

March 31, 1953

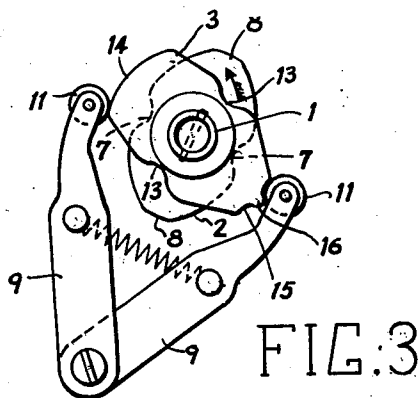
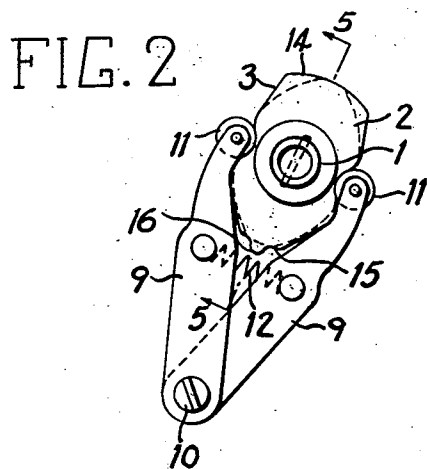
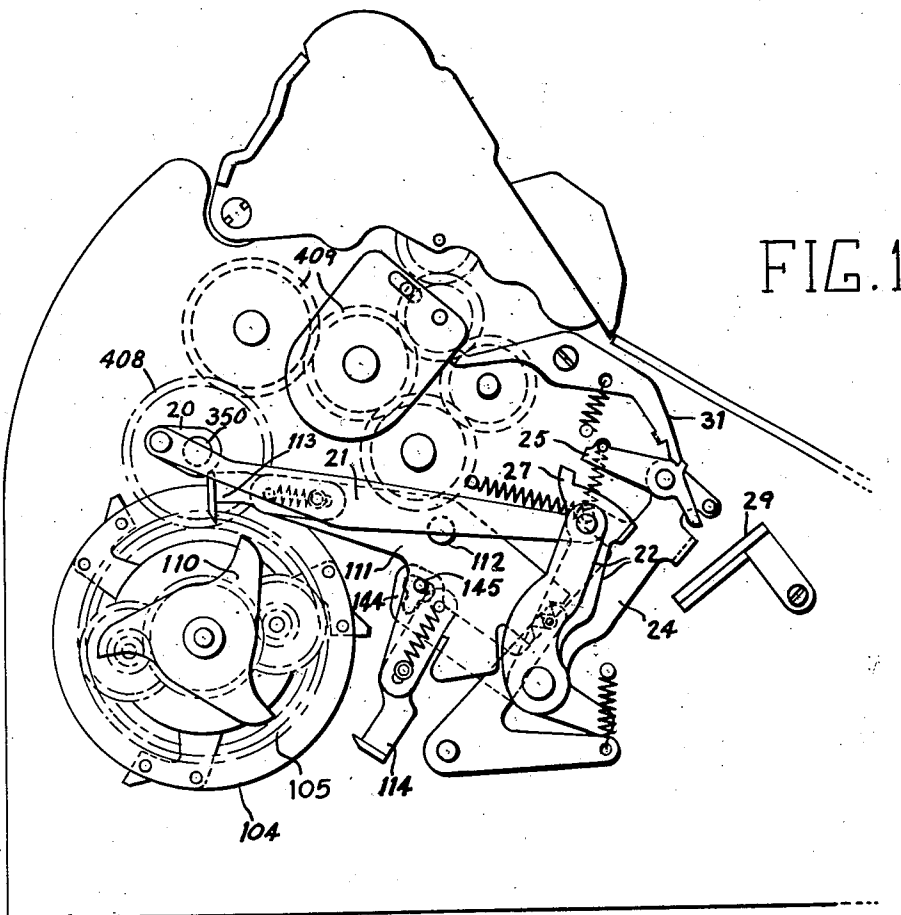
G. C. CHASE

2,633,220

FULL CYCLE LOCATING MEANS FOR CALCULATING MACHINES

Filed Sept. 2, 1949

2 SHEETS--SHEET 1



Inventor
GEORGE C. CHASE

George H. Lorch
Attorney

March 31, 1953

G. C. CHASE

2,633,220

FULL CYCLE LOCATING MEANS FOR CALCULATING MACHINES

Filed Sept. 2, 1949

2 SHEETS—SHEET 2

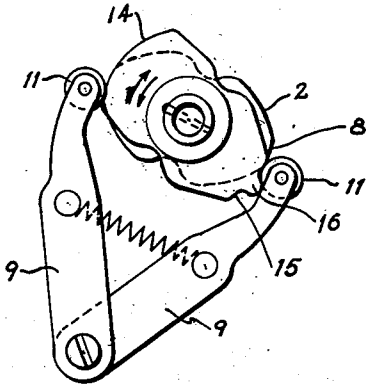


FIG. 4

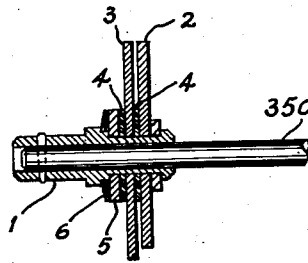


FIG. 5

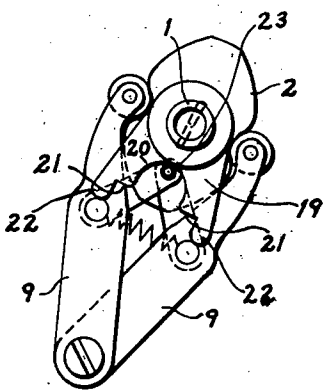


FIG. 6

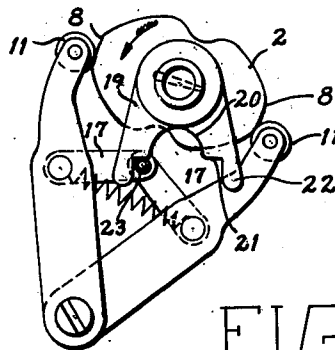


FIG. 7

Inventor
GEORGE C. CHASE

35

George H. Lorch
Attorney

UNITED STATES PATENT OFFICE

2,633,220

FULL CYCLE LOCATING MEANS FOR
CALCULATING MACHINES

George C. Chase, South Orange, N. J., assignor
to Monroe Calculating Machine Company,
Orange, N. J., a corporation of Delaware

Application September 2, 1949, Serial No. 113,796

4 Claims. (Cl. 192—148)

1

The invention relates to locating means for cyclically operable mechanisms in calculating machines whereby such mechanisms are brought to rest in a definite fixed position upon termination of a single or a plurality of cyclic operations.

The invention is shown as applied to the cyclically operable actuating mechanism of a calculating machine and is an improvement on the full cycle locating means disclosed in the patents to George C. Chase, No. 2,233,912, issued on March 4, 1941, and to Edward C. Walter, No. 2,101,767, issued December 7, 1937.

The locating devices as shown in the above noted patents customarily comprise a locator cam rotatably connected with the actuating mechanism and spring urged centralizing means adapted for engagement with a low portion of the cam, thereby locating the actuators in full cycle position. In the patented machines, as in the present invention, the locating devices are disclosed as adapted for operation in conjunction with stopping means which are operable to disconnect the actuator drive after the actuators have passed through full cycle position in either direction of operation and then to cause the actuators to rebound toward full cycle position. These devices include means whereby the spring urged centralizing means will be held dormant between successive cycles of operation and released for the locating operation at the time cyclic operation terminates.

The prior art devices each have certain inherent deficiencies or disadvantages which are overcome by the present invention. For example, the Chase devices place a limitation on the speed of cyclic operation because the member which renders the spring urged centralizing means dormant until the termination of cyclic operation is subject, at high speeds, to overrun by momentum at the time it should render the centralizing means effective. The present invention overcomes this deficiency.

Furthermore, these same members of the Chase patent must be and are so related to the locating cam that the range of action of the centralizing member is limited to approximately half the possible range of action if the dormancy control member were not present. The present invention provides for between cycle dormancy of the centralizing means without diminishing the range of locating action.

The earlier Chase device also had the inherent disadvantage of imposing a considerable burden on the driving motor because of the relatively

2

heavy frictional drag applied to the dormancy control member. The present invention relates the dormancy control member to the centralizing devices of the Chase patent but introduce other means in such a way as to substantially reduce this frictional drag and the consequent load on the motor.

The devices of the Walter patent overcome some of the above noted disadvantages of the locating devices of the Chase patent but introduce other disadvantages. For example, the desired locating action should occur only after the reversal of the driving mechanism which is brought to rest in full cycle position. According to the Walter disclosure, the locating devices are and must be tripped into action by a movement which occurs before said reversal. It has been found in practice that this pre-reversal tripping and post reversal functioning of the locating devices require very critical adjustments and timing to avoid trouble caused by the pre-reversal tripping.

These critical adjustments are not required of the device of the present invention in which the locating action is not initiated until after the reversal. Furthermore, the devices comprise a self-contained unit not dependent on a tripping action by the reversal devices as in the Walter mechanism.

The invention, however, will best be understood from the following description when read with reference to the accompanying drawings in which:

Fig. 1 is a fragmentary left side elevation of a calculating machine of the Monroe type showing the actuator drive and the stopping means operable to disconnect the drive as disclosed in co-pending application, Ser. No. 8,548, now Patent No. 2,531,207, of Herman Gang.

Fig. 2 is a right side elevation showing the preferred form of the invention with the parts in normal position.

Fig. 3 is a view similar to Fig. 2 showing the locating devices as positioned during operation of the actuators.

Fig. 4 is a view similar to Fig. 3 showing the parts as positioned when about to be released for the locating operation.

Fig. 5 is a fragmentary sectional view taken on line 5—5 of Fig. 2.

Fig. 6 is a right side elevation showing a modified form of the invention with the parts in normal position.

Fig. 7 is a view similar to Fig. 6 showing the parts as positioned during operation of the actuators.

Machine drive

The invention is disclosed as applied to a machine of the Monroe type and many of those parts and machine elements which are common to such machines are given the reference numbers heretofore applied to corresponding parts in the patents herein referred to. The actuating mechanism (not shown) is driven by a suitable gear train 409 from the output gear 408 of a differential clutch mechanism 104 (Fig. 1). The differential clutch mechanism is constructed substantially in accordance with the disclosure of U. S. Patent No. 1,566,650, issued to G. C. Chase on December 22, 1925. Normally the gearing comprising both working legs of the differential drive rotate idly as described in the aforementioned patent; interruption of the movement of one leg causing the planet gears to move in their orbit in one direction accordingly rotating the output gear 408, and interruption of the movement of the other leg causing a movement in the other direction. The working legs of the differential drive are selectively arrested by means of a reversing clutch lever 111 fulcrumed on the frame at 112, and adapted for neutral, additive, and subtractive setting. Suitable operating keys (not shown) are provided to effect the setting of the lever from its central or inactive position to either of its active positions. Clockwise movement of lever 111 positions it to additive setting whereby a hook arm 114 of said lever will engage a lug on gear 105 forming one leg of the differential drive to interrupt the movement thereby causing rotation of the output gear 408. Conversely, counterclockwise movement positions the lever 111 to subtractive setting whereby a hook arm 113 thereof will engage a stop 110 of the other leg of the differential to interrupt its movement and cause rotation of the output gear 408 in the reverse direction.

Stopping mechanism

The operation of the stopping means is initiated upon release of a pawl 25 by a trigger 31 (Fig. 1) which finally results in returning clutch lever 111 to its central inactive position. The means whereby the operation of trigger 31 is effected has no particular relation to the operation of the devices of the invention and therefore forms no part of the present disclosure and will be described only briefly.

The operation of trigger 31 is effected in accordance with the particular registering operation to be terminated, e. g., by the release of the plus or minus bars (not shown) or by movement of the dividend wheels (not shown) in the control of a program of division.

Trigger 31 is normally in restraining engagement with a lug of spring urged pawl 25 which is mounted on stop arm 24. A rock arm 22 is reciprocally operated in timed relationship with the actuators by a link 21 and a crank 20 which is fixed on shaft 350 on which output gear 408 of the differential clutch is mounted. When pawl 25 is released by trigger 31, it will be rocked in counterclockwise direction by its spring. Upon movement of the actuating mechanism through full cycle position in either direction of operation, pawl 25 will be engaged by a shoulder 27 of rock arm 22 thereby coupling arm 24 for movement with arm 22. Arm 24 therefore will be carried against a fixed stop 29 to prevent further rotation of the parts in their original direction. In the movement of arm 24 against stop 29, a rearward extension 144 of

said arm will engage a pin 145 of reversing clutch lever 111, and through the action of one or the other of the two opposed cam faces of said extension will move said lever to its central or neutral position, thereby disconnecting the drive to the actuating mechanism.

As a result of the movement of spring tensioned arm 24 against stop 29, the parts will rebound in the reverse direction toward full cycle position and the actuating mechanism entrained therewith will be moved accordingly. Furthermore, in this reverse movement of arm 24, the retaining lug of pawl 25 will be engaged by trigger 31 thereby moving said pawl from engagement with shoulder 27.

Locating mechanism

The operation of the devices of the invention to locate the actuating mechanism in full cycle position is effected upon this reverse movement of the parts, i. e., this reverse movement is utilized to initiate the locating action. The full cycle locating means and the operation thereof will now be described.

Shaft 350 on which output gear 408 (Fig. 1) is fixed extends across the machine and exteriorly of the right side where a sleeve 1 (Fig. 5) is fixedly mounted on said shaft. A locator cam 2 (Figs. 2 to 7 inclusive) is keyed to said sleeve adjacent the rightmost end of the sleeve (Fig. 5). Cam 2 will therefore be rotatably driven in timed relationship with the shaft and with the actuating mechanism.

Locator cam 2 is provided with oppositely disposed low portions 7 and high portions 8 as best seen in Fig. 3. A centralizing device comprises a pair of arms 9 having a common pivotal mounting 10 on the frame of the machine. The free ends of the arms 9 are each provided with a roller 11 and are urged inwardly toward each other by a tension spring 12 having an end attached to each arm, thereby engaging the rollers with said low portions of cam 2 (Fig. 2) to locate the actuating mechanism in full cycle position. Upon rotation of the cam in either direction, arms 9 will be moved outwardly until rollers 11 are engaged by the high portions of the cam at which time a latching device will be moved into position to hold said arms in outward position (Fig. 3) and thereby permit free rotation of the mechanism. The means whereby the latching device is moved into holding position comprises a normally dormant biasing means which, upon rotation of locator cam 2, is rendered active, thereby urging the latching means toward latching position in one or the reverse direction in accordance with the direction of rotation of the cam.

In the preferred form of the invention (Figs. 2, 3, 4, and 5) the latching means comprises a shutter 3 rotatably mounted and axially adjustable on sleeve 1. As best shown in Fig. 5, shutter 3 is adapted to be frictionally biased upon rotation of sleeve 1 and cam 2. The friction biasing means comprises a pair of friction washers 4; one of which is positioned between cam 2 and the shutter 3 and the other between the shutter and a press washer 5 which is axially movable on sleeve 1. A spring member comprising a spring washer 6 engaging an annular groove in sleeve 1 is effective to urge press washer 5 to the right (Fig. 5) and thereby urge shutter 3 into frictional relationship with cam 2 and sleeve 1.

Shutter 3 is provided with oppositely disposed low portions 13 (Fig. 3) of similar size and

contour as low portions 7 of locator cam 2 and when rollers 11 are in engagement with low portions 7 (Fig. 2) they likewise engage the low portions 13 of the shutter. Oppositely disposed high portions 14 and 15 of the shutter have a radial dimension preferably slightly less than that of high portions 8 of the locator cam, and as the actual dimensional difference is in the order of a few thousandths of an inch, the difference is not apparent in the drawings. If the high portions of the shutter are not made slightly less than the high portions of the locator cam, the device would be operative, the difference being that the spring washer 6 should be somewhat stronger, to augment the frictional slip drive or bias of shutter 3.

Upon initial rotation of locator cam 2 in either direction from full cycle position, shutter 3 will be frictionally urged or biased in the same direction. When rollers 11 have been moved outwardly to the high portions 8 of the cam, said rollers will be located a slight distance outwardly of the radial extremes of the shutter. Rollers 11 will be held in this outmost position, by high portions 8 of locator cam 2, a sufficient time to permit the friction bias to rotate shutter 3 until a projection or arresting means 16, radially extending from the high portion 15 of the shutter, engages one or the other of rollers 11, depending on the direction of rotation, thereby preventing further rotation of the shutter in that direction. When the rotation of the shutter is thus arrested, its high portions 14 and 15 will be positioned between rollers 11 in accordance with the position of the parts as shown in Fig. 4, wherein the cam and shutter are rotated in counterclockwise direction as indicated by the inner arrow.

Upon further rotation of cam 2 (Fig. 3) rollers 11 will be released by the high portions of the cam and will thereupon engage the high portions of the shutter to hold arms 9 in outward position against the tension of spring 12, and it will be apparent that the bias resulting from the rotation of the cam will insure the maintenance of the shutter in holding position.

Upon each rotation of cam 2, the high portions thereof will engage rollers 11 and thereby move said rollers a very slight distance outwardly from the shutter. It has been found, however, that this momentary contact and the resultant slight movement of the parts results in no appreciable noise or vibration. Furthermore, it will be noted that the slightly greater radial dimension of the high portions 8 of the cam permits the use of a minimum amount of friction to move shutter 3 into holding position and upon operation of the stopping means to move said shutter reversely from holding position.

At the instant arm 24 is stopped against stop 29, the shutter 3 is not only at rest and so has no momentum tending to cause it to overrun but is positively held against any unwanted displacement at the time by projection 16. Consequently, the frictional bias required by the devices of the present invention may be substantially less than the frictional braking effect necessary to devices wherein a frictional brake is required to prevent overrun of the shutter at the instant of reversal. Because of this fundamental difference, the devices of the present invention will function correctly at the highest speeds attainable by mechanically operated calculating machines.

The instant reverse movement starts, the friction bias will be effective to move shutter 3 from holding position and thereby permit operation

of the full cycle locating means, as follows: The movement of the parts beyond full cycle position upon operation of the stopping means is such that locator cam 2 is moved into position wherein the high portions 8 engage rollers 11 and thereby move said rollers outwardly from shutter 3.

It will be apparent, therefore that upon the aforescribed rebound of the parts toward full cycle position (as indicated by the outer arrow in Fig. 4) and the resulting reverse rotation of cam 2, the friction bias will be effective to likewise reversely rotate shutter 3 out of holding position with rollers 11 of centralizing arms 9.

In contrast with the locating devices of the above mentioned Chase patent, it will be noted that the parts may be so designed that reverse movement of the shutter will almost immediately be effective to release arms 9 or, if desired, the arrangement may be such as to delay the release. This timing of the operation will be determined by the dimensions of the high portions 14 and 15 of the shutter and consequently the extent of the reverse movement required to move said high portions from between rollers 11. Released arms 9 will now be urged inwardly by spring 12 and rollers 11 will follow the side contours of the locator cam and shutter until finally engaging the low portions of the cam to locate the parts in full cycle position.

In the modified form of the invention (Figs. 6 and 7), the locator arms are held in outward position by a frictionally biased latching means adapted for holding engagement with a collapsible pair of links 17 connecting the arms. The outer ends of the links have pivotal attachment with locator arms 9 respectively and midway between said arms the inward ends of the link are pivotally connected to each other. When arms 9 are positioned inwardly with rollers 11 engaging the low portions of locator cam 2, links 17 are in upwardly collapsed position with their pivotal connection vertically raised to maximum distance above their pivotal attachment to arms 9. When arms 9 are moved outwardly to maximum distance upon rotation of cam 2, links 17 will have been moved downwardly toward but not reaching a straightened position (Fig. 7). It will be apparent, therefore, that linkage 17 is readily collapsible to permit the inward movement of arms 9 and that means to prevent the collapse of the linkage will operate to hold said arms in outward position. The latching means adapted to prevent the collapse of linkage 17 is constructed and operates as follows:

A latch 19 is rotatably mounted on sleeve 1 and is urged into frictional relationship with locator cam 2 in the same manner as described in connection with shutter 3. Latch 19 is provided with a centrally located recess 20 in its lower edge, and at either side of the recess a latching edge 21 and stop lug 22. When arms 9 are inwardly positioned (Fig. 6) a roller 23 carried by the pivotal connection of the two links 17 is positioned upwardly within recess 20. Upon rotation of cam 2 in either direction from full cycle position, latch 19 will be frictionally biased as described in connection with shutter 3. When cam 2 has rotated to the position (Fig. 7) wherein the high portions 8 engage rollers 11, roller 23 will have been moved downwardly to a distance which will permit the friction bias to rotate latch 19 to move one or the other of edges 21 above roller 23 and a stop 22 into engagement with the roller. Upon further rotation of cam 2, roller

23 will be allowed a very slight upward movement to engage the holding edge 21 and arms 9 will be held in outward position by restrained links 17. It will readily be seen that upon operation of the stopping means, the reverse rotation of cam 2 will likewise be effective to cause rotation of latch 19 in the same manner as described in connection with shutter 3. The latching edge 21 will therefore be moved from position above roller 23 to permit the collapse of links 17 and the centralizing rollers 11 to be moved into locating engagement with the low portions of cam 2.

Although there have been shown and described specific embodiments of the full cycle locating means, it will be apparent that variations may be effected in the structural details without departing from the novel arrangement of the parts and principles of operation. For example, the biasing means for the latching device may comprise means duplicating the operation of the friction means wherein relative movement between the locator cam and the latching means is permitted. Such duplication of the principles of operation could be effected by a magnetic coupling between the locator cam and the latching means. Also, it may be found desirable to locate fixed stops on the framing of the machine for arresting engagement with a lateral projection on the latching means in lieu of the radial projection 16 of shutter 3 or lugs 22 of latch 19.

Furthermore, as hereinbefore noted, the invention is not restricted to an arrangement wherein there is a fixed dimensional relationship between the locator cam and the latching means, or to a precise configuration of the parts. For example, the holding edges of the latching means may be contoured to urge rollers 11 outwardly beyond the radial extremes of locator cam 2 and thereby prevent the high portions 8 of the cam from engaging the rollers upon each rotation of the cam.

It will be apparent that although the locating means have been shown as operating in conjunction with a particular form of stopping means, the invention is applicable to use with other forms wherein a reverse movement of the mechanisms is effected as an incident to the stopping operation.

Although the invention has been illustrated as applied to the actuator driving means of a calculating machine, it is applicable to any cyclically operable drive which may be provided with a limited reverse movement incidental to the location of the driven member in full cycle position, regardless of what the driven member may be.

I claim:

1. In a calculating machine having cyclically operable mechanism and stopping means operable to cause reverse movement of said mechanism; full cycle locating means for said mechanism, comprising a locator cam rotatably connected with said mechanism and having oppositely disposed low portions and oppositely disposed high portions, a pair of oppositely disposed centralizing members spring tensioned inwardly for engagement with said cam and outwardly movable from said low portions to said high portions of said cam upon initial rotation thereof, latching means comprising a shutter rotatably mounted in axial alignment with said locator cam, friction biasing means including a spring

member for urging said shutter into frictional relationship with said cam and effective upon initial rotation of said cam to rotate said shutter into holding engagement with said centralizing members thereby restraining said members against the tension of their spring from movement to said low portions of said cam, arresting means for preventing rotation of said shutter beyond its holding position and means comprising said biasing means and effective in response to the reverse movement of said mechanism upon operation of said stopping means for rotating said shutter from holding engagement with said centralizing members.

2. The invention according to claim 1 wherein the arresting means for the shutter comprises a portion radially projecting therefrom and movable into stopping engagement with one of the centralizing members upon rotation of said shutter to holding position.

3. The invention according to claim 2 wherein the cyclic mechanism is reversely operable, the stopping means is operable to cause reverse movement of said mechanism from either direction and the arresting means is movable into stopping engagement with one or the other of the centralizing devices respectively upon rotation of said shutter in one or the other direction to holding position.

4. In a calculating machine having cyclically operable mechanism and stopping means operable to cause reverse movement of said mechanism; full cycle locating means for said mechanism, comprising a locator cam rotatably connected with said mechanism and having a low portion and a high portion, a centralizing member spring tensioned inwardly for engagement with said cam and outwardly movable from said low portion to said high portion of said cam upon initial rotation thereof, latching means comprising a shutter rotatably mounted in axial alignment with said locator cam, friction biasing means including a spring member for urging said shutter into frictional relationship with said cam and effective upon initial rotation of said cam to rotate said shutter into holding engagement with said centralizing member thereby restraining said member against the tension of its spring from movement to said low portion of said cam, arresting means for preventing rotation of said shutter beyond its holding position and means comprising said biasing means and effective in response to the reverse movement of said mechanism upon operation of said stopping means for rotating said shutter from holding engagement with said centralizing member.

GEORGE C. CHASE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,101,767	Walter	Dec. 7, 1937
2,155,594	Hart	Apr. 25, 1939
2,233,912	Chase	Mar. 4, 1941
2,236,355	Russell	Mar. 25, 1941
2,339,089	Martin	Jan. 11, 1944