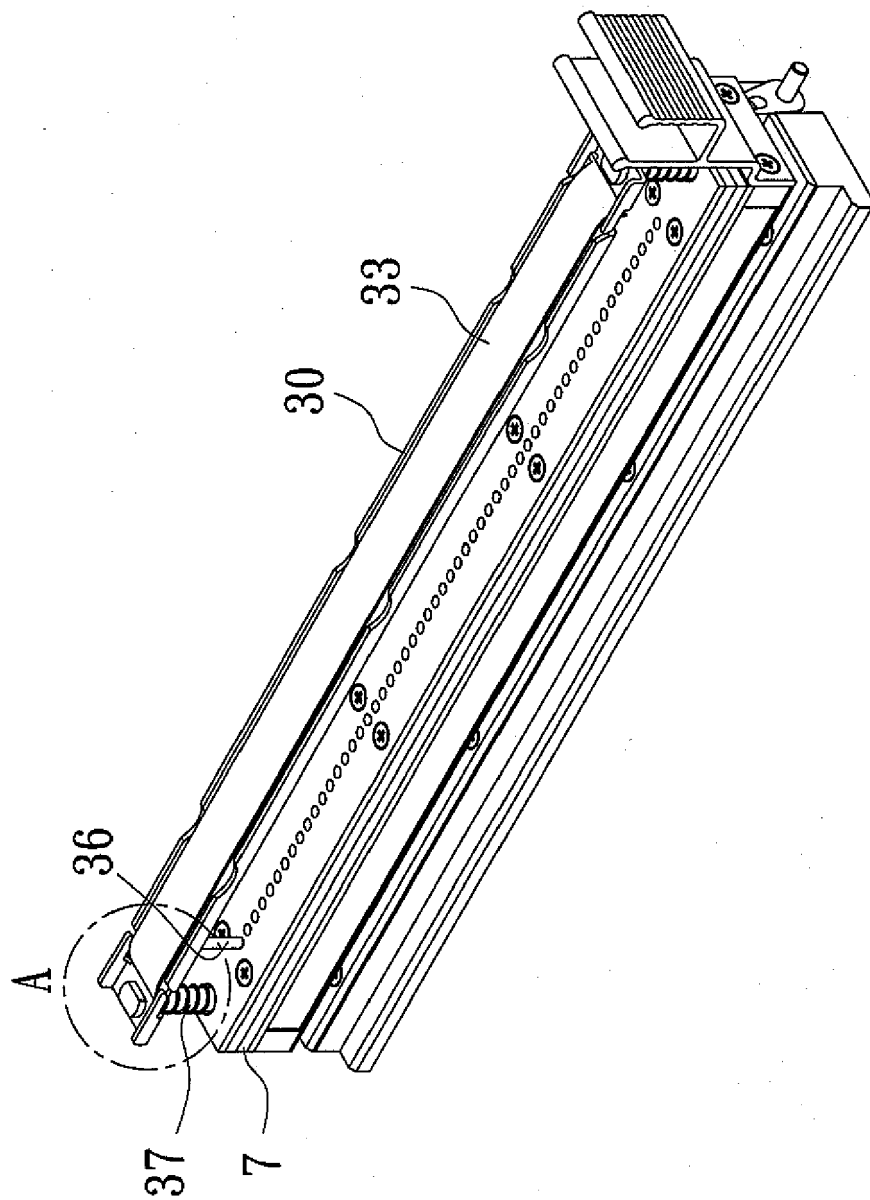


Fig. 10

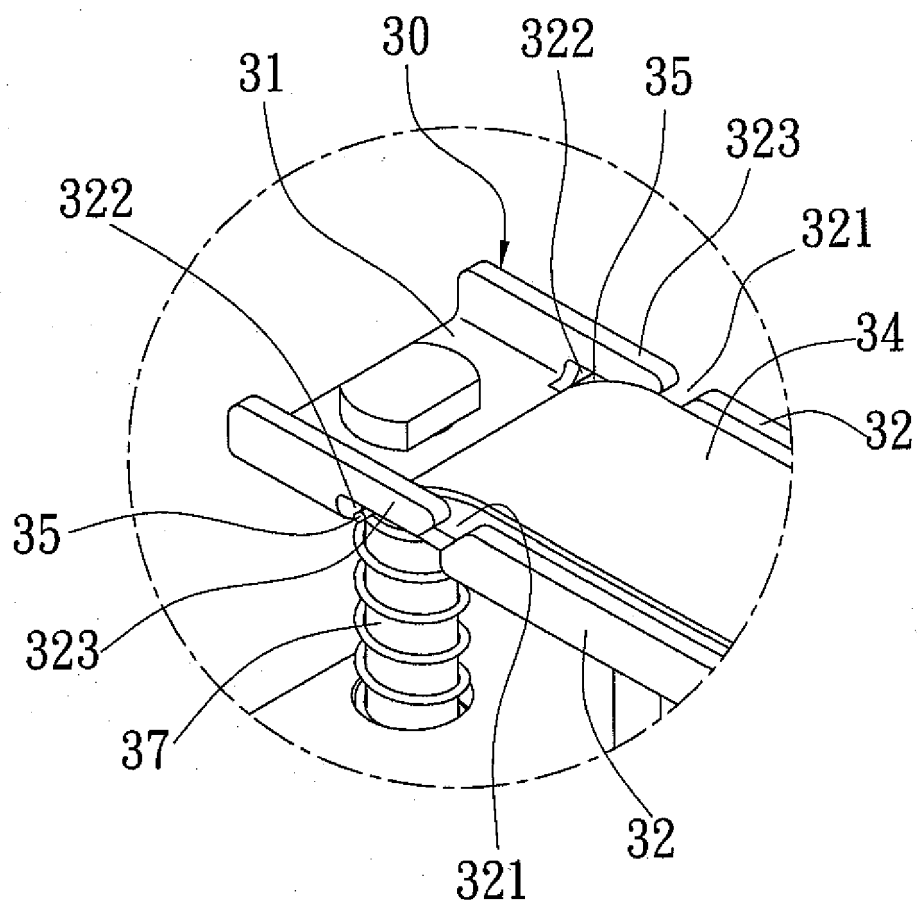


Fig. 10A

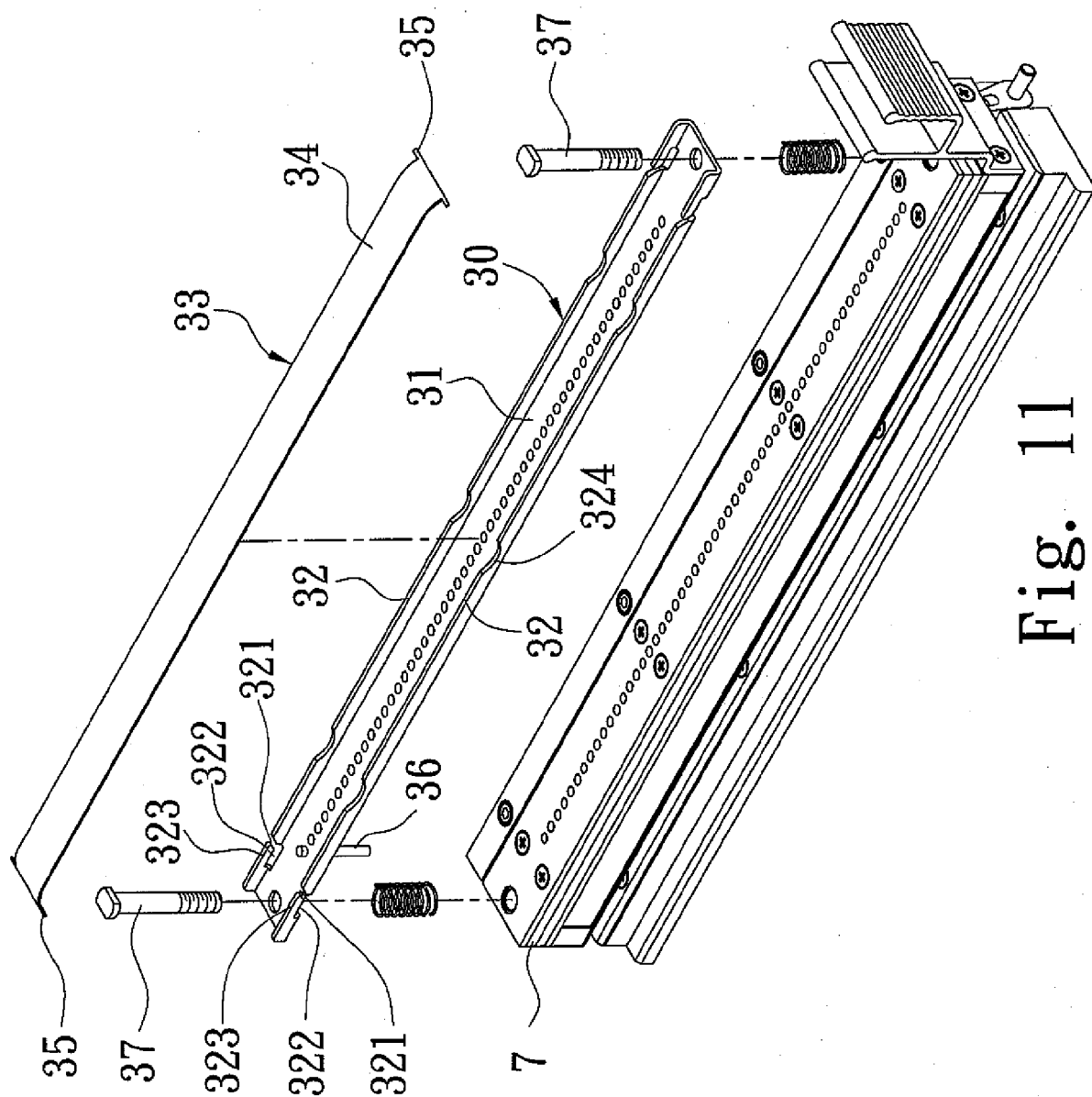


Fig. 11

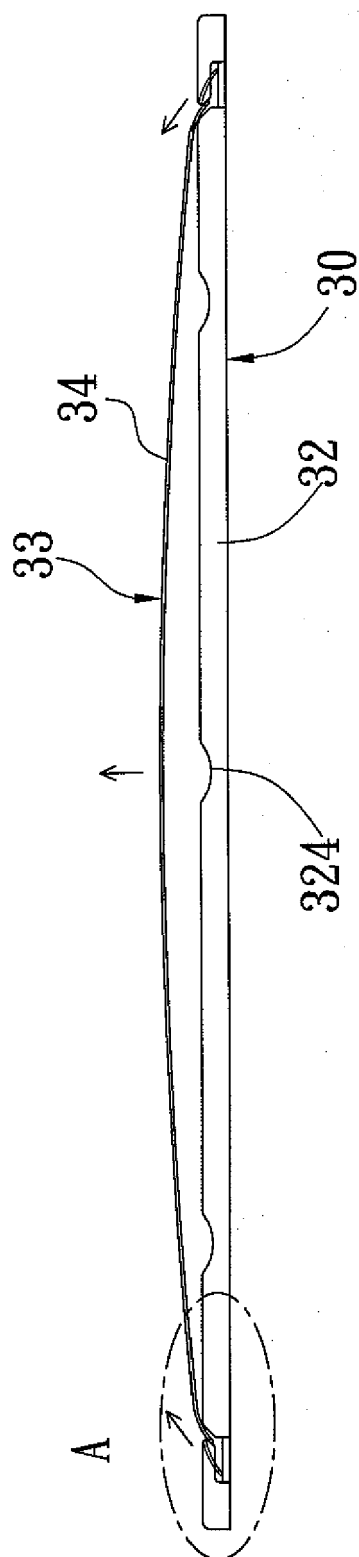


Fig. 12

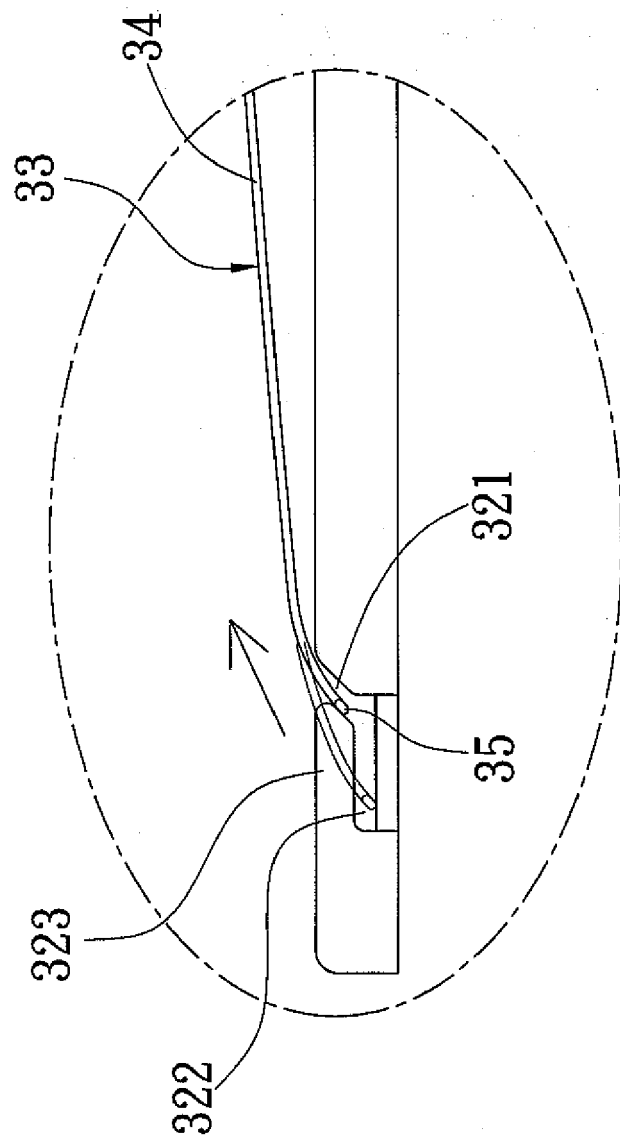


Fig. 12A

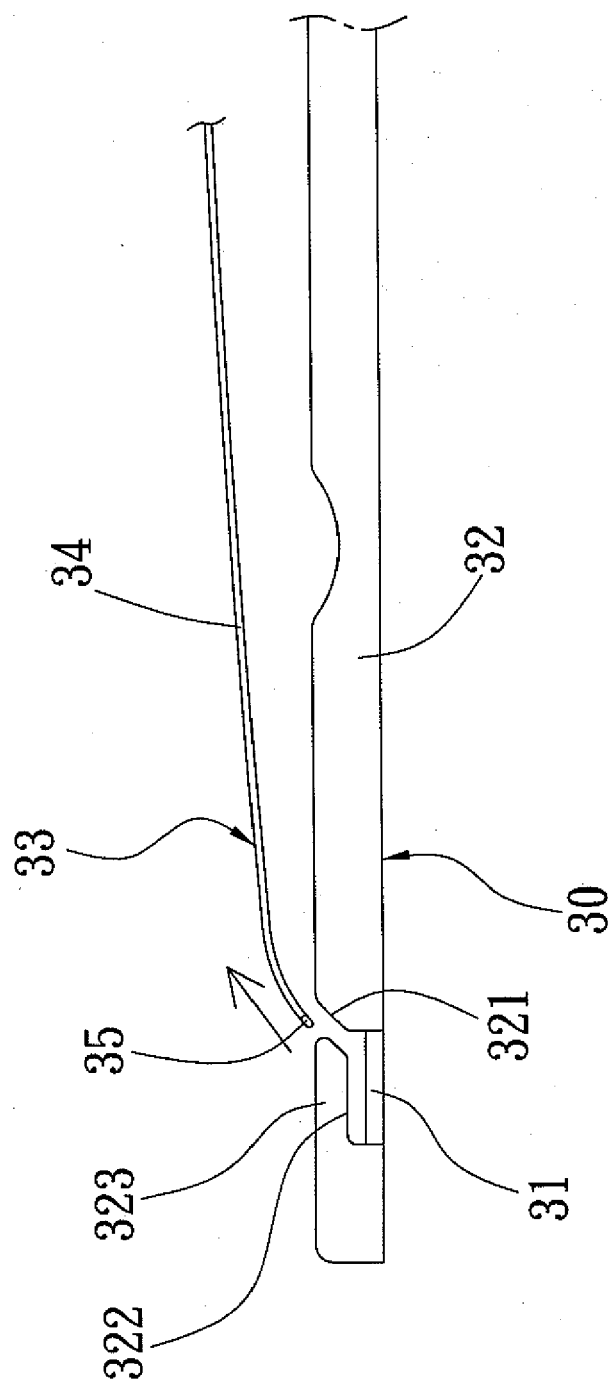


Fig. 13

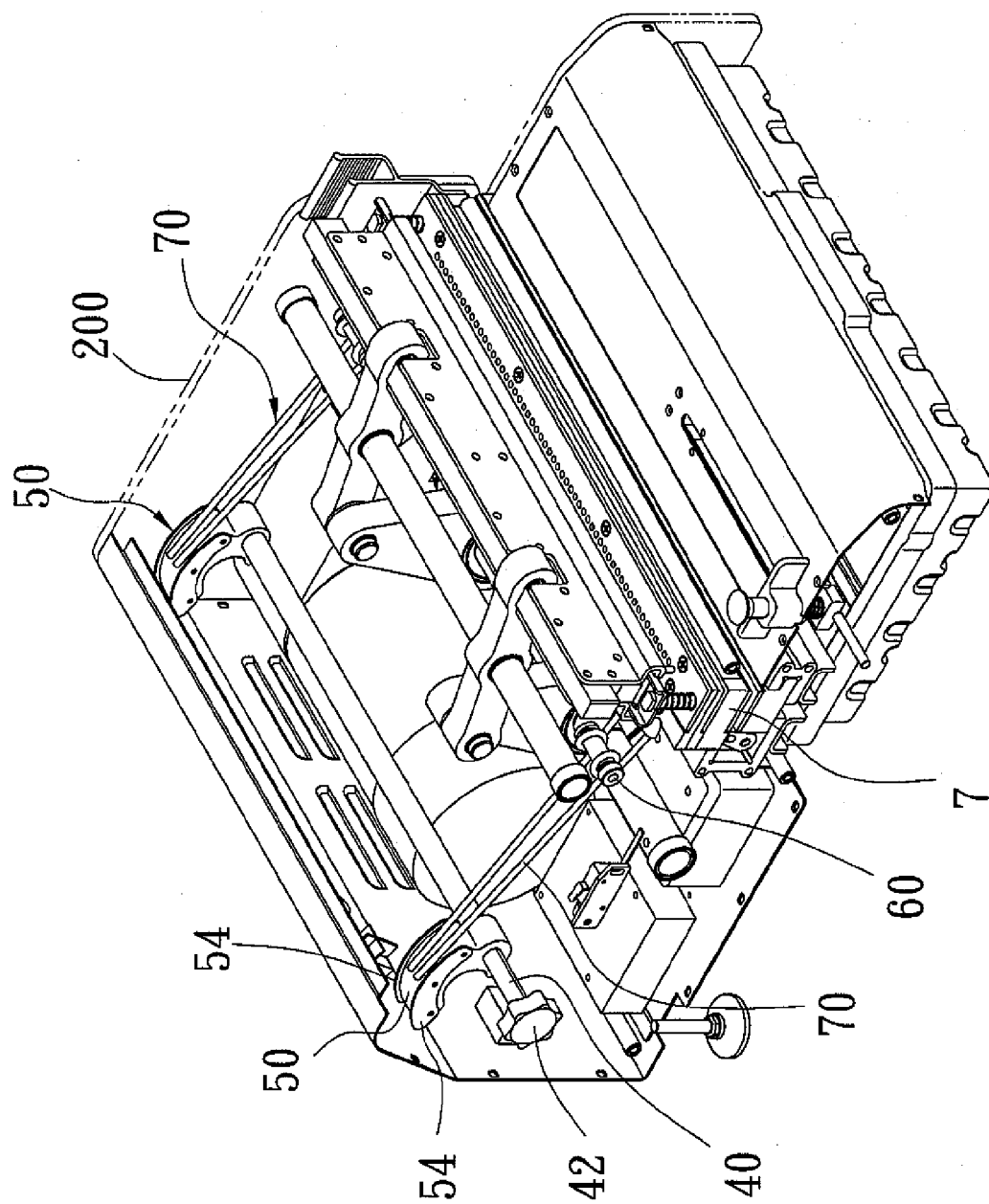


Fig. 14

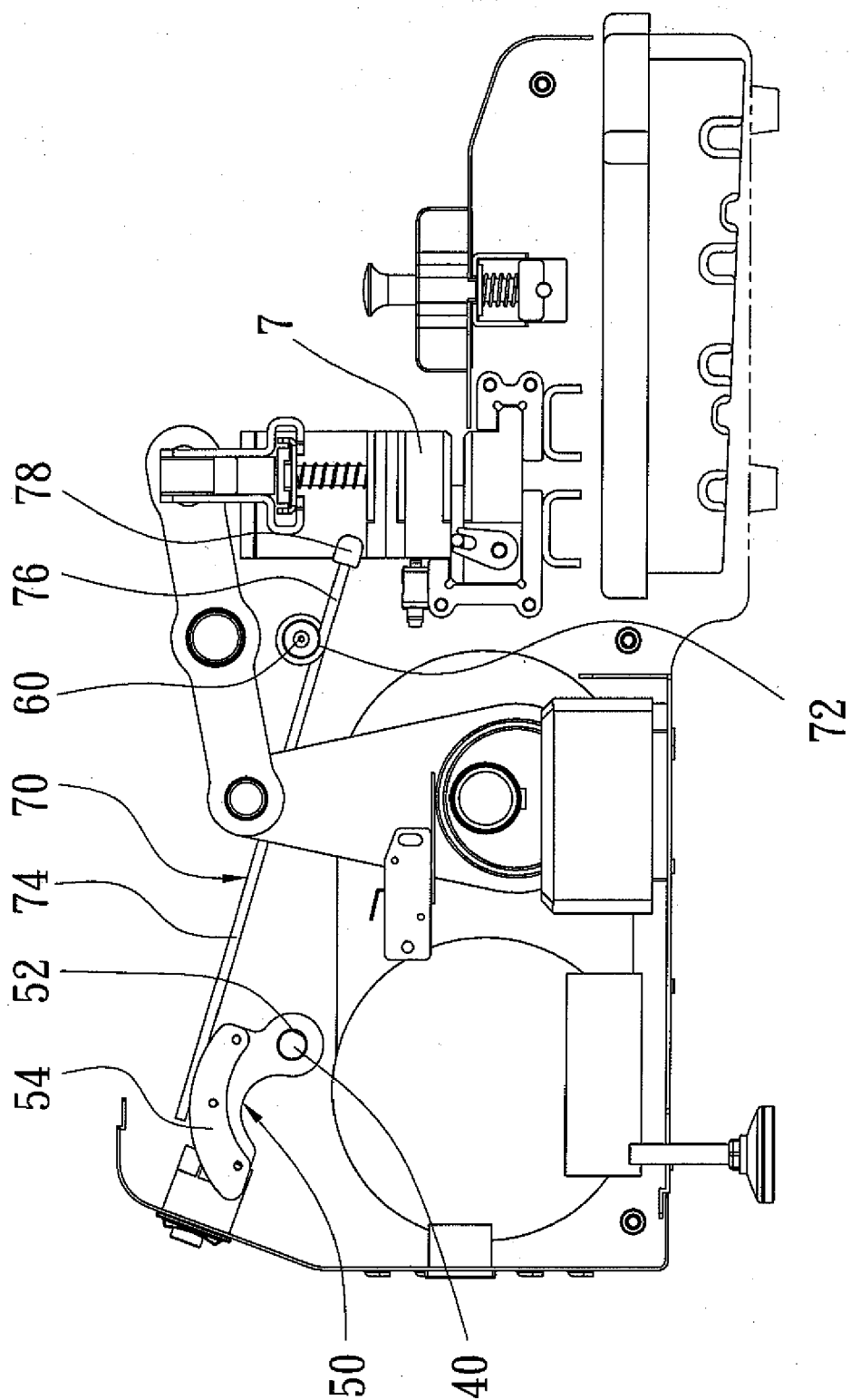


Fig. 15

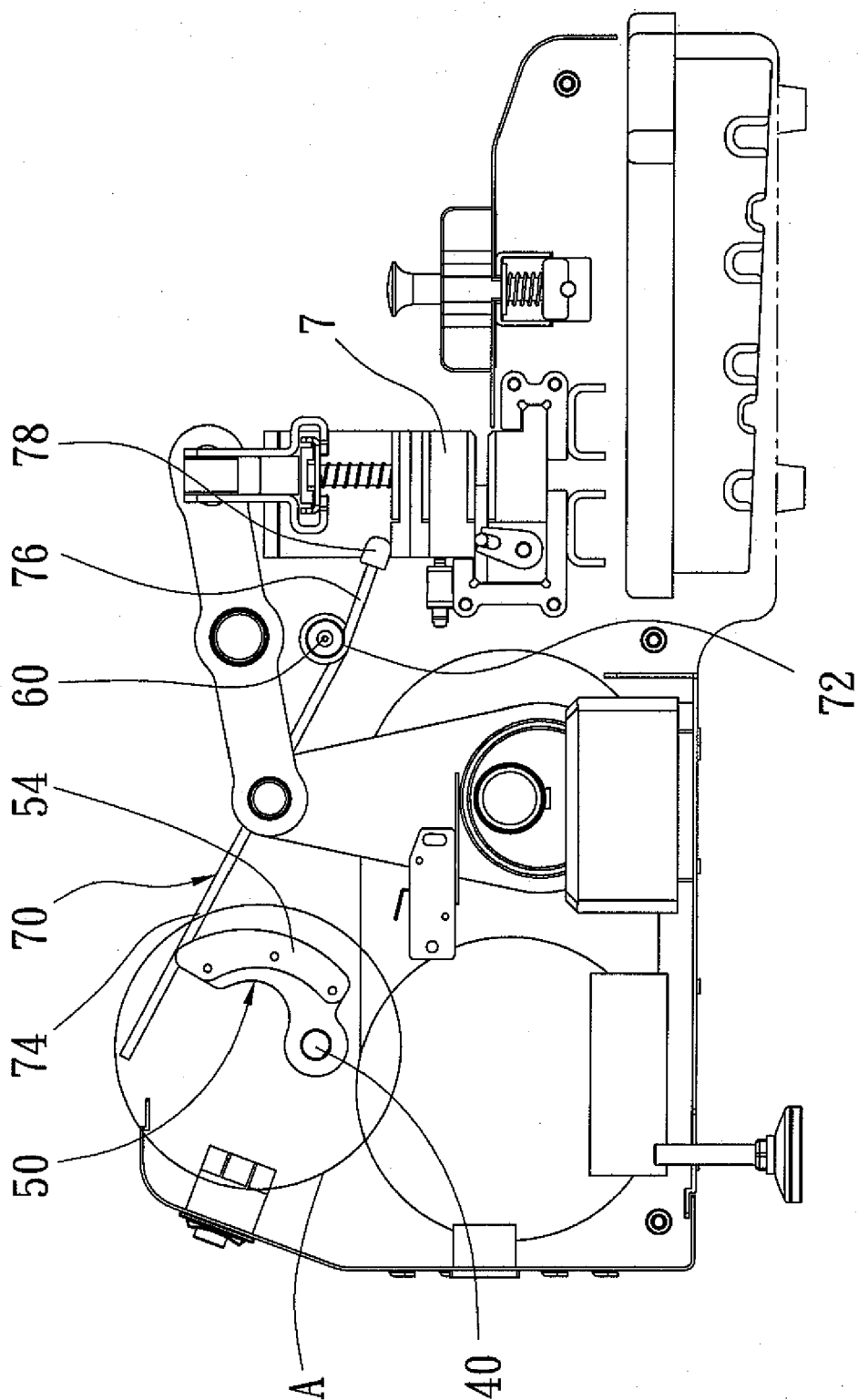


Fig. 16

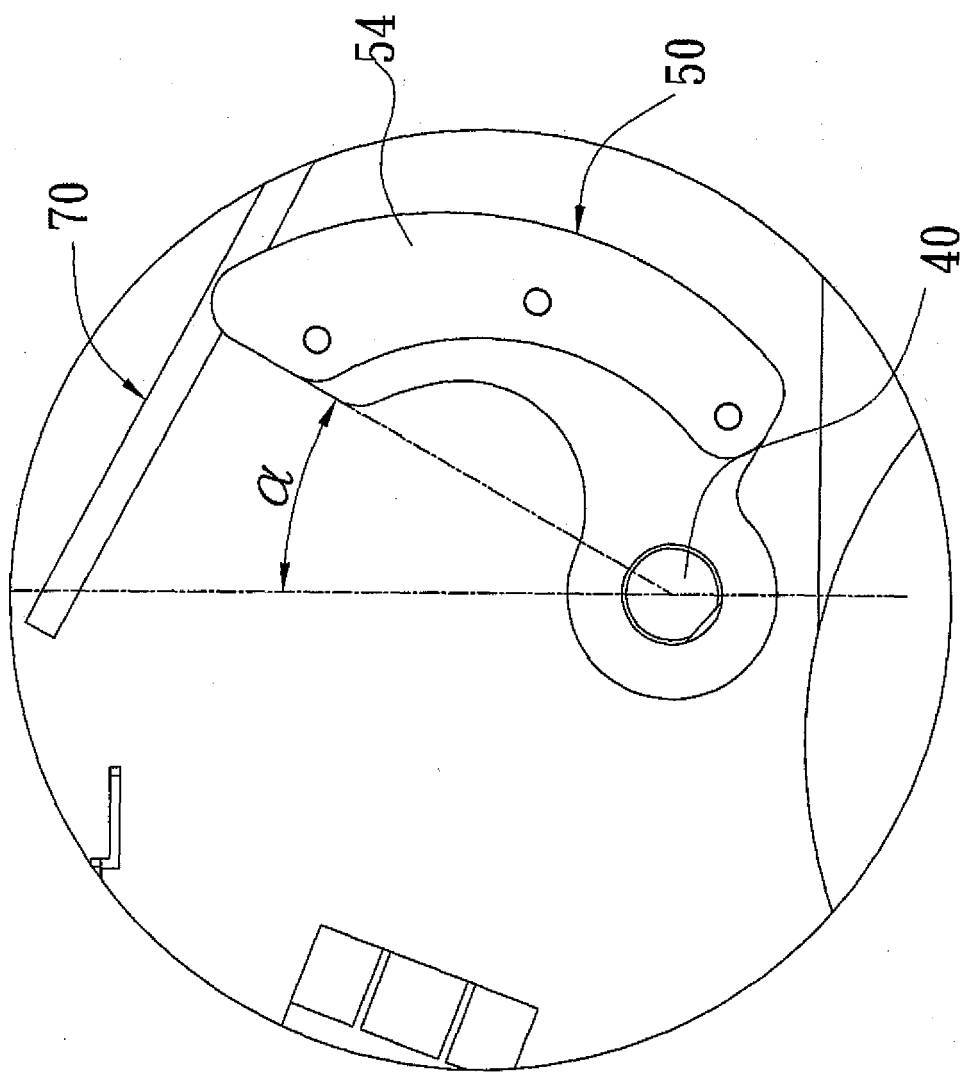


Fig. 16A

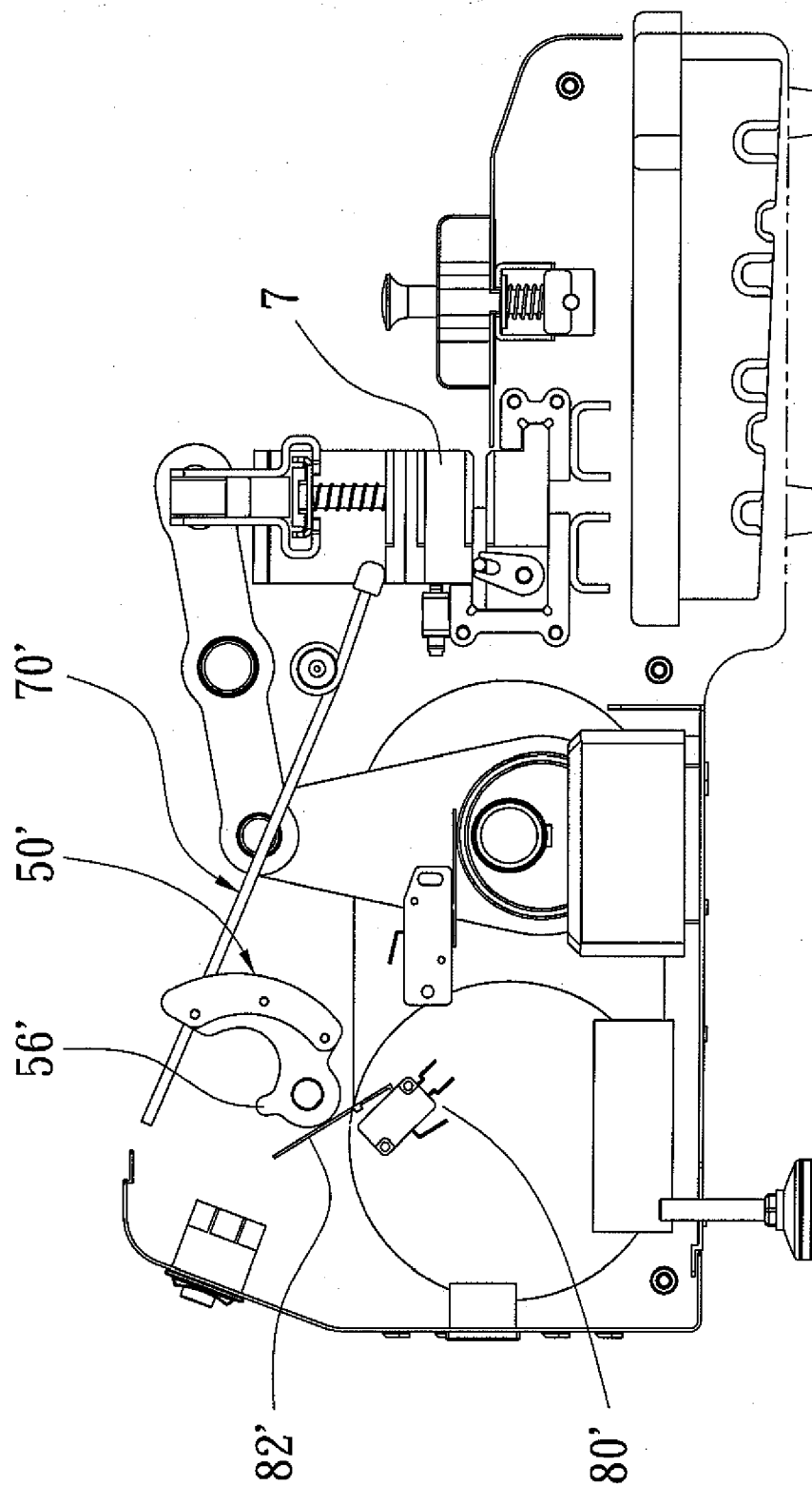


Fig. 17

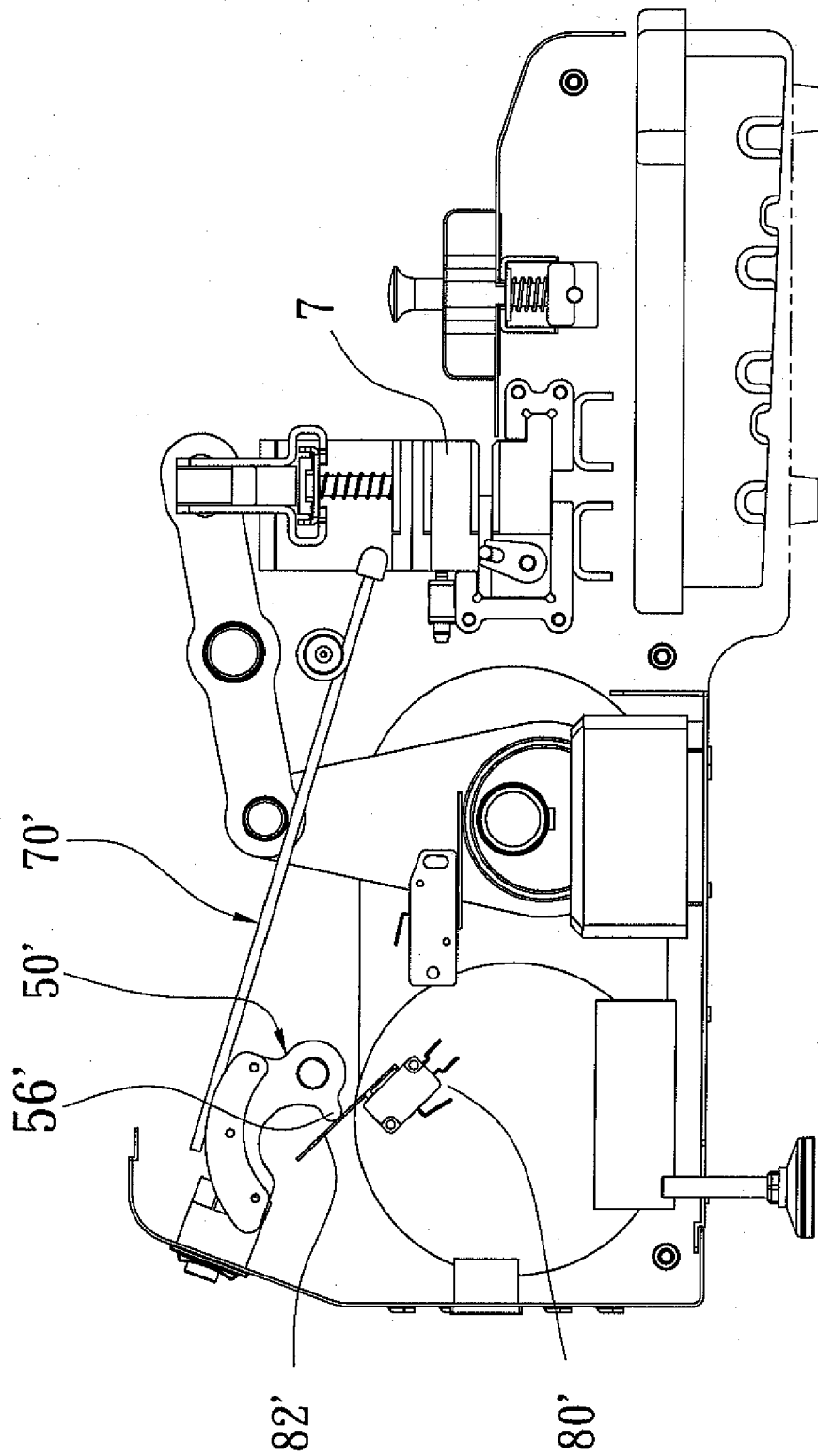


Fig. 18

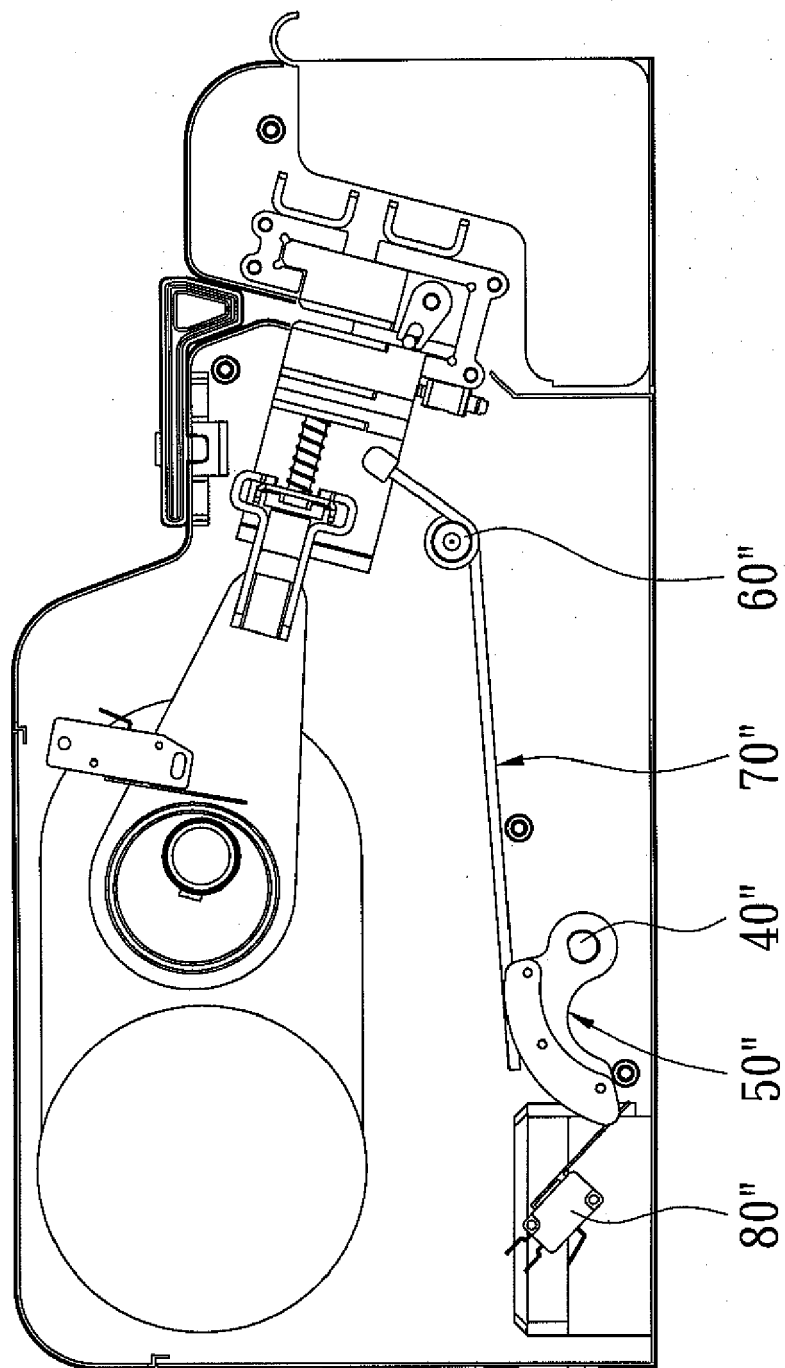


Fig. 19



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 11 2164

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 5 771 768 A (MALMSTROM ET AL) 30 June 1998 (1998-06-30) * page 15, column 3, line 49 - page 16, column 5, line 16; claims 1-9; figures 2,4,6 * * column 4, line 45 - column 5, line 16; claims 1,3-6,8,9; figures 2,4,6 * * column 4, line 14 - line 37; claims 1,2,6,7; figures 3,4,5A,5B *	1-14	INV. B21D28/24 B21D28/20 B26F1/14 B26F1/32
A	US 6 363 826 B1 (WHITEMAN MARVIN ET AL) 2 April 2002 (2002-04-02) * page 20, column 4, line 62; claims 1-10; figures 4,6,8-11 * * figures 8-10,12,13A,13B,14A,14B,15A,15B,16 * * column 5, line 29 - line 51; figures 3,4,5A,5B *	1-14	
A	US 2004/226428 A1 (WHITEMAN MARVIN ET AL) 18 November 2004 (2004-11-18) * paragraph [0036] - paragraph [0043]; claims 1-29; figures 4,6,8-11 * * figures 8-10,12,13A,13B,14A,14B,15A,15B,16 * * paragraph [0039] - paragraph [0040]; figures 3,4,5A,5B *	1-14	TECHNICAL FIELDS SEARCHED (IPC) B21D B26F B23D
A	US 2002/194973 A1 (TIAMSON NICK [US] ET AL) 26 December 2002 (2002-12-26) * paragraph [0033] - paragraph [0057]; claims 1-22; figures 1-12,14 *	5-10	
A	US 2005/066789 A1 (SHIH CHAO-TUNG [TW]) 31 March 2005 (2005-03-31) * paragraph [0022]; figures 2-5,7-9 *	11-14	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 22 January 2007	Examiner CANO PALMERO, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 11 2164

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2005/145085 A1 (LEE YING-CHOU [TW]) 7 July 2005 (2005-07-07) * paragraph [0002] - paragraph [0003]; claims 1,5; figures 2-4,5A,5B,5C,6,7 * * paragraph [0018] * -----	11-14	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 22 January 2007	Examiner CANO PALMERO, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-4

Manufacturing method for a hole -punching assembly of a
hole-punching unit

2. claims: 5-10

Hole-punching assembly structure for a hole-punching unit

3. claims: 11-14

Pressing structure for a hole-punching unit

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 06 11 2164

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

22-01-2007

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