Feb. 18, 1969 W. KLINGNER ET AL 3,428,159

TABULATING APPARATUS FOR DIRECTLY LOCKING AN ESCAPEMENT GEAR

Filed July 11, 1966

FIG. 1

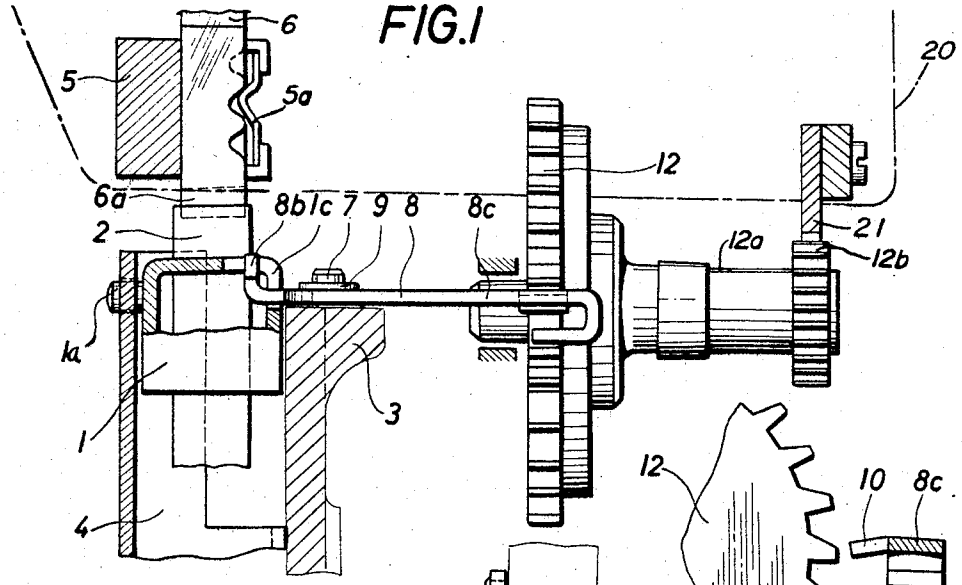
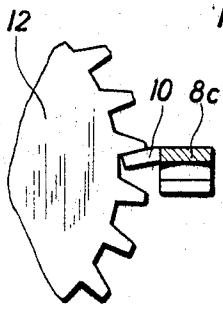


FIG. 4

FIG. 3



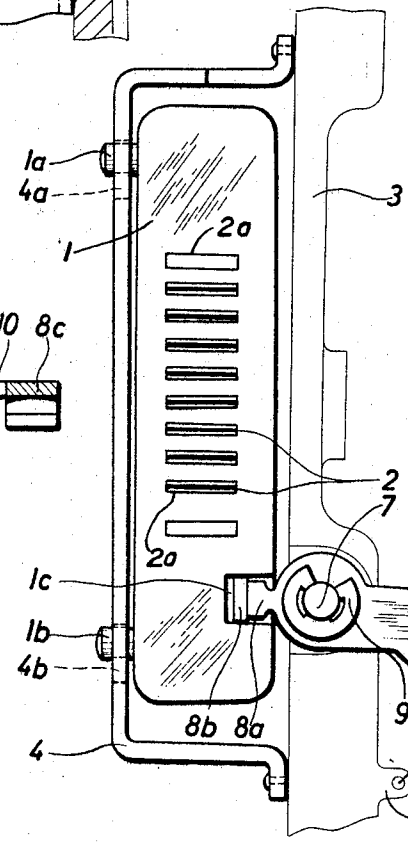
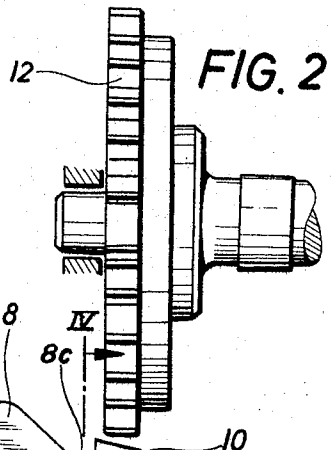


FIG. 2



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United States Patent Office 3,428,159
Patented Feb. 18, 1969

3,428,159

TABULATING APPARATUS FOR DIRECTLY LOCKING AN ESCAPEMENT GEAR

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Filed July 11, 1966, Ser. No. 564,283
Claims priority, application Germany, July 10, 1965, O 8,282
U.S. Cl. 197—64 10 Claims
Int. Cl. B41j *19/02, 19/66*

ABSTRACT OF THE DISCLOSURE

A control member carrying tabulator stops is shifted by a tabulator tab set on the paper carriage of a typewriter, and displaces a locking lever so that the same directly locks an escapement gear and thereby the paper carriage, independently of escapement pawls.

The present invention relates to a tabulating apparatus, and more particularly to apparatus for stopping and locking the paper carriage of a typewriter or calculator after a tabulating movement.

According to the prior art, a stop in the respective selected decimal order is placed in the path of movement of a tab set on the paper carriage when the tabulator key is actuated, and the escapement pawl of the escapement mechanism is turned to a position releasing the escapement gear so that the paper carriage runs to the left under the action of the carriage spring until the set tab runs onto the stop in its path. When the tab engages the stop, the housing carrying the stops is shifted a short distance in the tabulating direction, and the stop is permitted to return to its initial position. At the same time, the escapement pawl is actuated to engage the escapement gear for stopping the paper carriage. However, since the paper carriage may slightly bounce back different distances in accordance with the tabulated distance, the paper carriage is not always exactly in the desired position, so that it is not assured that the escapement pawl engages the corresponding notch between two teeth of the escapement gear. Frequently, the freely movable escapement pawl engages a tooth of the escapement gear so that the paper carriage is stopped in the wrong decimal order. Another disadvantage of this arrangement according to the prior art is that the escapement pawl or the escapement gear teeth are frequently damaged due to the great forces required for stopping the carriage after a tabulating movement.

It is one object of the invention to overcome the disadvantages of the prior art, and to provide a tabulating apparatus for reliably stopping a tabulated paper carriage in a desired position.

Another object of the invention is to provide a tabulating apparatus of extremely simple construction which reliably stops the carriage in a desired position.

Another object of the invention is to eliminate the function of the escapement pawl during tabulating operations.

Another object of the invention is to stop and lock the paper carriage in a desired tabulated position by a locking member which is operated by the impact of the tabulated carriage and directly engages the escapement gear.

With these objects in view, the present invention relates to an improvement in tabulating apparatus for typewriters having a paper carriage, a rack bar on the paper carriage, an escapement gear cooperating with the rack, and an escapement pawl cooperating with the escapement gear during stepwise operation of the paper carriage.

One embodiment of the invention comprises a paper carriage biased to move in a tabulating direction and having at least one tab moving along a path with the carriage, control means mounted on supporting means for limited movement in the tabulating direction and including stop means settable to be located in the path of movement of the tab on the paper carriage, an escapement gear meshing with the rack bar of the paper carriage, and a locking member positively connected with the control means and being movable between a normal position of rest spaced from the escapement gear and a locking position engaging and locking the same.

When the tab moving with the paper carriage in the tabulating direction engages the stop means, the control means is displaced in the tabulating direction and then stopped by an abutment. Due to the this displacement of the control means, the locking member is displaced from its normal position of rest, into which it is biased by a spring, to the locking position and locks the escapement gear and thereby the paper carriage in a tabulated position determined by the positions of the tab and of the stop means.

The escapement pawl which cooperates with escapement gear during the stepwise movement of the carriage, is not used for stopping the tabulating movement of the carriage, and the locking member can be constructed as a rigid, preferably double-armed lever pivotally mounted on the support means and having one arm located in a cutout of the control means, and a locking arm cooperating with the escapement gear and having such a shape as to match the shape of the teeth of the escapement gear so that the same is firmly and precisely locked for stopping the carriage in the desired tabulated position.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing, in which:

FIG. 1 is a fragmentary vertical sectional view and side elevation illustrating a tabulating apparatus according to the invention;

FIG. 2 is a fragmentary plan view of the embodiment of FIG. 1;

FIG. 3 is a fragmentary front view, partially in section, illustrating the locked condition of the escapement gear; and

FIG. 4 is a fragmentary front view, partially in section, on line IV—IV in FIG. 2 illustrating the escapement gear in a position released by the locking member.

Referring now to the drawing, a tabulator control means **1** has a row of slots **2***a* receiving stops **2** and is mounted within a tabulator housing **4** which is carried by supporting means **3**. Control means **1** carries two projecting abutment pins, **1***a*, **1***b* which are respectively located in slots **4***a*, **4***b* in housing **4**, so that control means **1** is mounted on supporting means and housing **4** for limited movement between two terminal positions in which pins **1***a*, **1***b* abut, respectively, the ends of slots **4***a*, **4***b*.

The paper carriage **20** of the typewriter carries the bar **5** on which tabs **6** are mounted settable between an inoperative position and a lower operative position cooperating with stop means **2**. FIG. 1 shows one tab **6***a* in the set operative position. A spring **5***a* is mounted on bar **5** to arrest the tabs in one or the other position. A tab **6***a* is shown in the operative position in which it moves with the carriage along a path in which the tabulator stop means **2** is located, if the latter is in the operative position.

A pivot means **7** is mounted on supporting means **3** and mounts a double-armed locking lever **8** for angular movement. A spring **11** connects the arm **8***c* of locking lever **8** with an eye **3***a* on supporting means **3** so that locking lever **8** is biased to assume the normal position of rest illustrated in FIG. 2. A washer **9** on pivot means **7** prevents axial movement of locking lever **8**.

The shorter arm **8***a* of locking lever **8** has an upwardly bent projecting coupling portion **8***b* which is located within a cutout **1***c* in control means **1**, positively engaging the lateral walls of the same. The biasing force of spring **11** acts through locking lever **8** on control means **1** to urge the same to the terminal position shown in FIG. 2 in which pins **1***a*, **1***b* abut one pair of ends of slots **4***a*, **4***b* which form abutment means. The action of spring **11** eliminates play of coupling projection **8***b* in the coupling cutout **1***c*.

The typewriter is provided with the standard escapement mechanism which is not illustrated in detail for the sake of simplicity, only the escapement gear **12** being shown connected by a shaft **12***a* with a gear **12***b* which in the usual manner meshes with the rack bar **21** on the schematically illustrated paper carriage **20** and cooperates with escapement pawl means, not shown, which are operated by the universal bar, not shown, of the typewriter when the carriage is to be stepwise shifted. In accordance with the present invention, the escapement pawl, not shown, is not used for stopping the carriage after a tabulating movement, for which purpose the locking lever **8** is used. Locking lever **8** has a locking projection or portion **10**, and the end of locking arm **8***c* is bent to form a U-shaped end portion from which locking projection **10** projects.

When one of the tabulating keys is actuated by the operator, the escapement pawl is withdrawn in the usual manner from the escapement gear **12** so that the carriage **20** is free to move in the tabulating direction under the action of the carriage spring, not shown. The bar **5** with tabs **6**, **6***a* moves with the carriage to the left, as viewed from the front of the typewriter, until a set tab **6***a* engages a set stop **2** which is located in the path of movement of the respective set tab **6***a*. When the moving tab **6***a* engages the stop **2**, control means **1** is shifted in the tabulating direction out of its normal position illustrated in FIG. 2 a distance sufficient to displace the set stop **2** in tabulating direction far enough to permit its dropping to its inoperative position.

During this movement of control means **1** toward the left, as viewed from the front of the typewriter, locking lever **8** is forced to perform an angular movement in counterclockwise direction so that the locking projection **10**, moving in a locking direction toward gear **12**, engages a corresponding recess between two teeth of escapement gear **12** which is stopped so that the paper carriage **20** is stopped in the correct position by gear means **12**, **12***a*, **12***b*, and **21**. Locking portion **10** moves a predetermined distance which is proportionate to the given distance of movement of control means **1** determined by abutment pins **1***a*, **1***b* and slots **4***a*, **4***b* in the ratio of arms **8***a* and **8***c* of locking lever **8**. A bouncing back of the paper carriage **20** is not possible, and the escapement pawl, not shown, engages the stopped escapement gear **12**, and need not sustain the substantial forces required for stopping the tabulated carriage.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of tabulating apparatus differing from the types described above.

What is claimed as new and desired to be secured by Letters Patent is:

1. Tabulating apparatus comprising, in combination, carriage means biassed to move in a tabulating direction, and having at least one tab moving along a path with said carriage means; supporting means; a control member mounted on said supporting means for movement in said tabulating direction and including at least one stop settable to be located in said path; abutment means for limiting movement of said control member in said tabulating direction to a given distance so that said control member is displaced said given distance when said tab engages said stop; an escapement gear operatively connected with, and driven by said carriage means during movement of said carriage means; a locking member including a coupling portion positively connected with said control member for movement therewith over said given distance, and a locking portion moving a predetermined distance in a locking direction when said coupling portion moves said given distance; and mounting means mounting said locking member on said supporting means for movement between a normal position of rest in which said locking portion is spaced said predetermined distance in said locking direction from said escapement gear, and a locking position in which said locking portion directly engages and locks said escapement gear, said locking member being moved by said control member to said locking position when said control member is displaced said given distance in said tabulating direction whereby said carriage means is stopped in a tabulated position determined by the positions of said tab and of said stop.

2. Tabulating apparatus as claimed in claim **1** wherein said mounting means include a pivot means on said supporting means for supporting said locking member for angular movement between said position of rest and said locking position.

3. Tabulating apparatus according to claim **2** wherein said locking member is a double armed locking lever having a long arm carrying said locking portion and a short arm connected with said control member for movement therewith.

4. Tabulating apparatus as claimed in claim **3** wherein said control member has a cut out; and wherein said short arm of said locking lever has said coupling portion located in said cut out for coupling said locking lever with said control member.

5. Tabulating apparatus according to claim **4** wherein said locking portion has a shape matching the shape of the teeth of said escapement gear.

6. Tabulating apparatus according to claim **1** and including a spring connecting said locking member with said supporting means for biassing said locking member to turn to said position of rest.

7. Tabulating apparatus according to claim **1** including means for biassing said control member in a direction opposite to said tabulating direction; and wherein said abutment means stop movement of said control member in two terminal positions, said locking member being in said locking position when said control member has moved in said tabulating direction to one of said terminal positions.

8. Tabulating apparatus as claimed in claim **1** wherein said abutment means include at least one abutment pin secured to said control member; and wherein said supporting means has at least one slot extending in said tabulating direction, said abutment pin being movable in said slot for limiting movement of said control member in two terminal positions, said locking member being in said locking position when said control member has moved in said tabulating direction to one of said terminal positions.

9. Tabulating apparatus as claimed in claim **8** wherein said control member has a cut out; wherein said locking member is a double arm locking lever pivotally mounted on said mounting means for movement between said position of rest and said locking position, said locking lever having one arm having said coupling portion, said coupling portion being located in said cut out, and a second arm having said locking portion; and comprising a spring connecting said supporting means with said locking lever for biassing said locking lever into said position of rest.

10. Tabulating apparatus as claimed in claim 1 wherein said carriage means include a rack bar; and wherein said escapement gear meshes with said rack bar.

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U.S. Cl. X.R.

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