Oct. 13, 1936. O. J. SUNDSTRAND 2,057,400

ALGEBRAIC TOTALIZER

Filed July 5, 1934

Fig. 1

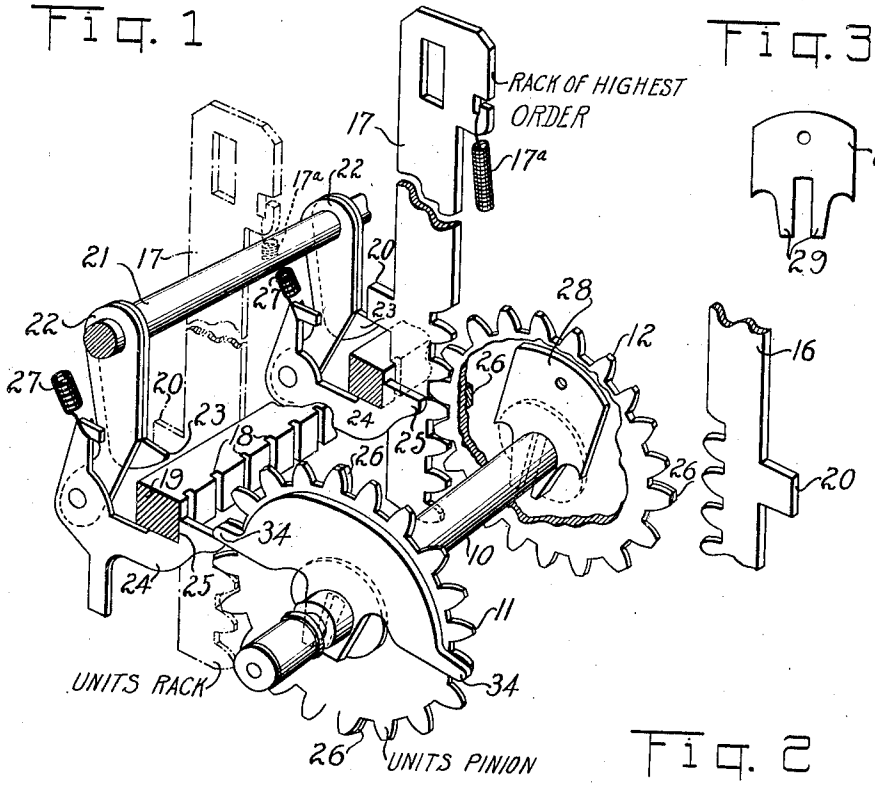


Fig. 3

Fig. 2

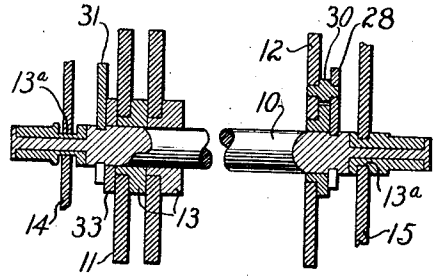


Fig. 5

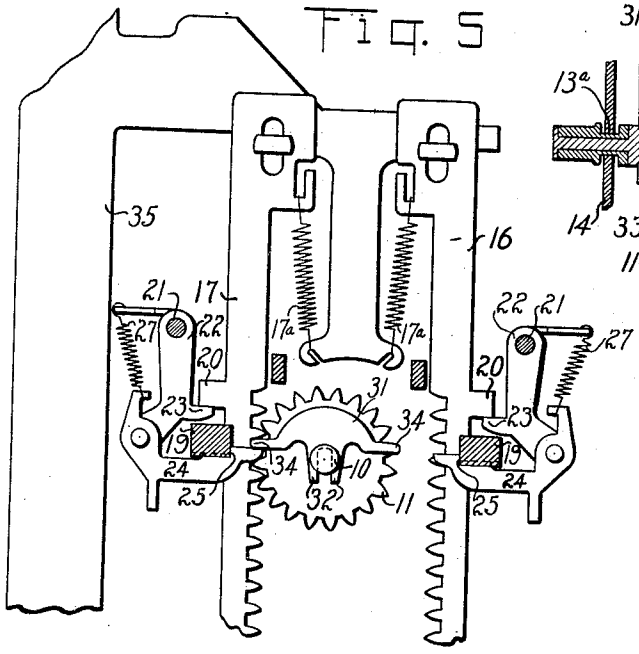
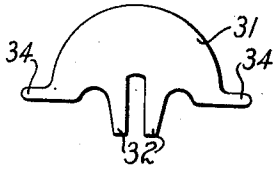


Fig. 4



INVENTOR
Oscar J. Sundstrand.
BY
ATTORNEY

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ALGEBRAIC TOTALIZER

Oscar J. Sundstrand, Bridgeport, Conn., assignor to Underwood Elliott Fisher Company, New York, N. Y., a corporation of Delaware

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3 Claims. (Cl. 235—60)

The invention relates to computing machines and more particularly to adding and subtracting totalizers therefor.

In the so-called direct subtraction type of calculating machine, an error of one occurs, when the totalizer moves from a positive to a negative condition, in the accumulation of subtractive amounts. Similarly, when the totalizer is operated for the accumulation of positive amounts so as to cause its condition to change from negative to positive character, the total represented by the positions of the respective wheels of the totalizer will be one less than the true positive total.

In machines of the class under consideration the error above described is corrected by the introduction of a fugitive one, it being understood that the fugitive one is introduced either subtractively, or additively, dependent upon whether the total standing in the totalizer is of a negative or positive character.

The present invention has for its object the provision of new and improved means for automatically effecting the introduction of the fugitive one.

In the accompanying drawing Figure 1 is a fragmental perspective view of one form of machine embodying the features of my invention.

Figure 2 is a detailed sectional view of some of the parts shown in Figure 1.

Figures 3 and 4 are elevational views of certain parts shown in assembled relation in Figures 1 and 2.

Figure 5 is a side elevation of both the adding and subtracting racks and the separate transfer mechanisms therefor.

The invention is herein exemplified in connection with mechanism of the general character disclosed in the Sundstrand Patents Nos. 1,198,487, 1,481,487, 1,583,102, and in my co-pending application Serial No. 118,628 filed June 26, 1926, (corresponding to French Patent No. 625,678) and my application Serial No. 670,665 filed October 25, 1923, (now Patent No. 1,965,611).

Reference may be made to the above-mentioned patents and application for an understanding of features not fully illustrated or described herein. It should, however, be understood that the present invention is not limited to machines of the Sundstrand type.

Referring to the drawing, a totalizer shaft is indicated at 10, a totalizer pinion of lowest denominational order at 11, and a totalizer pinion of highest denominational order at 12. It will be understood that any desired number of pinions of intermediate orders may be utilized, each such pinion of intermediate order being journaled for free rotary movement on the shaft 10, and spaced apart, one from the other, by bushings 13. As is typical of the Sundstrand machine, the totalizer shaft 10 is mounted for bodily movement forward and rearward of the machine in horizontal slots 13a in side walls 14 and 15 of a totalizer-supporting frame.

Such bodily movement of the totalizer shaft is effective to engage the totalizer pinions with either one of two sets of actuating racks. One such set of racks is arranged to rotate the pinions of the totalizer in a clockwise direction as viewed in Figure 5, for the accumulation of additive amounts, whereas the second set of actuating racks is effective to rotate the pinions in a counter-clockwise direction for the accumulation of subtractive amounts. The adding set of actuating racks is represented in the present instance by the rack 16 and the set of subtracting racks by the rack 17.

As is fully disclosed in the before-mentioned Sundstrand patents and application, the respective sets of adding and subtracting racks are arranged to be elevated differential distances corresponding to the amounts set up on the keyboard, as an incident to a cyclic operation of the machine.

Prior to the upstroke of the racks in an accumulating cycle, the totalizer is moved to a neutral position intermediate the two sets of racks and just prior to the downstroke of the racks the totalizer pinions are meshed with whichever set of racks is to be used in the accumulating operation.

It will also be understood that in a total taking operation the totalizer pinions are meshed with the selected set of racks during the upstroke of the latter.

The racks are connected to type bars 35 (Fig. 5), an adding and a subtracting rack being associated with each type bar by pin and slot connections permitting of one step of movement of each rack relative to the type bar to which it is articulated. The several racks are guided for vertical movement in slots 18 (Fig. 1), formed on the inwardly facing surfaces of a pair of similar bars 19 (Fig. 5), which extend longitudinally of the totalizer and are supported in the side walls 14 and 15 of the totalizer-supporting frame.

Each rack has integrally formed therewith a lug 20, which moves in the vertical plane of its respective bar 19, and is arranged to be arrested

thereby to define the extreme downward position of the racks.

Transfer mechanism of any desired form may be employed.

In the present disclosure, similar rods 21 are carried in the side walls 14—15 in spaced parallel relation at opposite sides of the two sets of racks. These rods operatively support a plurality of stop pawls 22, one such pawl being provided for each adding and subtracting rack. A stop lug 23 is formed integrally with each of the respective stop pawls in a position to coact with the lugs 20 on the respective racks to support the latter one step of movement above the bars 19. To the lower end of each stop pawl 22 is pivoted a dog 24, having a tooth 25 to engage the edge of the adjacent bar 19.

The means for disengaging the tooth 25 from the bar 19 consists of two diametrically opposite lugs 26, fixed to one side of each pinion. When the amount registered by a pinion reaches 9, continued rotation of the pinion as its rack descends brings one of the lugs 26 against the end of the dog 24 associated with the next higher rack, thereby depressing the dog until its tooth 25 is clear of the bar 19, whereupon a spring 27 (assisted by the downward pressure of the spring 17a of the said next higher order rack) moves the dog and the pawl 22 away from the last mentioned rack, the latter then moving down one tooth space where it is stopped by contact of its lug 20 with the bar 19. All of the beforementioned features are common to the Sundstrand patents and application hereinbefore enumerated and reference may be had to them for a more complete description of the functions and operation of the several parts concerned.

The rack 17 of highest order is shown in the drawing as supported by the lug 23 of a pawl 22. That lug is withdrawn by the spring 27 when the transfer dog 24 pivoted to said pawl is tripped by a lug 26 on the pinion of next to highest order, in the operation of carrying from the next to the highest order to the highest order.

The lugs 26 on the pinion of highest order perform no useful function in accumulation, but function in total-taking by stopping against the under side of the end of a transfer dog 24.

Means is provided to advance the pinion 11 of lowest order, a distance corresponding to one unit, in either an adding or subtracting direction, as an incident to a passage of the pinion 12 of highest order through zero.

To this end the pinion 12 of highest order is non-rotatably secured to the shaft 10 and the latter element in turn is provided with means effective to displace the dog 24 associated with the rack 17 of units order so as to permit that rack to move downwardly one unit of distance and thus rotate the units pinion 11 a corresponding amount.

In the present instance, the pinion 12 is fixed against rotation with respect to shaft 10 through the medium of a plate 28, arranged to be keyed to the shaft 10 by means of spaced arms 29 which engage parallel key surfaces formed in the body of shaft 10 normally of its axis. As will be seen from Figure 2, the pinion 12 is secured to the plate 28 by means of a coupling pin 30.

The dogs 24, associated with the adding and subtracting racks of units order, are arranged to be displaced by the rotary movement communicated to shaft 10 by highest order pinion 12.

To this end, an irregularly shaped plate 31 is keyed to the shaft 10 at the left of the pinion 11 of units order (as viewed in Figure 2). Spaced arms 32, formed integrally with the plate 31 are arranged to engage diametrically opposed parallel key surfaces formed in the shaft 10. A spacing washer 33 separates the pinion of lowest order from plate 31, to insure freedom of rotation of the pinion with respect to the plate.

The plate 31 includes a pair of fingers 34, which extend radially of the axis of shaft 10, when the parts are in assembled relation. The fingers 34 rotate in the plane of the dogs 24 of units order so as to displace the latter as the pinion of highest order passes through zero in either an adding or subtracting operation.

It will be evident that I have provided a new and improved means to effect the introduction of the fugitive one in the pinion of lowest order of an algebraic totalizer as an incident to a passage of the pinion of highest order through zero.

I claim as my invention.

1. In a machine of the class described, a totalizer shaft, totalizer wheels mounted thereon, the wheel of highest order being secured thereto, two sets of actuating racks located on opposite sides of the wheels, a separate set of transfer mechanism for use with each set of racks, a plate secured to the shaft adjacent the wheel of lowest denomination and having two teeth, means controlled by one of the teeth to enter a unit in the totalizer in one direction when the wheel of highest order is turned through zero by one set of racks either through item entry or transfer and means controlled by the other tooth to enter a unit in the totalizer in the other direction when the wheel of highest order is turned through zero by the other set of racks either through item entry or transfer.

2. In a machine of the class described, a totalizer shaft, totalizer wheels mounted thereon, the wheel of highest order being rotatable with said shaft, two sets of actuating racks located on opposite sides of the wheels, a separate set of transfer mechanism for use with each set of racks, a plate secured to the shaft adjacent the wheel of lowest denomination and having two teeth, means controlled by one of the teeth to enter a unit in the totalizer in one direction when the wheel of highest order is turned through zero by one set of racks either through item entry or transfer and means controlled by the other tooth to enter a unit in the totalizer in the other direction when the wheel of highest order is turned through zero by the other set of racks either through item entry or transfer.

3. In a machine of the class described, a totalizer having a plurality of rotatable wheels, a part rotated in coordination with the wheel of highest order and, extending through the hubs of the other wheels, two sets of actuating racks located on opposite sides of the wheels, a separate set of transfer mechanism for use with each set of racks, an element carrying two teeth and located adjacent the wheel of lowest denomination, the element being connected for movement by the said part, means controlled by one of the teeth to enter a unit in the totalizer in one direction when the wheel of highest order is turned through zero by one set of racks either through item entry or transfer, and means controlled by the other tooth to enter a unit in the totalizer in the other direction when the wheel of highest order is turned through zero by the other set of racks either through item entry or transfer.

OSCAR J. SUNDSTRAND.