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[54] **ESCAPEMENT CONTROLLING TABULATING APPARATUS**

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[51] **Int. Cl.** **B41j 19/66**

[58] **Field of Search** ..... 197/64, 70, 82, 84 R, 197/84 A, 84 B, 92, 93, 94, 95, 96, 176, 177, 178, 179, 183

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[57] **ABSTRACT**

A tabulating apparatus has tabulator stop means and escapement stop means, operated by tabulator control means which place the tabulator stop means in the path of a set tab, whereupon the moving tab moves the tabulator stop means to release the escapement stop means so that it blocks carriage movement before the tabulator stop means is released by the tabulator control means for biassed movement to an inoperative position releasing the set tab.

10 Claims, 3 Drawing Figures

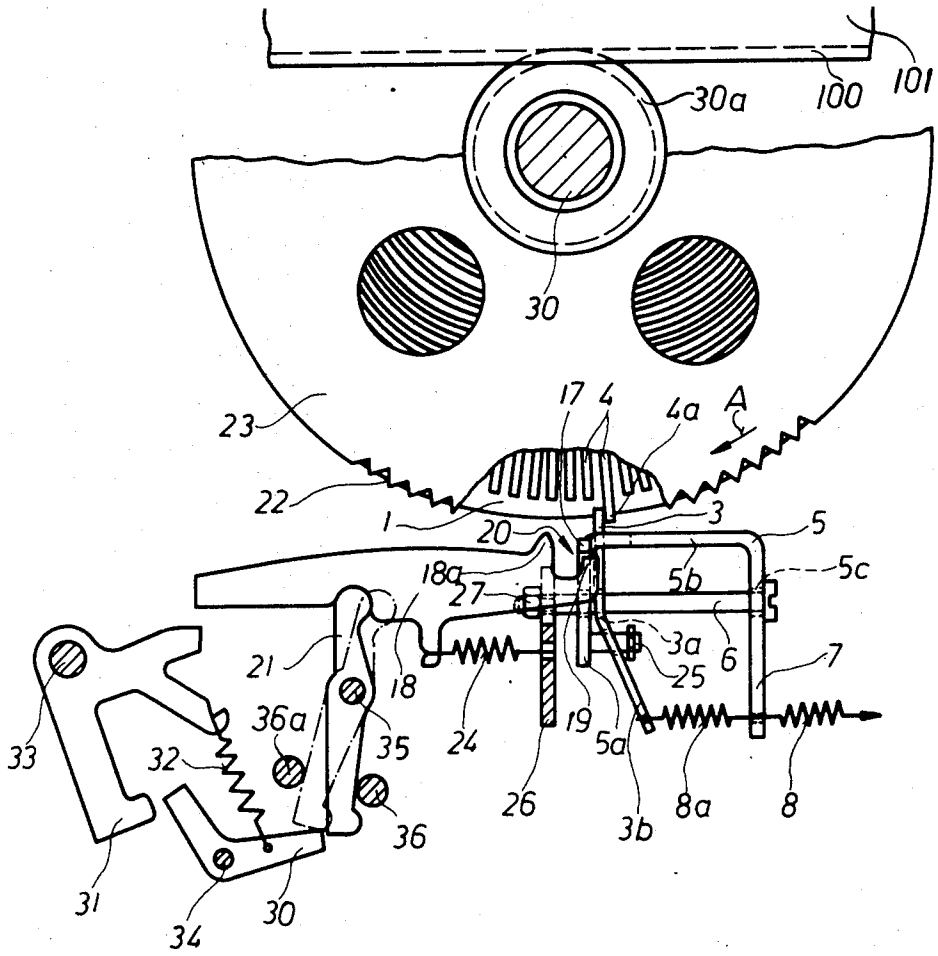


FIG. 1

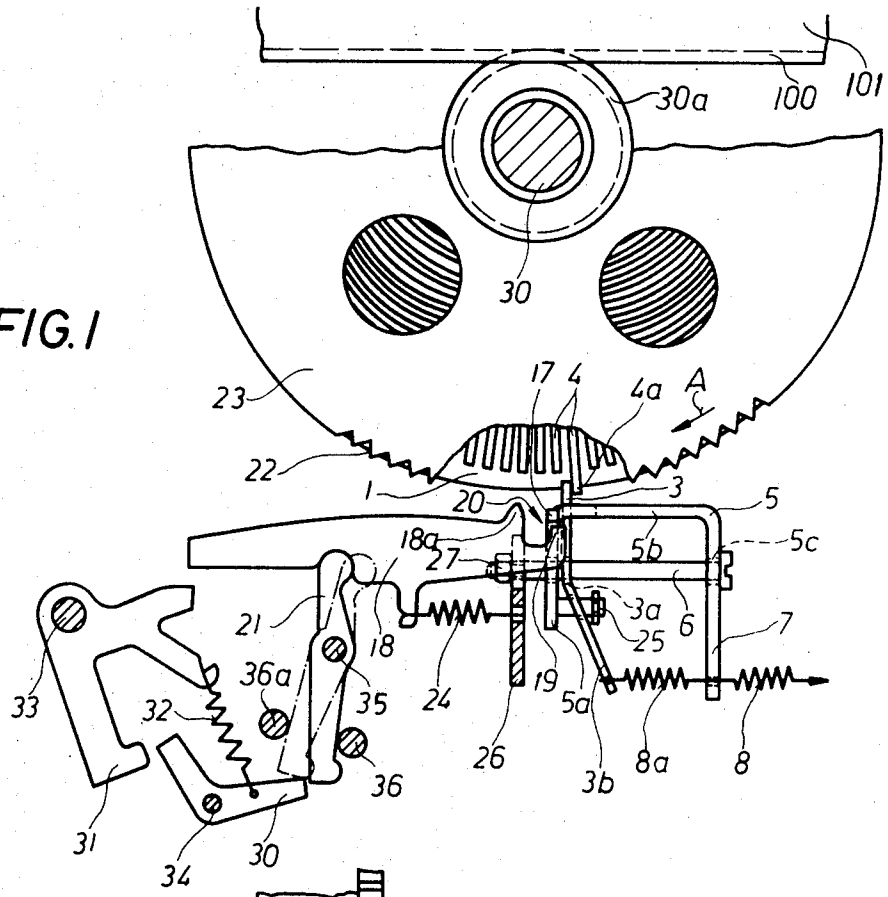


FIG. 2

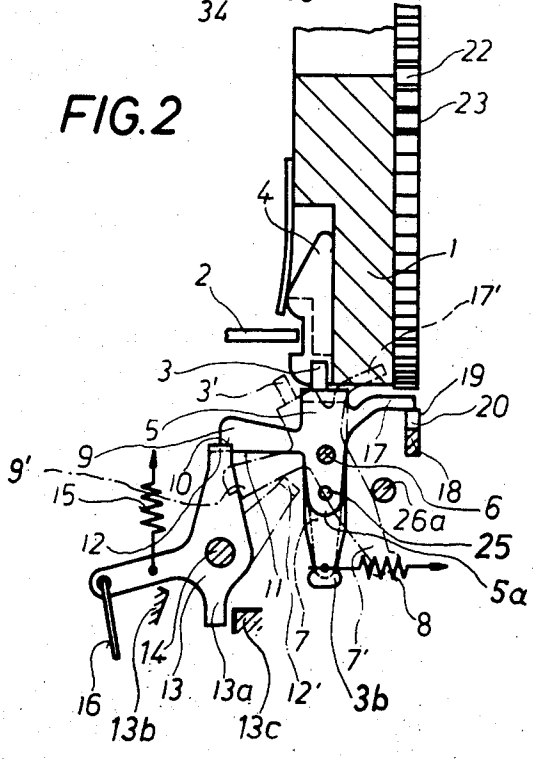
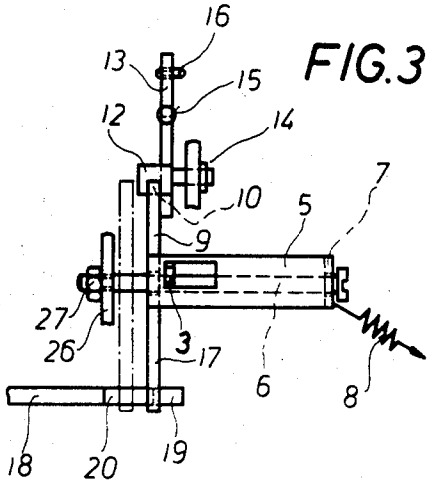


FIG. 3



ESCAPEMENT CONTROLLING TABULATING APPARATUS

BACKGROUND OF THE INVENTION

The present invention is concerned with an apparatus for controlling an escapement pawl by the tabulator of a business machine, such as a typewriter. In accordance with the prior art disclosed in U.S. Pat. No. 2,805,749, tabulator control means, including a tabulating key or a remote controlled magnet, are moved into the path of stop tabs of a movable tabulator means, such as a wheel or rail, which moves with the biassed carriage, and supports the tabs for movement to a set position. The tabulator stop means are locked, and remain locked until released by a set tab. This type of tabulating apparatus cooperates with escapement stop means in such a manner that upon operation of the tabulating apparatus, the escapement pawl releases the teeth of the escapement wheel or rack, permitting the carriage to move to the tabulated position.

The tabulating apparatus controlling the escapement means in this manner, operate satisfactorily at normal typing or printing speeds, but modern typewriters or printing devices, which operate at far higher speeds, cannot be reliably controlled by the tabulating means of the prior art. The escapement pawl must engage the teeth of the escapement wheel or rack, while the same moves at full tabulating speed, and stop the carriage in the column selected by setting a corresponding tab. Tests have shown that at high speed tabulating movements, the escapement pawl does not precisely engage the teeth of the escapement wheel or rack, so that it happens that the carriage is stopped in a wrong column, which is before or behind the selected column. This is caused by the fact that the escapement pawl is always operatively connected with the tabulator stop means from which follows that the movement of the escapement pawl into the teeth of the escapement means, depends on the speed of the return of the tabulator stop means to the initial position of the same. The escapement pawl can move only so fast, and so exactly into the teeth of the escapement wheel or rack, as is permitted by the mass and bearing friction of the tabulator stop means.

SUMMARY OF THE INVENTION

It is one object of the invention to control the escapement stop means of a typewriter or the like, by tabulator apparatus in such a manner that the disadvantages of the prior art constructions are avoided.

Another object of the invention is to provide an escapement controlling tabulating apparatus which is of simple construction, and reliably operates at high speeds.

Another object of the invention is to obtain engagement of a toothed escapement means moving with a typewriter carriage, by an escapement pawl before the tabulator stop means is separated from an engaged set tab.

With these objects in view, a tabulator stop means is connected by an actuating portion with a holding portion of an escapement stop means, and by a latch portion with another holding portion of a tabulator control means in such a manner that the escapement stop means is released for movement to a normal blocking position before the tabulator stop means has been released for separation from the set tab. Due to this arrangement it is assured that the escapement stop pawl engages the teeth of the escapement wheel or rack without any interference by the tabulator stop means. The movement of the escapement pawl into the teeth of the escapement means, and the return of the tabulator stop means to the initial position of rest, are separated and take place during successive time periods.

In the preferred embodiment of the invention, the actuating portion of the tabulator stop means moves along a holding portion of the escapement stop means, and a latch portion of the tabulator stop means moves along another holding portion of the tabulator control means. In the direction of movement, the holding portion of the escapement stop means is substantially shorter than the holding portion of the tabulator control means so that the escapement stop means is first operated.

An embodiment of the invention comprises preferably rotatable tabulator means including radially movable shiftable tabs selectively movable to a set position; preferably rotatable escapement means connected with the tabulating means for rotary movement together due to the action of the carriage spring so that a set tab moves along a circular path in one direction; biassed escapement stop means having a normal blocking position engaging the teeth of the escapement means, and a releasing position, the escapement stop means having a first holding portion and a recess following the first holding portion in said one direction; biassed tabulator stop means mounted on a support for movement in said one direction, and also for transverse turning movement between an inoperative position, and a tabulating position located in the path of the set tab for engagement by the set tab so that the tabulator stop means is moved in said one direction, the tabulator stop means in the tabulating position engaging the first holding portion for holding the escapement means in the releasing position; and tabulator control means for moving the tabulator stop means to the tabulating position, and including a second holding portion for holding the tabulator stop means in the tabulating position during the movement in said one direction, the first and second holding portions being dimensioned and positioned in said one direction so that during movement of the tabulator stop means by the set tab, the tabulator stop means is located opposite the recess for releasing the escapement stop means for biassed movement to the normal blocking position before the tabulator stop means is released by the second holding portion for biassed movement to the inoperative position so that escapement stop means is released and the escapement means stopped with the carriage before the tabulator stop means is retracted from the path of the set tab.

The tabulator stop means preferably includes a stop portion located in said tabulating position in the path of the set tab, an actuating portion cooperating with the first holding portion and with the recess of the escapement stop means, and a latch portion with a guide edge engaged by the tabulator control means and having an arresting recess at the end of the guide edge engaged by the second holding portion in said tabulating position for holding the tabulating stop means in the tabulating position.

The actuating portion and the latch portion are preferably located on opposite sides of the stop portion of the tabulator stop means, and the escapement stop means and the tabulator control means are preferably

located on opposite sides of the tabulator stop means.

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.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary schematic front view of an apparatus according to the invention in the tabulating position;

FIG. 2 is a fragmentary schematic side view, partially in section, and illustrating the apparatus in the tabulating position; and

FIG. 3 is a fragmentary schematic, partly developed view of the apparatus, illustrating the tabulator stop means in solid lines in the tabulating position, and in dash and dot lines in the inoperative position.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawing, a tabulator means including a wheel **1** is connected for rotation about the axis of a shaft **30** with an escapement means in the form of a wheel **23** having uniformly spaced peripheral escapement teeth **22.** Shiftable tabs **4** are mounted on tabulator wheel **1** and can be selectively shifted by setting means **2** in outward radial direction to a set position, see FIG. **1,** in which the outer extremity of a set tab **4***a* moves along a circular path having its center in the axis of shaft **30.** A pinion **30***a* is secured to wheels **1,23** and meshes with an escapement rack bar **100** on a carriage **101,** only partly shown.

A stationary wall **26** supports a shaft **6** on which tabulator stop means **3, 5, 7, 9, 17, 25** are mounted for angular movement about shaft **6,** and also for axial movement along the same toward the wall **26.** Shaft **6** is a bolt whose threaded end is secured by a nut **27** to the wall **26.** The tabulator stop means **3, 5, 7, 9, 17, 25** includes a U-shaped carrier **5** having two legs **7** and **5***a*, and a yoke **5***b*. Legs **7** and **5***a* have bearing bores **5***c* through which shaft **6** passes. A journal **25** projects from leg **5***a* and supports a stop portion **3** provided with a bore **3***a* through which shaft **6** passes, and having a leg portion **3***b* connected by a spring portion **8***a* to a spring **8** which is slanted to the direction of shaft **6,** as best seen in FIG. **3.** In the tabulating position shown in FIGS. **1** and **2,** the end of stop portion **3** is located in the path of movement of a set tab **4***a*, and engaged by the same during rotary movement of the tabulating means **1, 4** in the direction of the arrow A.

As best seen in FIG. **2,** the tabulator stop means **3, 5, 7, 9, 17, 25** further include a latch portion **9** having a guide edge **11** ending in an arresting recess **10** cooperating with a holding portion **12** of an angular control member **13** which is biassed by spring **15** to turn in clockwise direction as viewed in FIG. **2,** and is connected with a link **16** controlled by an electromagnet or by a tabulator key, not shown. Tabulator control member **13** has a projection **13***a* between stationary stops **13***b*, **13***c*. When a pull is exerted on link **16,** tabulator control member **13** is turned in counterclockwise direction against action of spring **15.** Spring **8** biasses the tabulator stop means **3, 5, 7, 9, 17, 25** in counterclockwise direction to an inoperative position shown in chain lines in FIG. **2** and into abutment with a stop **26***a*. The actuating portion **17** of the tabulator stop means **3, 5, 7, 9, 17, 25** assumes the position shown in broken lines in FIG. **2** remote from the escapement stop lever **18** when the tabulator stop means **3, 5, 7, 9, 17, 25** is in the inoperative position **9' 3', 7',** released by holding portion **12,** when latch portion **9** is in the position **9',** but when the tabulating stop means **3, 5, 7, 9, 17, 25** are turned to the position illustrated in solid lines, the actuating portion **17** engages a holding portion **19** of the escapement stop lever **18** for retracting the pawl portion **18***a* of escapement stop lever **18** from the teeth **22** of the escapement means **23.** At the same time, the end of stop portion **3** is located in the path of movement of a set tab **4***a*.

As best seen in FIG. **1,** the escapement stop lever **18** is biassed by a spring **24** connected with the wall **26** and has, adjacent the narrow holding portion **19,** a wide control recess **20,** followed by the tab portion **18***a*. Movement of a set pawl **4***a* in the direction of the arrow A causes movement of actuating portion **17** to the recess **20,** permitting spring **24** to turn escapement stop lever **18** to a position in which pawl portion **18***a* engages the escapement teeth **22** of escapement means **23** for stopping the same together with the carriage, **101** of the machine.

The holding portion **19** of the escapement stop lever **18** is in the direction of the movement of set tab **4***a*, substantially shorter than the holding portion **12** of the tabulator control member **13** which is mounted for turning movement about the journal **14.**

Escapement stop lever **18** is mounted on the rounded head of double armed lever **21** for angular movement between a normal blocking position, not shown, engaging teeth **22,** and a releasing position, illustrated in FIG. **1,** in which the escapement wheel means **23, 22** can freely rotate with the moving carriage **101** and the tabulating means **1, 4.** In addition to levers **18** and **21,** the escapement stop means include a lever **30** cooperating with lever **21** and mounted on a pivot **34** for angular movement and connected by a spring **32** with a lever **31** whose journal **33** is connected by a linkage, not shown, with a universal bar, not shown, from which escapement stop lever **18** is operated. Lever **21** is mounted on a journal **35** for angular movement, so that escapement stop lever **18** can be longitudinally shifted with pawl portion **18***a*. Stops **36, 36***a* limit the angular movement of lever **21.**

FIG. **2** shows in broken lines an inoperative position of the apparatus in which the actuating portion **17** is in the position **17',** the tabulator stop portion **3** is in the position **3',** the latch portion **9** is in the position **9',** and the holding portion **12** is in the position **12'.** In this position, pawl portion **18***a* of escapement stop lever **18** engages the teeth **2** of the escapement means **23** due to the action of spring **24,** so that the carriage **101** is stopped until the escapement stop means **18, 19, 21 30–35,** are operated by actuation of a key or of the space bar, now shown, in a manner which is not an object of the present invention.

When the tabulator key, not shown, of the tabulator control means **13, 16, 15** is operated, tabulator control member **13** is turned by link **16** in counterclockwise direction so that its holding portion **12** moves along the guide edge **11** of latch portion **9** so that the tabulator stop means **3, 5, 7, 9, 17, 25** are turned in clockwise direction as viewed in FIG. **2** until the arresting recess **10**

is engaged by the holding portion 12 due to the action of spring 8, as shown in solid lines. The turning movement of the tabulator stop means 3, 5, 7, 9, 17, 25 brings stop portion 3 into the circular path of movement of a set tab 4*a* in the direction of the arrow A, while the actuating portion 17 is turned to a position engaging the holding portion 19 of the escapement stop lever 18 so that the escapement pawl portion 18*a* is moved out of teeth 22, and the escapement stop means 18, 19, 21, 30–35 assume the position shown in FIG. 1.

Consequently, the carriage 101 of the typewriter is released, and is moved by the respective carriage spring, not shown, so that escapement means 23 and tabulator means 1, 4 turn in clockwise direction, as viewed in FIG. 1, in the direction of the arrow A until the first set tab 4*a* engages the tabulator stop portion 3 which is now located in its path, so that the entire tabulator stop means 3, 5, 7, 9, 17, 25 is shifted along shaft 6 in axial direction, with latch portion 9 and actuating portion 17 moving from the solid line position of FIG. 3 to the positions shown in chain lines in FIG. 3.

During the first part of this movement, the actuating portion 17 moves to a position located above the recess 20, so that spring 24 can turn escapement stop lever 18 with pawl portion 18*a* to a position in which pawl portion 18*a* engages a tooth 22 of the escapement means 23 so that the carriage 101 is stopped, while latch portion 9 is still engaged by the holding portion 12 which is longer in the direction of movement than the holding portion 19 of the escapement stop lever 18. When arresting recess 10 of latch portion 9 releases holding portion 12 of control lever 13 during rectilinear movement in the direction of the axis of shaft 6, spring 8 turns the entire tabulator stop means 3, 5, 7, 9, 17, 25 to the position shown in chain lines in FIG. 2, so that stop portion 3 is moved to the position 3′, releasing the set tab 4*a* so that the carriage can move in steps together with escapement means 23, 22. Control member 13 is returned by spring 15 to the initial position in which holding portion 12 is in the position 12′ shown in chain lines in FIG. 2. Spring 8 also returns the tabulator stop means 3, 5, 7, 9, 17, 25 to the initial position.

Due to the fact that the holding portion 12 of control member 13, and the holding portion 19 of escapement stop lever 18 extend different distances in the direction of movement of the portions 9 and 17 of the tabulator stop means 3, 5, 7, 9, 17, 25, it is assured that the escapement stop means 18, 19, 30–35 are released for movement to a position engaging and stopping the escapement means 23, 22 with the carriage 101, before the stop portion 3 of the tabulator stop means 3, 5, 7, 9, 17, 25 can be turned by spring 8 to the inoperative position, the desired and correct time sequence of the operations is assured.

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 escapement controlling tabulating apparatus differing from the types described above.

While the invention has been illustrated and described as embodied in a tabulating apparatus which reliably effects stopping of the escapement wheel 23 or rack bar 100 before the tabulator stop means 3, 5, 7, 9, 17, 25 separate from a set tab 4*a*, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can be applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly consitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

I claim:

1. Escapement controlling tabulating apparatus, comprising tabulator means including shiftable tabs selectively movable to a set position; escapement means having escapement teeth, and connected with said tabulator means for movement together, said tabulator means and escapement means being connected and biassed for movement together in one direction so that a set tab moves along a path in said one direction; biassed escapement stop means having a normal blocking position engaging said escapement teeth for blocking movement of said escapement means and of said tabulator means, and a releasing position, said escapement stop means having a first holding portion and a control recess following said first holding portion in said one direction; a support; biassed tabulator stop means mounted on said support for movement in said one direction, and also for transverse turning movement between an inoperative position, and a tabulating position located in said path for engagement by a set tab moving in said one direction so that said tabulator stop means is moved in said one direction, said tabulator stop means in said tabulating position engaging said first holding portion for holding said escapement stop means in said releasing position; and tabulator control means for moving said tabulator stop means to said tabulating position, and including a second holding portion for holding said tabulator stop means in said tabulating position during movement in said one direction, said first and second holding portions being dimensioned and positioned in said one direction so that during movement of said tabulator stop means in said one direction by said set tab, said tabulator stop means is located opposite said control recess for releasing said escapement stop means for biassed movement to said normal blocking position before said tabulator stop means is released by said second holding portion for biassed movement to said inoperative position.

2. Apparatus as claimed in claim 1 wherein said first holding portion is shorter in said one direction than said second holding portion so that said escapement stop means is released and said escapement means stopped before said tabulator stop means is retracted from said path.

3. Apparatus as claimed in claim 1 wherein said support includes a shaft extending in said one direction; and wherein said tabulator stop means is mounted on said shaft for turning movement between said inoperative and tabulating positions, and for axial movement by said set tab.

4. Apparatus as claimed in claim 1 wherein said tabulator stop means includes a stop portion located in said path in said tabulating position, an actuating portion cooperating with said first holding portion and with

said control recess of said escapement stop means, and a latch portion with a guide edge engaged by said tabulator control means and having an arresting recess at the end of said guide edge engaged by said second holding portion in said tabulating position for holding said tabulating stop means in said tabulating position.

5. Apparatus as claimed in claim **4** wherein said latch portion is at said arresting recess substantially longer in said one direction than said first holding portion.

6. Apparatus as claimed in claim **1** comprising biassing means urging said tabulator stop means to move opposite to said one direction, and to turn to said inoperative position; and wherein said tabulator control means, when turned, engages said tabulator stop means for moving said tabulator stop means from said inoperative to said tabulating position.

7. Apparatus as claimed in claim **1** wherein said escapement stop means include a spring biassed stop lever having said control recess, said first holding portion on one side of said control recess, and a projecting pawl portion on the other side of said control recess cooperating with said escapement teeth of said escapement means.

8. Apparatus as claimed in claim **1** wherein said tabulator stop means includes a stop portion located in said path in said tabulating position, an actuating portion cooperating with said first holding portion and with said recess of said escapement stop means, and a latch portion with a guide edge engaged by said tabulator control means and having an arresting recess at the end of said guide edge engaged by said second holding portion in said tabulating position for holding said tabulating stop means in said tabulating position; wherein said actuating portion and said latch portion are located on opposite sides of said stop portion; and wherein aid escapement stop means and said tabulator control means are located on opposite sides of said tabulator stop means.

9. Apparatus as claimed in claim **8** wherein said support includes a shaft extending in said one direction; wherein said tabulator stop means is mounted on said shaft for turning movement between said inoperative and tabulating positions, and for axial movement by said set tab; comprising biassing spring means urging said tabulator stop means to move opposite to said one direction, and to turn to said inoperative position; and wherein said tabulator control means, when turned, engages said latch portion of said tabulator stop means for moving said tabulator stop means from said inoperative to said tabulating position.

10. Apparatus as claimed in claim **9** wherein said escapement stop means include a spring biassed stop lever having said control recess, said first holding portion on one side of said control recess, and a projecting pawl portion on the other side of said control recess cooperating with said escapement teeth of said escapement means; wherein said escapement means includes a wheel having said escapement teeth on the periphery thereof; wherein said tabulator means includes a wheel carrying said tabs for radial movement to and from said set position; and wherein said wheels are concentric.

* * * * *