

12

EUROPEAN PATENT APPLICATION

21 Application number: **81104005.4**

51 Int. Cl.³: **B 41 J 21/02**

22 Date of filing: **25.05.81**

30 Priority: **27.06.80 US 163677**
27.06.80 US 163676

43 Date of publication of application:
06.01.82 Bulletin 82/1

84 Designated Contracting States:
DE FR GB IT NL

71 Applicant: **International Business Machines Corporation**

Armonk, N.Y. 10504(US)

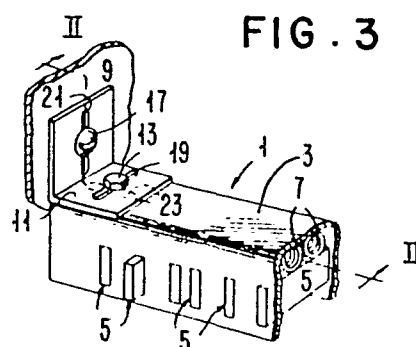
72 Inventor: **Abbott, Clinton Edward**
Route 5
Nicholasville Kentucky 40356(US)

72 Inventor: **Rice, Larry Joe**
3810 Camelot Drive
Lexington Kentucky 40503(US)

74 Representative: **Siccardi, Louis**
COMPAGNIE IBM FRANCE Département de Propriété Industrielle
F-06610 La Gaude(FR)

54 **Tabulation rack for a typewriter or the like.**

57 A tabulation rack, for a typewriter or the like, having simple and inexpensive construction. The rack (1) has a set of straight-sided pins (5) which act as tabulation stops. Each pin (5) is loosely fitted within a pair of opposed holes in opposing sides of a bracket (3). A pair of coil springs (7), placed under deformed configuration in the area between bracket (3) and pins (5), engage all of the pins (5) and provide a frictional drag for holding pins (5) in their set or clear positions. In an alternative embodiment, a single music wire extends in a serpentine configuration between staggered, cylindrical pins.



TABULATION RACK FOR A TYPEWRITER OR THE LIKE

Description

This invention relates to tabulation racks for printers which step to printing locations, particularly typewriters.

Tabulation racks for use in a tabulation operation are well known in the typewriter and related arts. The tabulation mechanisms permit the machine operator to quickly position printing means relative to paper at a predetermined point on the writing line by depressing a "tab" keybutton. Movement is initiated by depression of the keybutton and usually is terminated in response to the movement carrying a member into contact with a tabulation stop element located properly on a tabulation rack. This is used in typing columns of figures, indenting paragraphs, and any other operation that requires positioning the printing means to a specific point each time.

Tabulation racks are known which comprise an elongated slotted frame structure and a plurality of tabulation stop elements (often called "tab stops") fitted in the slots of the frame structure and pivotably mounted with respect thereto, for individually pivoting between a set position and a clear position, in which they are respectively located in the travel path of the moving carriage and out of said travel path. In order for the tab stops to releasably remain in their set or clear position, tab stop holding means must be provided. Some known devices employ a friction positioning of the tab stops with respect to the frame structure. For example, in United States patent 3,333,669, a drag force between the tab stops and said frame structure is created by the resilience of the tab stops which are twisted to frictionally bear against one of the sides of their associated slots. In other known devices, such as those disclosed in German patent 745,564 and United States patents 2,852,120 and 2,312,676, shaped surfaces on the tab stops provide a positive detenting action.

No prior art is known in which a tabulation rack employs tab stops in the form of simple pins having straight surfaces, with the pins held at different settings by frictional engagement between said straight surfaces and a pin receiving hole of the frame structure, with sufficient frictional drag created by force from a biased spring or resilient member.

It is accordingly the object of the invention to provide a tabulation rack having simple and inexpensive construction, particularly suited for a compact typewriter or other stepping printer.

The tabulation rack according to the invention is of the type having :

- . a plurality of tabulation stop elements,
- . an elongated frame structure for movably supporting each of said tabulation stop elements for movement between a set position and a clear position and,
- . holding means for releasably holding each of said tabulation stop elements in its set or clear position,

said tabulation rack being characterized in that :

- . said elongated frame structure is in the form of a bracket supporting opposite sides, said sides having opposed holes positioned along said bracket at locations providing tabulation positions,
- . said tabulation stop elements are pins having substantially straight outer surfaces, each of said pins being loosely fitted in pair of said opposed holes and extending past said bracket sides to slide to set and clear positions and

said holding means comprises at least one continuous, resilient member extending in contact with each of said pins, said resilient member being in a deformed configuration to provide a recovery force to press said pins against on side of said holes, the said recovery force creating sufficient frictional drag to prevent movement of said pins during normal use, while permitting a direct pushing force to slide said pins to said set and clear positions.

The details of this invention will be described in connection with the accompanying drawings in which:

Figure 1 is an end view of a first embodiment the subject tabulation rack shown partially in its operating environment.

Figure 2 is a side view of the tabulation rack sectioned on line II-II shown in Figure 3.

Figure 3 is a perspective view showing the end of the tabulation rack and its mounting to the carriage frame.

Figure 4 is an end view of the main beam or bracket of the tabulation rack.

Figure 5 is a side view of an intermediate part of the main beam or bracket of the tabulation rack.

Figure 6 is a side view of one of the pins which function as tabulation stops.

Figure 7 is an end view of one of the pins which function as tabulation stops.

Figure 8 is a view from the top of an intermediate portion of the tabulation rack.

Figure 9 is a side view sectioned on line IX-IX, shown in Figure 10, of an intermediate portion of the tabulation rack of a second embodiment.

Figure 10 is an end view of the bracket of the second embodiment.

Figure 11 is an illustration of the pin and wire positions of the second embodiment.

Figure 12 generally illustrates the tabulation rack of this invention as part of a typewriter, and

Figure 13 illustrates the tabulation rack as a pin is about to engage the tabulation stop lever.

Figure 1 shows a first embodiment of the tabulation rack 1, according to the invention, assembled and partially in its operating environment. The rack can be considered to have three major elements: the main bracket or beam 3, which may be as long as necessary to encompass all tabulation positions in a particular typewriter; the tabulation stop, elements which are pins 5; and the resilient, biasing members 7. In the application presently preferred for this tabulation rack, the typewriter has a paper carriage which moves past a printing station step-by-step during printing as is entirely conventional.

Referring to Figures 2 and 3, the beam or bracket 3 is seen to be mounted to vertical portions of the carriage 9 by attachment through an L shaped bracket 11. The shorter leg of bracket 11 is mounted on top of beam 3 through a screw 13 and nut 15. The longer leg of bracket 11 is mounted against a thin vertical area of carriage 9 which is threaded to receive an hold screw 17.

Figure 3 presents a perspective view which illustrates the structures by which adjustments of the rack 1 are made. The

short leg of bracket 11 has a slot 19 just wide enough to receive screw 13, but elongated across the width of the leg. The slot 19 terminates near each side of the leg of bracket 11. Similarly, the long leg of bracket 11 has a slot 21 just wide enough to receive screw 17, but elongated up the length of the leg. Shown in dotted outline, as it is hidden by the short leg of bracket 11, is an elongated slot 23 in the upper section or bridge 25 of beam 3. Slot 23 is just wide enough to receive screw 13, but long enough to permit screw 13 to be positioned at positions varying 2 millimeters longitudinally along the length of rack 1.

It will be apparent from this structure, that slots 19, 21 and 23 and associated screws 13 and 17 provide adjustment vertically and horizontally, both down the direction of the length of rack 1 and at 90° to that, which is toward the front and back of typewriter.

Bracket 3 of rack 1 is stamped from soft, cold rolled steel, specifically from a sheet one-half millimeter in thickness. The bracket alone, in a view looking down its long dimension, is shown in Figure 4. Although stamped from a single piece, bracket 3 has a bridge 25 joining opposing sides 27 at 90° angles; sides 27 have opposing holes 29. Holes 29 are elongated in the direction perpendicular to bridge 25 to accommodate pins 5 as will be further discussed.

The small sizes realized in accordance with this invention should be appreciated. The inside dimension between sides 27 is 7 millimeters. The length of sides 27 from top to end is 5.84 millimeters. The shortest distance from the underside of bridge 25 to farthest end of a slot 29 is 5 millimeters.

Figure 5 is a side view of an intermediate part of bracket 3, illustrating more clearly the slots 29. The slots 29 have regular, straight sides and are rectangular in cross section. Their long dimension, which extends perpendicularly to bridge 25, is about 2.5 millimeters. Their width is about 0.76 millimeters.

It will be understood that holes 29 are in pairs directly opposed on opposing sides of bracket 3, so that a pin 5 can be inserted through the pair and thereby be supported on two sides by the sides of the holes 29 in which it is inserted.

A pin 5 is illustrated by side view in Figure 6 and by end view in Figure 7. Although gently rounded at its top 40 and bottom 42, its major dimensions are straight rather than curved. Of particular interest is the straight bottom surface 42, which appears as one of the sides of a rectangle when viewed from the side, as in Figure 6. Surface 42 rides against the bottom side of holes 29. Since the surface is straight, any significant resistance to movement laterally from set and clear positions will be by simple frictional drag. The pins are 10 millimeters in major length, 2 millimeters high, and 0.7 millimeters thick. They are thereby designed to enter holes 29 with a loose fit.

Two coil springs 7 fit side-by-side in the area between bridge 25 and pins 5 and extend along the entire length of the rack where pins 5 are situated, so that each spring 7 contacts all of the pins 5. Springs 7 are of 0.3 millimeter diameter mechanical spring wire. The outside diameter of each spring 7 is 3.4 millimeters and the initial tension is 0.231 Newton.

Reference is made again to Figure 1 to illustrate the selection of pins 5 as tabulation stops. The set and clear mechanism 50 is essentially conventional and is shown only illustratively as it forms no part of this invention. Each pin 5 may be brought opposite the abutments 52 and 54 of the mechanism 50 by relative longitudinal movement of the bracket 3 with respect to mechanism 50. When mechanism 50 is rotated in the set direction, as shown in Figure 1, the abutment 52 is moved leftward to engage the end of a pin 5 and move that pin 5 by direct force down its length until that end of the pin 5 is substantially flush with the outside of the right side of bracket 3.

In a clearing operation, mechanism 50 is rotated in the opposite direction after the pin 5 to be cleared is brought to the position at which the mechanism 50 is located. Abutment 54 pushes the pin 5 until its end is substantially flush with the outside of the left side of bracket 3. Figure 8 shows an intermediate portion of a rack 1 having various pins 5 in the set and clear position.

As is entirely conventional, a different pin 5 must be present to locate each different stop location. As is well known to those skilled in the art, the stops 5 trip a mechanism which causes an escapement pawl to fall between selected teeth in an escapement pinion or the like. If the typewriter is of dual pitch type, two escapement pinions are provided, one having teeth spaced for 10 pitch typing and the other for 12 pitch typing. Accordingly, the tabulation rack must be such that it can control the engagement of the escapement pawl with the teeth of either of the escapement pinions. This leads to a non-uniform spacing of the stops along the tabulation rack. As shown in Figure 2, pins 5 are arranged in sequences of six pins, with the second and third spaced 0.1 inch from the preceeding pin along the tab rack. A fourth pin is spaced 0.05 inch from the third pin. A fifth pin is spaced 0.083 inch from the fourth pin. The last of six pins is spaced from the fifth also 0.083 inch, and the first pin of the next sequence of six pins is spaced 0.083 inch from this pin.

The dual pitch dimensions were a factor in the specific design in that experimentation showed that the two pins 5 closest together in a dual pitch rack were not invariably held by a single coil spring. Where only one coil spring was used, occasional failures occurred always with respect to the two pins close together in the dual pitch rack.

With the use of two identical coil springs 7, none of the occasional failures described occurred. Accordingly, where a dual pitch rack is to be designed using a coil spring, the use of two springs side-by-side should be understood as essential, absent other design changes.

Naturally, it is desirable and generally within the state of present manufacturing arts to automate assembly of the tabulation rack here disclosed. During assembly, the springs 7 must be depressed so as to be partially collapsed along their central axis while a pin 5 is inserted through opposing holes 29. When the springs 7 are released, their recovery force presses and holds the pin 5. The springs 7 are simply placed in the bracket 3, resting on bridge 25, and pushed in one direction along their central axis with a surface which fits within the bracket.

Both of the springs 7 are deformed in the same direction down their central axes. As shown in Figure 2, this results in an acute angle between the coils and the central axes of springs 7, said acute angle being smaller than the corresponding angle when the springs are undeformed.

Finally, the assembled tabulation rack is sprayed by SAE 30 weight oil. In quantity production, it is expected that the rack will be dipped into the oil, rather than sprayed.

Figures 9, 10 and 11 illustrate a second embodiment of this invention, in which the pins 50 are round and the resilient, biasing member 52 is a single, normally straight wire. Figure 9 is a side view of an intermediate portion of the tabulation rack in accordance with this second embodiment. The discussion and illustrations of functioning and associated structures made with respect to the first embodiment, with reference to Figures 1 through 8, are equally applicable to the second embodiment and will not be repeated.

As with the foregoing embodiment, the rack can be considered to have three major elements: the main bracket or beam 54; the stops 50; and the biasing member 52. The beam or bracket 54 is mounted in a typewriter as discussed with respect to Figure 2 and 3 for the first embodiment.

Bracket 54 is stamped from soft, cold-rolled steel, specifically from a sheet one-half millimeter in thickness. The bracket 54 containing pins 50 is shown in Figure 10 in a view looking down the long dimension of bracket 54. Bracket 54 has opposing sides 56 having opposing cylindrical holes about 1.1 millimeter in diameter, which loosely receive a pin 50. The pins 50 are cylindrical, with their major dimension extending between opposing sides 56.

The outer dimensions of this embodiment are the same as those of the first embodiment, illustrated in Figures 1 through 8. The pins 50 are one millimeter in diameter, being cut from a rod of 8620 steel, a very hard steel. As shown in Figure 10, each pin 50 has an entirely flat face on the set side (right side in Figure 10) and a chamfer on the clear side. The chamfer is a surface at 45° starting 0.3 millimeter from the end. One purpose of the chamfer is to assist in a continuous clear of tab stops by bringing a wedge-shaped clear abutment into close contact with the rack while the rack is moved continuously. The details of such continuous clearing operation form no part of this invention. The second purpose of the chamfer is to facilitate insertion of the pins 50 in the holes of bracket 54, using the chamfered end of the pin as the leading part during the insertion.

Located half-way between the sides of bracket 54 and engaging all of the pins 50 is a single length of round music wire 52 of about 0.250 mm diameter. The vertical positioning of the pins 50 is illustrated in Figure 11. This positioning is such that the top of one pin is on the same plane, labeled 60, as the bottom of the next adjacent pins. Thus, the top of every other pin 50 is located substantially on the same plane as the bottom of the other pins 50. Wire 52 is deflected in up and down or serpentine configuration by the amount of its radius. Wire 52, thus, produces a force toward assuming a straight line. This forces the pins 50 located above the wire, upward, and the other pins 50, located below the wire, downward.

The pins 50 remain in their set and clear position by simple frictional drag against lateral movement created by the force of the wire 52 attempting to assume a straight line.

The primary advantages anticipated from this second embodiment are in manufacture. The staggered holes permit wider spacing between the holes. Since the holes will be punched, the increased separation provides a margin of safety against failures in the punching operation. Also, the round pins 50 may be more readily inserted in certain feeding techniques. The wire 52 can be guided into place while the pins 50 are inserted, using automated equipment for quantity production.

Finally, the assembled tabulation rack is sprayed by SAE 30 weight oil. In quantity production, it is expected that the rack will be dipped into the oil, rather than sprayed.

For the purposes of further clarifying the environemant in which the subject tabulation racks are employed, Figure 12 shows a typewriter from the rear without a cover and with emphasis on the tabulation rack 70. The latter is mounted on a movable carriage 72 and is as described in the foregoing.

The other typewriter structures are conventional and form no part of this invention. These structures include the keyboard 74, the platen 76, upon which paper to receive typing is mounted, and margin controls 78. The printing structures, located between platen 76 and keyboard 74, are not shown.

In the particular embodiment presently preferred, the carriage 72 moves from left to right, as viewed in Figure 12, during typing, spacing, and tabulation. The set and clear mechanism 50, discussed in connection with Figure 1, is mounted to the typewriter base 80 at the center of the typewriter.

Tabulation is initiated by a key operation, at which time the carriage 72, including rack 70 moves freely from left to righth as viewed from the rear of the carriage. A stop lever 82,

normally located in front of the clear abutment and below the pins of the rack, is raised up to the plane of the pins. This is shown illustratively, but in some detail, in Figure 1 and 13. It should be understood, of course, that this discussion of stop lever 82 is equally applicable to the embodiment of Figures 9 through 12.

In Figure 1, stop lever 82 is shown in its position prior to tabulation, immediately in front of clear abutment 54 and with its top part under pins 5. Stop lever 82 is mounted on a pivot stud 84 in a vertical elongated slot 86. During tabulation, stop lever 82 is shifted upward as indicated by the arrow in Figure 1.

With stop lever 82 at the upper position, any pin 5 in the set position will engage stop lever 82 and pivot the same, clockwise as viewed in Figure 12, around stud 84. That motion is linked to the escapement mechanism of the typewriter to cause a pawl to fall between the teeth of the escapement pinion or rack, thereby stopping carriage motion and completing the tabulation. An intermediate part of the tabulation rack, with a pin 5 about to engage stop lever 82, is shown in Figure 13, again illustratively only.

After tabulation, the operator may resume typing using keyboard 74.

CLAIMS

1. A tabulation rack (1) for a typewriter or the like, of the type having:

a plurality of tabulation stop elements (5, 50),

an elongated frame structure (3, 54) for movably supporting each of said tabulation stop elements (15, 50) for movement between a set position and a clear position and

holding means (7, 52) for releasably holding each of said tabulation stop elements (5, 50) in its set or clear position,

said tabulation rack being characterized in that:

said elongated frame structure (3, 54) is a bracket supporting opposing sides (27), said sides (27) having opposed holes (29) positioned along said bracket at locations providing tabulation positions,

said tabulation stop elements (5, 50) are pins having substantially straight outer surfaces each of said pins being loosely fitted in a pair of said opposed holes (29) and extending past said bracket sides (27) to slide to said set and clear positions and

said holding means (7, 52) comprises at least one continuous, resilient member (7, 52) extending in contact with each of said pins (5, 50), said resilient member (7, 52) being in a deformed configuration to provide a recovery force to press said pins (5, 50) against one side of said holes (29), the said recovery force creating sufficient frictional drag to prevent movement of said pins (5, 50) during normal use, while permitting a direct pushing force to slide said pins (5, 50) to said set and clear positions.

2. A tabulation rack (1) according to claim 1, characterized in that said bracket (3) has a continuous surface (25) spaced away from said pins (5) and in that said resilient member comprises two identical coil springs (7) positioned in the space between said continuous surface (25) and said pins (5), and engaging said continuous surface (25) and said pins (5), the outside diameter of said coil springs (7) being greater than the distance between said pins (5) and said continuous surface (25), in order to require deviation of the coils of the springs with respect to the central axis thereof, to reduce the angle between said coils and said axis to a value less than that of the corresponding angle defined by the underformed springs.
3. A tabulation rack (1) according to claim 1, characterized in that said pins (50) are generally cylindrical with their axis extending through said opposing holes (29), and further characterized in that said resilient member (52) comprises a normally straight wire wound through said pins (50) in a serpentine configuration.
4. A tabulation rack (1) according to claim 3 characterized in that the holes (29) in a same bracket side (29) are staggered so that the top of one pin (50) is located on the same plane as the bottom of the next adjacent pins (50).

FIG. 1

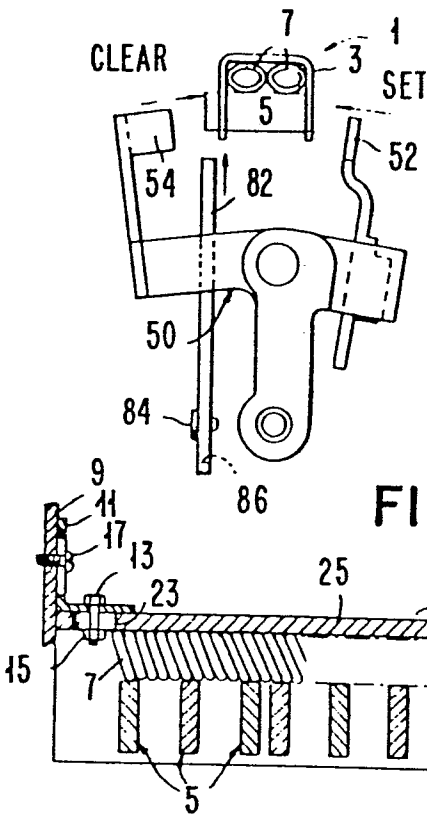


FIG. 3

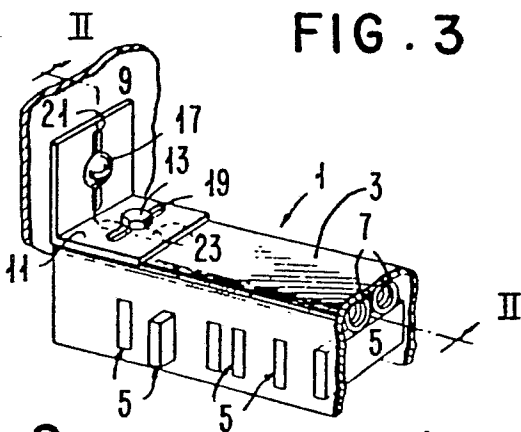


FIG. 2

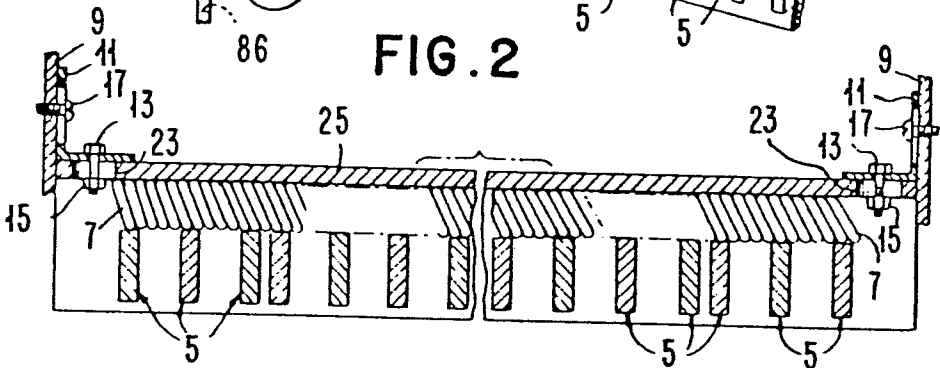


FIG. 4

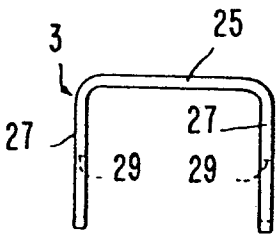


FIG. 5

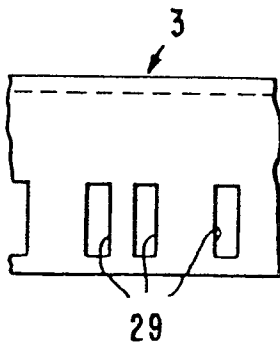


FIG. 6

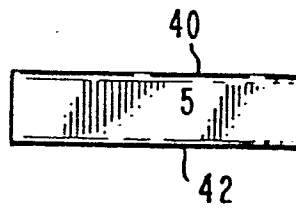


FIG. 7



FIG. 8

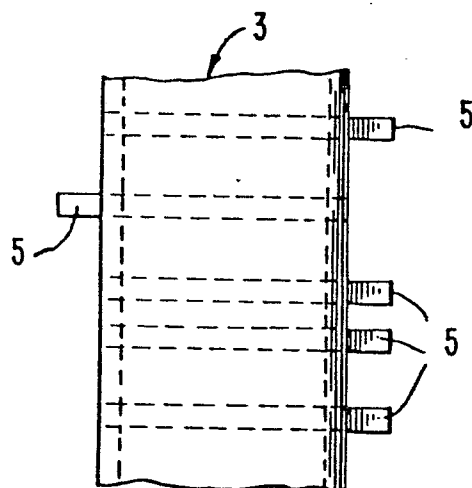


FIG. 9

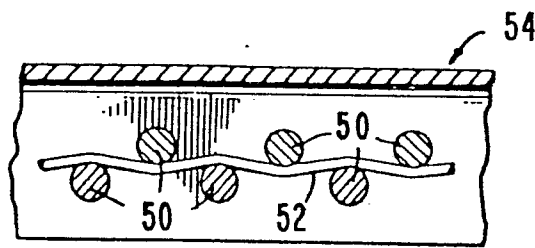


FIG. 10

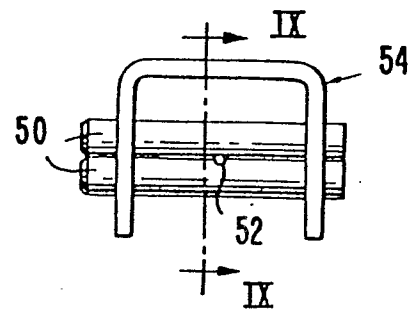


FIG. 11

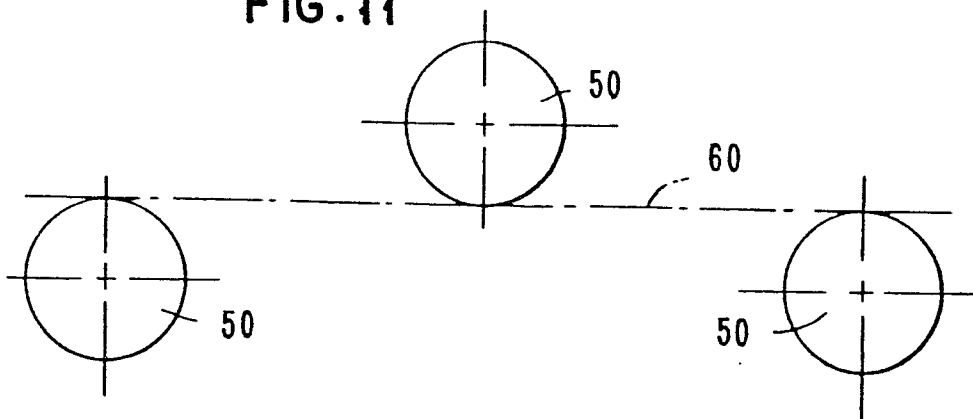


FIG. 13

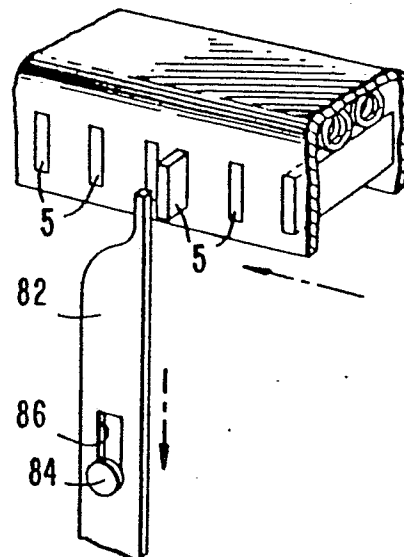
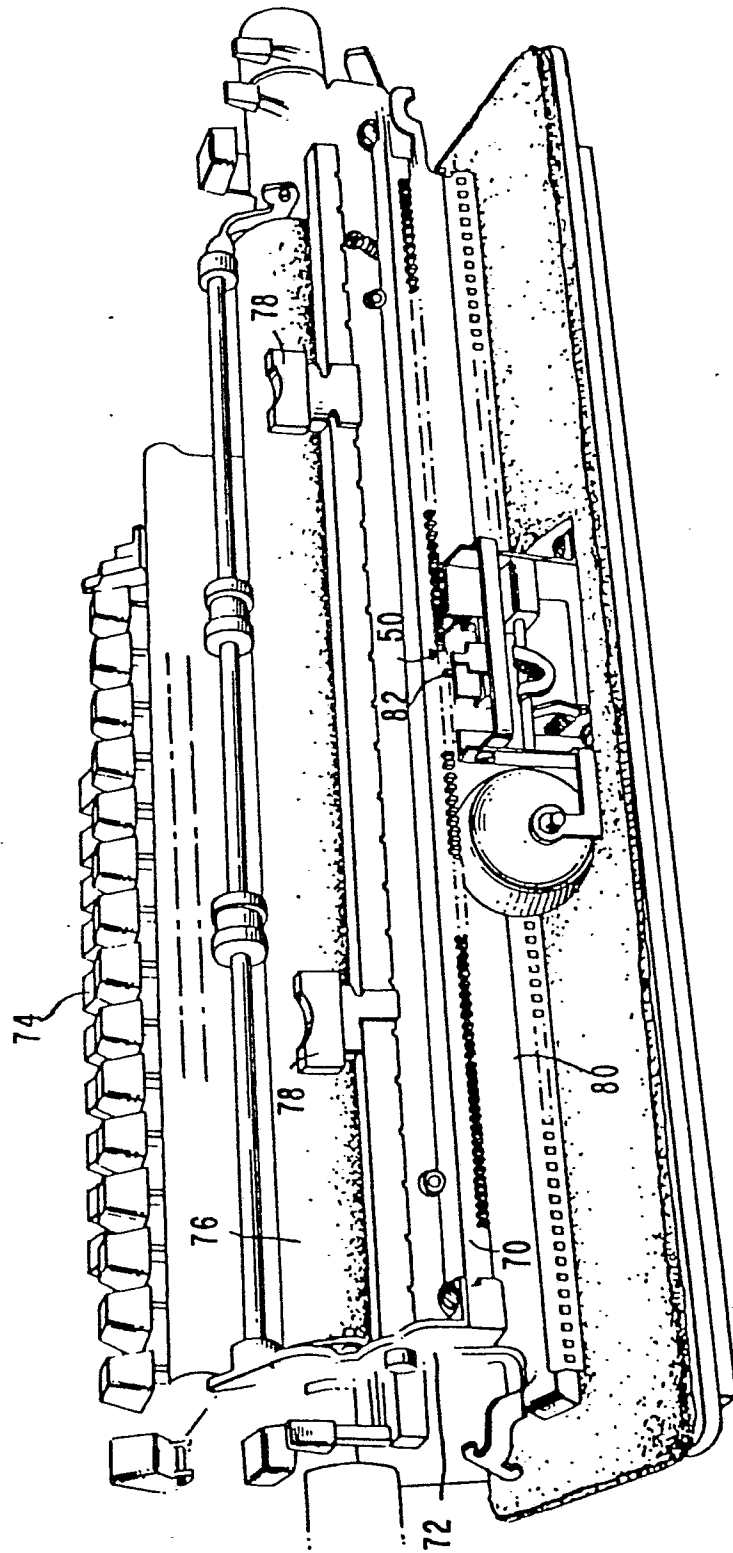


FIG. 12





0042975

Application number

EP 81104005.4

EPO Form 1503.1 06.78