Dec. 31, 1957 W. T. SAGNER 2,818,153

DECELERATING DEVICE

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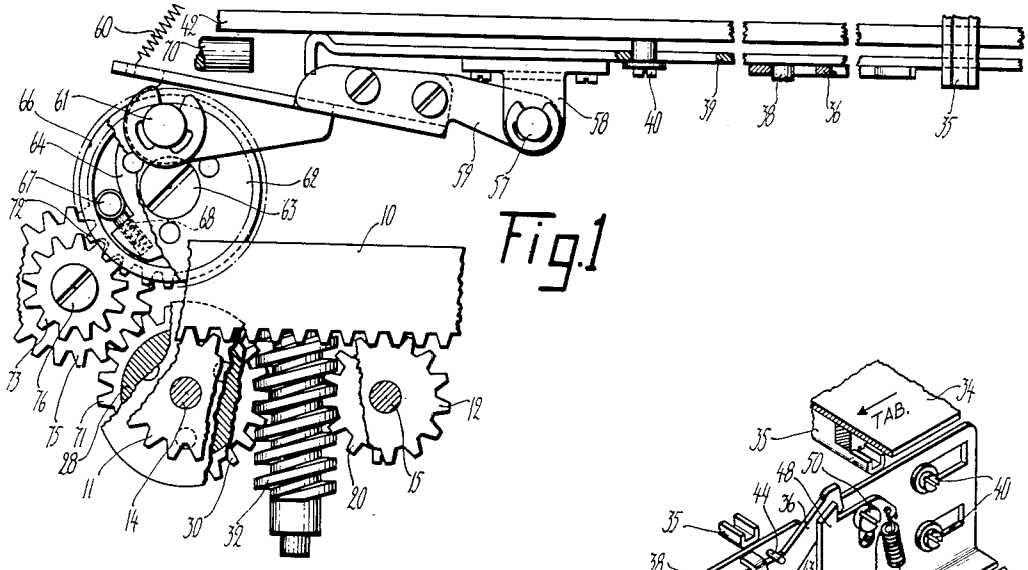


Fig.1

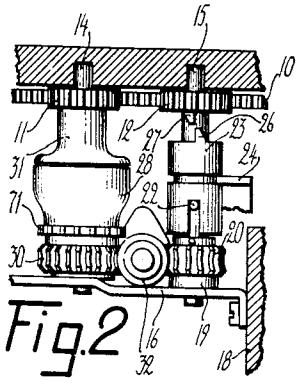


Fig.2

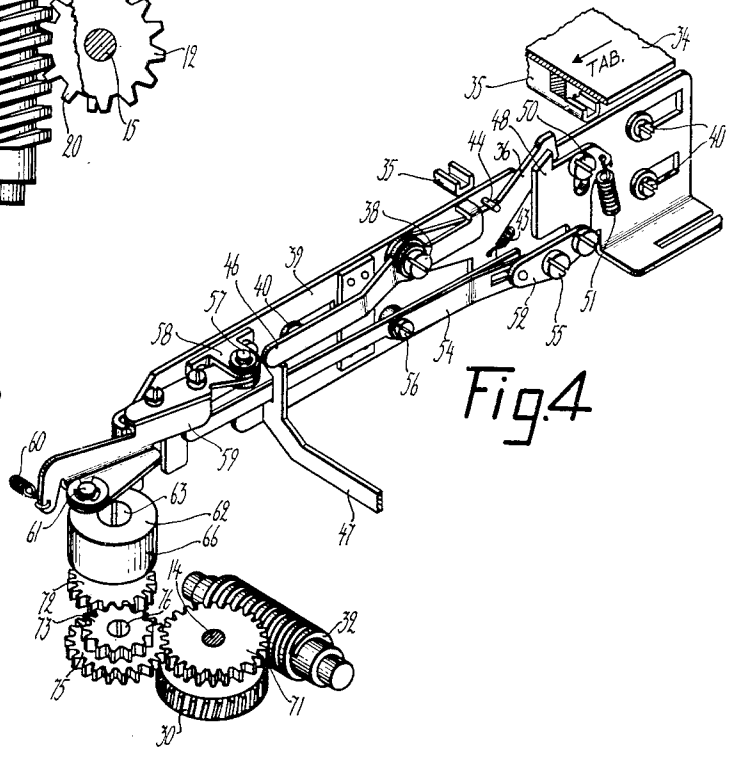


Fig.4

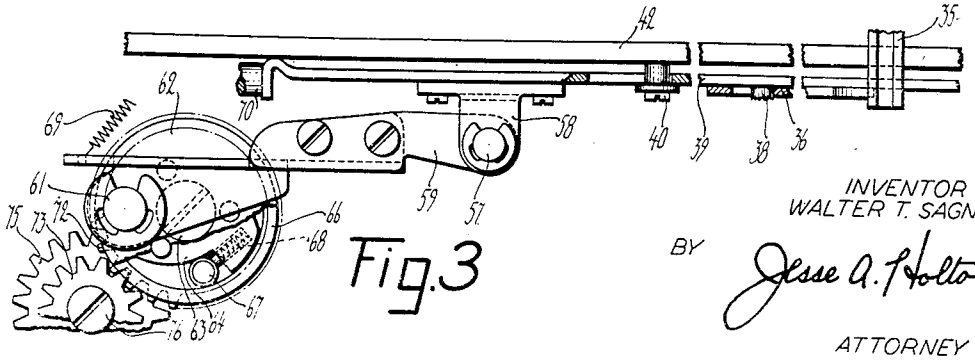


Fig.3

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DECELERATING DEVICE

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4 Claims. (Cl. 197—64)

This invention relates to a device for smoothly arresting a moving member at a predetermined point or points and more particularly to a reliably operating device to terminate tabulation of an accounting machine carriage.

The work sheet holding carriages of accounting machines have over the years increased in size and complexity until present carriages may weigh as much as fifty pounds or more. During operations of the machine, such carriages are driven by a strong spring from one position to another position at which the carriage must be arrested and held within very narrow limits and yet, the carriage must be moved at the maximum safe speed to enable efficient use of the machine. Decelerating of such carriages from top speed to a stop within a very short distance, approximately one-half inch, and with a minimum of shock has previously been controlled by a dash pot buffer but such a buffer is not satisfactory. Dash pots in general are subject to considerable variations in resistance due to loss or variation in oil, wear, dirt, etc., and also are likely to cause rebound of the carriage from the final position.

It is an object of this invention to devise an arresting device which will smoothly arrest a relatively heavy and fast moving member in a short distance with no substantial shock.

It is also an object of this invention to provide such an arresting device which will not vary in its action over a long period of time.

Another object is to provide an arresting device which will stop a moving member at a predetermined location with a comparatively short decelerating zone and without shock.

Still another object of the invention is the provision of such an arresting device which is not capable of causing a rebound of the arrested member.

Other objects will be obvious from the following description of a preferred embodiment of the invention and by reference to the appended drawings.

In the drawings:

Figure 1 is a plan view of the structure of the invention,

Figure 2 is an elevation of a part of the power train of Figure 1,

Figure 3 is a plan view of a portion of Figure 1 showing the parts in operated position, and

Figure 4 is an isometric showing of the arresting mechanism of Figure 1.

The accounting machine to which the present invention is applied is of the well known "Sundstrand" type shown in U. S. Patent No. 2,194,270, issued March 19, 1940, to O. J. Sundstrand disclosing generally the accounting machine and No. 2,536,524, issued January 2, 1951, to Walter Anderson showing the present style carriage and for this reason need not be further described herein.

In accounting machines of this class the carriage is positively driven in a return direction and is controlled in speed during movement in a tabulating direction by a driven shaft with a spring providing the power for driving the carriage during tabulation movements. The carriage is arrested after a tabulation movement by a yieldably mounted tabulator stop which is engaged by a member on the carriage. As such carriage members are mounted on the carriage to determine a columnar position and may be as close as four tenths of an inch apart, a decelerating device to be fully effective must operate within such a small distance.

Referring now to Figure 2 of the drawings, a rack bar 10 is secured to the machine carriage and is engaged by two pinions 11 and 12 mounted on spindles 14 and 15, respectively, secured to a bracket 16 fixed on a stationary part 18 of the machine frame. Rotatable on spindle 15 is a sleeve 19 having a worm gear 20 and a pin 22 secured thereto. A second sleeve 23, rotatable and slidable on spindle 15, is slotted to embrace pin 22 and is slidable by a carriage return arm 24 to engage a tooth 26 with a tooth 27 on pinion 12 to drive the carriage to the right for carriage return.

Rotatable on spindle 14 is a casing 28 having a worm gear 30 secured thereto and forming, with a member 31 secured to pinion 11, an overrunning clutch more particularly described in the above noted Patent No. 2,536,524. This clutch will limit carriage movement to the left to a predetermined speed. A worm 32 between worm gears 20 and 30 is continuously driven by a motor, not shown, to rotate the sleeve 19 and casing 28 at predetermined speeds.

The mechanism for retaining the carriage at a columnar position and for arresting it after a tabulation movement is substantially similar to the mechanism shown in the above patents. As best shown in Figure 4, a control plate 34 mounted in the carriage has secured thereto a number of column stops 35. The carriage is spring urged to the left and normally is retained in a columnar position by the engagement of a column stop 35 with a tabulator stop 36 pivoted on a stud 38 fixed in a plate 39 which is slidable on studs 40 secured in a stationary frame plate 42. Tabulator stop 36 is rocked counterclockwise in Figure 4 by a spring 43 into engagement with a stop pin 44 to hold the tabulator stop in position to intercept a column stop 35 during leftward movement of the carriage. A lever 46 pivoted on stud 38 has a bent off ear resting on top of the tabulator stop and its left arm is above an actuating arm 47.

A counterstop 48 to restrain the carriage from free movement when tab stop 36 is depressed is slidable on a stud 50 in plate 39 and is urged downward into ineffective position by a spring 51. A pair of connected levers 52 and 54 pivoted respectively on studs 55 and 56 in plate 39 are connected at one end to counterstop 48 and at the other end rest on actuating arm 47 to project counterstop 48 when the tabulator stop 36 is withdrawn from the column stop 35. This tabulator stop mechanism is more completely set out in the above noted patents and need not be further described herein.

In operation, the carriage will normally be positioned with its column stop 35 engaging the tabulator stop 36 and holding it and plate 39 to the left. Upon operation of actuating arm 47, stop 36 will be lowered and counterstop 48 will be raised to permit a slight leftward movement of the carriage by its customary actuating spring (not shown). When arm 47 is restored, counterstop 48 is withdrawn by its spring 51 to free the carriage for leftward movement until a succeeding column stop 35 engages stop 36 and moves stop 36 and plate 39 leftward to the final stopping position. When counterstop 48 is withdrawn from stop 35, plate 39 is moved rightwardly by a spring to be later described to engage the next column stop 35 a short distance before the carriage reaches its final position.

An arresting device is provided to enable a smooth

deceleration of the carriage between the point at which a stop 35 engages tabulator stop 36, at which point the carriage is travelling at its maximum velocity, and the leftmost, carriage arresting, position of plate 39 and stop 36. Pivoted on a stud 57 in a bracket 58 fast on plate 39 is an arm 59 made of two parts adjustably secured together. A spring 60 connected between the left end of arm 59 and a stationary machine part serves to urge arm 59 clockwise, and to the right in Figure 1 to shift plate 39 to the right when stops 36 and 48 are free of column stop 35. The left end of arm 59 is pivoted on a stud 61 fixed to a cap 62 freely rotatable on a spindle 63 fixed in bracket 16, Figure 2. A notched cam plate 64, Figures 1 and 3, is fixed to the bottom of cap 62 to rotate with it. Also rotatable on spindle 63 below cap 62 and surrounding cam plate 64 is a casing 66. Freely movable in the outwardly tapered notches of cam plate 64 and inside casing 66 are rollers 67, each pressed in a clockwise direction to a jamming position between the cam plate 64 and casing 66 by a spring 68. The cap 62, cam plate 64, casing 66, rollers 67 and springs 68 form an overrunning clutch of a well known type and will prevent counterclockwise movement of cap 62 and cam plate 64 at a speed faster than the rotation of casing 66.

The length of arm 59 is adjusted so that when plate 39 is in its right hand position to intercept a column stop 35, the line between pivots 57 and 61 and the line between pivot 61 and spindle 63 are substantially at right angles with the radius of pivot 61 being approximately equal to the free motion of plate 39. Leftward motion of plate 39 by column stop 35 will then be limited in speed by the rotation of casing 66 since cam plate 64 cannot, as above pointed out, rotate faster than casing 66. Also because pivot 61 moves about spindle 63, the leftward motion of plate 39 will approximate simple harmonic motion and will be shocklessly arrested when pivots 57 and 61 and spindle 63 are in a straight line. In actual practice, to avoid possible jamming of arm 59 at the dead center position, plate 39 is arrested by a stop 70 which is engaged by the left end of slide 39 a few degrees before such dead center at which time the carriage is moving very slowly.

In theory, the casing 66 should be rotated at a speed such that the maximum velocity of pivot 61 is the same as that of the carriage to be arrested. It has been found, however, that due to manufacturing tolerances, initial slippage between cam plate 64, rollers 67, and casing 66 and similar unavoidable departures from an ideal condition, that the best results are obtained when the actual speed of rotation of casing 66 is approximately one-half of the theoretically correct speed, the actual ratio, of course, depending upon other factors such as the diameter of casing 66, the radius of pivot 61 and their relation to the required tolerances.

Casing 66 is driven from casing 28 through a system of speed reducing gearing comprising a gear 71 secured to casing 28, a gear 72 secured to casing 66 and a pair of gears 73, 75 secured together for rotation on a stud 76 in bracket 16 and meshing between gear 71 and 72. The drive ratio between casings 28 and 66 is selected to drive casing 66 at the speed determined to give the smoothest arrest to the machine carriage.

A decelerating device of this type has been found to retain its characteristics unchanged over a substantial interval and to require far less service than dash pots and comparable stopping devices with additional benefits due to lack of shock and rebound of the carriage.

The above description of a preferred embodiment of the invention is illustrative only and is not to be taken in a limiting sense as the device is, with obvious modifications, useful in stopping any object moving at a limited speed.

What is claimed is:

1. A decelerating device to arrest an object having a projection thereon and moving at a velocity having a predetermined maximum, said device comprising a slidable stop engageable with said projection, an overrunning clutch having parts rotatable in only one direction relative to each other, an arm connected between said stop and a radial point on one part of said clutch, and drive means connected to the other part of said clutch to limit the speed of rotation of said first part by said stop when driven by said moving object.

2. A carriage decelerating device to arrest a linearly moving carriage having a projection thereon, said device including a stationary part, a stop member slidable on said stationary part by said projection, a clutch comprising a rotatable casing, a notched cam plate and rollers in the notches of said cam plate, an arm connected to said slidable stop member and to a radial point on said cam plate, and means to drive said clutch casing at a rotational speed related to the velocity of said carriage.

3. A decelerating device to arrest a linearly moving carriage having a projection thereon, said device comprising a stop member engageable with said projection and driven thereby, means to mount said stop member for slidable movement, a clutch having two parts rotatable in only one direction relative to each other, an arm connected between said stop member and a radial point of one part of said clutch to rotate said part when said stop member is driven by said carriage, and means to drive the other part of said clutch at a speed related to the speed of said carriage, to limit the rotational speed of said first clutch part.

4. An accounting machine of the class described including a linearly movable carriage, a projection thereon, means to limit the maximum velocity of said carriage in one direction, a spring urged tabulator stop engageable with said projection and movable thereby against the urge of said spring, a rotatable member, an arm connected to said tabulator stop and to said rotatable member at a point on a radius of said member which radius is, when said stop is not engaged with said projection, substantially perpendicular to the line of motion of said stop, a sleeve rotatable on the axis of said rotatable member, means driving said sleeve at a substantially uniform speed and means intermediate said sleeve and said rotatable member to limit the maximum rotational speed of said rotatable member whereby the linear speed of said stop and said carriage engaged therewith is smoothly reduced to zero.

References Cited in the file of this patent

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