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REGISTER TRANSFER MECHANISM

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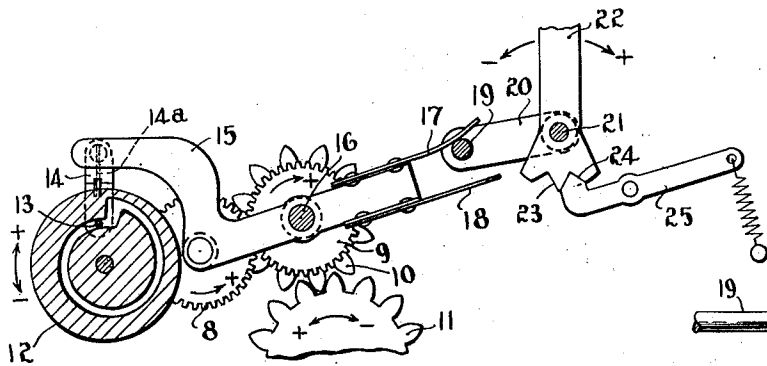


Fig. 1

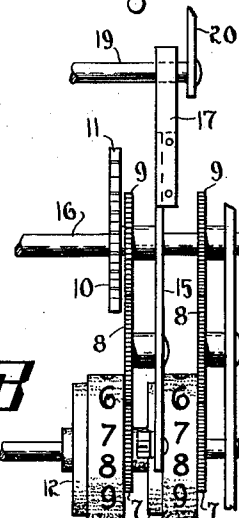


Fig. 2

Fig. 3

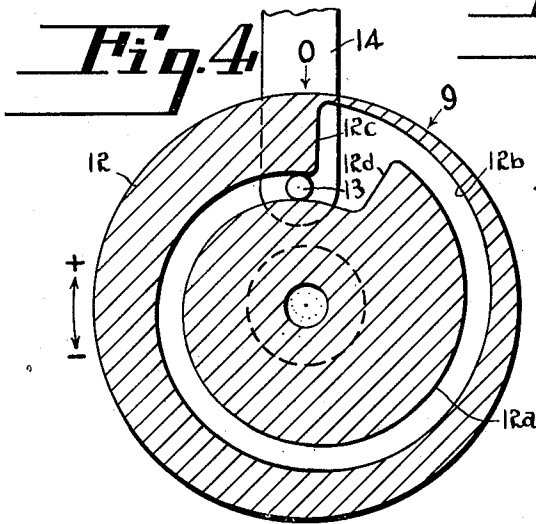


Fig. 4

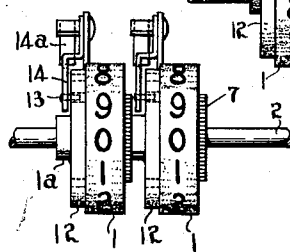
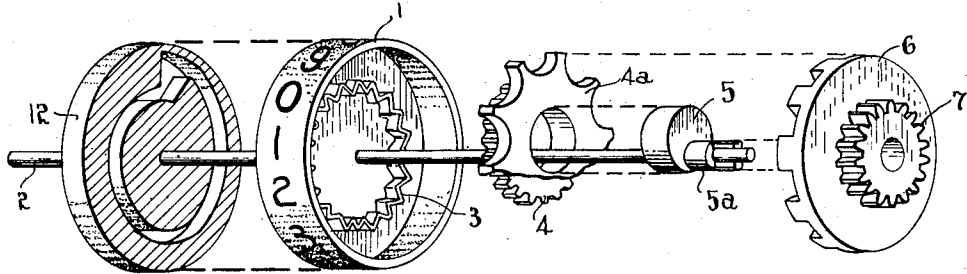


Fig. 5



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REGISTER TRANSFER MECHANISM

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5 Claims. (Cl. 235—136)

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The present invention relates to improvements in register transfer mechanisms and particularly to transfer mechanisms of the "crawl" carry type.

In registers having "crawl" carry types of transfer mechanisms, a "snail" type cam rotatable with each of the numeral wheels may be adapted to control means to counteract the carry movements transmitted from lower to higher order wheels upon additive rotation of the wheels from 0 to 9, and upon passage of a wheel from 9 to 0, the associated "snail" cam provides that the next higher order wheel will be advanced the distance of the counteracted carry movement. Because of the "snail" cams the numeral wheels are always in aligned or reading position. Registers having this type of carry control, however, are not adapted for minus or reverse operation because the cam followers are brought into abutment with the steep rise of the "snail" cams upon passage of the wheels from 0 to 9.

It is, therefore, the primary object of the present invention to provide a register having transfer mechanism of the "crawl" carry type with improved and simplified means to maintain the numeral wheels in aligned position upon either additive or subtractive operation.

The invention is herein disclosed as operating in conjunction with a register having "crawl" carry type of mechanism involving "entocyclic" gearing substantially as disclosed in Patent No. 1,828,180 to Clyde Gardner. As disclosed in the aforementioned patent, an eccentrically mounted intermediate gear transmits digital actuation to a numeral wheel. Upon actuation of the next lower order wheel, the intermediate gear is eccentrically operated to transmit the carry or transfer movement which is merged with the digital actuation upon simultaneous actuation of the wheels.

According to the present invention, each wheel is provided with a cam having opposed cam faces. In effect, the faces comprise an external and an internal cam of "snail" type contour. Upon additive actuation of a numeral wheel from 0 to 9, the external cam in conjunction with a cam follower operates to control means whereby carry movement transmitted to the next higher order wheel is counteracted and upon movement of the lower order wheel from 9 to 0, the cam permits a movement equal to the counteracted movement to be transmitted to the higher order wheel. Conversely, upon subtractive operation from 9 to 0, the internal cam controls the counteracting movement, and upon passage from 0 to 9 the cam permits the transmission of the counteracted movement. The invention, however, will best be

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understood from the following description with reference to the accompanying drawings in which:

Fig. 1 is a right side view showing one of the control cams in section and the digital actuator drive train for the next higher order numeral wheel.

Fig. 2 is a top plan view of a pair of the numeral wheels showing the actuator drive train of the higher order wheel and the cross over connections to the carry control cam of the lower order wheel.

Fig. 3 is a front elevation of the parts shown in Fig. 2.

Fig. 4 is an enlarged sectional view of the control cam shown in Fig. 1.

Fig. 5 is an exploded perspective of one of the numeral wheels, the "entocyclic" gearing therefor and the carry control cam.

The register

The register comprises a series of ordinaly arranged numeral wheels 1, two of which are shown in Figs. 2 and 3. The wheels are rotatably mounted on a common shaft 2 (Figs. 3 and 5) and each wheel has a 20-tooth internal gear 3 fixed to its left inner side face. An 18-tooth intermediate gear 4 is meshed with each of the internal gears 3 and is rotatably mounted on an eccentric 5. Each eccentric 5 is rotatably mounted on shaft 2 and has a shank 5a extending to the right and keyed to the hub 1a of the next lower order numeral wheel to provide driven connection therewith. Digital actuation is transmitted to each intermediate gear 4 by a 1 to 1 coupling comprising a toothed wheel 4a fixed to the associated intermediate gear 4 and a cup-shaped member 6 having leftwardly extending teeth meshing with the toothed wheel. Each of the cup-shaped members 6 is fixed concentrically with a digital input gear 7 which is rotatably mounted on the shank 5a of the associated eccentric 5. Digital actuation of a wheel 1 is effected by a one ninth turn, for each digit value, of its input gear 7 which through the 1 to 1 coupling 6—4a will rotate intermediate gear 4 one ninth turn on eccentric 5. Therefore, because of the 9 to 10 ratio between intermediate gear 4 and the internal gear 3, wheel 1 will be rotated one tenth of a turn for each digit value.

A digital input transmission train for each numeral wheel 1 may comprise, for example, a floating intermediate gear 8 meshing with the gear 7 of the wheel, a gear 9 meshing with gear 8 and rotatably mounted on a shaft 16, a gear

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10 integral with gear 9, and a gear 11 meshing with gear 10 and driven forwardly or reversely by any suitable differentially operable actuating mechanism (not shown).

Normally, upon digital actuation of a wheel 1, eccentric 5 driven therewith would eccentrically operate the intermediate gear 4 of the next higher order wheel and thereby transmit a one tenth step of carry movement for each revolution as fully disclosed in the aforementioned Patent No. 1,828,180. Control means, however, are provided to counteract carry movement to the next higher order wheel upon additive digital movement of the lower order wheel from 0 to 9 and to transfer a movement equal to the counteracted carry movement to the higher order wheel upon passage of the lower order wheel from 9 to 0. Also, upon subtractive operation of a lower order wheel from 9 to 0, means are provided to counteract the carry movement and to transfer the equivalent of the same to the higher order wheel upon passage of the lower order wheel from 0 to 9.

The control means includes a cam 12 integral with and extending from the left side face of each numeral wheel 1, or fixed for rotation therewith in any suitable manner. The cams 12 each have an external face 12a and an internal face 12b of "snail" type configuration. The 0 to 9 positions are indicated on the enlarged view of the cam (Fig. 4). A cam follower comprising a pin 13 (Figs. 1 and 3) mounted at the lower end of an arm 14 normally held in central, substantially vertical position by leaf spring 14a (Figs. 1 and 4) is disposed with a slight clearance, between the cam faces 12a and 12b of each cam 12. Arms 14 are each rotatably mounted at their upper ends on the forward ends of levers 15 which are fulcrumed on shaft 16 on which gears 9, 10 are mounted. At the rearward end of each lever 15 is a pair of oppositely disposed leaf springs 17 and 18. A shaft 19 extends between the springs 17 and 18 and is supported at the forward ends of a pair of arms 20, one of which is shown in Fig. 1. The arms 20 are fixed at their rearward ends on a rock shaft 21, to which is also fixed a setting lever 22 having a pair of notches 23 and 24 at its lower end. Notches 23 and 24 are adapted for engagement by a detent 25 thereby holding lever 22 in either clockwise or counterclockwise position.

Each intermediate gear 8 of the digital transmission trains is mounted intermediate the fulcrum 16 and the forward end of lever 15 of the next lower order. Therefore, upon clockwise movement of a lever 15, the gear 8 mounted thereon will be rotated clockwise about the gear 9 thereby imparting counterclockwise movement to gear 7 and to its numeral wheel. Conversely, upon counterclockwise movement of levers 15 the gears 8 will be rotated counterclockwise about gears 9 and clockwise movement will be imparted to the numeral wheels.

Additive operation

The register is set for additive operation upon movement of lever 22 to its clockwise position as shown in Fig. 1. Arms 20 and shaft 19 supported thereby will therefore be rocked in clockwise direction and thus shaft 19 will engage leaf springs 17 to tension the springs and urge levers 15 in counterclockwise direction. Upon rotation of a numeral wheel 1 from 0 to 9 in clockwise additive direction, pin 13 engaging cam face 12a of the associated cam 12 will, through arm 14, rock the lever 15 to which it is attached in clock-

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wise direction against the tension of its spring 17. Gear 8 of the next higher order digital transmission train mounted on lever 15 will therefore be rotated clockwise about gear 9 of the train thereby driving gear 7 of the next higher order numeral wheel counterclockwise to counteract the carry movement which would normally be transferred to the wheel. However, upon passage of the lower order wheel from 9 to 0, lever 15 will be rocked by its spring in counterclockwise direction as pin 13 is moved from the high portion to the low portion of cam face 12a. This movement of lever 15 will effect counterclockwise rotation of intermediate gear 8 of the next higher order transmission train thereby effecting a movement of the higher order wheel in additive direction equal to the counteracted carry movement.

If, upon high-speed operation of a numeral wheel, pin 13 falls to move downwardly from the high to the low portion of cam face 12a in time to prevent interference by engagement with the straight face 12c (Figs. 1 and 4) of cam face 12b, link 14 will be permitted counterclockwise movement (Fig. 1) by centralizing spring 14a. However, when pin 13 is moved into engagement with cam face 12a, centralizing spring 14a will be of sufficient strength to restore arm 14 to the vertical position shown in Fig. 1.

Subtractive operation

Lever 22 will be moved counterclockwise, thereby moving shaft 19 into position to tension leaf springs 18 and to urge levers 15 clockwise. Cam follower pins 13 will therefore be urged away from external cam faces 12a and against the internal faces 12b of the cams 12. Upon counterclockwise subtractive movement of a numeral wheel from 9 to 0, pin 13 engaging cam face 12b will operate to rock the associated lever 15 counterclockwise, and through the movement of the intermediate gear 8, counteract the carry movement to the next higher order wheel. Upon passage of the lower order wheel from 0 to 9, the lever 15 will be rocked clockwise by its leaf spring 18 and pin 13 will be moved from the low to the high portion of the cam face 12b, thereby effecting a movement of the higher order wheel in subtractive direction equal to the counteracted movement. In like manner, as described in connection with additive operation, should pin 13 engage the straight face 12d (Fig. 4) of cam face 12a, link 14 will yield and thereafter be straightened by its centralizing spring as the pin 13 is brought into engagement with cam face 12b.

Although the invention is disclosed as operating in conjunction with "crawl" carry transfer means of the "entocyclic" type as disclosed in the aforementioned patent, it will be obvious that the invention is equally adaptable for use in conjunction with "crawl" carry mechanism of the planetary type such as disclosed in Patent No. 2,211,736. In this embodiment of the invention, levers 15 would have connection with the planet gears of the numeral wheels which are adjustable to counteract the carry movement as disclosed in the patent. Furthermore, although the external cam faces 12a have been disclosed as utilized in conjunction with additive and the internal cam faces 12b with subtractive actuation, it will be obvious that the operation may be reversed by reversing the numerals on the register wheels. The invention, therefore, is to be restricted only as necessitated by the spirit of the appended claims.

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I claim:

1. In a register comprising numeral wheels having carry mechanism of the crawl type between said wheels, and reversible differential actuators for said wheels; the combination with a lower and a higher order wheel, of a cam having oppositely disposed faces and rotatable with said lower order wheel, a cam follower disposed between said cam faces, drive means operable by said cam follower to counteract the carry movement transmitted to said higher order wheel upon rotation of said lower order wheel in either direction, and upon rotation of said lower order wheel from 0 to 9 or from 9 to 0 registering position to rotate said higher order wheel in the direction of and a distance equal to said counteracted movement.

2. In a register comprising numeral wheels having carry mechanism of the crawl type between said wheels, and reversible differential actuators for said wheels; the combination with a lower and a higher order wheel, of a cam rotatable with said lower order wheel and having an external and an internal face, a cam follower, selectively operable means for biasing said follower toward said external face or alternatively toward said internal face, drive means controlled by said follower when biased toward one or the other of said cam faces to counteract carry movement transmitted to said higher order wheel upon rotation of said lower order wheel in one or the other direction respectively, and upon rotation of said lower order wheel from 0 to 9 or from 9 to 0 registering position to rotate said higher

order wheel in the direction of and a distance equal to said counteracted movement.

3. In a register comprising numeral wheels having carry mechanism of the crawl type between said wheels, and reversible differential actuators for said wheels; the combination with a lower and a higher order wheel, of drive means for said higher order wheel operable to counteract carry movement transmitted thereto by said lower order wheel, a cam rotatable with said lower order wheel and having an external and an internal face, a cam follower, a lever connected with said cam follower and with said drive means, and spring means selectively operable through said lever to bias said cam follower toward said external cam face or alternatively toward said internal cam face, whereby upon rotation of said lower order wheel in one or the other direction respectively said drive means is operable to counteract the carry movement transmitted to said higher order wheel, and upon rotation of said lower order wheel from 0 to 9 or from 9 to 0 registering position to rotate said higher order wheel in the direction of and a distance equal to the counteracted carry movement.

4. The invention according to claim 3 wherein said cam follower is connected with said lever by a yieldable mounting.

5. The invention according to claim 4 wherein the yieldable mounting comprises a spring centralized link.

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No references cited.