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FRICTION DRIVE FOR TABULATING MACHINE COUNTERS

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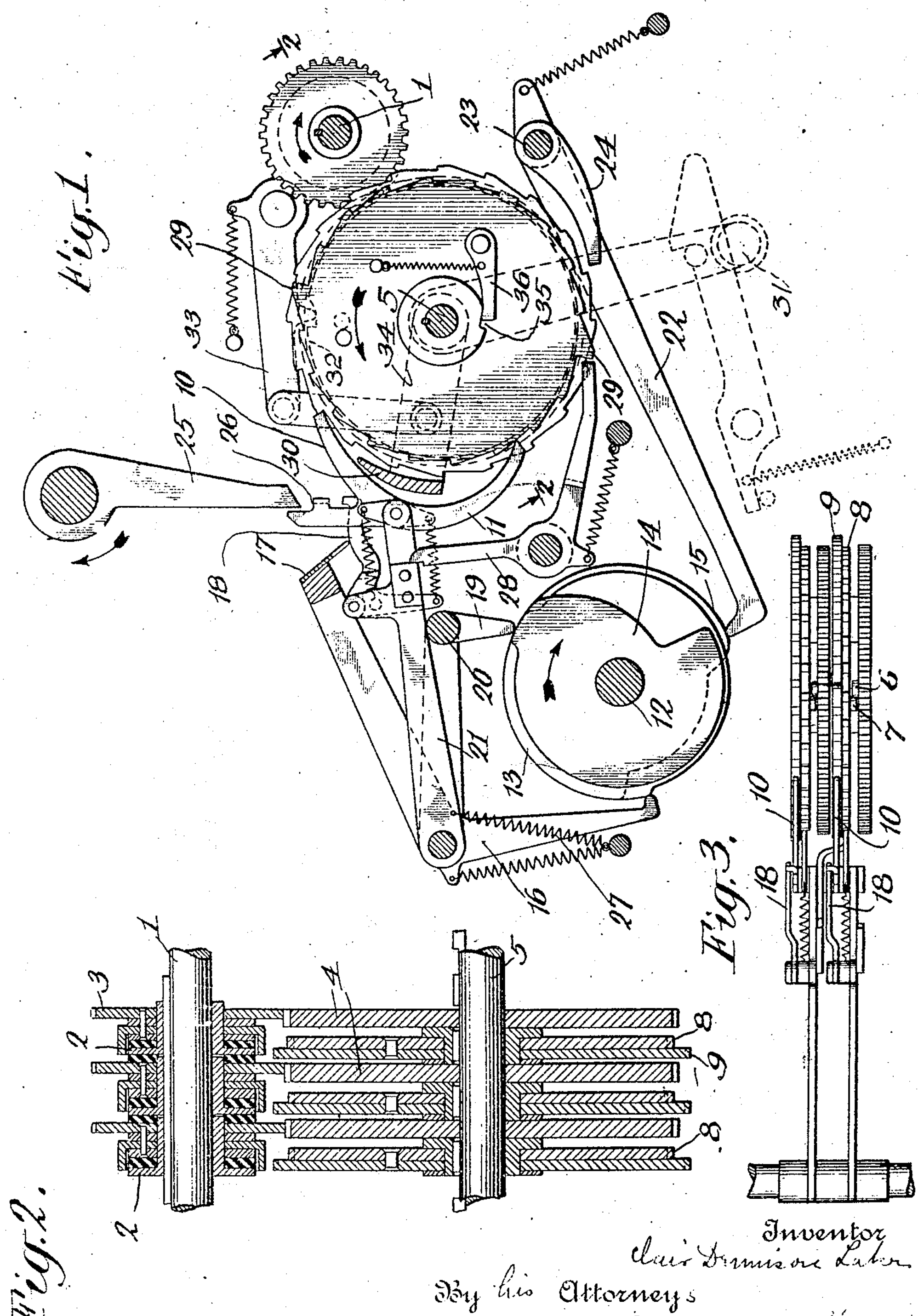

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UNITED STATES PATENT OFFICE.

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FRICTION DRIVE FOR TABULATING-MACHINE COUNTERS.

Application filed April 21, 1921. Serial No. 463,199.

To all whom it may concern:

Be it known that I, CLAIR D. LAKE, a citizen of the United States of America, residing at Binghamton, in the county of Broome and State of New York, have invented certain new and useful Improvements in Friction Drives for Tabulating-Machine Counters, of which the following is a full, clear, and exact description.

The invention subject of my present application is an improvement in friction drives for the counters of tabulating or other like machines, and is based upon a modified form of such device, the original of which is shown and described in a companion application filed April 21, 1921.

For a more ready understanding of the nature and purpose of this improvement a certain amount of information with regard to tabulating machines and counters therefor is necessary, and for such information I may refer to my Patent No. 1,307,740, dated June 24, 1919, and to the now well known and widely used Hollerith tabulator.

In the case of such machines, a series of punched cards are run through under contact brushes and when a brush passes over a perforation it closes a circuit that operates a magnet in the counter at such point in a given cycle of operation as corresponds to the numerical value of that particular hole, and this magnet effects an operation of the counter by which the units, tens or other wheel of the device is turned to display or record such number. For example, if a card has the 9 hole punched in the units column, and the next card the 6 hole in the same column, the counter wheel will first indicate 9 units and then 1 ten and 5 units or the sum of the two numbers, and so on. A cycle of operation in such counters is usually one complete revolution of the counter drive shaft and occurs once during the passage of a single card through the machine or under the brushes.

In these counters as heretofore constructed the control of the type or indicating counter wheels by which they are caused to display or record the proper figures corresponding to the punched holes in a card or series of cards, is effected by the use of clutch mechanisms of various kinds which lock and release the counter wheel or wheels driving the same at the proper instants of time in a cycle, and such mechanisms involve more or less complication and a great number of parts, besides being somewhat delicate and liable to derangement. I have, therefore, sought to provide another means for driving or rotating the counter wheels, and in this application I shall set forth and describe one form of apparatus in which this is accomplished by means of a friction drive.

In the drawings hereto annexed I have shown only the counter mechanism proper, assuming that the tabulating machine with which it is designed to be used is sufficiently well known to require no special description or illustration. I have, moreover, assumed that these counters generally are so well known that I have not illustrated the specific construction in detail but have shown the working parts mainly in their theoretical, rather than in their actual physical, relations.

The drawings, therefore, show in Fig. 1 the mechanism of the counter assembled in its proper theoretical relations.

Fig. 2 is a sectional view on the line 2—2 of Fig. 1, and

Fig. 3 is an end view of a part of the driving gear and attached parts.

In my application above referred to the frictionally driven counter is designed to work with a tabulating machine in which the cards are passed through the machine or under the brushes in an inverted position or upside down, while in the present case the tabulator cards are fed right side up, so that the 9 holes or those of highest numerical value pass first under the brushes, and in this as in most machines of this character, there is a positive stop position of the mechanism which occurs at a predetermined time with reference to the position of a card with reference to the brushes.

Referring now to the drawings: 1 is the drive shaft impelled by any suitable source of power, and usually disconnected from the power when no cards are passing, in order to save unnecessary wear. On this shaft, as shown in Fig. 2, are fixed as many friction disks 2 as there are counter wheels, and each of these disks operatively engages with a gear wheel 3 loose on the drive shaft and meshing with a gear wheel 4 on a shaft 5.

In each gear wheel 4 is a pin 6 which is in the path of a pin 7 on a ratchet wheel 8 loosely mounted on the shaft 5 and fast

to this ratchet wheel 8 is a second and larger ratchet wheel 9. A pawl 10 is adapted to engage with the ratchet 9 and a second pawl 11 engages with the ratchet wheel 8.

On a shaft 12 are three cams 13, 14 and 15, which are driven at the same time and rate as the drive shaft 1. On cam 13 travels the end of a bell crank lever 16 that carries and controls the movements of a bail 17 adapted to engage with and depress spring-actuated latch levers 18. On cam 14 travels an arm 19 that raises and lowers a bail 20 engaging levers 21, that carry the pawls 10 and 11, and on cam 15 travels the end of a lever 22 that is fast to a rock shaft 23 to which are fixed pawls 24 engaging with the ratchets 9.

Normally the ratchets 9 are held against rotation by the pawls 10. Assuming, however, that a card is passing through the machine which has, say, the three hole in a given column punched, then when this hole passes under a brush a current is produced that operates to swing the arm 25 by what is known as a delayed action, but with regard to which this application is not concerned, and by the engagement of that arm with the cam surface of a vertical extension 26 of the pawl 10 the latter is moved.

This movement releases the pawl from engagement with the ratchet wheel 9 and locks it in such position by the engagement therewith of the latch lever 18. This permits the ratchet to turn, its release being effected at such point in the cycle that it will have permitted the corresponding counter wheel in gear with it to travel three number spaces by the time that the lever 16 has reached the high part of cam 13, and thereby thrown the bail 17 down, unlatched the pawl 10 and arrested the movement of the ratchet 9.

As the counter mechanism starts up and before a contact has been made through a number hole in a card, the bail 20, by the action of cam 14, allows the levers 21, which are held against the bail by springs 27, to drop until they engage stop levers or latches 28, which form one arm of bell crank levers adapted to be operated by high points 29 on the ratchets 8 of another order of units during that part of the cycle when the adding wheels of the counter are going from 9 to 0 in the window. When the lever 21 is thus unlatched, and this may occur at any time during the adding, the lever 21 drops a trifle until it is arrested by the bail 20, but this movement is not sufficient in extent to release the pawl 10.

Pivotally mounted on the shaft 5 is a bail 30 adapted to oscillate between the pawls 10 and the ratchets 9. The dropping of the levers 21 and of the pawls 10 does not bring the pawls into engagement with the bail 30, however, but at the carrying part of the cycle the bail 20 meeting the lower point on cam 14, drops to its lowest position and this movement causes the pawl 11 to move the ratchet with which it engages ahead one tooth, and by such movement to move the pin 7 ahead of pin 6, and to bring the pawl 10 into engagement with the bail 30 and thereby release said pawl from engagement with its ratchet.

Prior to this action the lever 22 has reached the low point on cam 15 and has brought the overthrow lock or pawl 24 into engagement with a tooth of the ratchet 9, so that ultimately the pin 6 will catch up with and re-engage the pin 7. The overthrow pawl 24 disengages the ratchet 9 during the time that the bail 20 is at its highest position.

Let it now be assumed by way of illustration that the counter or adding wheels register and display at the window 0999, and that one unit be added to this total: the units ratchet will move one tooth or 1/20 of a complete revolution because the ratchets are geared to the adding wheels in the ratio of 2 to 1, and during this movement a long tooth 29 of ratchet 8 engages the latch lever 28 of the units ratchet and allows lever 21 of the tens ratchet with which its other end engages to drop. This movement of the tens lever drives the tens ratchet ahead one tooth, which causes a long tooth 29 on that ratchet to engage the latch lever of the tens ratchet to release the lever 21 of the hundreds ratchet, and so on. In this way the carrying is effected.

The operation of resetting to zero is effected by the following means. The shaft 5 is turned by a handle 31 through one complete revolution, and at the start of such movement a cam 32, shown in dotted lines in Fig. 1, and which is fixed to the shaft 5, raises a lever 33 which is connected by a link with one of the arms 34 of the bail 30, which raises that bail and thus disengages pawls 10 from the ratchets 9. The adding wheels do not start to revolve until a tooth 35 in a collar fixed to shaft 5 engages a pawl 36 carried by the ratchets 8. At the very end of the movement of rotation of the shaft 5 the lever 33 drops into a low part of the cam 32 and this permits the bail 30 to drop and the pawl 10 to re-engage these ratchets and thus prevent overthrow. The complete resetting to zero is not finally accomplished until the machine starts again and brings a tooth of ratchet 9 against the pawl 10.

Having now described the plan of construction and mode of operation of my improved counter, what I now claim is:—

1. In a counter for tabulating machines and the like, the combination of the following elements: a main drive shaft, counter

and gear wheels loosely mounted thereon and friction disks operatively engaging said gear wheels, a counter shaft, gear wheels loose thereon in mesh with the gear wheels on the drive shaft, and ratchet wheels driven by said gear wheels, pawls normally locking said ratchet wheels, means for disengaging said pawls therefrom at such points in the cycle of operation that the counter wheels will be moved the number of spaces corresponding to the time from that at which the pawl was released until the pawl is at another given point in the cycle restored to engagement, and cam-operated means for so restoring the pawl to engagement.

2. In a counter for tabulating machines and the like, the combination of the following elements: friction driven counter and connected gear wheels, ratchet wheels in gear with the said connected wheels, pawls normally locking the ratchet wheels, a cam-controlled means for bringing said pawls into their locking position at a given point in each cycle of operation, and means for unlocking said pawl at such instants in the cycle as will permit the ratchet and counter wheels to turn through the desired number of spaces before the operation of the cam-controlled locking means.

3. In a counter for tabulating machines and the like, the combination of the following elements: a series of frictionally driven and connected gear wheels, gear wheels in mesh therewith, two connected ratchet wheels with oppositely disposed teeth driven by the last named gear wheels, pawls normally engaging each of said ratchet wheels, means for unlocking one of such pawls at predetermined instants in each cycle, cam-controlled means for restoring their engagement at a fixed point in each cycle, cam-controlled means for advancing by means of the other of said pawls the ratchet wheels one tooth while the first-named pawls are unlocked, and means controlled by the ratchets for one order of units for permitting the advance of such means of the ratchets of the next higher order of units in the operation of carrying.

4. In a counter for tabulating machines and the like, the combination of the following elements: a drive shaft and frictionally driven counter and connected gear wheels therein, a counter shaft, gear wheels meshing with the counter gear wheels, two ratchets with oppositely disposed teeth in fixed relation and driven by the gear wheels in the counter shaft, pawls normally engaging both of said ratchet wheels, means for unlocking one of said pawls at the desired instant, cam-controlled means for restoring said pawls to locking engagement at a given point in each cycle, a bail for unlocking the said pawls, and cam-controlled means on the counter-shaft for operating said means, whereby, when the counter-shaft is revolved the counter wheels may be reset to zero position.

In testimony whereof I hereto affix my signature.

CLAIR DENNISON LAKE.